NEW GEOSPATIAL TECHNOLOGIES TO SUPPORT RESULTS-BASED REDD+ ACTIONS IN DEVELOPING COUNTRIES

In the recent years, FAO in collaboration with Google has developed new technologies to support developing countries in monitoring and assessing their territories.

Here we present Collect Earth and Earth Map

COLLECT EARTH

Earth Map

Food and Agriculture Organization of the United Nations

Food and Agriculture Organization of the United Nations

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

The International Climate Initiative (IKI)

Collect Earth

an innovative tool

Danilo Mollicone

Ingredients for the success:

1) Open source software

2) Developed on Google technology

3) Rely of existing open source software (e.g. Saiku)

4) Learning from what is working

5) A clear strategy from measurements to submission under

Learning from what is working:

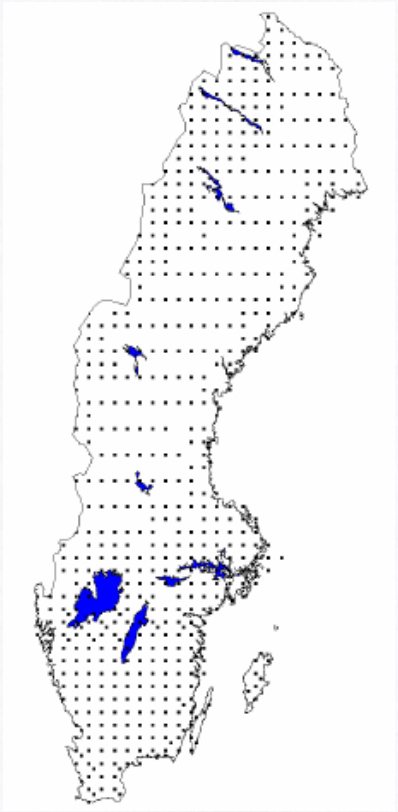
Collect Earth has been developed by learning from experiences from Annex I countries reporting activity data under UNFCCC

All Annex I countries use IPCC Approach 3 to assess activity data:

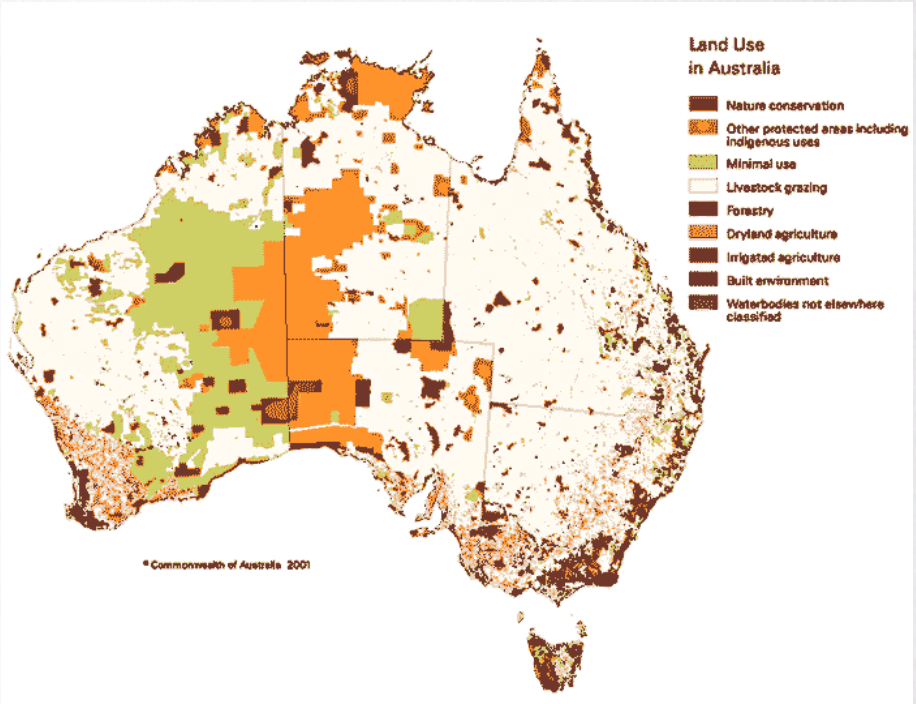
39 countries use
mainly sampling approaches

3 countries use
mainly wall to wall approaches

Sweden



Australia

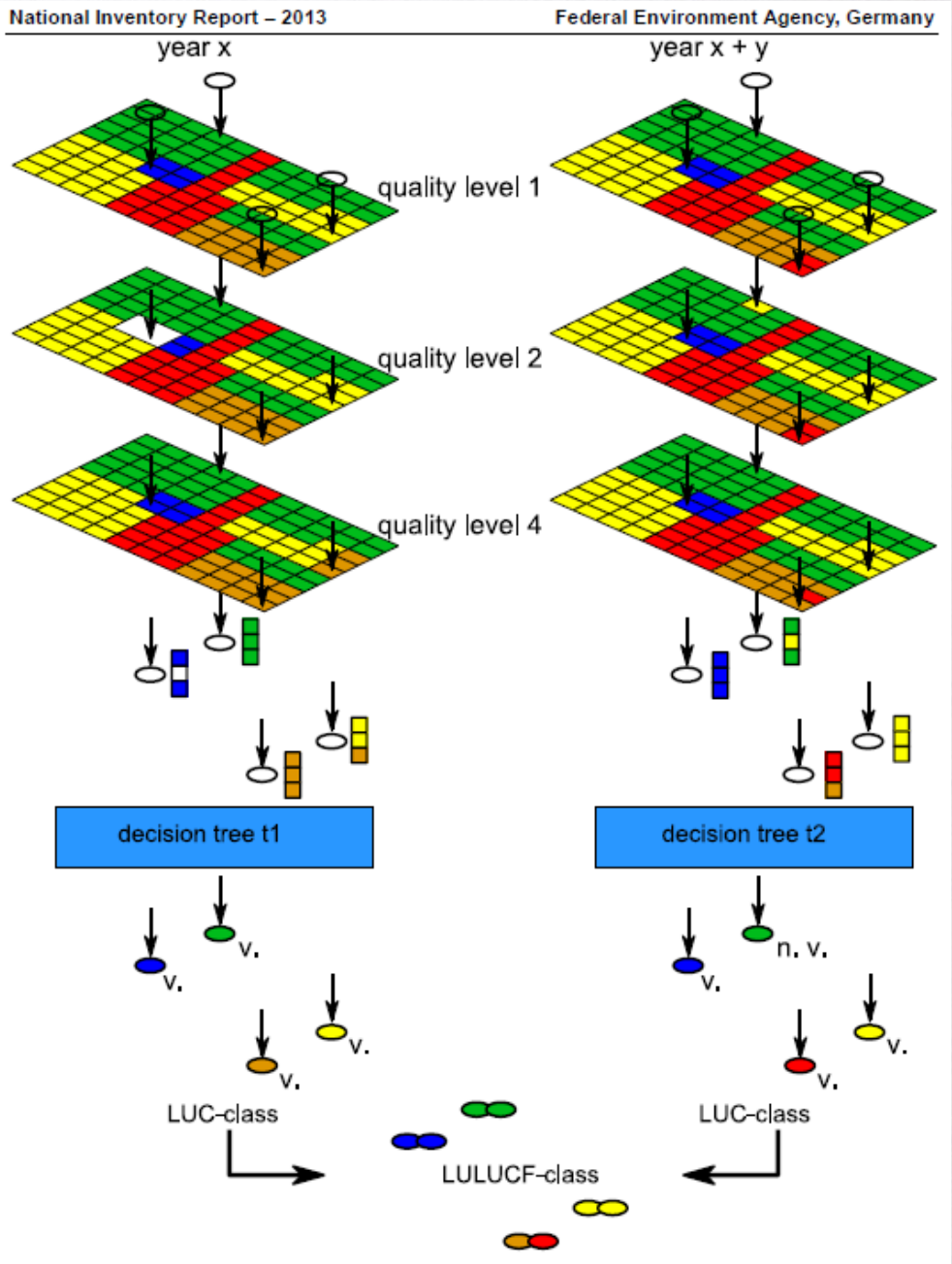


National Inventory Report
Germany

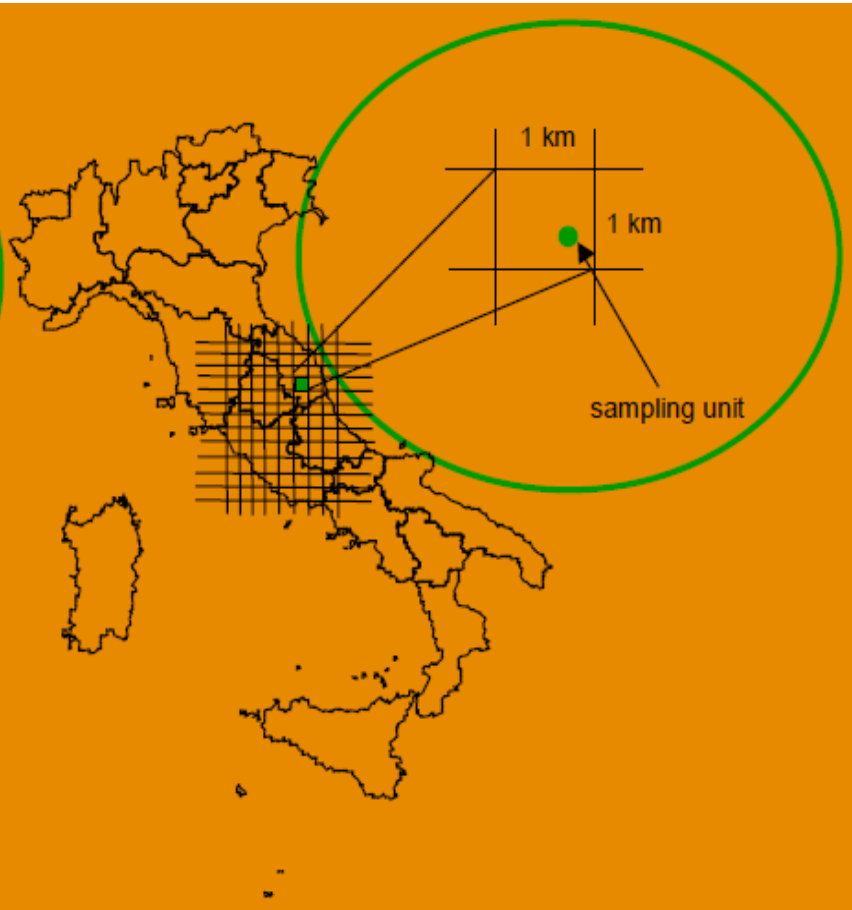
Schematic representation of allocation of sample points to a land-use category

GHG NIR Germany 2013
http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/7383.php

The National Forest Inventory surveys the state of forests, and of forest production potential, on a large scale throughout Germany, using a standardised sampling procedure. The National Forest Inventory is a terrestrial sampling inventory that uses permanently marked sample points in a 4 km x 4 km basic grid whose resolution, at the request of the Länder, has been increased on a regional basis



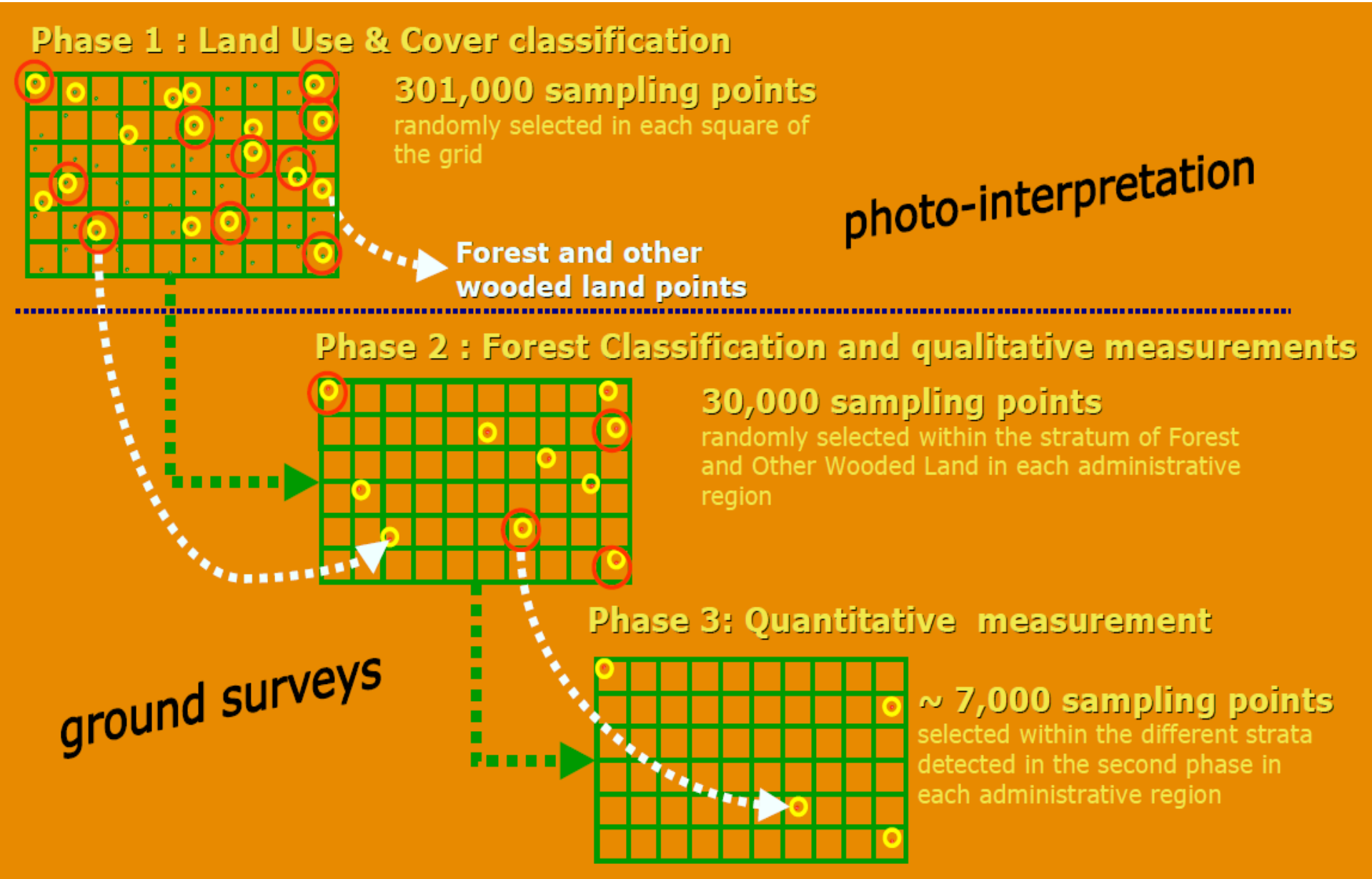
The Italian sampling system (within NFI)



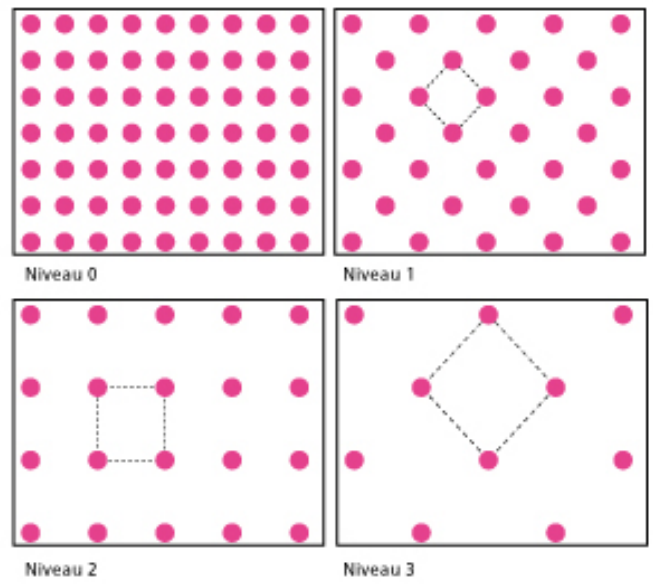
IFNI85
30,000 sampling units
Aligned Systematic Sampling
One-phase Sampling Design

INFC2005
300,000 sampling units
Unaligned Systematic Sampling
Three-phase Sampling Design

The Italian multi-phase sampling system (within NFI)



France NFI multi-phase sampling design



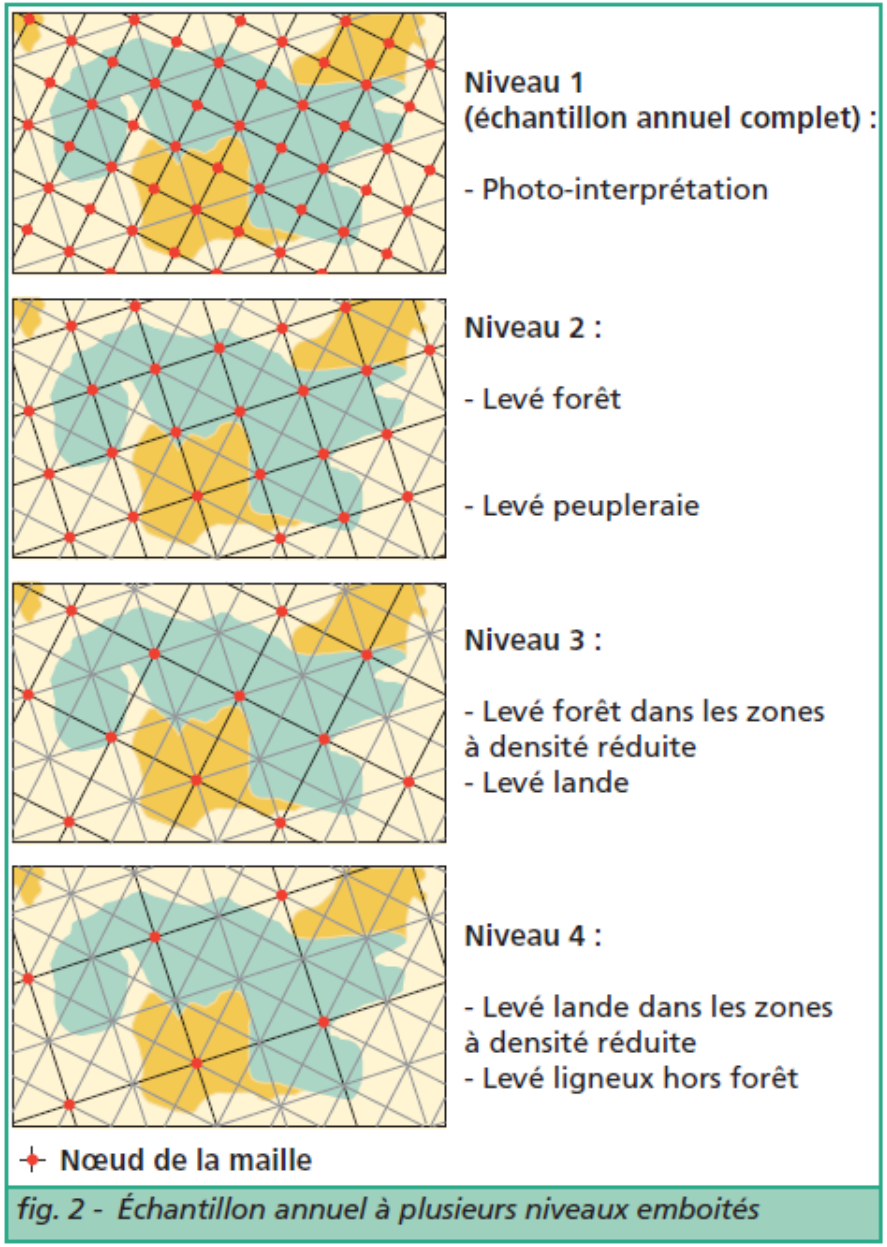
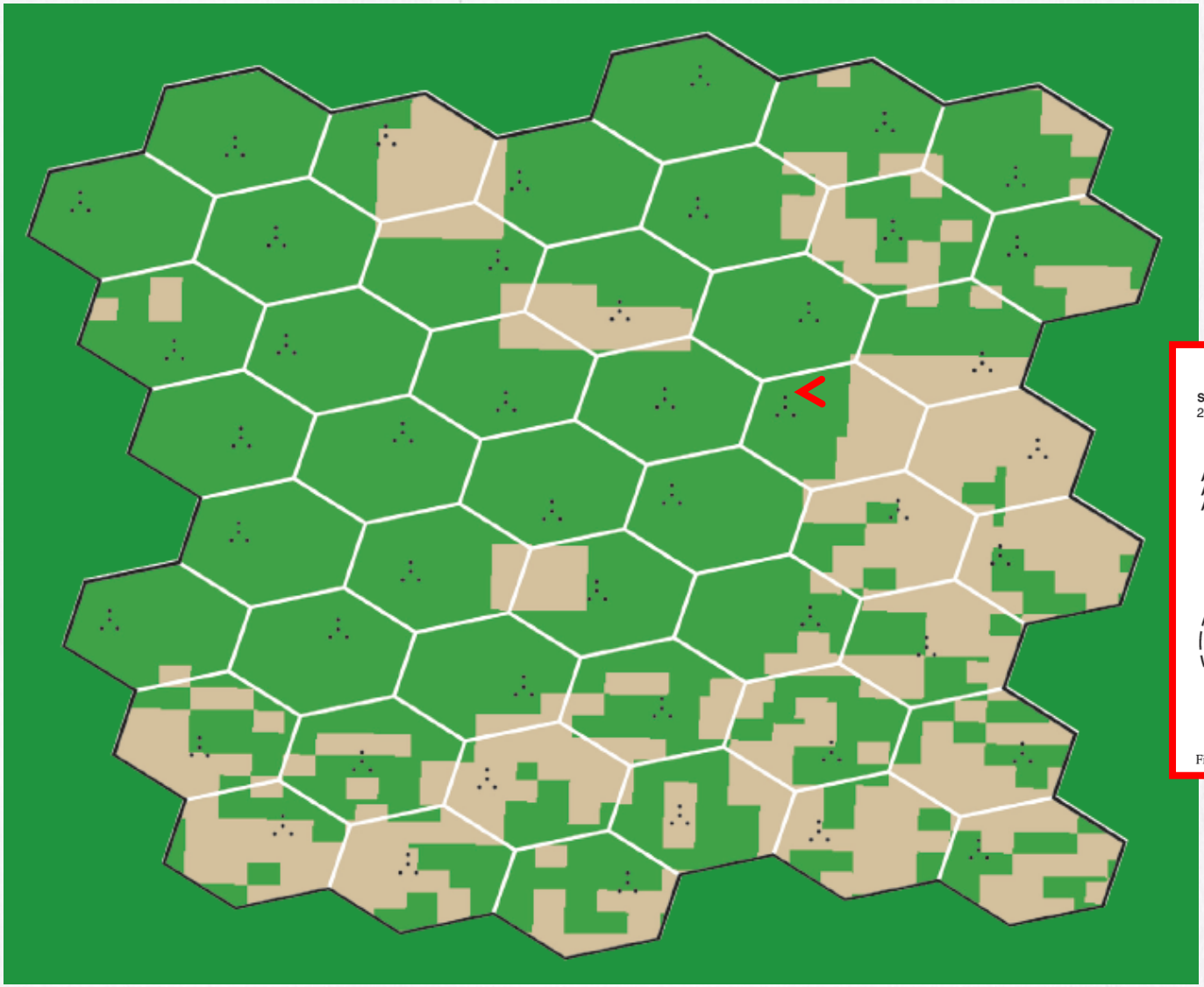


fig. 2 - Échantillon annuel à plusieurs niveaux emboités

USA NFI multi-phase sampling design



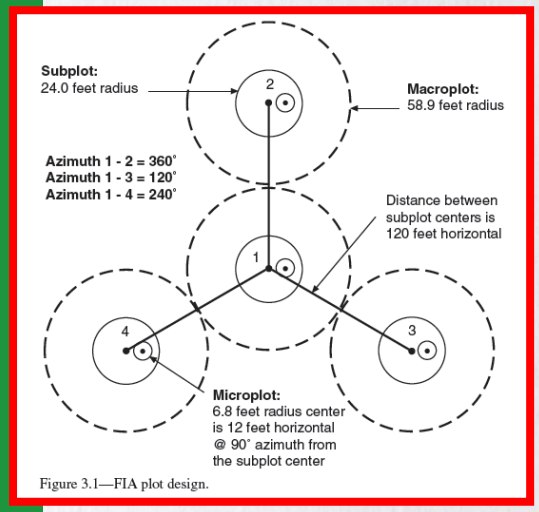


Figure 3.1—FIA plot design.

USA NFI multi-phase sampling design

Table 2.1—Summary of general attributes associated with FIA Phase 1, Phase 2, and Phase 3 sampling

Attribute	Phase 1	Phase 2	Phase 3
Sample type	Photo point or satellite pixel	Ground plot, subset of Phase 1	Ground plot, subset of Phase 2
Sample configuration	Point or pixel	Cluster of four 1/300-acre micro-plots, four 1/24-acre subplots, and optional four 1/4-acre macroplots	Same as Phase 2[a]
Purpose	Stratification[b] of the landscape for the purpose of variance reduction	Samples FIA traditional attributes of interest, primarily related to tree species of all sizes	Samples FIA traditional attributes of interest,[c] plus additional attributes associated with forest health
Tesselation method	Supplemental regional grid superimposed over the population of interest[d]	Systematic national hexagonal cell grid	Systematic national hexagonal cell grid (subset of Phase 2 grid)
Base-grid intensity	At the discretion of each FIA unit	One plot per every 6,000-acre hexagonal cell	One plot per every 1/16 6,000-acre hexagonal cell (i.e., one per 96,000 acres)

NFI Sampling design in Czech Republic

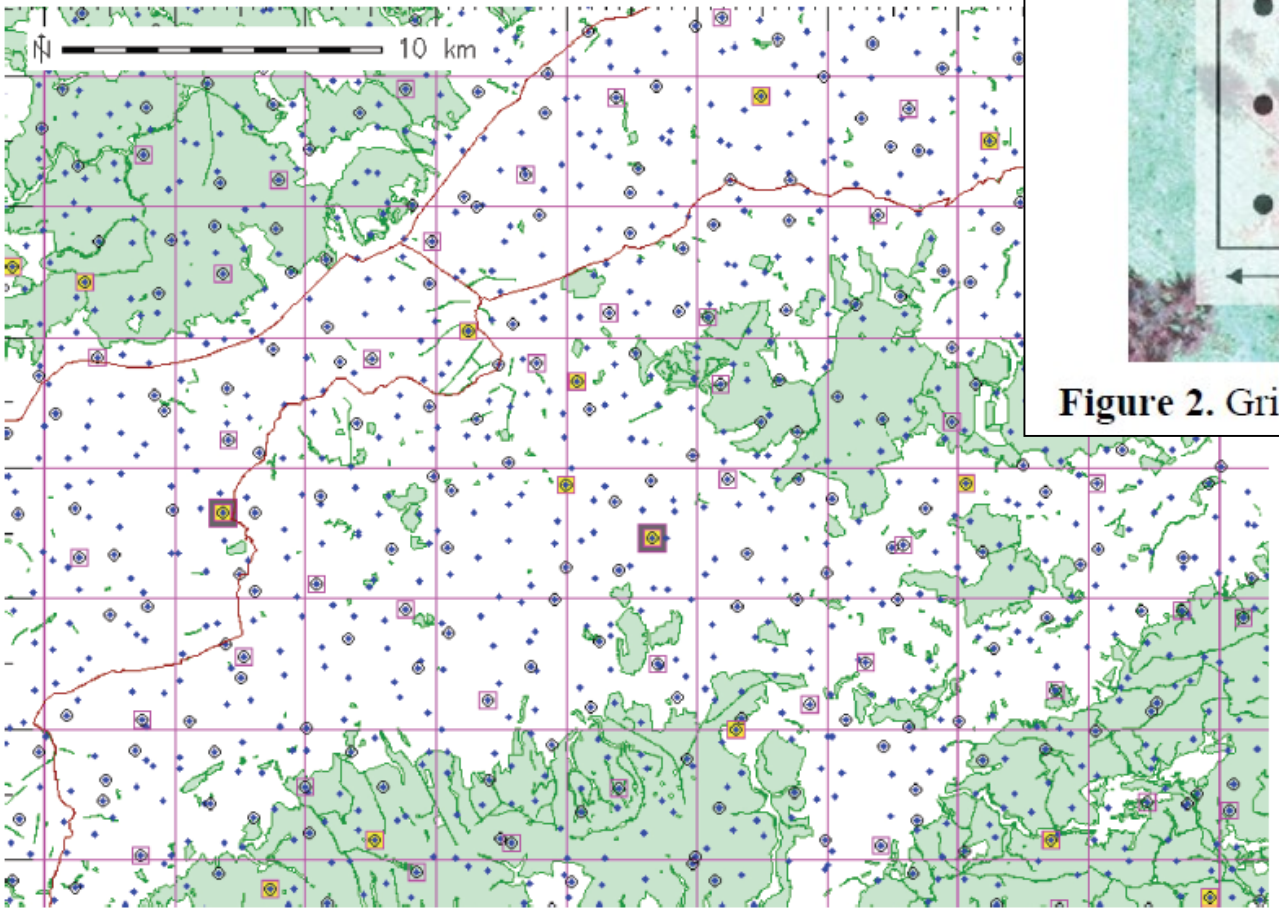


Figure 1. Czech NFI2 sampling grid.

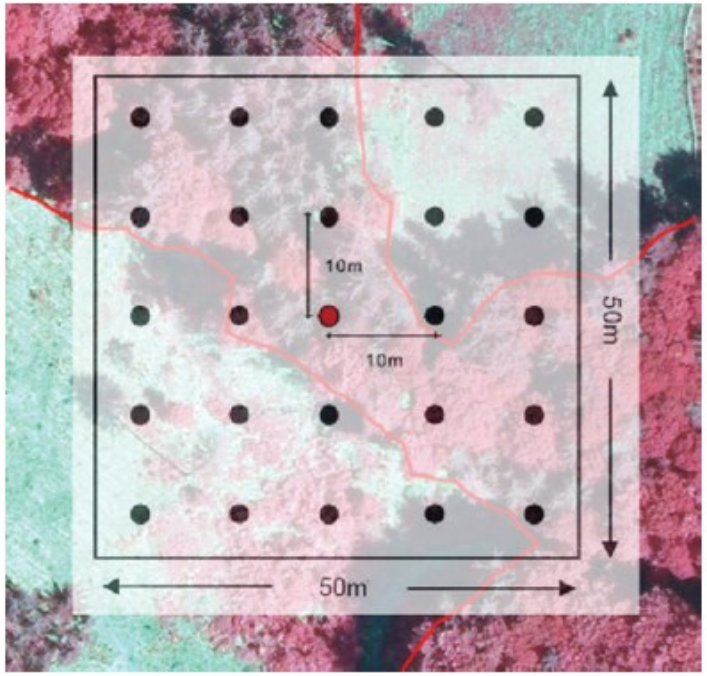


Figure 2. Grid points in the interpretation quadrate

The photogrammetric assessment will take part on a four times denser sample grid, with a limited set of acquired variables.

About the NFI
Inventory
Purpose
Methods
inventory concept
aerial photo interpretation
field survey
Organisation
Content
Implementation
Projects
Results
Services
Publications
Glossary / dictionary
Contact

Inventory concept

There are more than 500 million trees in Switzerland - far too many to investigate individually. Random sampling, however, yields adequate information. For that purpose a 1km-grid was mapped over Switzerland in the first NFI. The intersections defined the location of the sample plots in the forest.

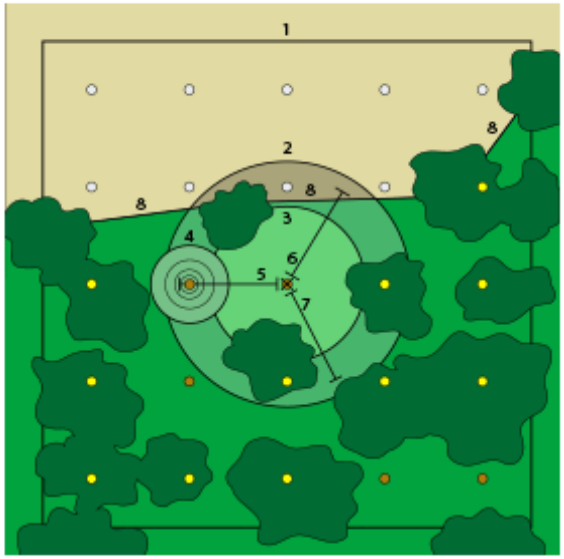
Since the second NFI, only half of these plots, roughly 6500, have been located in the field. The grid, which originally had a mesh size of 1 km, was extendend to 1.4 km. To compensate for this reduction, the aerial photos were interpreted in a grid of 500 m.

The same methods have been carried out since switching from a periodic to a continuous survey in the fourth NFI, but the sample plots are now located over a period of nine years. Thereby another ninth of the sample plots, which are evenly distributed all over Switzerland, are surveyed every year.

Circles and radii of sample plots

The center of the sample plot is marked by a metal pole in the ground. Roughly 130,000 sample trees were measured in the NFI1 and marked so as they can be found again in later inventories. Thanks to the exact sketches, about 98% of the sample plots could be found directly during the NFI2 without having to search for them. In the NFI4, the position of the centers of the sample plots are located exactly with a GPS.

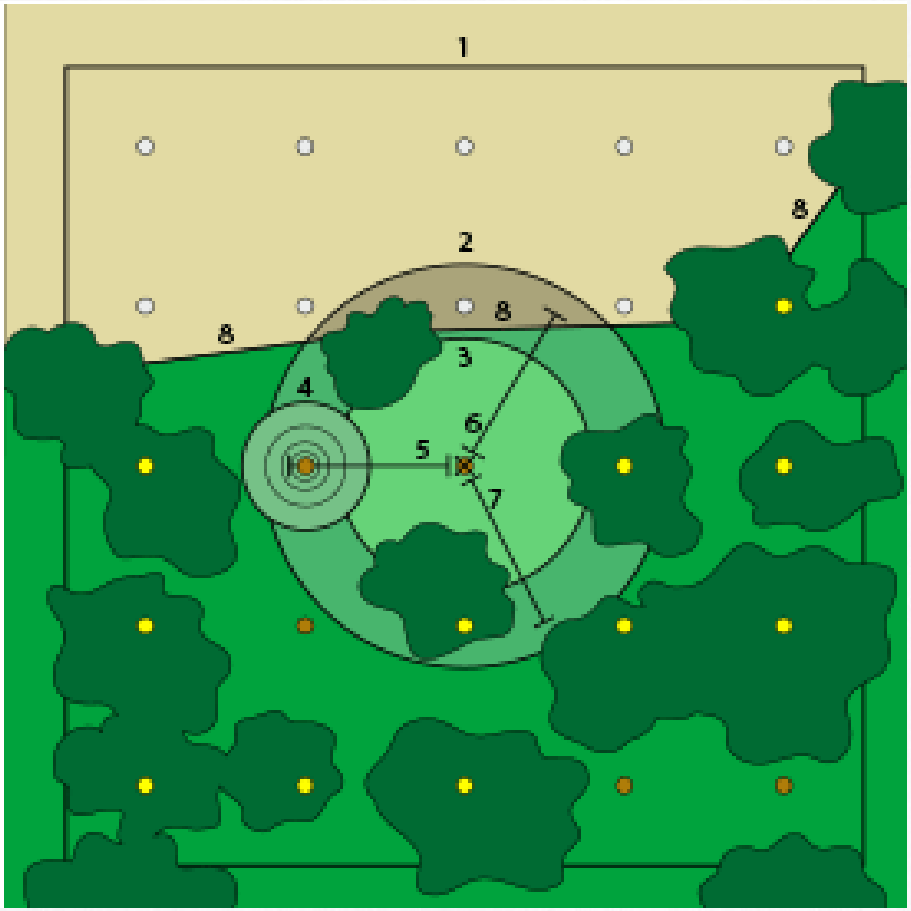
Within a 200 m^2 circle, every tree which has a diameter larger than 12 cm is recorded, and within a 500 m^2 circle, every tree which has a diameter larger than 36 cm is recorded. These diameters are measured at a height of 1.3 m (diameter at breast height DBH). The radii are 7.98 m (r_1) and 12.62 m (r_2) on level terrain.



1 NFI3 sample plot
2 circle for survey of trees with a DBH greater than 36 cm.
3 circle for survey of trees with a DBH greater than 12 cm
4, 5 circle for survey of young forest
5, 6, 7 transect for survey of deadwood
X sample plot center

Movie of the first NFI (1983) (in German)

Swiss NFI sampling design



First Phase

1 Visual interpretation of NFI3 sample plots

Second Phase

2 circle for survey of trees with a DBH greater than 36 cm.

3 circle for survey of trees with a DBH greater than 12 cm

4, 5 circle for survey of young forest

5, 6, 7 transect for survey of deadwood

X sample plot centre

Collect Earth:

1) Open source software

2) Developed on Google technology

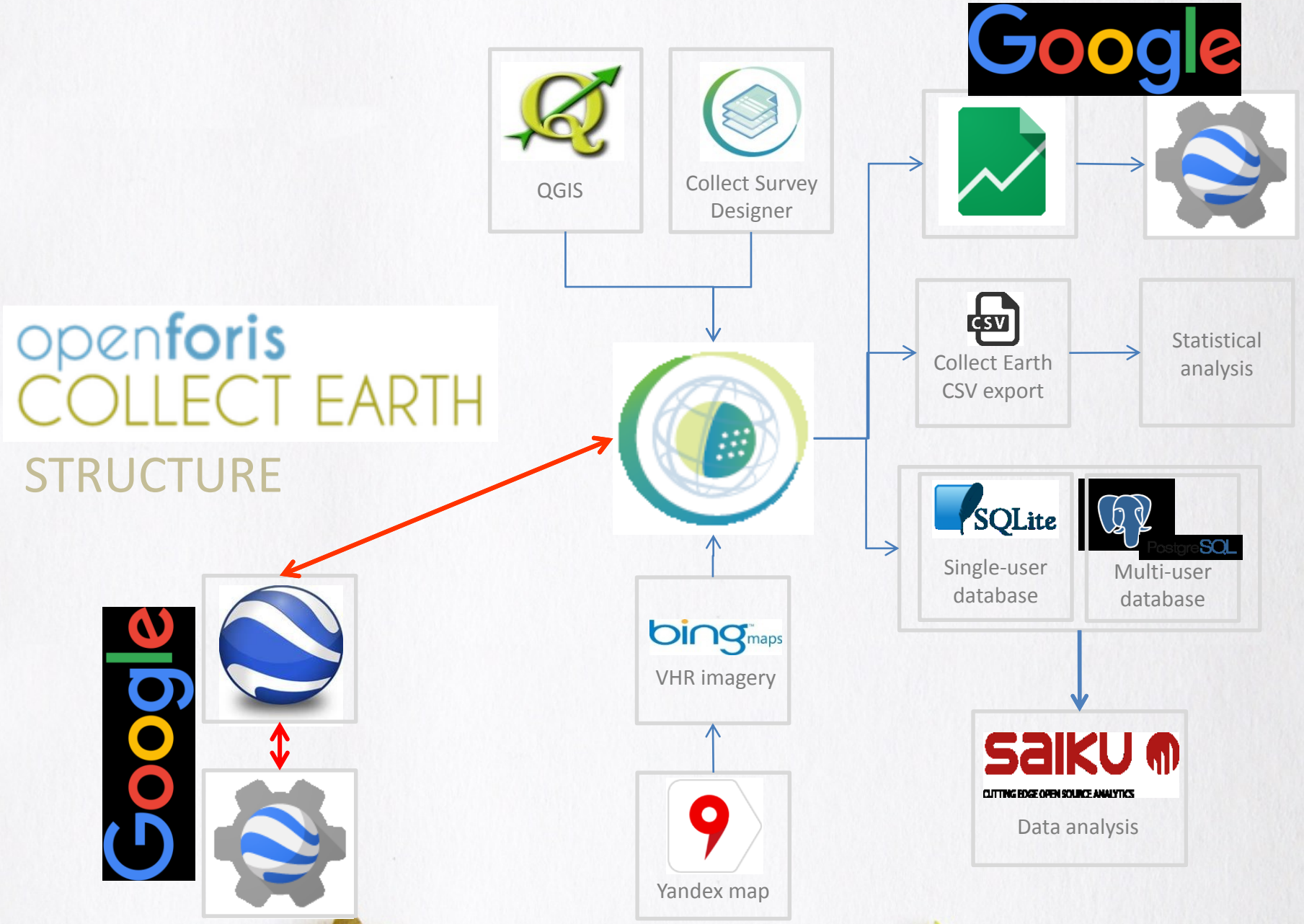
3) Rely of existing open source software (e.g. Saiku)

The *Open Foris Initiative* launched in October 2014. Five tools, and others on the way

www.openforis.org

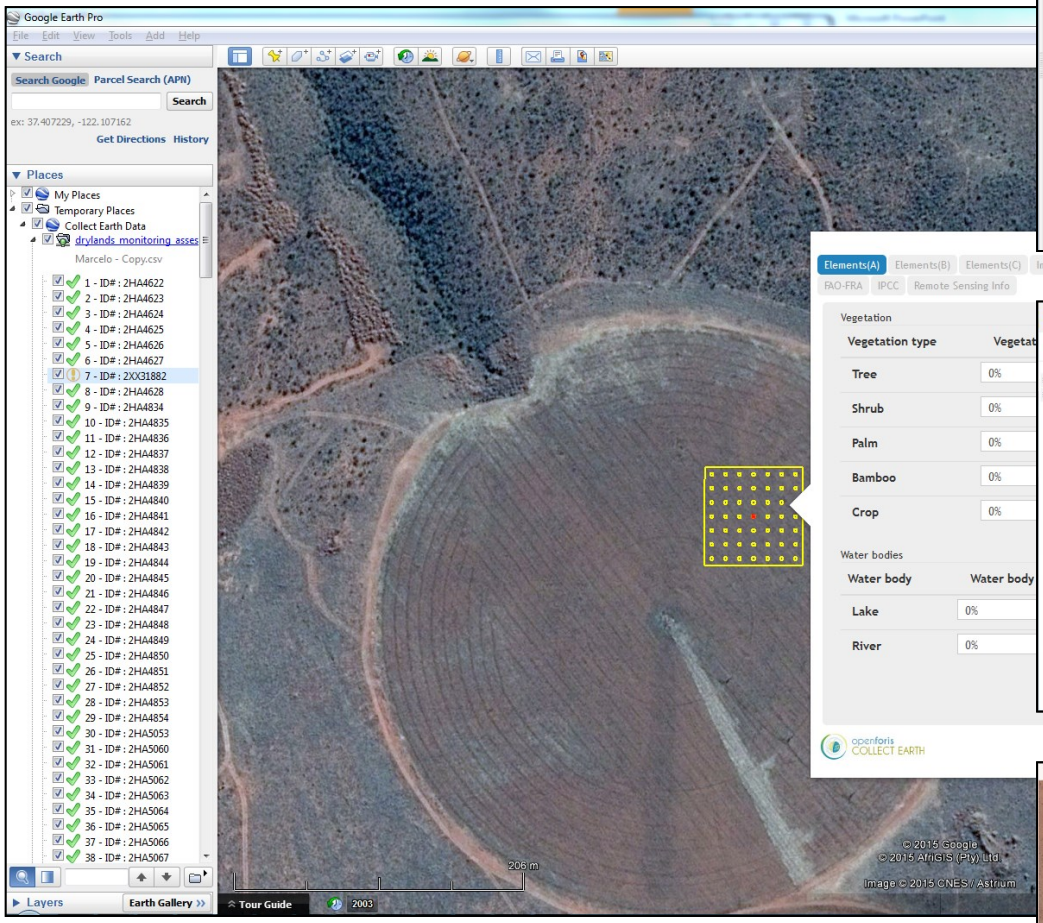
openforis COLLECT EARTH

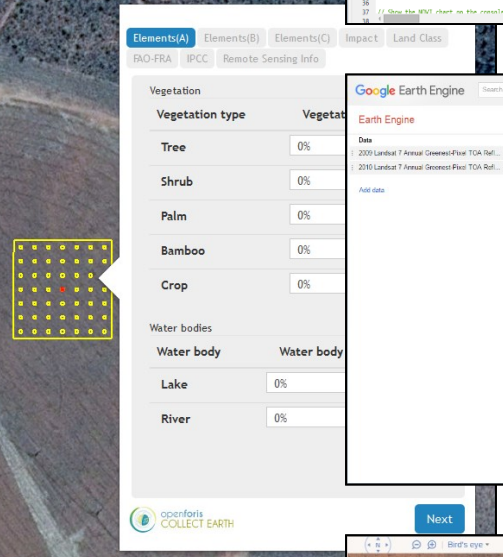
STRUCTURE

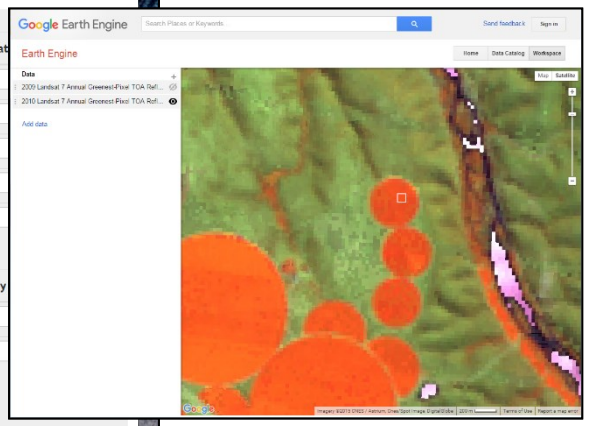


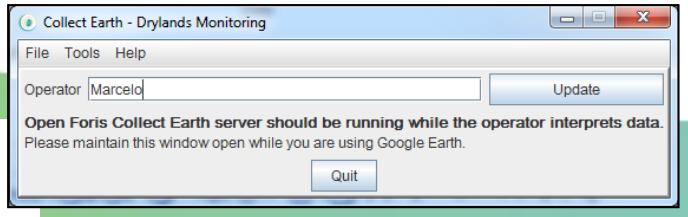
COLLECT EARTH

AN OPEN SOURCE TOOL FOR AUGMENTED VISUAL INTERPRETATION





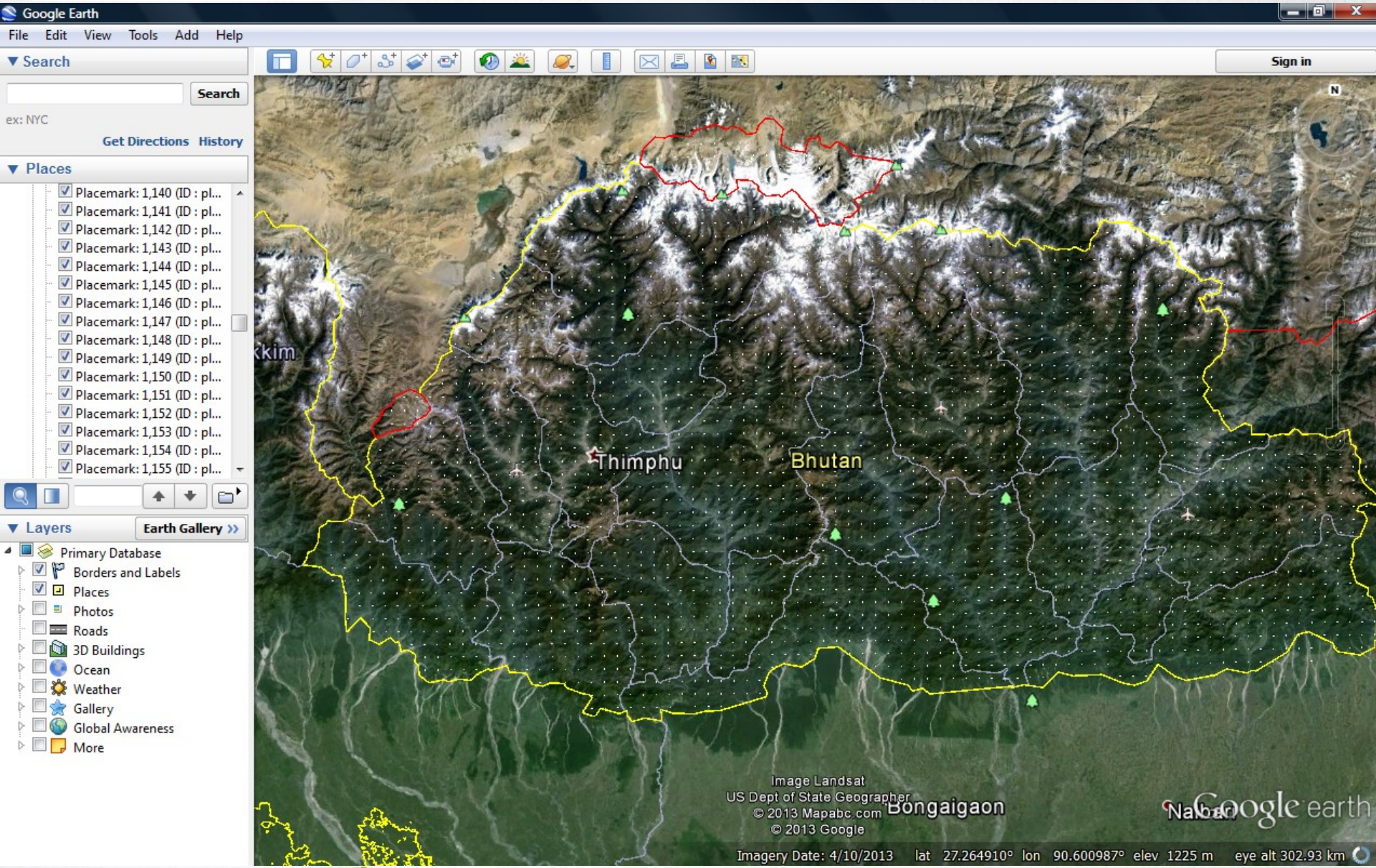




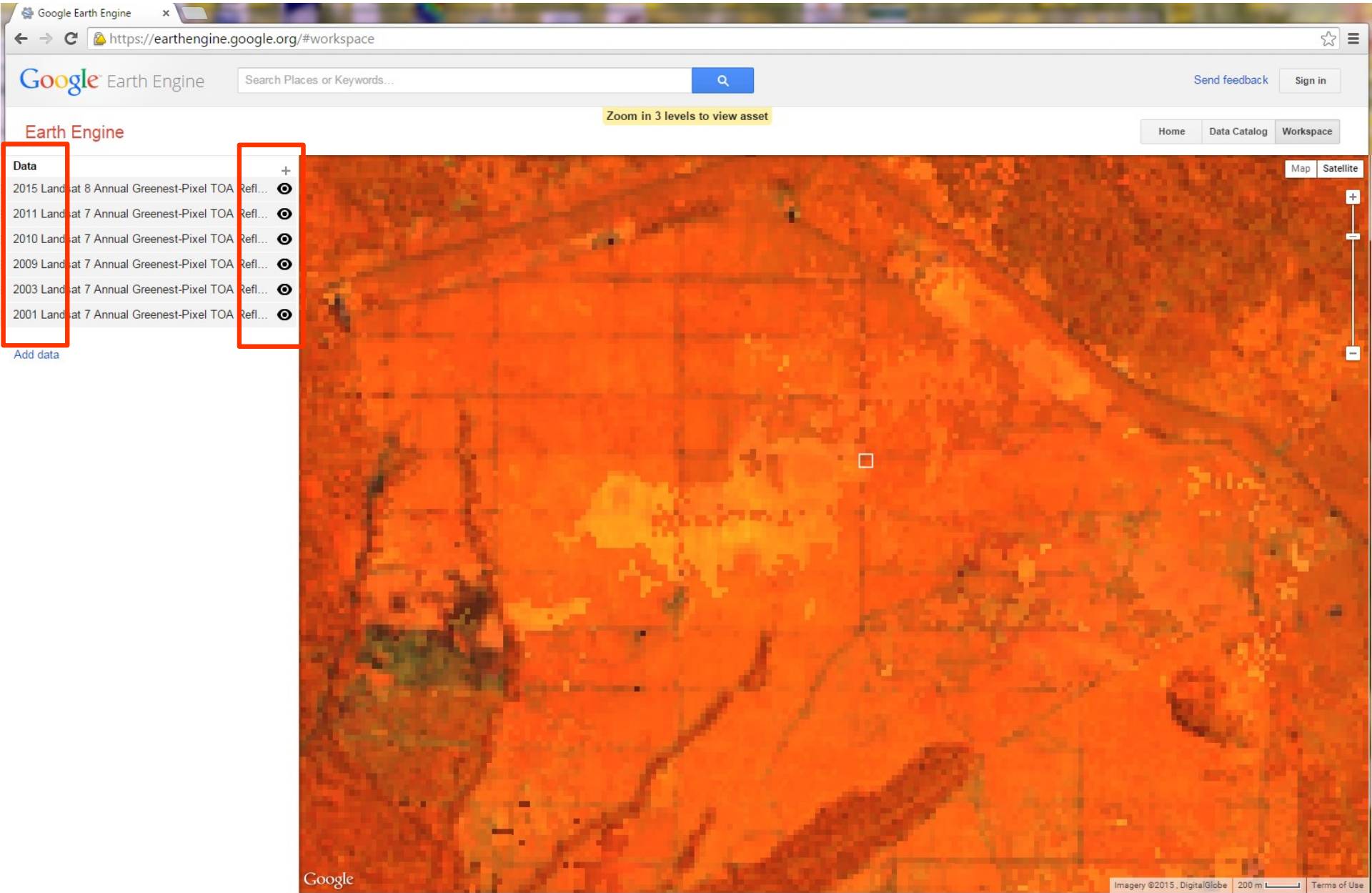
United Nations

openforis COLLECT EARTH

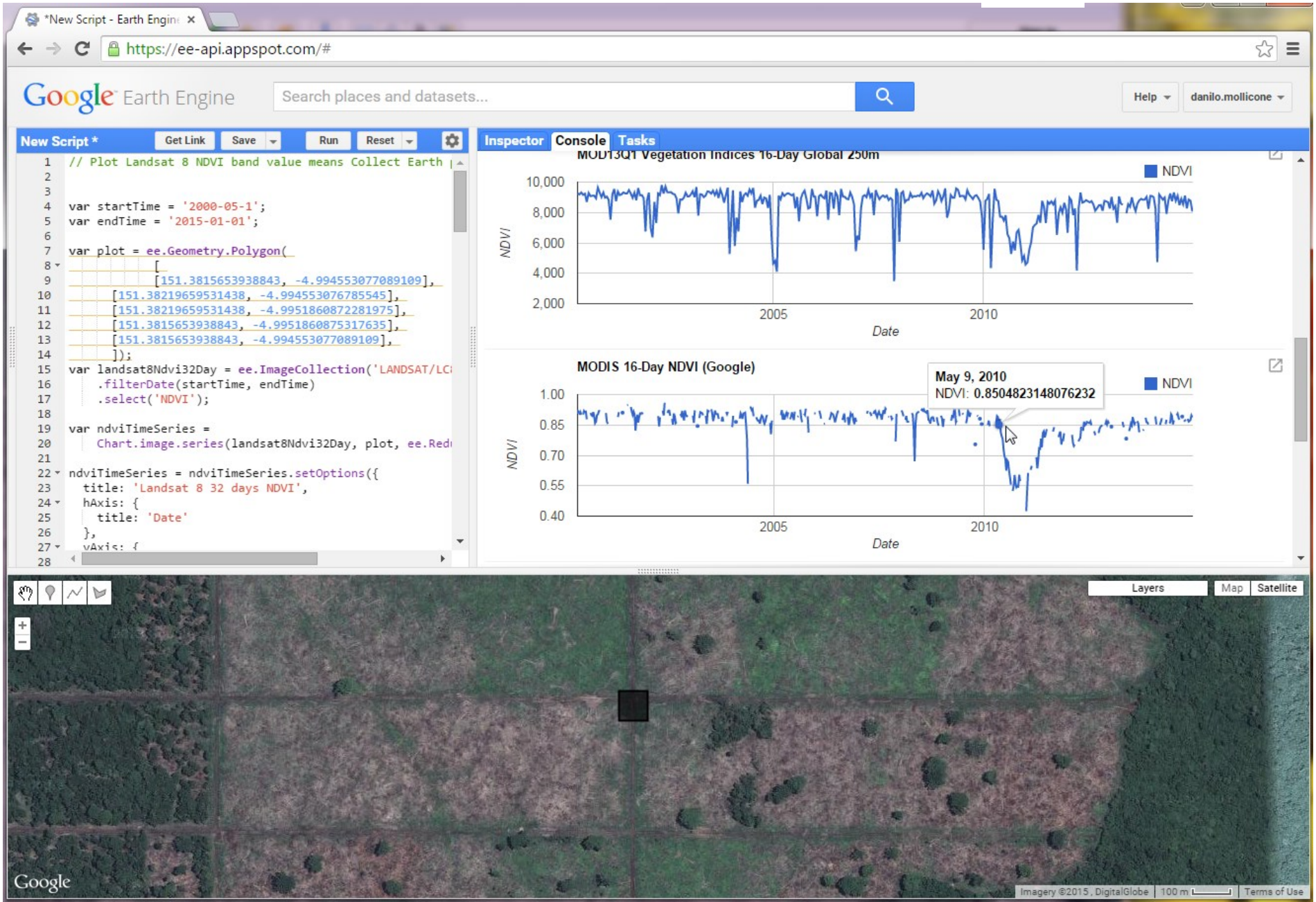
sampling grid in Bhutan, 8,000 points



openforis COLLECT EARTH in Google Earth Engine

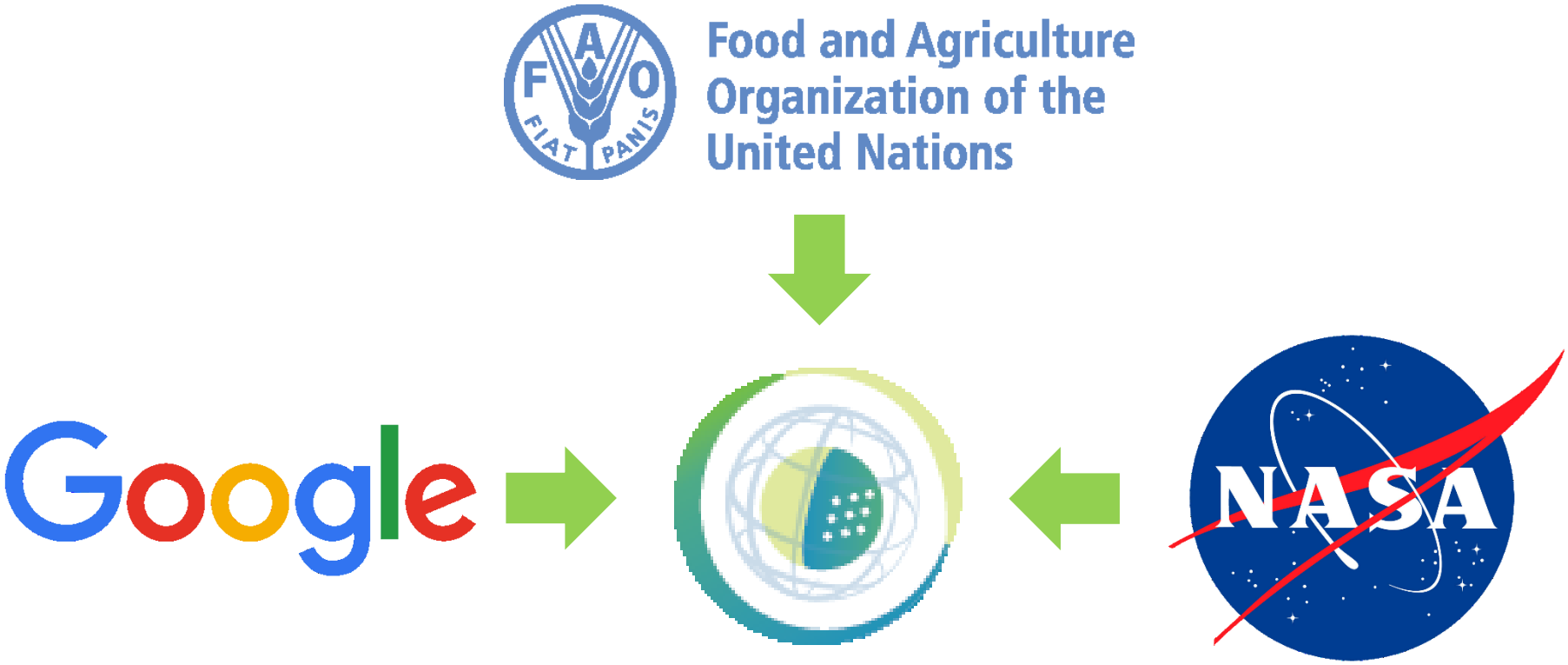


openforis COLLECT EARTH in Google Earth Engine Playground



Collect Earth: submissions to UNFCCC

- More than 20 countries are already using Collect Earth to measure and report activity data to UNFCCC
- In January 2018, six countries submitted their FRELs using Collect Earth
- Panama, Mozambique and Mongolia with a full land use assessments. These cauntries are now ready for a full report on the AFOLU within their BURs



In 2017 a new Collect Earth

New global forest geography:

FOREST ECOLOGY

The extent of forest in dryland biomes

Jean-François Bastin,[1,2*] Nora Berrahmouni,[1] Alan Grainger,[3] Danae Maniatis,[4,5] Danilo Mollicone,[1] Rebecca Moore,[6] Chiara Patriarca,[1] Nicolas Picard,[1] Ben Sparrow,[7] Elena Maria Abraham,[8] Kamel Aloui,[9] Ayhan Atesoglu,[10] Fabio Attore,[11] Çağlar Bassüllü,[12] Adia Bey,[1] Monica Garzuglia,[1] Luis G. García-Montero,[13] Nikée Groot,[3] Greg Guerin,[7] Lars Laestadius,[14] Andrew J. Lowe,[15] Bako Mamane,[16] Giulio Marchi,[1] Paul Patterson,[17] Marcelo Rezende,[1] Stefano Ricci,[1] Ignacio Salcedo,[18] Alfonso Sanchez-Paus Diaz,[1] Fred Stolle,[19] Venera Surappaeva,[20] Rene Castro[1*]

Dryland biomes cover two-fifths of Earth's land surface, but their forest area is poorly known. Here, we report an estimate of global forest extent in dryland biomes, based on analyzing more than 210,000 0.5-hectare sample plots through a photo-interpretation approach using large databases of satellite imagery at (i) very high spatial resolution and (ii) very high temporal resolution, which are available through the Google Earth platform. We show that in 2015, 1327 million hectares of drylands had more than 10% tree-cover, and 1079 million hectares comprised forest. Our estimate is 40 to 47% higher than previous estimates, corresponding to 467 million hectares of forest that have never been reported before. This increases current estimates of global forest cover by at least 9%.

http://science.sciencemag.org/content/356/6338/635

Food and Agriculture Organization of the United Nations

Volume 8, Issue 10

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FOR POSTDOCS AND PHD STUDENTS

Remote Sens. **2016**, *8*(10), 807; doi:10.3390/rs8100807 (registering DOI)

Open Access | Article

Collect Earth: Land Use and Land Cover Assessment through Augmented Visual Interpretation

Adia Bey [1,*], Alfonso Sánchez-Paus Díaz [1], Danae Maniatis [2,3], Giulio Marchi [1], Danilo Mollicone [1], Stefano Ricci [1], Jean-François Bastin [1,4], Rebecca Moore [5], Sandro Federici [1], Marcelo Rezende [1], Chiara Patriarca [1], Ruth Turia [6], Gewa Gamoga [6], Hitofumi Abe [1], Elizabeth Kaidong [6] and Gino Miceli [5]

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2 United Nations Development Programme, Bureau for Policy and Programme Support, New York, NY 10017, USA
3 School of Geography and the Environment, University of Oxford, Oxford OX1 3QY, UK
4 Landscape Ecology and Plant Production Systems Unit, Université Libre de Bruxelles, Brussels 1050, Belgium
5 Google, Mountain View, CA 94043, USA
6 Papua New Guinea Forest Authority, Boroko 111, Papua New Guinea

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Academic Editors: Chandra Giri, James Campbell, Clement Atzberger and Prasad S. Thenkabail

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(This article belongs to the Special Issue Monitoring of Land Changes)

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Abstract

PUBLISH YOUR DATA SET IN OUR OPEN ACCESS JOURNAL *data* AND ENHANCE ITS VISIBILITY

DEPOSIT DATA | PUBLISH ARTICLE | PUBLISH DATA DESCRIPTOR

MDPI

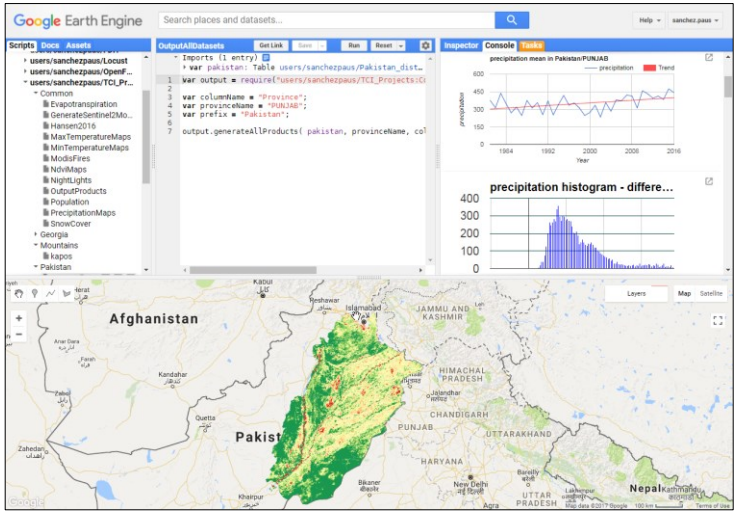
http://www.mdpi.com/2072-4292/8/10/807

Food and Agriculture Organization of the United Nations

Earth Map

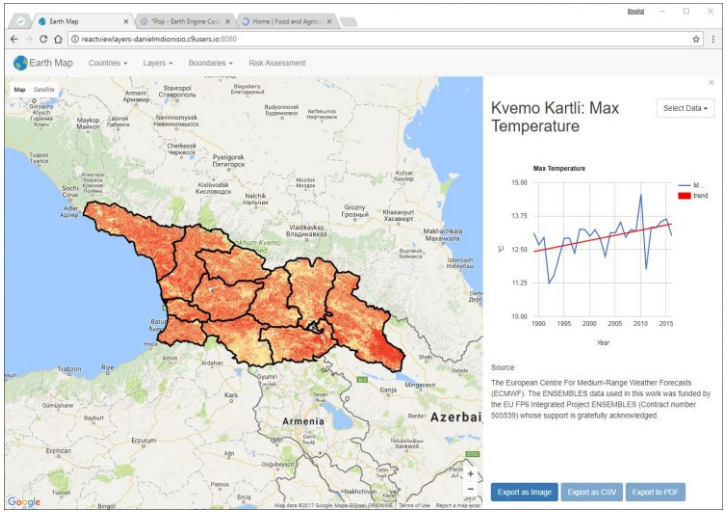
is

A library of scripts in Google Earth Engine



- for advanced user
- wide scope of applications
- link with other libraries
- for all project phases: preparation, implementation and evaluation

A user friendly console for data review and displ



- for standard user
- limited number of applications
- data/report export
- for project proposal preparation

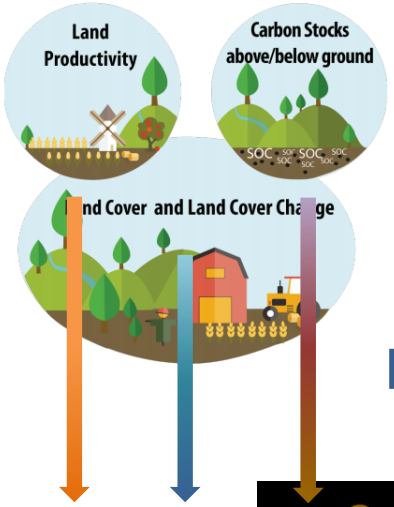
Food and Agriculture Organization of the United Nations

United Nations Convention to Combat Desertification

THE GLOBAL MECHANISM
United Nations Convention to Combat Desertification

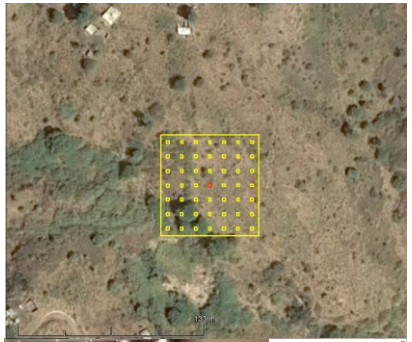
Indicator 15.3.1
Proportion of land that is degraded over total land area

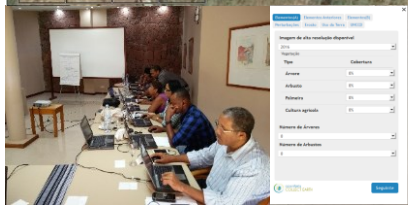
Sub -Indicators
UNCCD (CBD, UNFCCC)
Reporting Mechanisms



Earth Map

openforis
COLLECT EARTH





Food and Agriculture Organization of the United Nations

Tier 1

LPD

LCC

SOC

Global Data

National Data

LCC
Tier 3

S
C
Tier 2

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Thank you