Food and Agriculture Organization
of the United Nations

# Defining Agro-Ecological Units

Douglas Muchoney, FAO

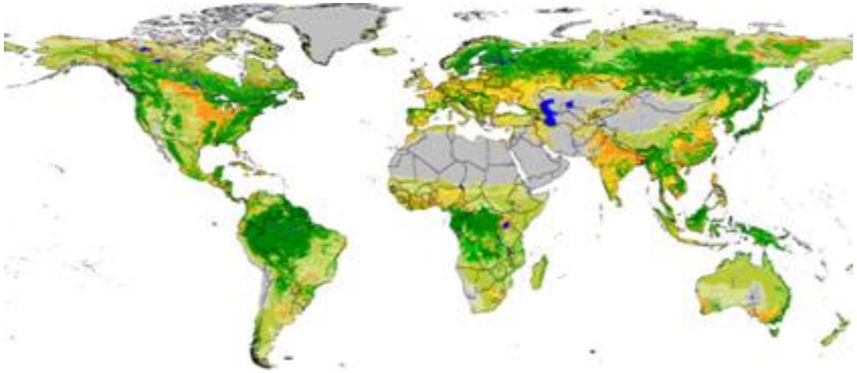
Forum of Experts in SEEA Experimental Accounting 2018

Glen Cove, New York

18-20 June 2018

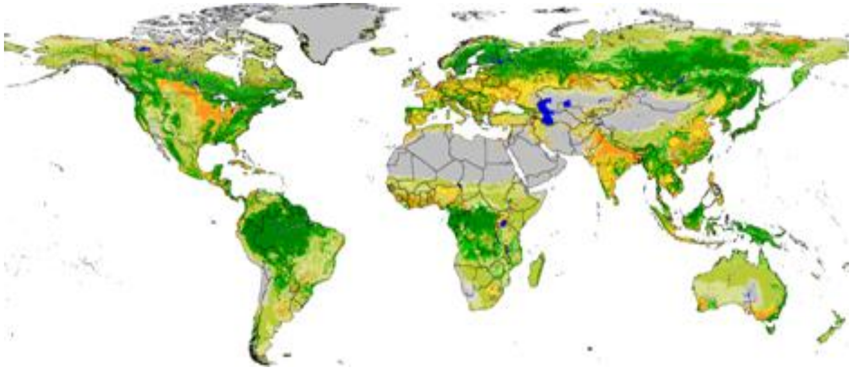
# Land evaluation and planning

- **The Agro - Ecological Zones (AEZ) process** is the main system for assessing agricultural resources and potential
- Can be applied at global, regional and national levels for better planning, management and monitoring of land resources
- FAO involved in methodology development since 1978
- Used as SO-2 indicator (area with improved agricultural productivity and crop suitability



# GAEZ - Global Agro-Ecological Zones

- By FAO and the International Institute for Applied Systems Analysis (IIASA).
- GAEZ database is publicly available through a WEB portal.



IIASA International Institute for Applied Systems Analysis

Food and Agriculture Organization of the United Nations

FAO LAND & WATER
GLOBAL
IIASA

GAEZ Global Agro-Ecological Zones

http://gaez.fao.org/Main.html

# GAEZ Data Portal capabilities

- Designed to facilitate access to the GAEZ database and resources
- Enables users management
- Delivers terabytes of spatial data, maps, tables, statistics, metadata, reports
- Fully documented (Data model, User's Manual,  GAEZ definitions, FAQ, limitations, and hints available)
- Compliant with FAO definitions, classifications and standards, ISO metadata standards to feed FAO GeoNetwork

GLOBAL
IIASA
GAEZ Global Agro-Ecological Zones

http://gaez.fao.org/Main.html

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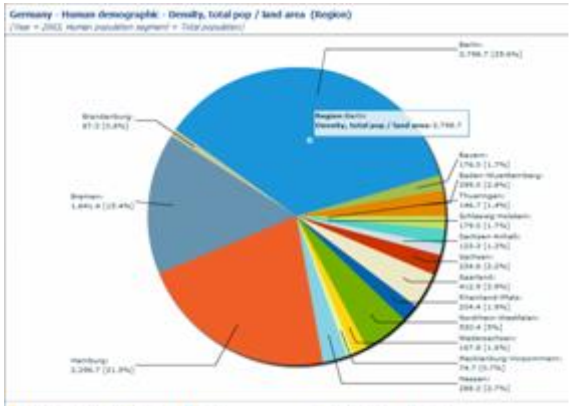
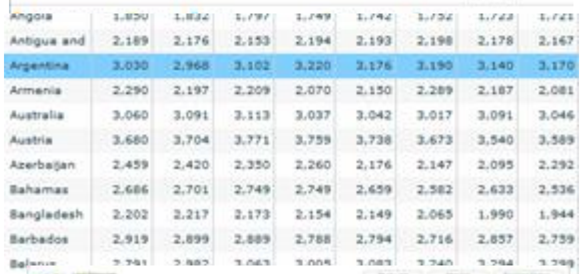
# GAEZ Data Portal

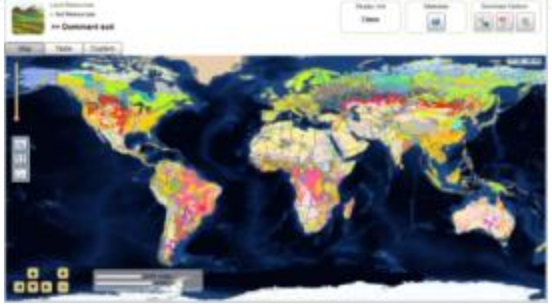
www.fao.org/nr/gaez

- Brief summary of content:
  - *5 thematic areas (Land and water resources; Agro-climatic resources; Suitability and potential yields; Actual yields and production; Yield and production gaps)*
  - *> 300,000 global datasets at mainly 5 arc-minutes, also core layers at 30 arc-seconds*
  - 11 crop groups, 49 crops, 92 crop types and 280 Crop/LUTs
  - yield and production gap analysis for 17 crops/commodities
  - *5 water supply types*
  - *4 Input levels (High, Intermediate, Low, Mixed)*
  - *Historical 1961-2000, 30 year average (1961-1990) and Future, 2020s, 2050s, 2080s)*

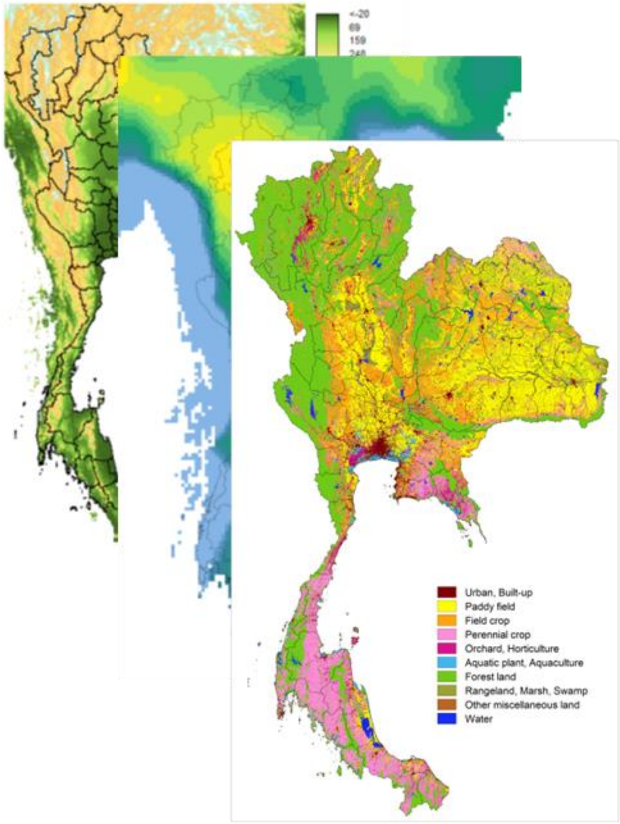




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Angola | 1,850 | 1,832 | 1,797 | 1,749 | 1,742 | 1,732 | 1,723 | 1,721 |
| Antigua and | 2,189 | 2,176 | 2,153 | 2,194 | 2,193 | 2,198 | 2,178 | 2,167 |
| Argentina | 3,030 | 2,968 | 3,102 | 3,220 | 3,176 | 3,190 | 3,140 | 3,170 |
| Armenia | 2,290 | 2,197 | 2,209 | 2,070 | 2,150 | 2,289 | 2,187 | 2,081 |
| Australia | 3,060 | 3,091 | 3,113 | 3,037 | 3,042 | 3,017 | 3,091 | 3,046 |
| Austria | 3,680 | 3,704 | 3,771 | 3,759 | 3,738 | 3,673 | 3,540 | 3,589 |
| Azerbaijan | 2,459 | 2,420 | 2,350 | 2,260 | 2,176 | 2,147 | 2,095 | 2,292 |
| Bahamas | 2,686 | 2,701 | 2,749 | 2,749 | 2,659 | 2,582 | 2,633 | 2,536 |
| Bangladesh | 2,202 | 2,217 | 2,173 | 2,154 | 2,149 | 2,065 | 1,990 | 1,944 |
| Barbados | 2,919 | 2,899 | 2,889 | 2,788 | 2,794 | 2,716 | 2,857 | 2,759 |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

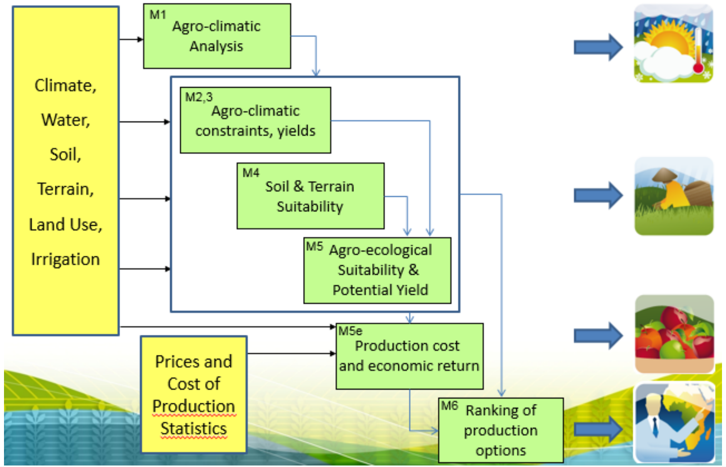


# National AEZ: Thailand


<-20
69
159
248
Urban, Built-up
Paddy field
Field crop
Perennial crop
Orchard, Horticulture
Aquatic plant, Aquaculture
Forest land
Rangeland, Marsh, Swamp
Other miscellaneous land
Water

**Agro-ecological assessment of crop suitability and productivity**

- **Input:** resource databases; crop requirements and crop suitability criteria; crop calendars; crop statistics; industry and research data of potential attainable yields.
- **Output:** Mapped suitability and attainable yields by single crop and selected multi-cropping systems.



Climate,
Water,
Soil,
Terrain,
Land Use,
Irrigation

M1 Agro-climatic Analysis

M2,3 Agro-climatic constraints, yields

M4 Soil & Terrain Suitability

M5 Agro-ecological Suitability & Potential Yield

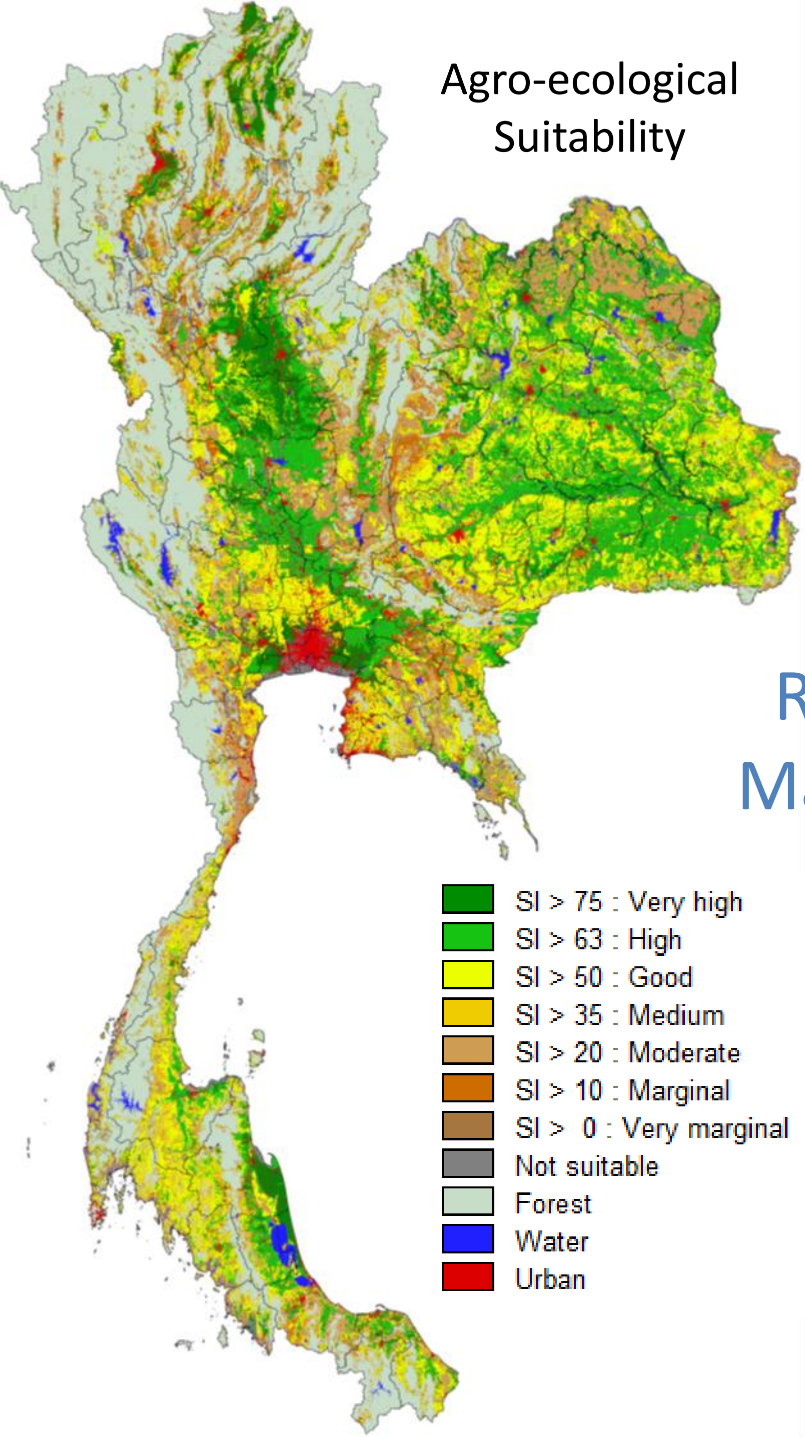
M5e Production cost and economic return

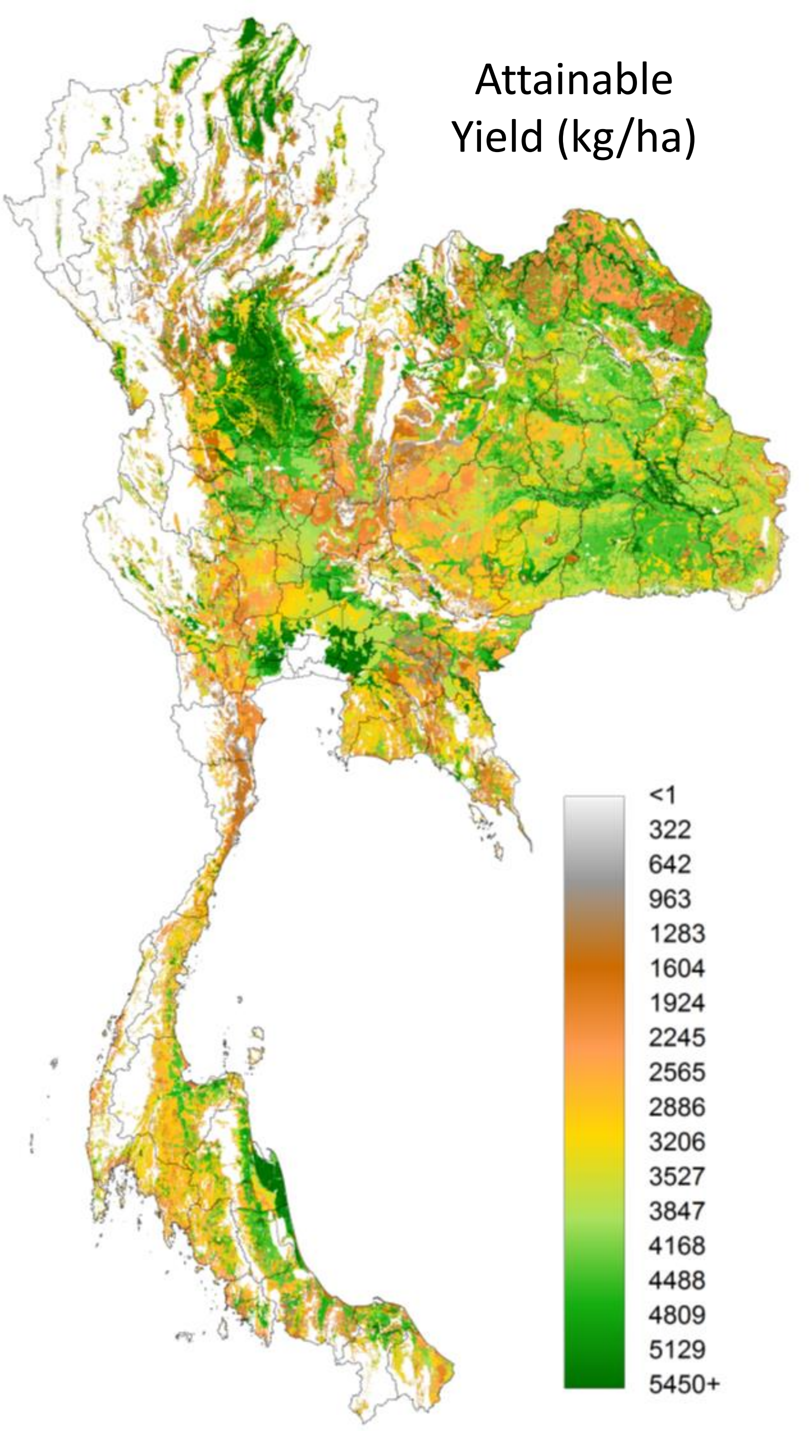
Prices and Cost of Production Statistics

M6 Ranking of production options

http://www.fao.org/3/a-i7077e.pdf

# Rain-fed Major Rice

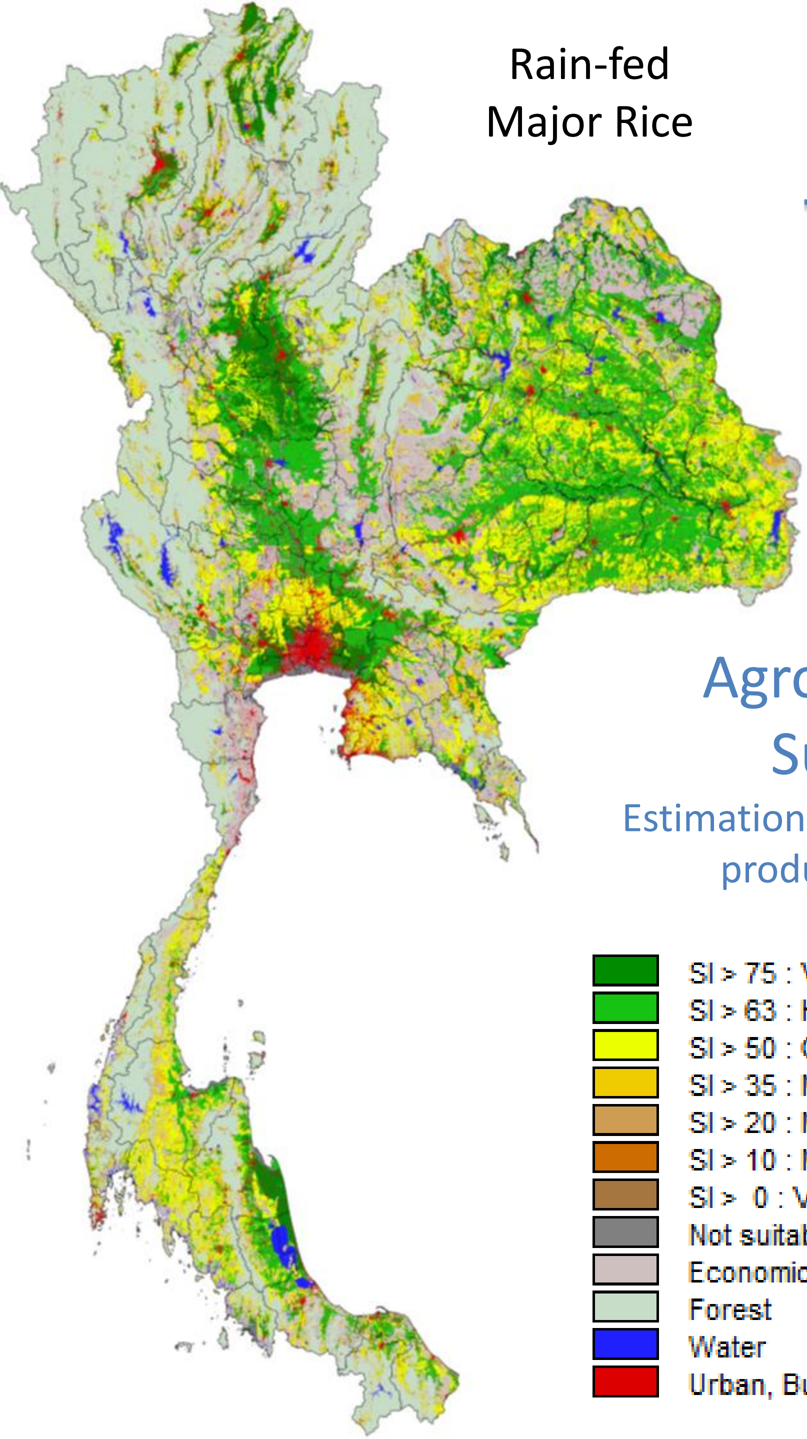

Agro-ecological Suitability
🟩 SI > 75 : Very high
🟩 SI > 63 : High
🟨 SI > 50 : Good
🟨 SI > 35 : Medium
🟧 SI > 20 : Moderate
🟧 SI > 10 : Marginal
🟫 SI > 0 : Very marginal
⬛ Not suitable
⬜ Forest
🟦 Water
🟥 Urban


Attainable Yield (kg/ha)
<1
322
642
963
1283
1604
1924
2245
2565
2886
3206
3527
3847
4168
4488
4809
5129
5450+

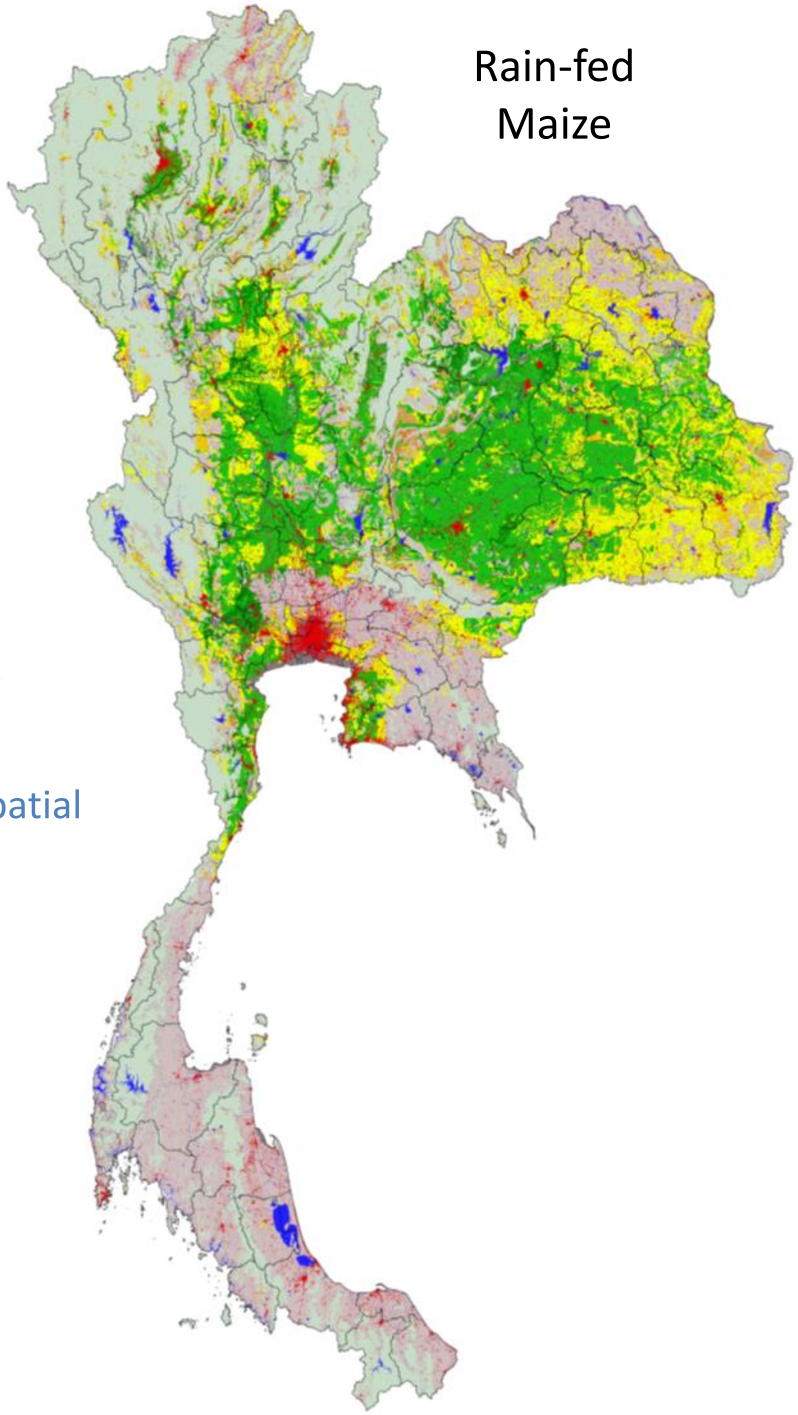
# Agro-economic Suitability

Estimation of ‘optimized’ spatial production structure

Rain-fed
Major Rice



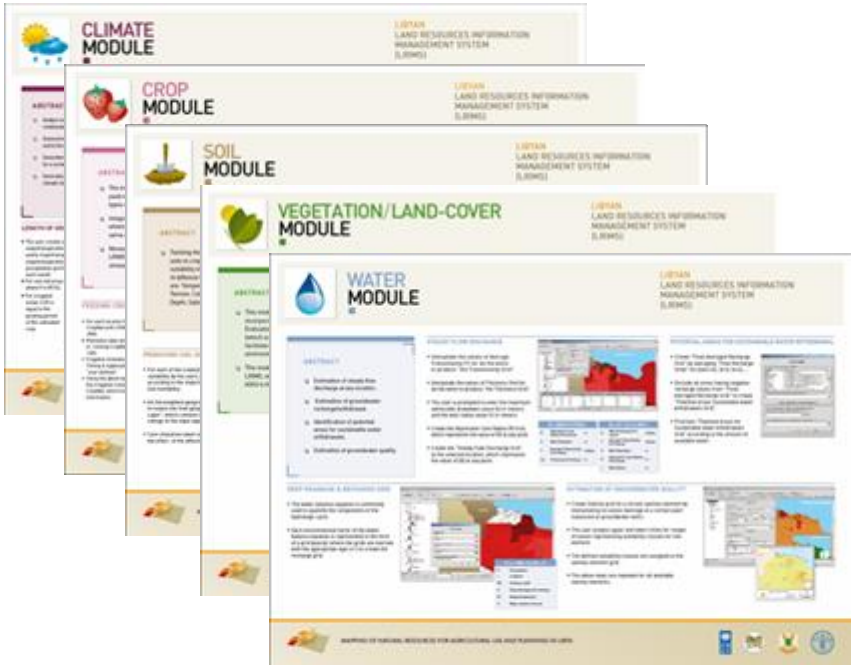
Rain-fed
Maize



- 🟩 SI > 75 : Very high
- 🟩 SI > 63 : High
- 🟨 SI > 50 : Good
- 🟨 SI > 35 : Medium
- 🟧 SI > 20 : Moderate
- 🟧 SI > 10 : Marginal
- 🟫 SI > 0 : Very marginal
- ⬛ Not suitable or not assessed
- ⬜ Economically unsuitable
- ⬜ Forest
- 🟦 Water
- 🟥 Urban, Built-up

# Land Resources Information Management System (LRIMS)

- Integrated processing environment where **physical and socio-economic** data are analyzed;
- Help identify sustainable land management practices;
- Allows implementation of an integrated and interactive approach to land use planning;
- Support for technicians and policy makers;
- Enables assessment and modeling of land suitability and responses to potential agricultural production;
- Developed and applied in Libya; Currently under development in Laos, Afghanistan and Macedonia


CLIMATE MODULE

CROP MODULE

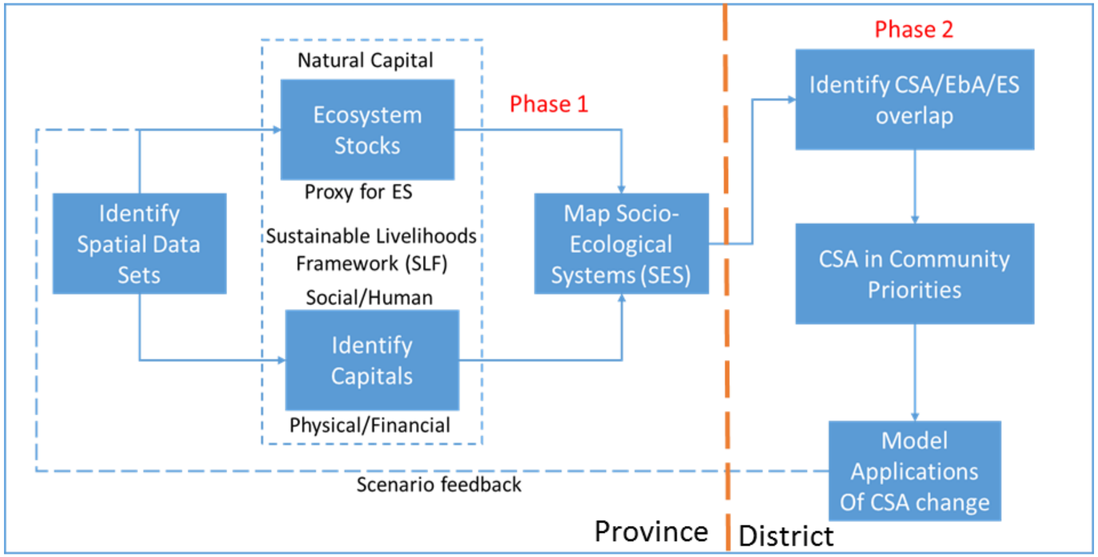
SOIL MODULE

VEGETATION/LAND-COVER MODULE

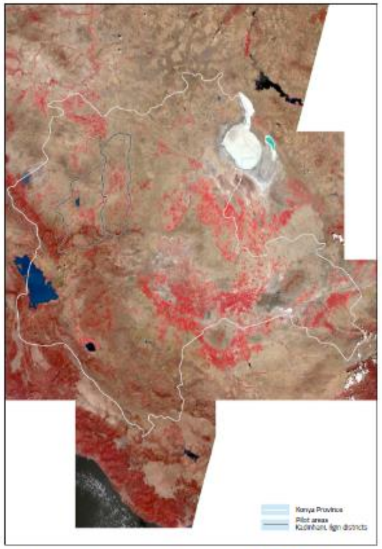
WATER MODULE

LIBYAN LAND RESOURCES INFORMATION MANAGEMENT SYSTEM (LRIMS)

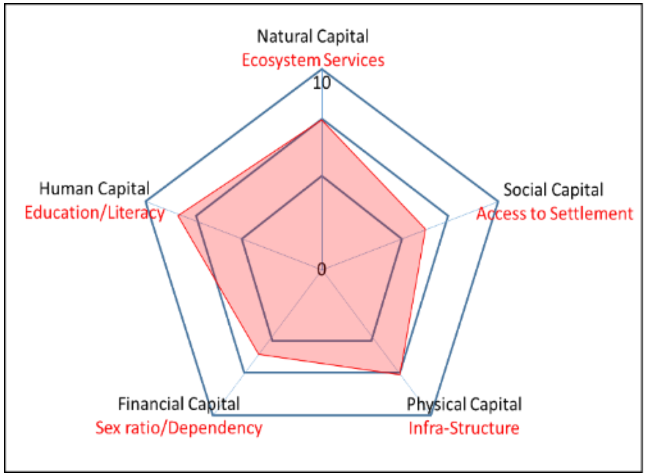
# Socio-Ecological Systems in Central Anatolia



Natural Capital
Ecosystem Stocks
Proxy for ES
Phase 1
Identify Spatial Data Sets
Sustainable Livelihoods Framework (SLF)
Map Socio-Ecological Systems (SES)
Social/Human
Identify Capitals
Physical/Financial
Scenario feedback
Province
Phase 2
Identify CSA/EbA/ES overlap
CSA in Community Priorities
Model Applications Of CSA change
District



False Color Sentinel-2 Mosaic **AUG 2016**



i) map the ecosystems

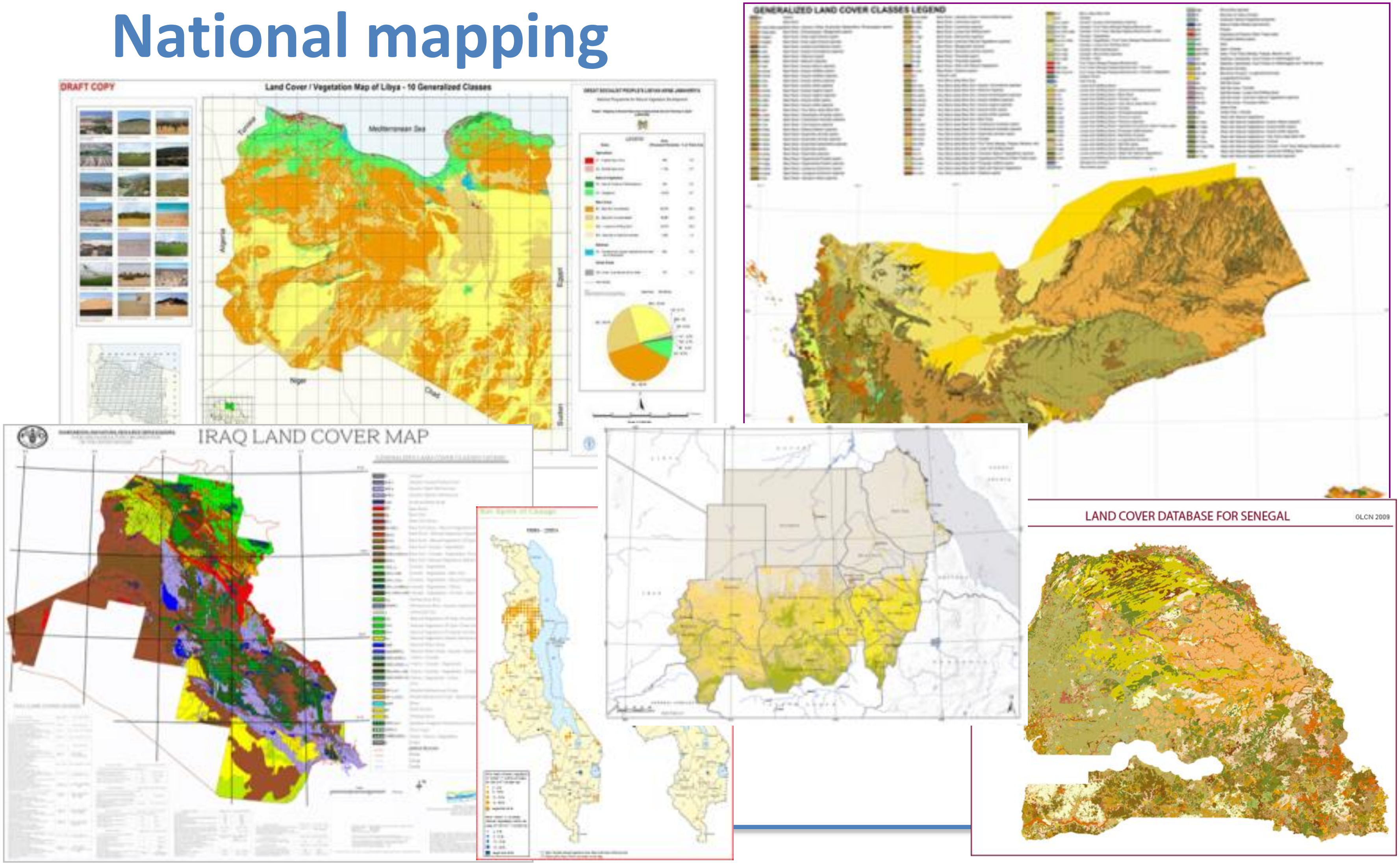
ii) determine the ecosystem condition

iii) determine relevant ecosystem services for provisioning and regulating services

iv) select indicators or modelled outputs of the ecosystem services for which viable data are available

v) map the ecosystem services and service potential

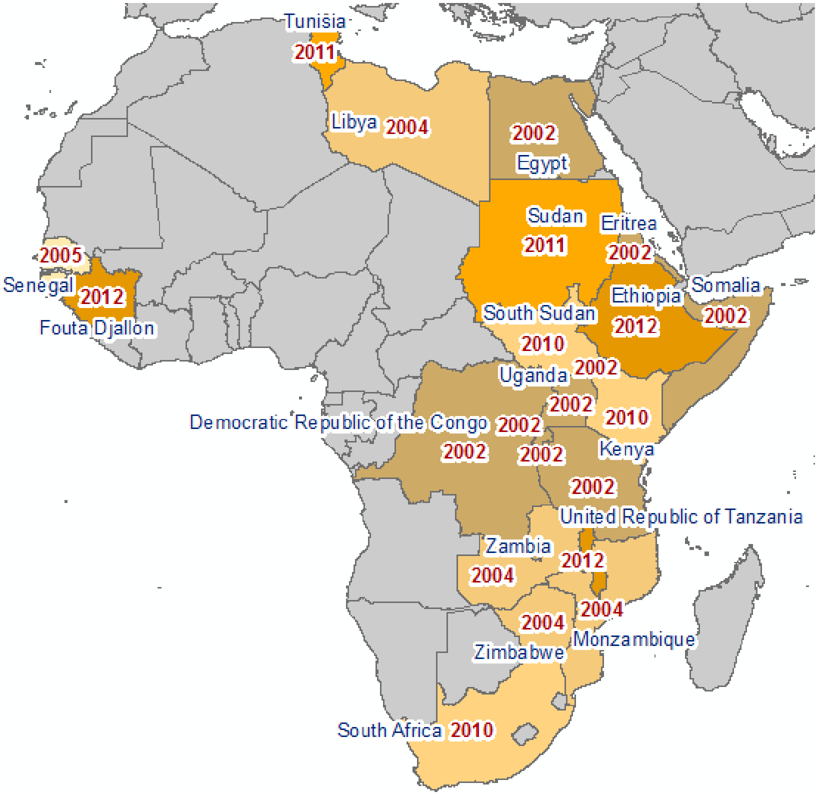
# National mapping


DRAFT COPY
Land Cover / Vegetation Map of Libya - 10 Generalized Classes
Mediterranean Sea
Tunisia
Algeria
Egypt
Niger
Chad
Sudan
GENERALIZED LAND COVER CLASSES LEGEND
IRAQ LAND COVER MAP
LAND COVER DATABASE FOR SENEGAL
GLCN 2009

# FAO’s Land Cover Mapping in Africa

*Spatial resolution: 30m or better*

- 2018 South Sudan
- 2018 Macedonia
- 2018 Bangladesh
- 2017 Jordan
- 2017 Afghanistan
- 2016 Lesotho
- 2013 ECONET
  Ethiopia
- 2012 Fouta Djallon Highlands
  Malawi
- 2011 Sudan
- 2010 South Sudan
  Tunisia
  Kenya Update
- 2007 Somalia
- 2006 Kenya LCC
- 2005 Senegal
- 2004 Libya
- 1998-2004 AFRICOVER

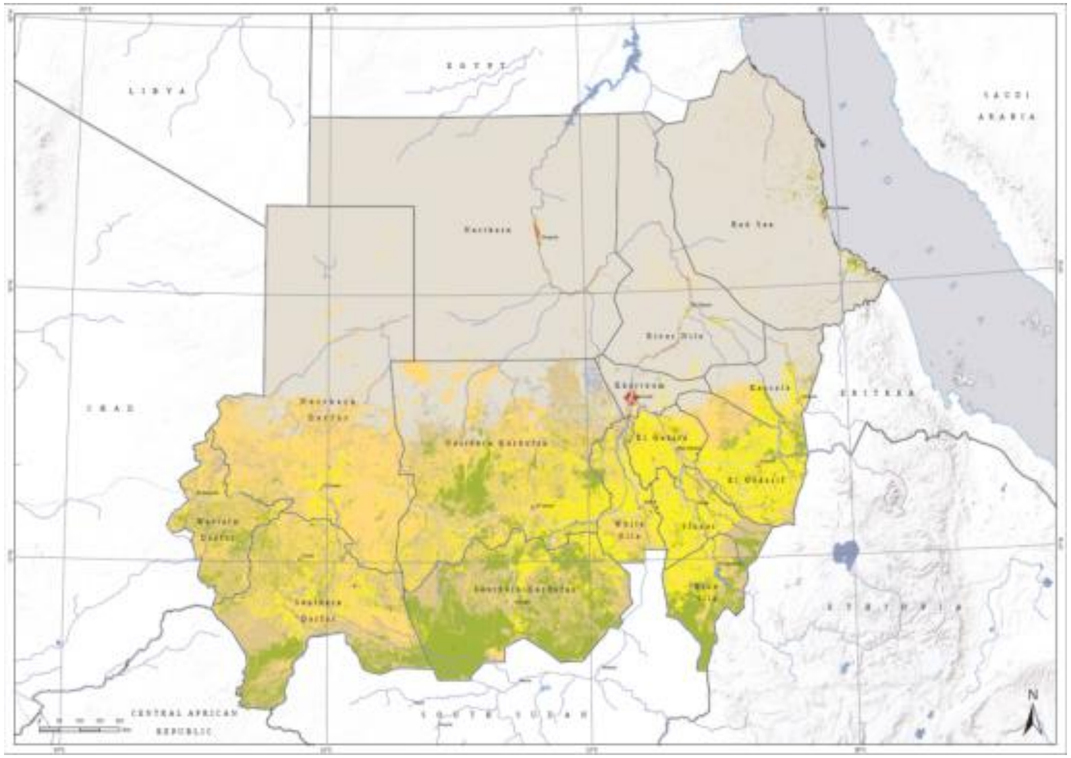

Tunisia
2011
Libya 2004
2002
Egypt
Sudan
2011
Eritrea
2002
2005
Senegal
2012
Fouta Djallon
Somalia
Ethiopia
2002
2012
South Sudan
2010
Uganda
2002
2002
Democratic Republic of the Congo
2002
2010
2002
2002
Kenya
2002
United Republic of Tanzania
Zambia
2004
2012
2004
2004
Zimbabwe
Monzambique
South Africa 2010

# Land Cover Mapping: Sudan

Sudan Land Cover Mapping project was implemented by FAO/NRL division to support the Food Security Information for Action (SIFSIA) program of Sudan Government funded by the European Commission.

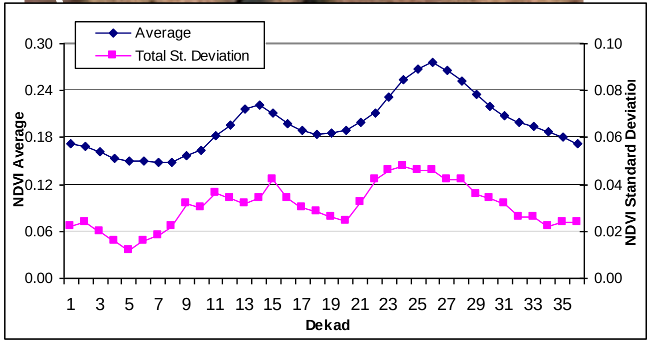
OBJECTIVE :

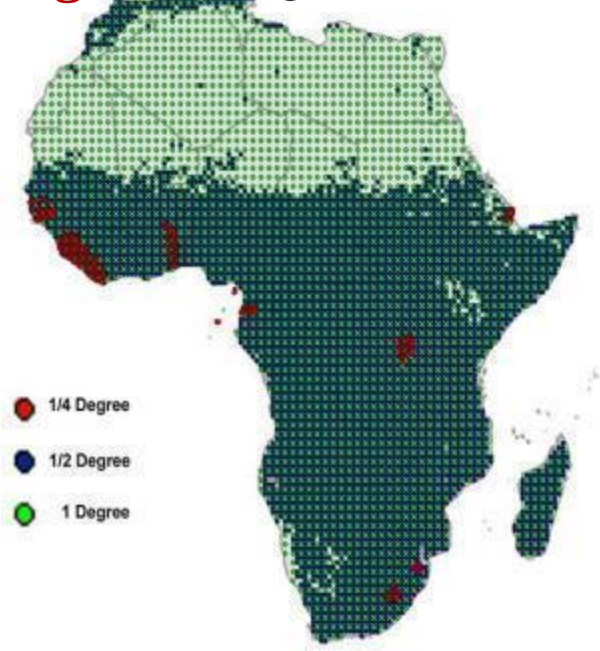
1. production of a detailed and harmonized national land cover database and
2. national capacity building on FAO/GLCN mapping methodology, tools and software to support the national capacity to produce the land cover database.


LIBYA
EGYPT
SAUDI ARABIA
Northern
Red Sea
River Nile
Khartoum
Kassala
CHAD
ERITREA
North Darfur
Northern Kordofan
El Gezira
El Gedaref
West Darfur
White Nile
Sinnar
Blue Nile
Southern Kordofan
Southern Darfur
ETHIOPIA
CENTRAL AFRICAN REPUBLIC
SOUTH SUDAN
N

# ECO-NET Africa

Land Cover Mapping: national….regional….global





- ECO-NET : mapping based on a statistical method approach
- GOAL: ensure reliable information at country levels
- MAPPING METHOD based on samples chosen on a fixed grid with appropriate density interval.
- OUTPUT: successfully validated in several demonstration countries in Africa

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# GLC-SHARE initiative

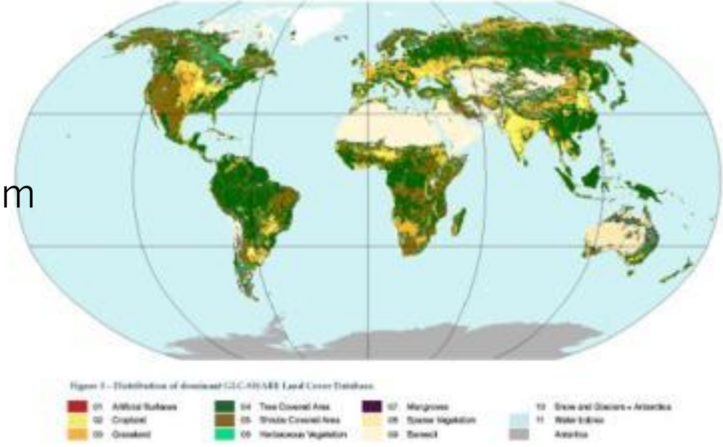
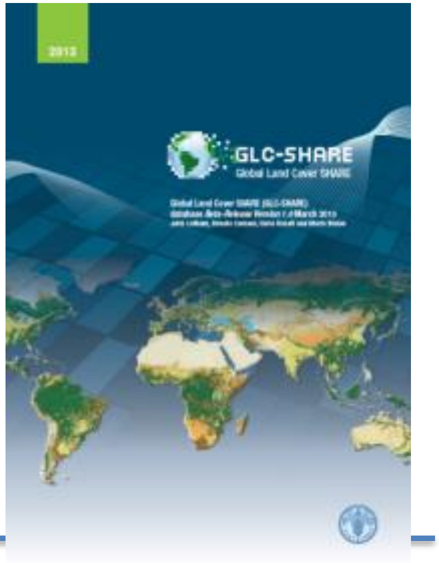


Figure 1 – Distribution of dominant GLC-SHARE Land Cover Database

01 Artificial Surfaces
02 Cropland
03 Grassland
04 Tree Covered Area
05 Shrubs Covered Area
06 Herbaceous Vegetation
07 Mangroves
08 Sparse Vegetation
09 Baresoil
10 Snow and Glaciers + Antarctica
11 Water Bodies
Antartica

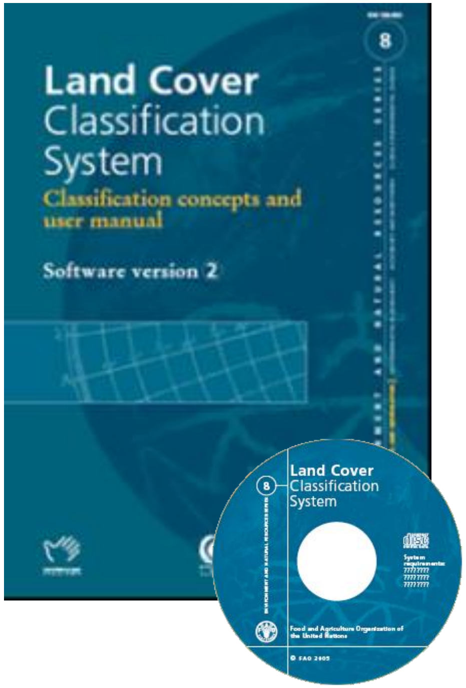
- New global land cover database created by FAO in partnership and with contributions from various partners and institutions;
- First global product created using the ISO standard for land cover classification ISO TC 211 – 19144-2 LMCL (Land Cover Meta Language);
- It provides a set of eleven major thematic land cover layers (FAO SEEA LCML legend);
- Resulted by a combination of “best available” high resolution national, regional and/or sub-national land cover databases;
- The database is produced with a resolution of 30 arc-second (~1sqkm) .

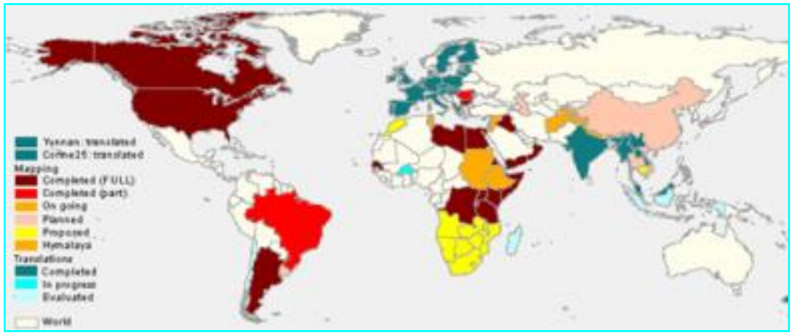


2013
GLC-SHARE
Global Land Cover SHARE

# Land Cover Classification System

- LCCS / LCML : Comprehensive methodology for description, characterization, classification and comparison of most land cover features identified anywhere in the world, at any scale or level of detail: basis for comparative classification. (6 UN official languages)
- Created in response to a need for a harmonized and standardized collection and reporting on the status and trends of land cover


Land Cover
Classification
System
Classification concepts and
user manual
Software version 2
8
Land Cover
Classification
System
Food and Agriculture Organization of
the United Nations
© FAO 2005

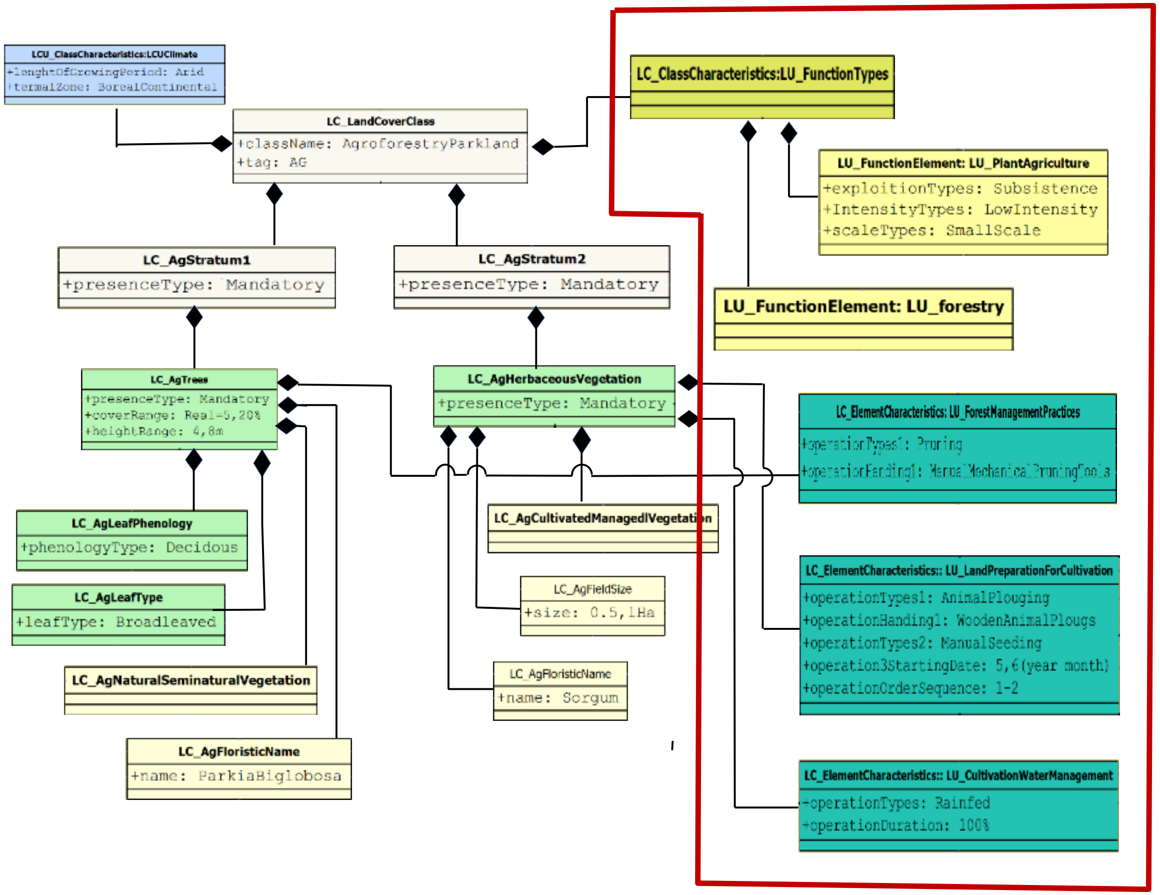

Yunnan: translated
Corine25: translated
Mapping
Completed (FULL)
Completed (part)
On going
Planned
Proposed
Hymalaya
Translations
Completed
In progress
Evaluated
World

ISO
Standards
About us
Standards Development
News
Store
Standards catalogue
Online collections
Publications
ISO Store › Store › Standards catalogue › By TC › ISO/TC 211 Geographic information/Geomatics
Subscribe to updates

**ISO 19144-2:2012**

**Geographic information - Classification systems -- Part 2: Land Cover Meta Language (LCML)**

# From land cover to land use (LCML to LCHML)



**LCU_ClassCharacteristics:LCUClimate**
+lenghtOfGrowingPeriod: Arid
+termalZone: BorealContinental

**LC_LandCoverClass**
+className: AgroforestryParkland
+tag: AG

**LC_AgStratum1**
+presenceType: Mandatory

**LC_AgStratum2**
+presenceType: Mandatory

**LC_AgTrees**
+presenceType: Mandatory
+coverRange: Real=5,20%
+heightRange: 4,8m

**LC_AgHerbaceousVegetation**
+presenceType: Mandatory

**LC_AgLeafPhenology**
+phenologyType: Decidous

**LC_AgLeafType**
+leafType: Broadleaved

**LC_AgNaturalSeminaturalVegetation**

**LC_AgFloristicName**
+name: ParkiaBiglobosa

**LC_AgCultivatedManagedlVegetation**

LC_AgFieldSize
+size: 0.5,1Ha

LC_AgFloristicName
+name: Sorgum

**LC_ClassCharacteristics:LU_FunctionTypes**

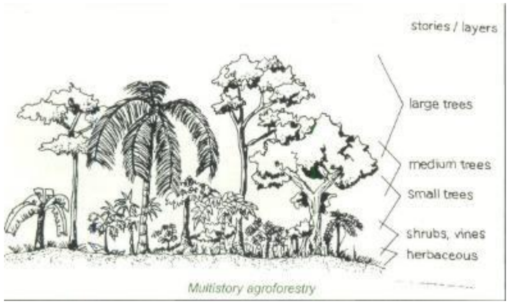
**LU_FunctionElement: LU_PlantAgriculture**
+exploitionTypes: Subsistence
+IntensityTypes: LowIntensity
+scaleTypes: SmallScale

**LU_FunctionElement: LU_forestry**

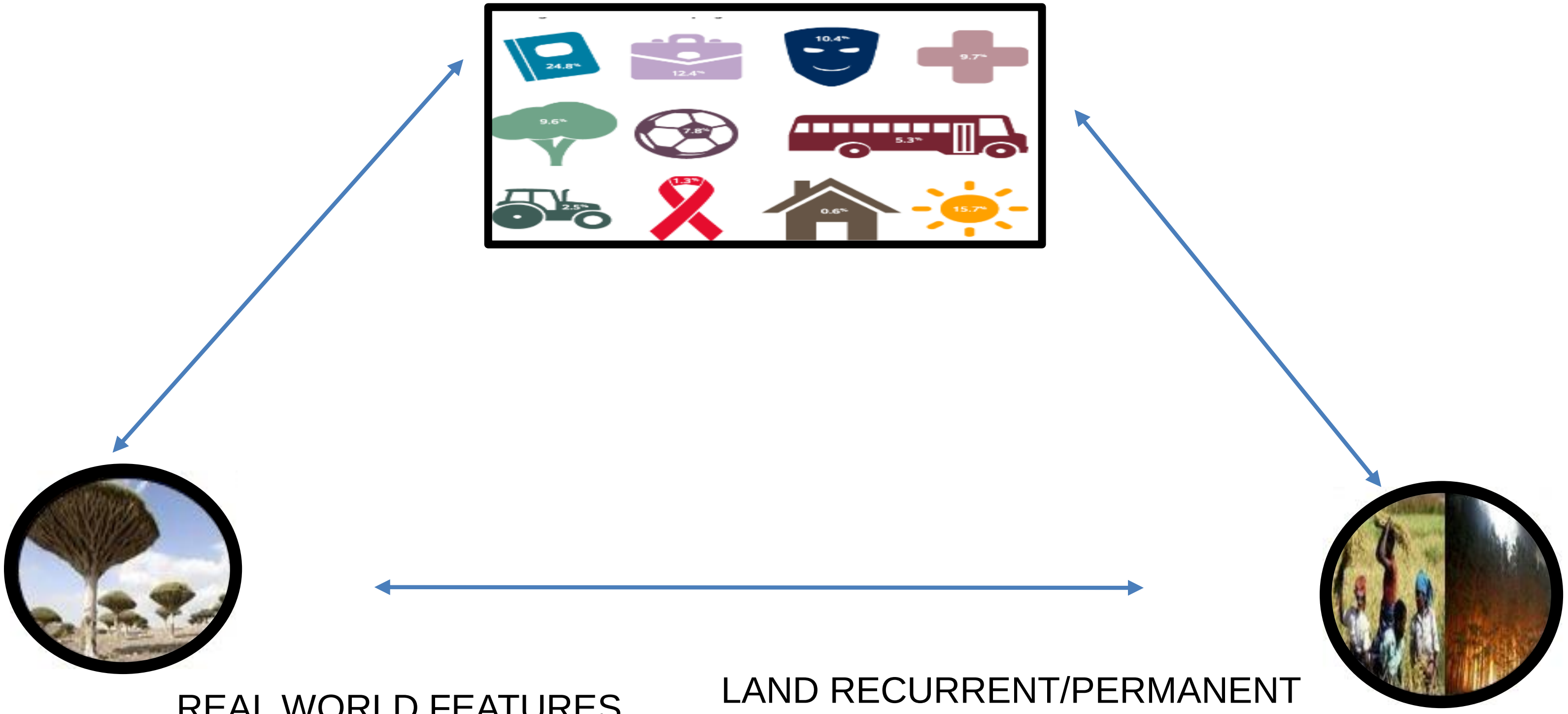
**LC_ElementCharacteristics: LU_ForestManagementPractices**
+operationTypes1: Pruning
+operationHanding1: ManualMechanicalPruningTools

**LC_ElementCharacteristics:: LU_LandPreparationForCultivation**
+operationTypes1: AnimalPlouging
+operationHanding1: WoodenAnimalPlougs
+operationTypes2: ManualSeeding
+operation3StartingDate: 5,6(year month)
+operationOrderSequence: 1-2

**LC_ElementCharacteristics:: LU_CultivationWaterManagement**
+operationTypes: Rainfed
+operationDuration: 100%



Multistory agroforestry



BEHAVIORAL INTERACTION OF INDIVIDUALS
AND GROUPS THROUGH CULTURAL, SOCIAL
ECONOMIC RELATIONSCHIPS

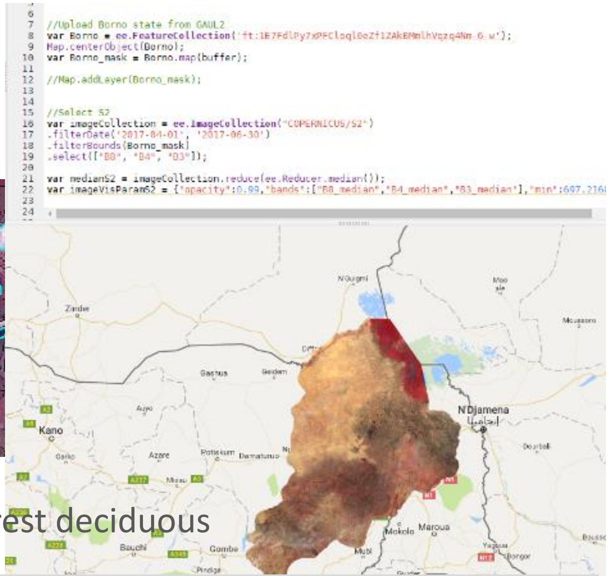
REAL WORLD FEATURES

LAND RECURRENT/PERMANENT
MODIFICATIONS

The functional relationship between physical objects, land events and related socio economic functions key parameters to built up a “Land Representation” system

# New opportunities for LC

- OBIA
- Multi-temporal
- Optical and radar
- ARD
- LCML - LCHML
- Cloud computing (SEPAL – GEE)
- Machine-learning
- Integration with local knowledge and field data

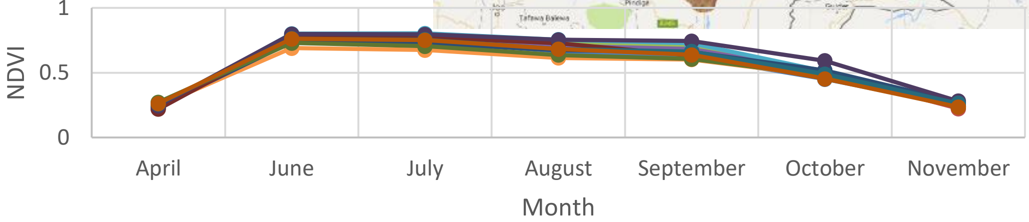


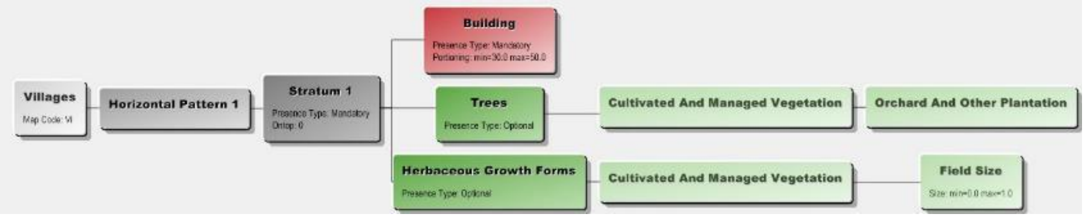
```
//Upload Borno state from GAUL2
var Borno = ee.FeatureCollection('ft:1E7FdlPy7xPFCloql6eZf1ZAkBMmlhVqzq4Nm-6_w');
Map.centerObject(Borno);
var Borno_mask = Borno.map(buffer);

//Map.addLayer(Borno_mask);


//Select S2
var imageCollection = ee.ImageCollection("COPERNICUS/S2")
.filterDate('2017-04-01', '2017-06-30')
.filterBounds(Borno_mask)
.select(["B8", "B4", "B3"]);

var medianS2 = imageCollection.reduce(ee.Reducer.median());
var imageVisParamS2 = {"opacity":0.99,"bands":["B8_median","B4_median","B3_median"],"min":697.216
```





**Villages**
Map Code: VI

**Horizontal Pattern 1**

**Stratum 1**
Presence Type: Mandatory
Order: 0

**Building**
Presence Type: Mandatory
Positioning: min=30.0 max=50.0

**Trees**
Presence Type: Optional

**Cultivated And Managed Vegetation**

**Orchard And Other Plantation**

**Herbaceous Growth Forms**
Presence Type: Optional

**Cultivated And Managed Vegetation**

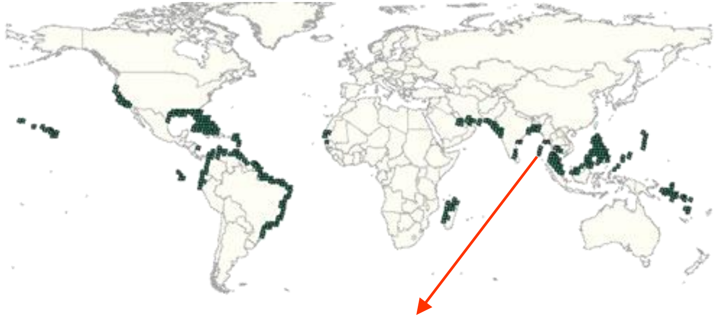
**Field Size**
Size: min=0.0 max=1.0

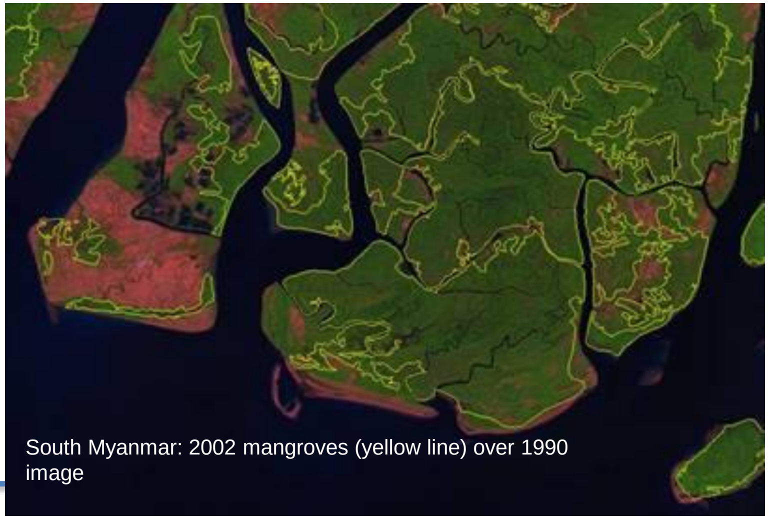
# Fragile ecosystem mapping: mangroves

- The World Atlas of Mangroves is a significant attempt to provide an overview of the distribution of mangroves worldwide

- NRL (now CBDS) has contributed to this initiative with its extensive experience in remote sensing and mapping, by applying mapping standards (LCCS) and tools (land cover toolbox)

Photo-interpreted Landsat imagery

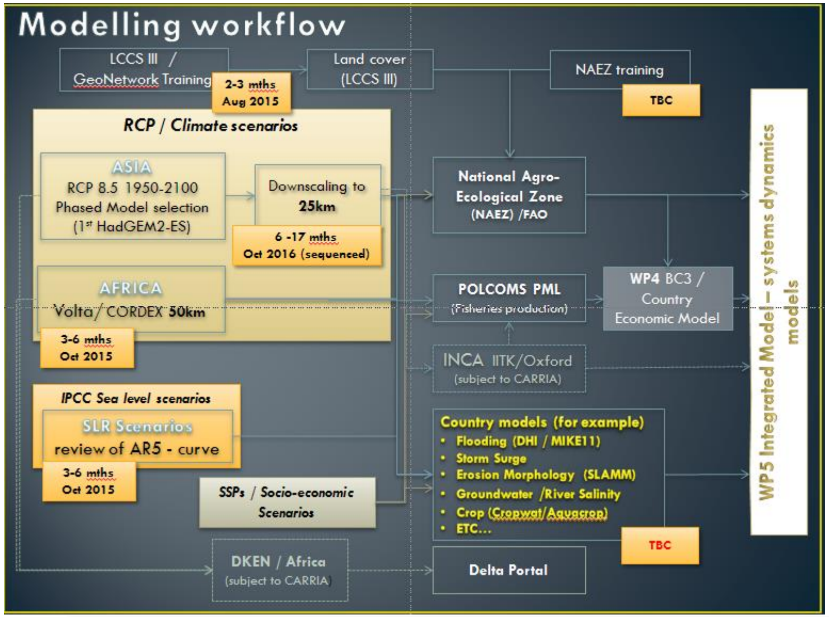




South Myanmar: 2002 mangroves (yellow line) over 1990 image

# Vulnerable Ecosystems: DECCMA project

DECCMA: Deltas Vulnerability and Climate Change: Migration and Adaptation" examines the vulnerability, environmental stressors and hazards of a range of climate change and biophysically driven scenarios across the study deltas.



**Modelling workflow**

LCCS III / GeoNetwork Training
2-3 mths
Aug 2015

Land cover (LCCS III)

NAEZ training
TBC

*RCP / Climate scenarios*

ASIA
RCP 8.5 1950-2100
Phased Model selection
(1st HadGEM2-ES)

Downscaling to **25km**
6 -17 mths
Oct 2016 (sequenced)

AFRICA
Volta / CORDEX **50km**
3-6 mths
Oct 2015

*IPCC Sea level scenarios*
SLR Scenarios
review of AR5 - curve
3-6 mths
Oct 2015

*SSPs / Socio-economic Scenarios*

DKEN / Africa
(subject to CARRIA)

**National Agro-Ecological Zone (NAEZ) /FAO**

**POLCOMS PML**
(Fisheries production)

**WP4** BC3 / Country Economic Model

INCA IITK/Oxford
(subject to CARRIA)

**Country models (for example)**
- Flooding (DHI / MIKE11)
- Storm Surge
- Erosion Morphology (SLAMM)
- Groundwater /River Salinity
- Crop (Cropwat/Aquacrop)
- ETC…

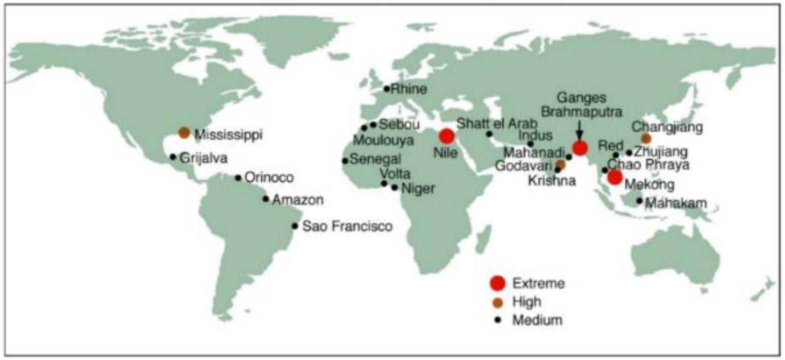
TBC

**Delta Portal**

WP5 Integrated Model – systems dynamics models

THREATENED DELTAS

(Ericson et al (2006); IPCC AR4, 2007)

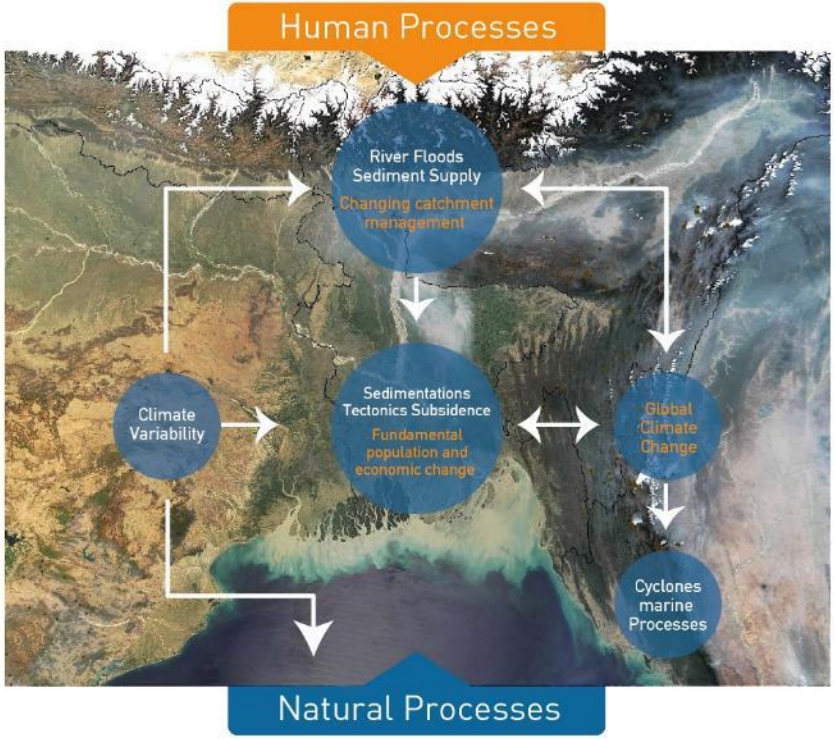

Rhine
Mississippi
Grijalva
Sebou
Moulouya
Senegal
Volta
Niger
Nile
Orinoco
Amazon
Sao Francisco
Shatt el Arab
Indus
Ganges
Brahmaputra
Mahanadi
Godavari
Krishna
Changjiang
Red
Zhujiang
Chao Phraya
Mekong
Mahakam

● Extreme
● High
● Medium

Population potentially displaced by current sea-level trends to 2050
(*Extreme >1 million; high =1 million-50,000; medium 50,000–5,000 people*)
**Global population in deltas is about 500 million people**

# Delta synthesis

- Complex systems with large vulnerable populations
- Multiple drivers at multiple scales
- Rapid resultant change, including significant migration
- Climate change needs to be analysed in this dynamic context, including established and emerging migration
- As climate change and sea-level rise increases, so the range of sustainable (plausible) adaptation choices diminishes


Human Processes
River Floods
Sediment Supply
Changing catchment management
Climate Variability
Sedimentations
Tectonics Subsidence
Fundamental population and economic change
Global Climate Change
Cyclones marine Processes
Natural Processes

# DECCMA aims

1. to assess migration as an adaptation in deltaic environments under a changing climate;
2. to deliver policy support on sustainable gender-sensitive adaptation in deltaic areas.

OR

Better understand in deltas:

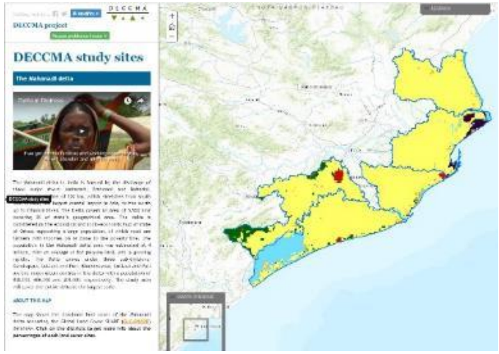
1. migration processes, including the role of climate change
2. adaptation choices, with a focus on migration.

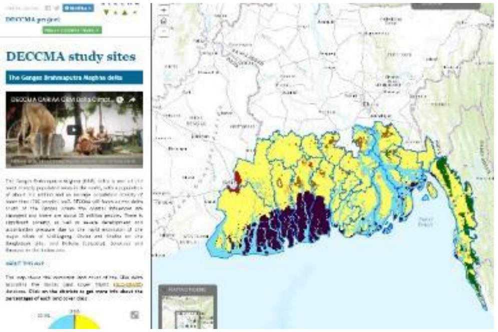
This will take a participatory and adaptive pathway approach that addresses gender dimensions.

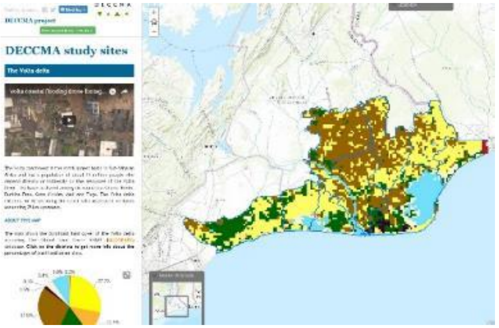
# Study sites

The analysis will guide sustainable and equitable development of deltas in Ghana (Volta), India (Mahanadi) and India-Bangladesh (Ganges-Bramaputra-Meghna) and will:

1. identify gender-differentiated stakeholder-relevant scenarios of local/regional/delta level vulnerability to climate change;
2. identify options for effective climate adaptation by the poorest groups in deltas; and
3. lead to the development of gender-sensitive adaptation funding proposals in the three deltas.


DECCMA project
DECCMA study sites
The Mahanadi delta


DECCMA project
DECCMA study sites
The Ganges Brahmaputra Meghna delta

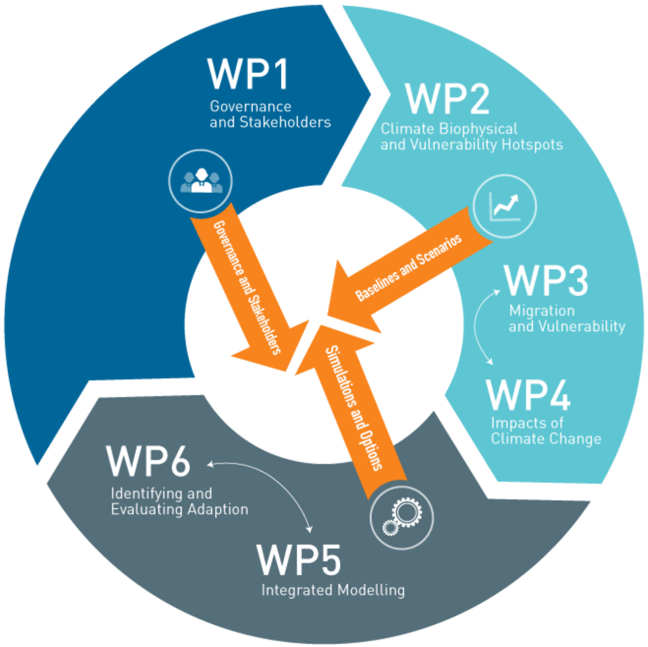

DECCMA project
DECCMA study sites
The Volta delta

# FAO in DECCMA

FAO CBDS is contributing to WP2 on vulnerability, hazard and climate change hotspot mapping.

Main outputs are:

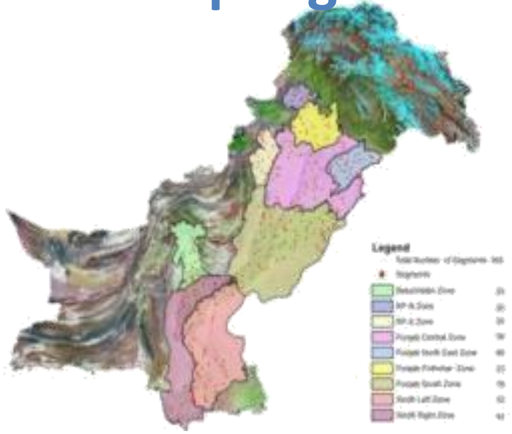
- Development of high-resolution land cover datasets using ISO standards (LCCS) for assessment of natural and agricultural resources;
- Development of the agro-Ecological Zoning (AEZ) assessment under a range of scenarios;
- Support on the portal for geospatial data management and distribution


WP1
Governance and Stakeholders
WP2
Climate Biophysical and Vulnerability Hotspots
WP3
Migration and Vulnerability
WP4
Impacts of Climate Change
WP5
Integrated Modelling
WP6
Identifying and Evaluating Adaption
Governance and Stakeholders
Baselines and Scenarios
Simulations and Options

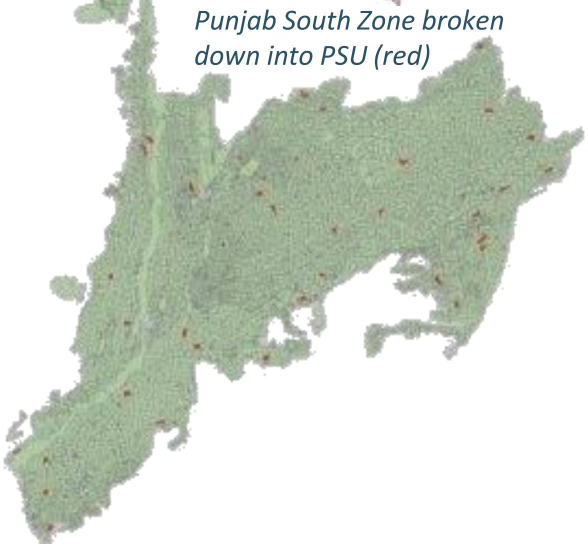
WP0 Management

# Crop Monitoring: land cover for Area Frame sampling

1. Area frames (AF) is used for crop acreage and yield estimation.
2. Good quality land cover data improves stratification, reduces sample size and allocation and produces more accurate estimates.
3. Ethiopia, Pakistan, Afghanistan



Sampling unit

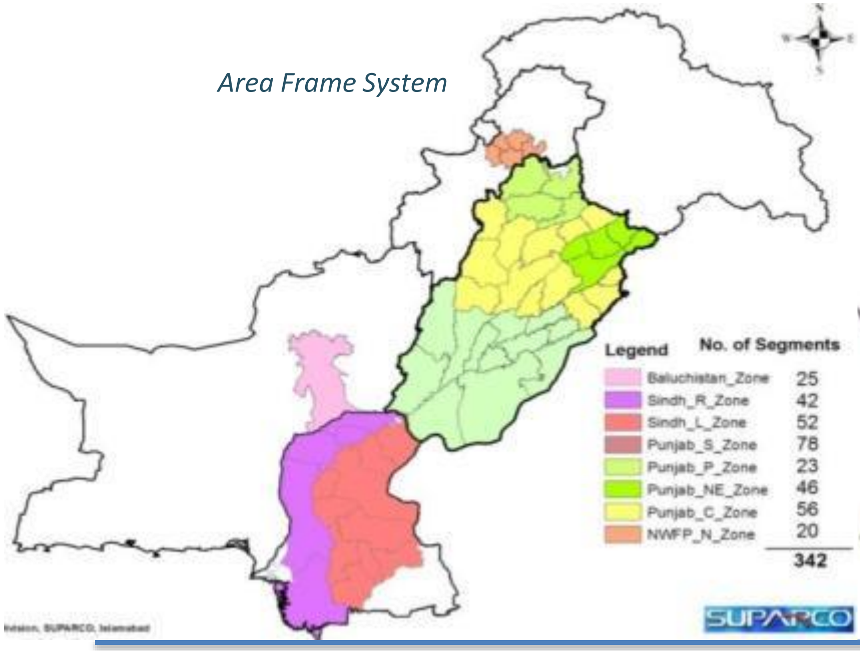


*Punjab South Zone broken down into PSU (red)*

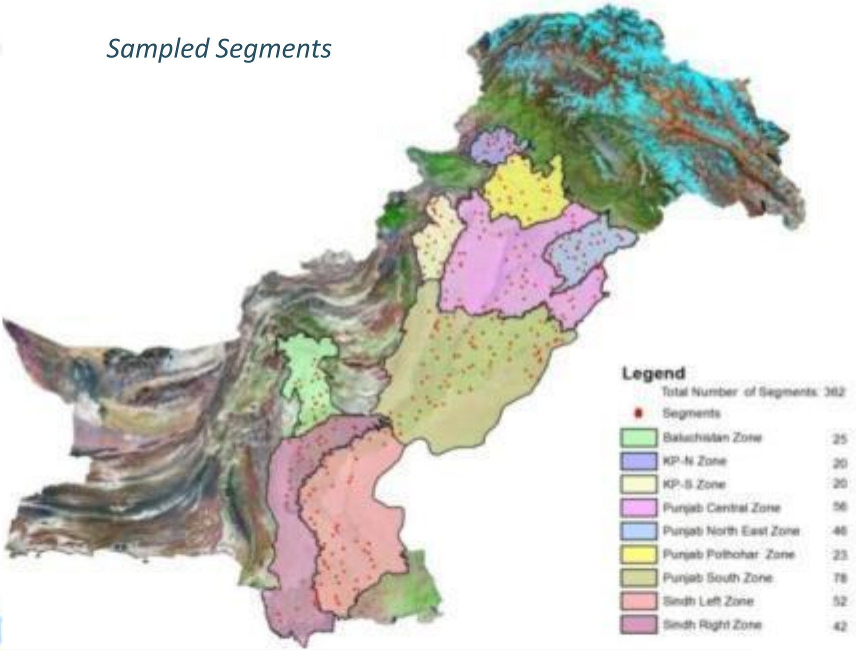
# Area Frame Sampling Survey in Pakistan

- To substantiate the satellite based image classification system, an area frame sampling system has been designed (see below).
- The spatial distribution of sampled segments as laid down by standard statistical/remote sensing techniques is shown below.

*Area Frame System*


N
W
E
S
Legend
No. of Segments
Baluchistan_Zone 25
Sindh_R_Zone 42
Sindh_L_Zone 52
Punjab_S_Zone 78
Punjab_P_Zone 23
Punjab_NE_Zone 46
Punjab_C_Zone 56
NWFP_N_Zone 20
342
SUPARCO
ivision, SUPARCO, Islamabad

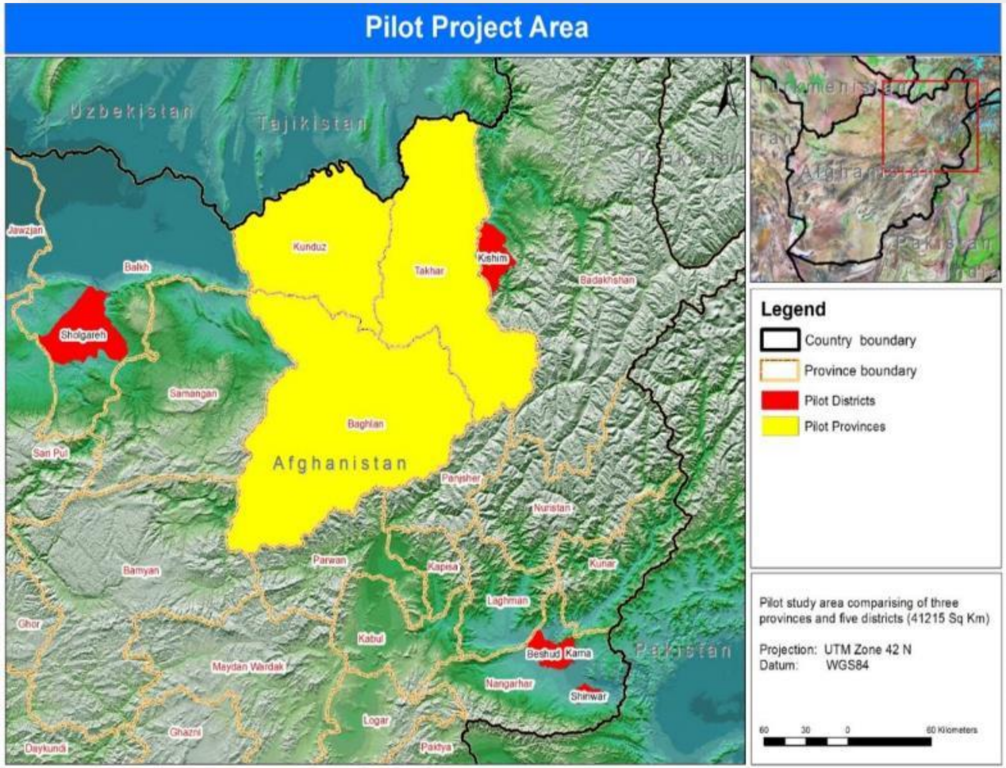
*Sampled Segments*


Legend
Total Number of Segments: 362
● Segments
Baluchistan Zone 25
KP-N Zone 20
KP-S Zone 20
Punjab Central Zone 56
Punjab North East Zone 46
Punjab Pothohar Zone 23
Punjab South Zone 78
Sindh Left Zone 52
Sindh Right Zone 42

# Monitoring of Rice and Cotton in Afghanistan

## Objectives

- To test relevant agriculture methodologies based on recent medium and high resolution geospatial information: Proba-V, Aqua/Terra, Landsat-8, Sentinel-1, Sentinel-2, SPOT-5/6/7 and Pleiades 1A/ 1B imagery with focus on rice monitoring.
- Crop area estimation and crop mask development


Pilot Project Area
Uzbekistan
Tajikistan
Afghanistan
Pakistan
Turkmenistan
Iran
Jawzjan
Balkh
Sholgareh
Samangan
Kunduz
Takhar
Kishim
Badakhshan
Baghlan
Sari Pul
Panjsher
Nuristan
Parwan
Kapisa
Kunar
Bamyan
Ghor
Laghman
Kabul
Beshud Kama
Maydan Wardak
Nangarhar
Shinwar
Ghazni
Logar
Daykundi
Paktya
Legend
Country boundary
Province boundary
Pilot Districts
Pilot Provinces
60 30 0 60 Kilometers

Pilot study area comparising of three provinces and five districts (41215 Sq Km)

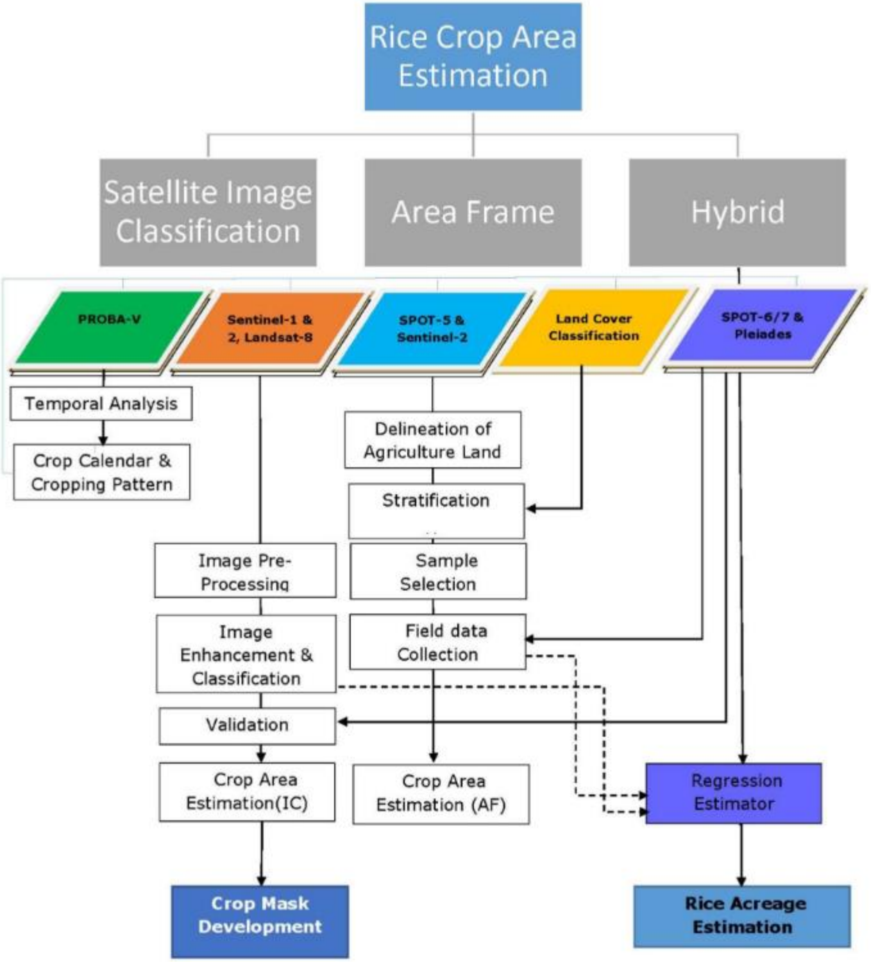
Projection: UTM Zone 42 N
Datum: WGS84

Geographical Area: 41000 Sq. Km
Agriculture area: 4100 Sq. Km

# Methodology

Following techniques have being used to estimate the area under rice crop:

- Satellite image classification
- Satellite based area frame sampling technique
- Regression estimator



Rice Crop Area Estimation

Satellite Image Classification

Area Frame

Hybrid

PROBA-V

Sentinel-1 & 2, Landsat-8

SPOT-5 & Sentinel-2

Land Cover Classification

SPOT-6/7 & Pleiades

Temporal Analysis

Crop Calendar & Cropping Pattern

Delineation of Agriculture Land

Stratification

Image Pre-Processing

Sample Selection

Image Enhancement & Classification

Field data Collection

Validation

Crop Area Estimation(IC)

Crop Area Estimation (AF)

Regression Estimator

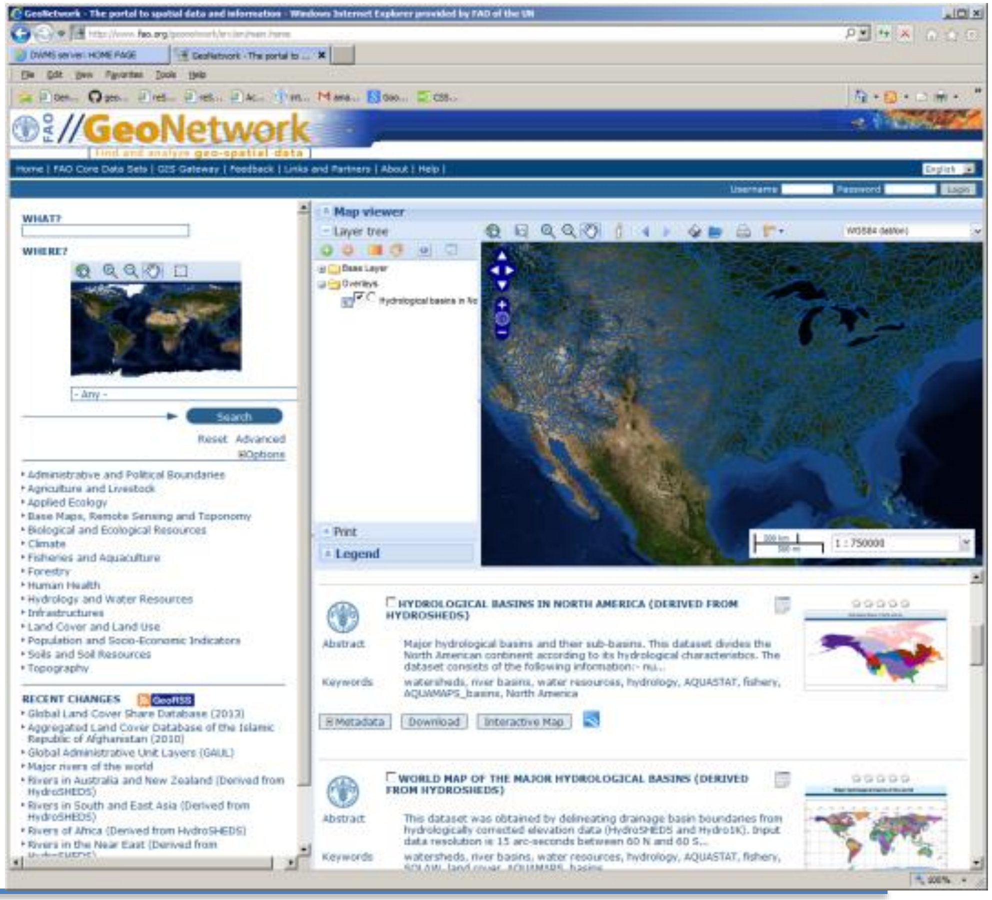
**Crop Mask Development**

**Rice Acreage Estimation**

# GeoNetwork – FAO metadata catalogue

- Internet access to interactive maps, satellite imagery and related spatial databases maintained by FAO and its partners;
- Powered by GeoNetwork opensource, which was developed by FAO and other UN agencies based on Free and Open Source Software (FOSS) principles and international standards;
- Almost 7000 records are stored;
- Ongoin upgrade to latest opensource version.

http://www.fao.org/geonetwork/srv/en/main.home


//GeoNetwork
Find and analyze geo-spatial data
Home | FAO Core Data Sets | GIS Gateway | Feedback | Links and Partners | About | Help |
English
Username
Password
Login
WHAT?
WHERE?
- Any -
Search
Reset
Advanced
Options
Map viewer
Layer tree
Base Layer
Overlays
Hydrological basins in N
Print
Legend
1 : 750000
Metadata
Download
Interactive Map

- Administrative and Political Boundaries
- Agriculture and Livestock
- Applied Ecology
- Base Maps, Remote Sensing and Toponomy
- Biological and Ecological Resources
- Climate
- Fisheries and Aquaculture
- Forestry
- Human Health
- Hydrology and Water Resources
- Infrastructures
- Land Cover and Land Use
- Population and Socio-Economic Indicators
- Soils and Soil Resources
- Topography

RECENT CHANGES GeoRSS

- Global Land Cover Share Database (2013)
- Aggregated Land Cover Database of the Islamic Republic of Afghanistan (2010)
- Global Administrative Unit Layers (GAUL)
- Major rivers of the world
- Rivers in Australia and New Zealand (Derived from HydroSHEDS)
- Rivers in South and East Asia (Derived from HydroSHEDS)
- Rivers of Africa (Derived from HydroSHEDS)
- Rivers in the Near East (Derived from

**HYDROLOGICAL BASINS IN NORTH AMERICA (DERIVED FROM HYDROSHEDS)**

Abstract: Major hydrological basins and their sub-basins. This dataset divides the North American continent according to its hydrological characteristics. The dataset consists of the following information:- nu...

Keywords: watersheds, river basins, water resources, hydrology, AQUASTAT, fishery, AQUAMAPS_basins, North America

**WORLD MAP OF THE MAJOR HYDROLOGICAL BASINS (DERIVED FROM HYDROSHEDS)**

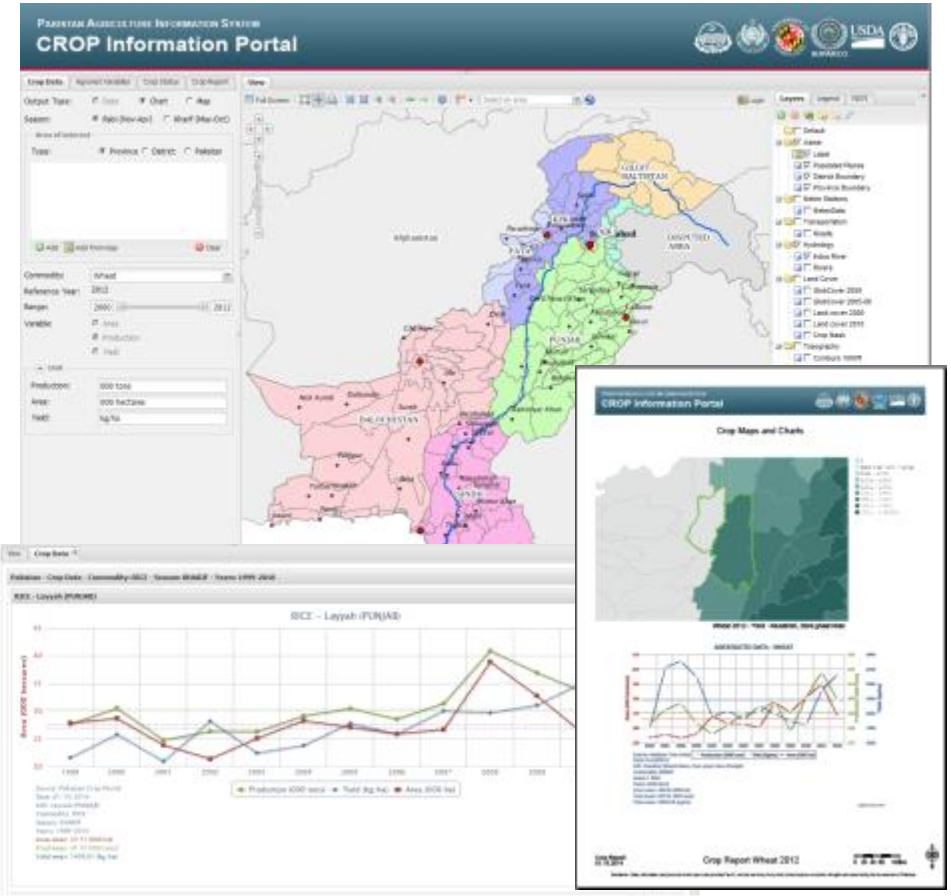
Abstract: This dataset was obtained by delineating drainage basin boundaries from hydrologically corrected elevation data (HydroSHEDS and Hydro1K). Input data resolution is 15 arc-seconds between 60 N and 60 S...

Keywords: watersheds, river basins, water resources, hydrology, AQUASTAT, fishery,

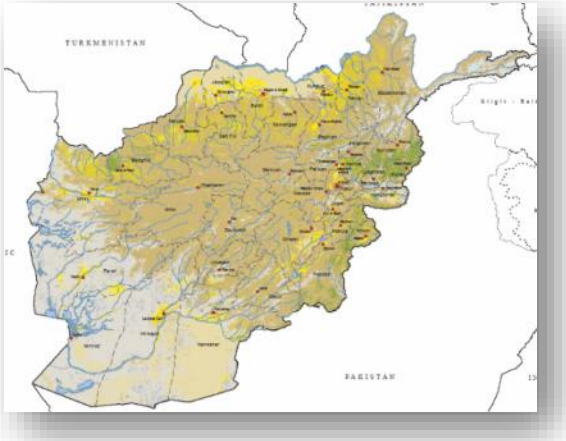
# Pakistan Crop Information Portal

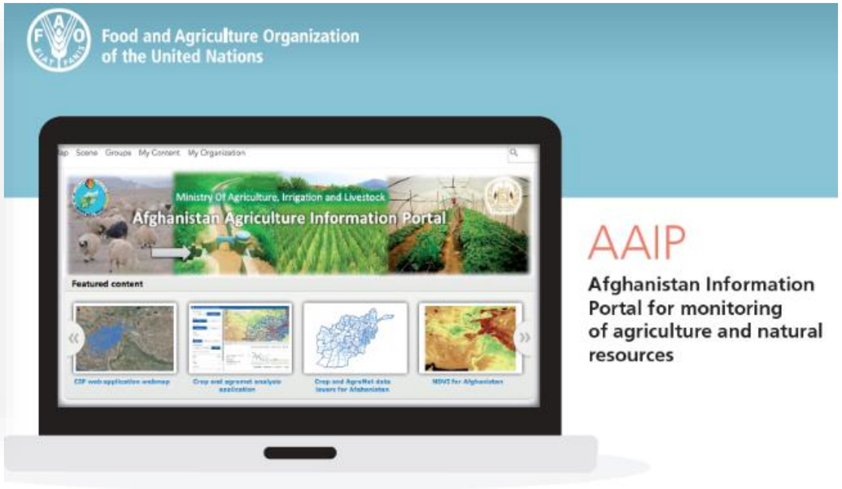
- The **Pakistan's Crop Portal** is a component of the *Pakistan Agriculture Information System*;
- It is being developed to support data and information dissemination on major crops (area, yield and production) and agro-meteorological conditions affecting crop growth;
- The Crop Portal uses **District** based crop data (wheat, maize, sugarcane, rice and cotton) and agromet conditions

*http://cip.sgs-suparco.gov.pk]*


Pakistan Agriculture Information System
CROP Information Portal
USDA
GILGIT BALTISTAN
PUNJAB
BALOCHISTAN
SINDH
Crop Data
RICE – Layyah (PUNJAB)
CROP Information Portal
Crop Maps and Charts
Crop Report Wheat 2012

# Afghanistan Agriculture Information Portal (AAIP)


TURKMENISTAN
PAKISTAN


Food and Agriculture Organization
of the United Nations
Map
Scene
Groups
My Content
My Organization
Ministry Of Agriculture, Irrigation and Livestock
Afghanistan Agriculture Information Portal
Featured content
CSP web application webmap
Crop and agromet analysis application
Crop and AgroMet data layers for Afghanistan
NDVI for Afghanistan

AAIP

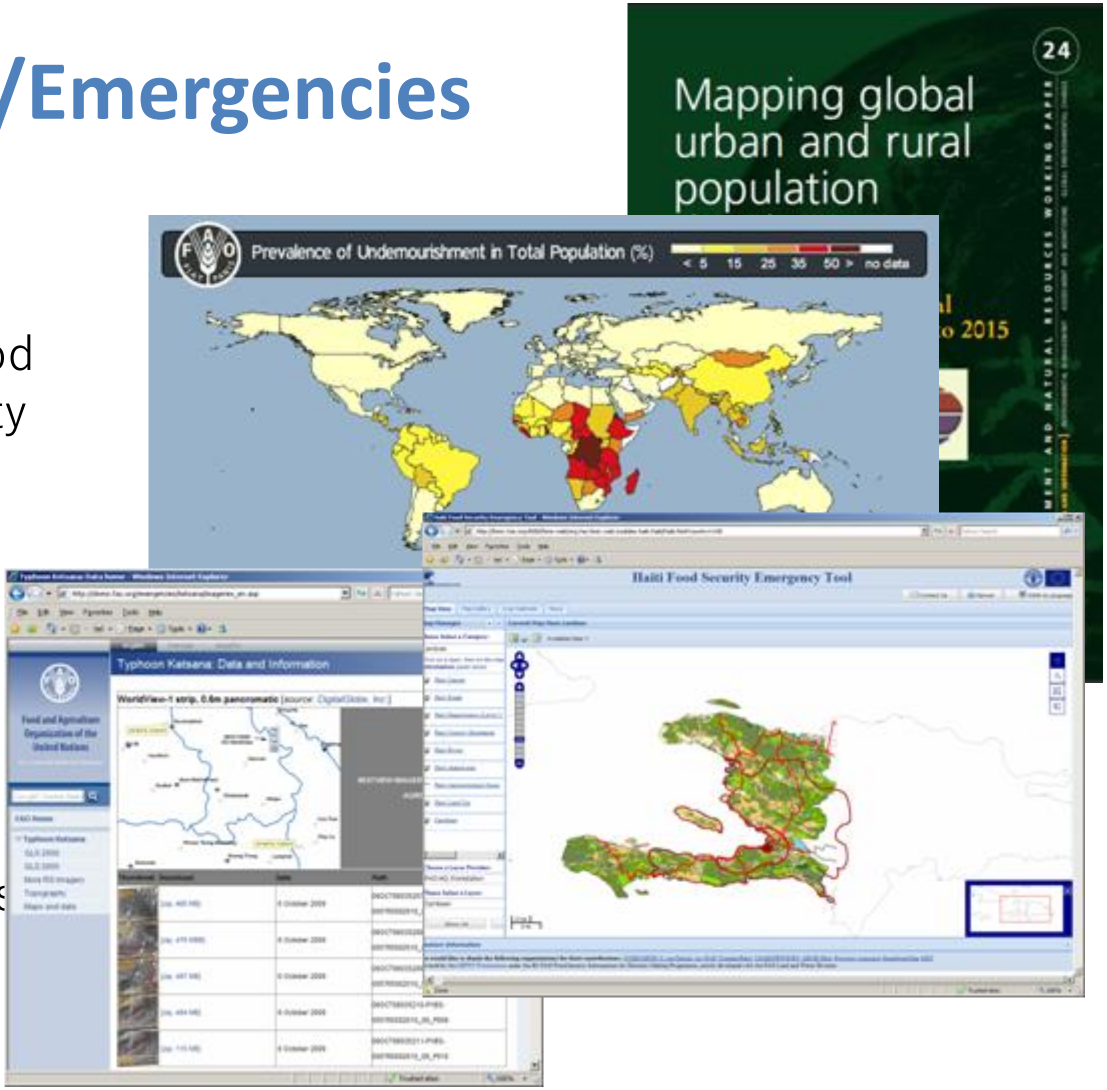
Afghanistan Information Portal for monitoring of agriculture and natural resources

## MAIN OBJECTIVES OF THE CROP PORTAL:

1. Sharing historical statistics and forecasts on crop yields and area.
2. Sharing historical and near real time agronomic, meteorological and hydrological data.
3. Monitoring crop conditions during main growing stages to detect stresses affecting future crop results.
4. GIS interface for the mapping of crop production information, natural resources, infrastructure and vegetation indexes from remote sensing.

# Food Security/Emergencies

- FIVIMS:
  - Stunting index, poverty and food security, poverty mapping atlas
- Emergency Preparedness:
  - Laos, Haiti,
  - Afghanistan
  - Pakistan Floods

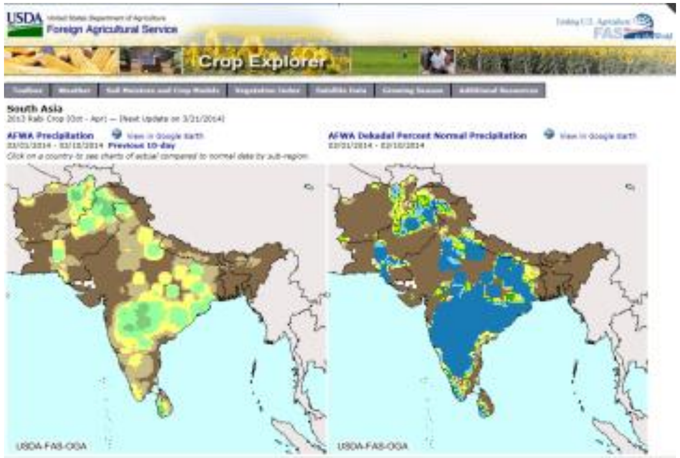

24
Mapping global urban and rural population
o 2015
Prevalence of Undernourishment in Total Population (%)
< 5
15
25
35
50 >
no data
Typhoon Ketsana: Data and Information
Haiti Food Security Emergency Tool

# GEOGLAM

## Monitoring Crop Production

- In this context a global system to monitor and assess production is seen as an important decision making tool to:
  - provide timely information on crop production and yield in a standardized and regular fashion at the regional to global level.
  - provide estimates as early as possible during the growing season(s) and update the estimates periodically through the season until harvest.
- Examples of current global crop estimation systems is **GEOGLAM**, which combines in-situ information, weather and satellite data in a convergence of evidence approach to estimate production and yield.

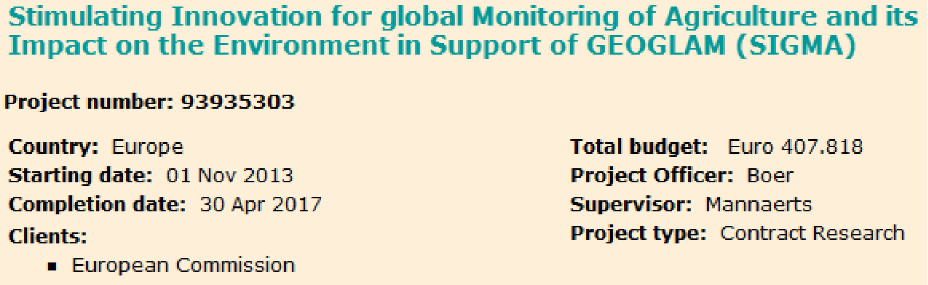
GEOGLAM
Global Agricultural Monitoring
MONTHLY ASSESSMENT
SEARCH
MAP
REPORTS
ABOUT
SETTINGS


USDA
United States Department of Agriculture
Foreign Agricultural Service
FAS
Crop Explorer
South Asia
AFWA Precipitation
View in Google Earth
Previous 10-day
AFWA Dekadal Percent Normal Precipitation
View in Google Earth
USDA-FAS-OGA
USDA-FAS-OGA

# SIGMA

## Stimulating innovation for Global Monitoring of Agriculture (SIGMA)

- FP7 EC Project.
- SIGMA's main challenge is to develop innovative methods and indicators to monitor and assess progress towards 'sustainable agriculture'.
- The project is a contribution to GEOGLAM initiative started by the G20.
- Reinforce awareness of the impact of agriculture on the global environment enabling the prediction of the impact of crop production on natural resources and ecosystems.



**Stimulating Innovation for global Monitoring of Agriculture and its Impact on the Environment in Support of GEOGLAM (SIGMA)**

**Project number:** 93935303

| | |
|---|---|
| **Country:** Europe | **Total budget:** Euro 407.818 |
| **Starting date:** 01 Nov 2013 | **Project Officer:** Boer |
| **Completion date:** 30 Apr 2017 | **Supervisor:** Mannaerts |
| **Clients:** | **Project type:** Contract Research |

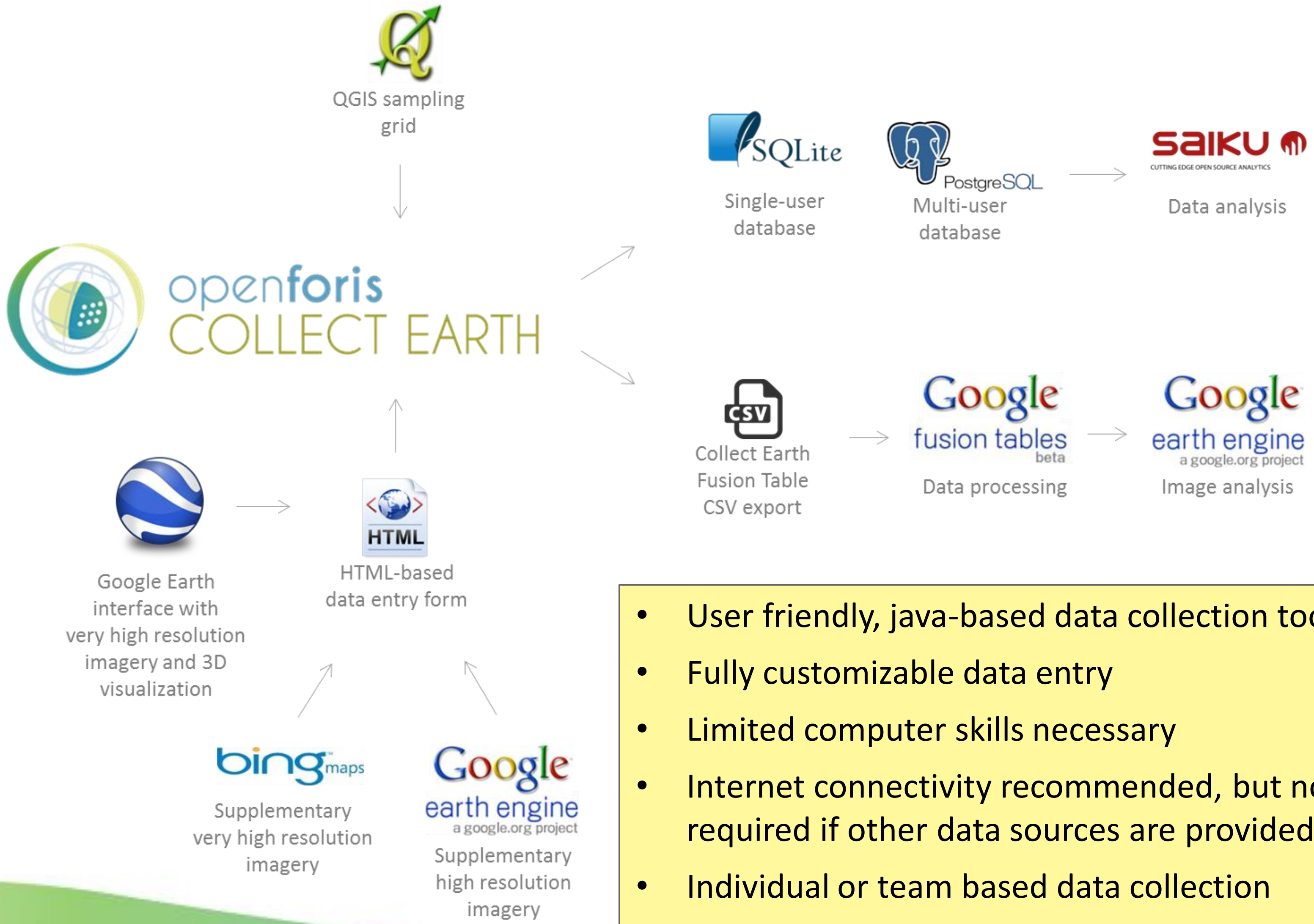
- European Commission

send by email | print this page
AMIS Agricultural Market Information System
HOME
ABOUT
MARKET MONITOR
INDICATORS
ANALYSES
STATISTICS
EVENTS

Monitoring markets

May update: The early outlook for major cereals points to a relatively stable supply in 2014/15 despite rising consumption.

# Collect Earth System Overview


openforis
COLLECT EARTH
SQLite
PostgreSQL
SAIKU
CUTTING EDGE OPEN SOURCE ANALYTICS
CSV
Google
fusion tables
beta
Google
earth engine
a google.org project
HTML
bing maps
Google
earth engine
a google.org project

QGIS sampling grid

Single-user database

Multi-user database

Data analysis

Collect Earth Fusion Table CSV export

Data processing

Image analysis

Google Earth interface with very high resolution imagery and 3D visualization

HTML-based data entry form

Supplementary very high resolution imagery

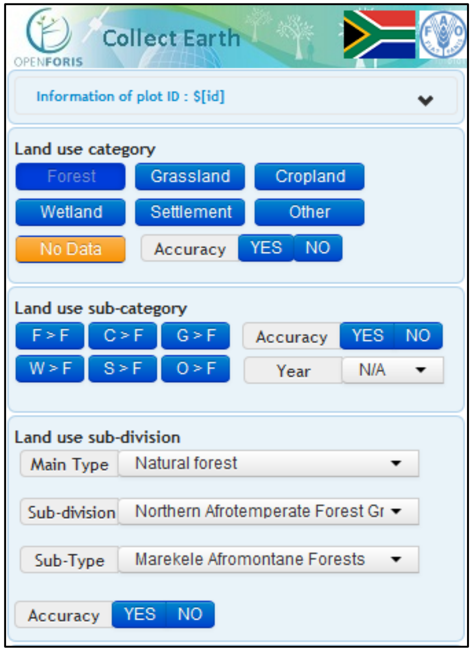
Supplementary high resolution imagery

- User friendly, java-based data collection tool
- Fully customizable data entry
- Limited computer skills necessary
- Internet connectivity recommended, but not required if other data sources are provided
- Individual or team based data collection
- Open-source software with code available on Github.com

# Collect Earth user cases

Collect Earth facilitates the analysis of high and very high resolution satellite imagery for a wide variety of purposes, including :

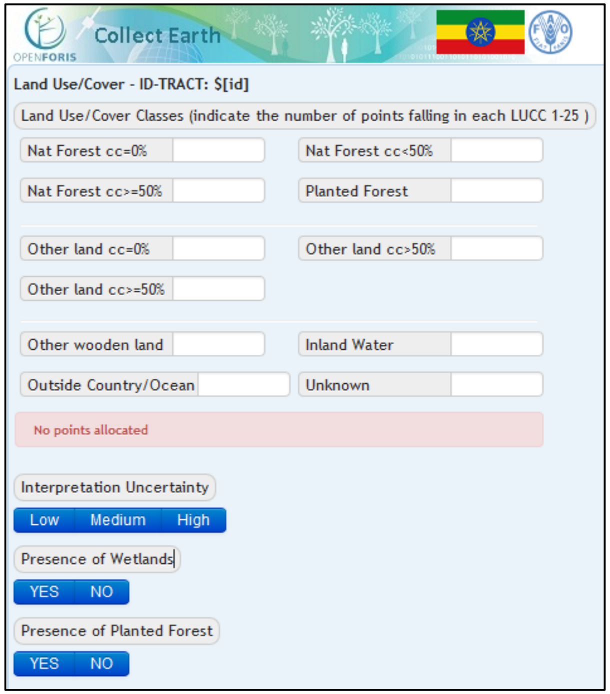
- Support **multi-phase National Forest Inventories**
- **Land Use, Land Use Change and Forestry (LULUCF) assessments** (18 partnering countries)
- **Monitoring agricultural land** and urban areas
- Accuracy assessment of existing maps (DRC, Zambia)
- Collection of spatially explicit socio-economic data (Vietnam)
- Quantifying deforestation, reforestation and desertification


OPENFORIS
Collect Earth
Information of plot ID : $[id]
Land use category
Forest
Grassland
Cropland
Wetland
Settlement
Other
No Data
Accuracy
YES
NO
Land use sub-category
F > F
C > F
G > F
W > F
S > F
O > F
Accuracy
YES
NO
Year
N/A
Land use sub-division
Accuracy
YES
NO

Main Type: Natural forest

Sub-division: Northern Afrotemperate Forest Gr

Sub-Type: Marekele Afromontane Forests


OPENFORIS
Collect Earth
Land Use/Cover - ID-TRACT: $[id]
Land Use/Cover Classes (indicate the number of points falling in each LUCC 1-25 )
Nat Forest cc=0%
Nat Forest cc<50%
Nat Forest cc>=50%
Planted Forest
Other land cc=0%
Other land cc>50%
Other land cc>=50%
Other wooden land
Inland Water
Outside Country/Ocean
Unknown
No points allocated
Interpretation Uncertainty
Low
Medium
High
Presence of Wetlands
YES
NO
Presence of Planted Forest
YES
NO

# Capacity Building

- Awareness workshops, training resources and sessions
    - Regional awareness workshops by FAO staff on land cover mapping methodology, standards and tools
    - National on-the-job trainings to support national mapping programmes
    - Project coordination and backstopping

## Juba – January 2018

## Pakistan – March 2018

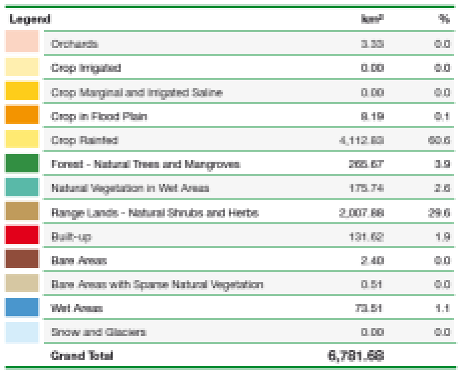
**1st Mission to Punjab Region, Lahore and Faisalabad provinces** 4-day trainings for the AEZ study in the Punjab region. Center for Advanced Studies in Agriculture and Food Security, University of Agriculture-Faisalabad (Dec. 2017).

# Outreach

## Atlas and DVD

Atlas of Malawi
Land Cover and Land Cover Change
1990 - 2010
Hot Spots of Change
1990's - 2000's
2000's - 2010's

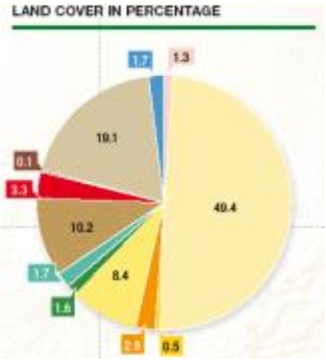
Land Cover Atlas of Pakistan
The Khyber Pakhtunkhwa Province
and Federally Administered Tribal Areas
Land Cover Atlas of
The Punjab
Land Cover Atlas of Pakistan
The Sindh Province
KHARIF CROP MASK



DISTRIBUTION OF LAND COVER IN THE DISTRICT

| Legend | | km² | % |
|---|---|---|---|
| ⬜ | Orchards | 3.33 | 0.0 |
| 🟨 | Crop Irrigated | 0.00 | 0.0 |
| 🟨 | Crop Marginal and Irrigated Saline | 0.00 | 0.0 |
| 🟧 | Crop in Flood Plain | 8.19 | 0.1 |
| 🟨 | Crop Rainfed | 4,112.83 | 60.6 |
| 🟩 | Forest - Natural Trees and Mangroves | 265.67 | 3.9 |
| 🟩 | Natural Vegetation in Wet Areas | 175.74 | 2.6 |
| 🟫 | Range Lands - Natural Shrubs and Herbs | 2,007.68 | 29.6 |
| 🟥 | Built-up | 131.62 | 1.9 |
| 🟫 | Bare Areas | 2.40 | 0.0 |
| ⬜ | Bare Areas with Sparse Natural Vegetation | 0.51 | 0.0 |
| 🟦 | Wet Areas | 73.51 | 1.1 |
| ⬜ | Snow and Glaciers | 0.00 | 0.0 |
| | **Grand Total** | **6,781.68** | |

LAND COVER IN PERCENTAGE



# Thank You!!

Douglas.Muchoney@fao.org

Geospatial: www.fao.org/geospatil
SEPAL: https://sepal.io
GAEZ: http://gaez.fao.org/Main.html