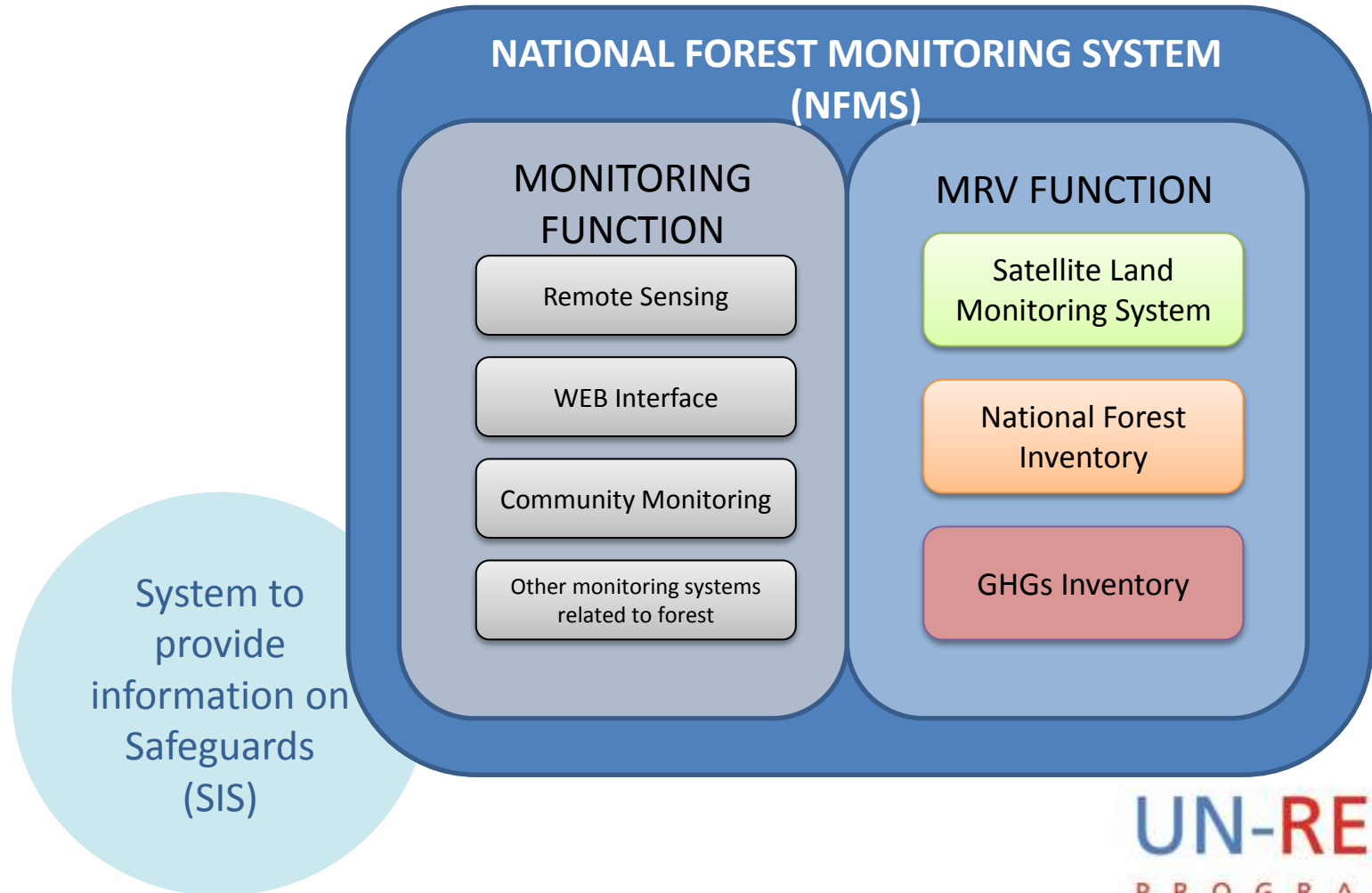


# Ethiopia's National Forest Monitoring System for REDD+

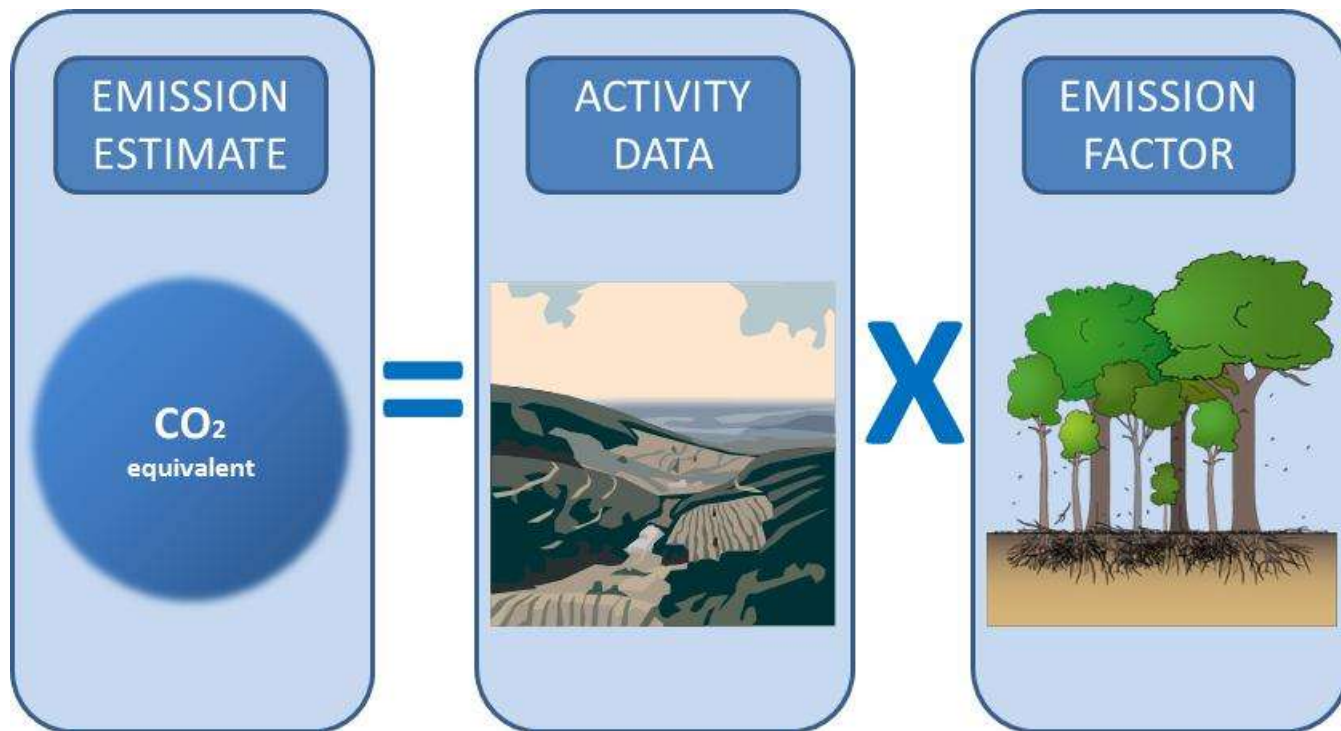
Yitebitu Moges (PhD)

National REDD+ Coordinator, REDD+  
Secretariat, Ministry of Environment  
and Forest

# Functions of the NFMS



# Methodological approach of the IPCC to calculate human-induced GHG emissions by sources and removals by sinks in forest land



# National Stakeholders' Workshop on REDD+ MRV: Recommendations

Decision Support Tool developed by the World Bank has been used to make decisions on the following aspects of the REDD+ MRV

- Scale
- Scope
- Approach (land based or activity based)
- REL/RL
- MRV
- REDD+ Compliant NFI
- Stratification

# Scale and implications of piloting

- Sub-national should not have to wait for federal
- However federal should be coordinating and defining framework including forest definition, mapping 'standards' and approaches

# Scope

- REDD Activities for Monitoring
  - Deforestation
  - Degradation → to be reviewed based on data availability and further analysis of drivers
    - Fuel wood
    - Agricultural activities
    - Others including fires
  - Reforestation/Carbon Enhancements
- Carbon pools:
  - Above and below ground biomass
  - Soil carbon to be assessed

# Approach: Land based vs Activity based

- Activity based;
- But to be assessed once initial review of data sources and national forest change analysis is available

# Reference Level

- Period: initially start from 1990 onwards but to be reviewed
- Start with 3 points, review if trend analysis is justified and add data points as needed
- Classification approach to be decided based on availability of ground truth data (woody biomass study and others)
- Adjustments: further analysis of drivers, policies and trends required
- Start simple and stepwise approach to improve



# MRV

- Review institutional arrangements and their capacity
- Need for standard on the use of RS?  
Discussion will continue
- Test use of alternative sources of RS information, including high resolution data to improve activity data, forest classification and other landscape attributes

# Stratification

- Initial stratification based on: Agro-ecological zones and forest categories
  - High forest
  - Woodland
  - Shrub land
- Step wise approach to improve/ further stratification

# Community involvement in MRV

- No experience in Ethiopia in involving communities is forest inventory / MRV
- To be explored further

# REDD+ MRV and the Current NFI

- Current NFI design can be scalable
- Separate process on NFI design
- Further coordination between REDD+ and NFI design required

# Key short term actions

- Making decision on forest definition
- Decide land classification categories and complete land cover map (NFI?)
- Update forest cover map and perform initial change analysis
- Clarify institutional arrangements for MRV
- Analyze information that already exists (relevance and if/how it can be used → includes woody biomass inventory, information available in regional bureaus, Bale Mountain project etc

# **THE NATIONAL FOREST INVENTORY (NFI) PROCESS IN ETHIOPIA**

**NFI is designed in order to align with  
REDD+ MRV needs**

**NFI Manual and Field Forms revised to  
capture four carbon pools**

**Support provided by REDD+ Secretariat  
to NFI**

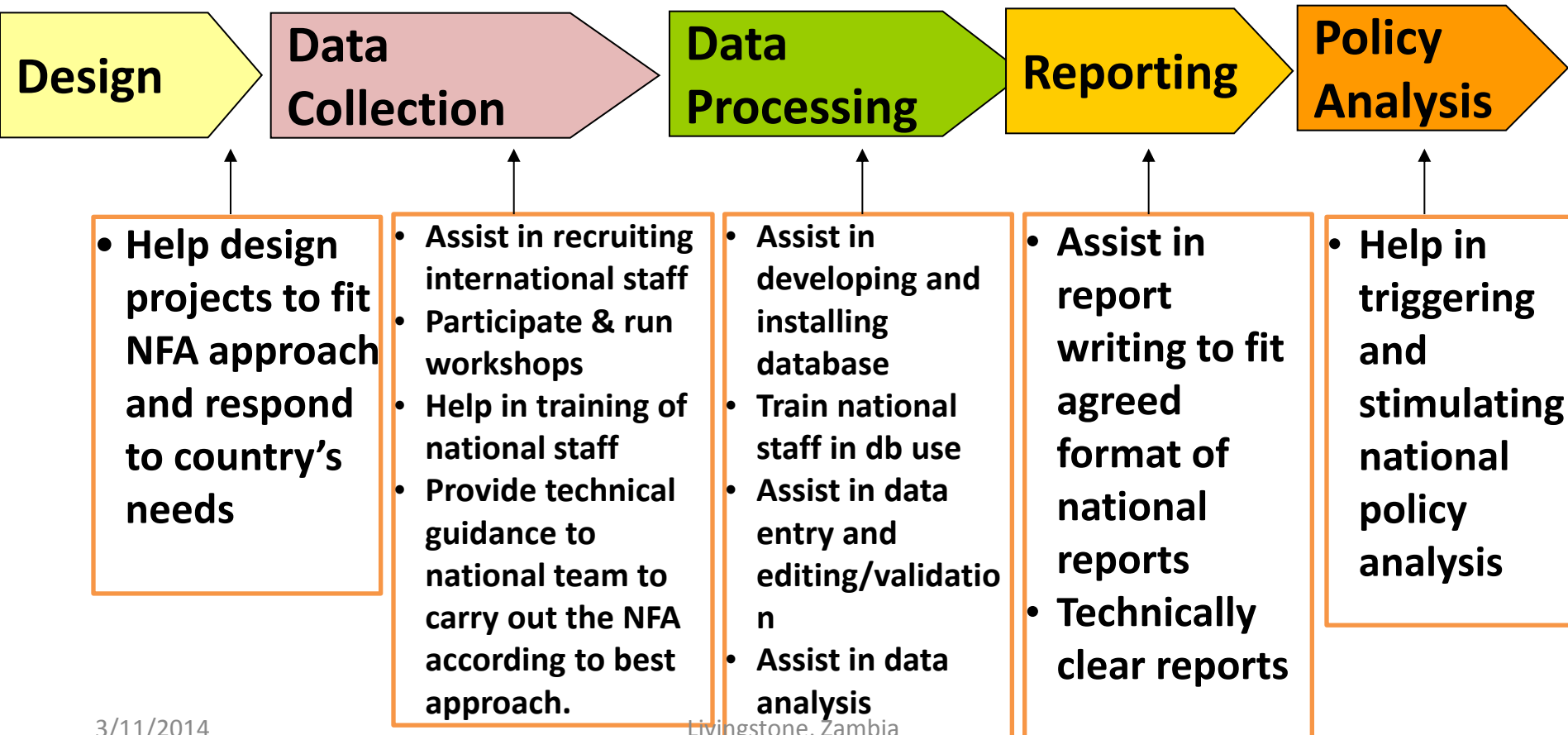
# Developing Ethiopia's NFI to answer REDD+ needs

1. Increase sampling intensity in areas where forest cover has historically been changing the most or is most likely to change (e.g. southwest high forests)
2. Start NFI in priority areas
3. Ensure that sampling design intensity is appropriate for all forest classes
4. Consider measuring all 5 carbon pools, at least for the first inventory round, to determine key pools
5. Include destructive sampling to complete the inventory to improve biomass estimates
6. Systematically record land cover AND land use, notably to try and identify location of potential REDD+ activities
7. Cover all land uses (REDD+ is also about enhancing carbon stocks)
8. Ensure that the land classification system used allows Ethiopia to report on UNFCCC land classes (LCCS3 allows for this)
9. Consider tailoring socio-economic interviews/studies to gather relevant information on safeguards



# NFI PROCESS (FAO)

US\$ 0.3–3M, 2-3 years



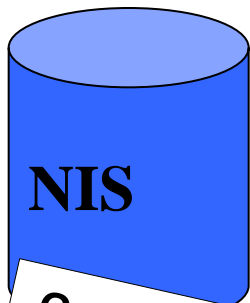


# METHODOLOGY – Overview

Capacity Building

**Field Survey**  
(local interviews / measurements)

**Remote Sensing**



**National policy making**

**Sustainable resources management**

Support to sectoral (nfp) and cross-sectoral policy dialogue, harmonisation

# METHODOLOGY

**Interviews**



**Field Survey**

**Triangulation**

**Measurements**



**Observations**



# FIELD DATA COLLECTION

- **Field measurements at plot and subplot levels**
  - **Biophysical information**
- **Interviews with:**
  - Local people (users): focus groups
  - Key informants
  - Randomly selected households
- **Information on uses, users and management of natural resources (products/ services – environmental problems)**
- **Observations and cross-checking**





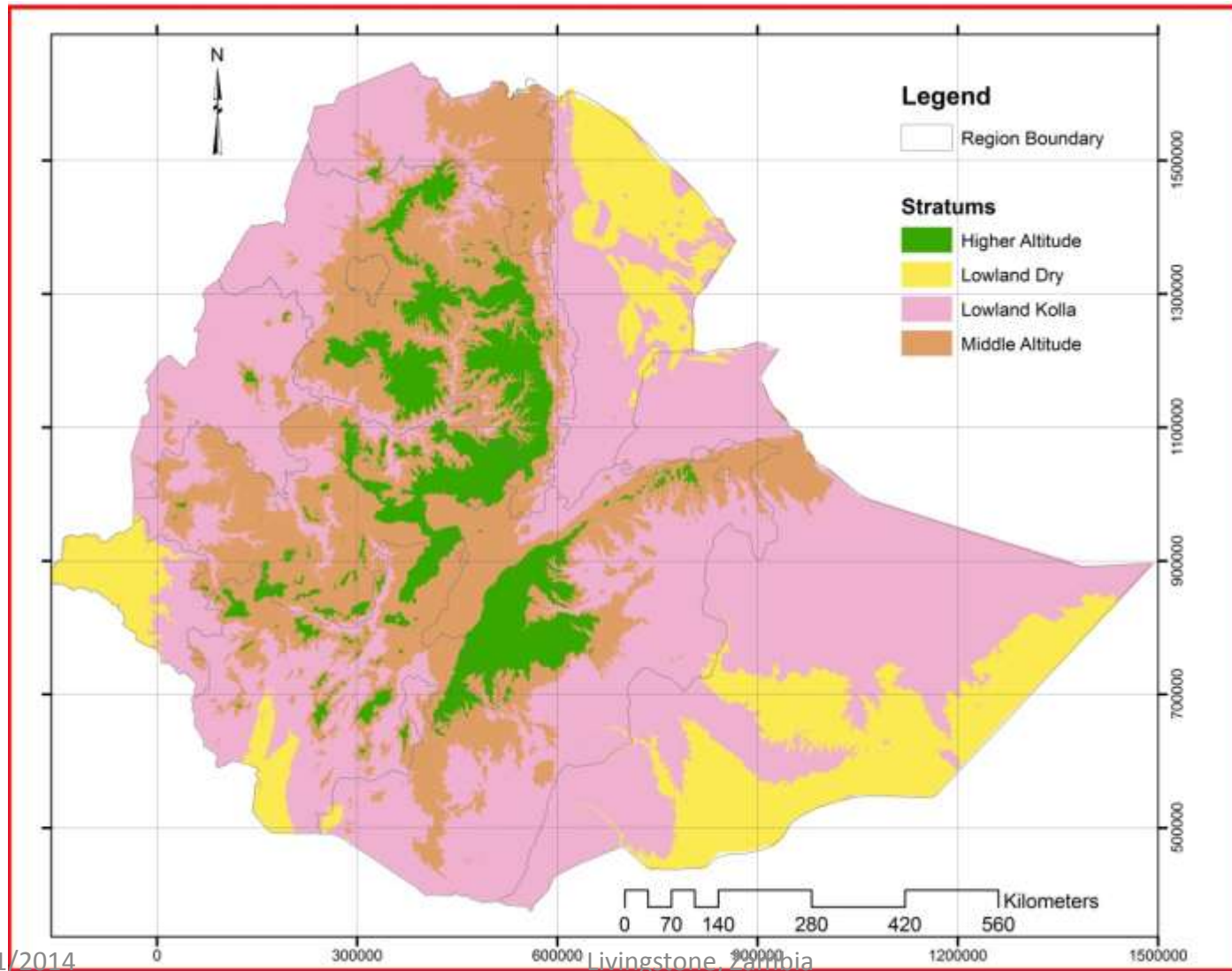
## FOREST DEFINITION

- Forest: Land that spans more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ (FAO)

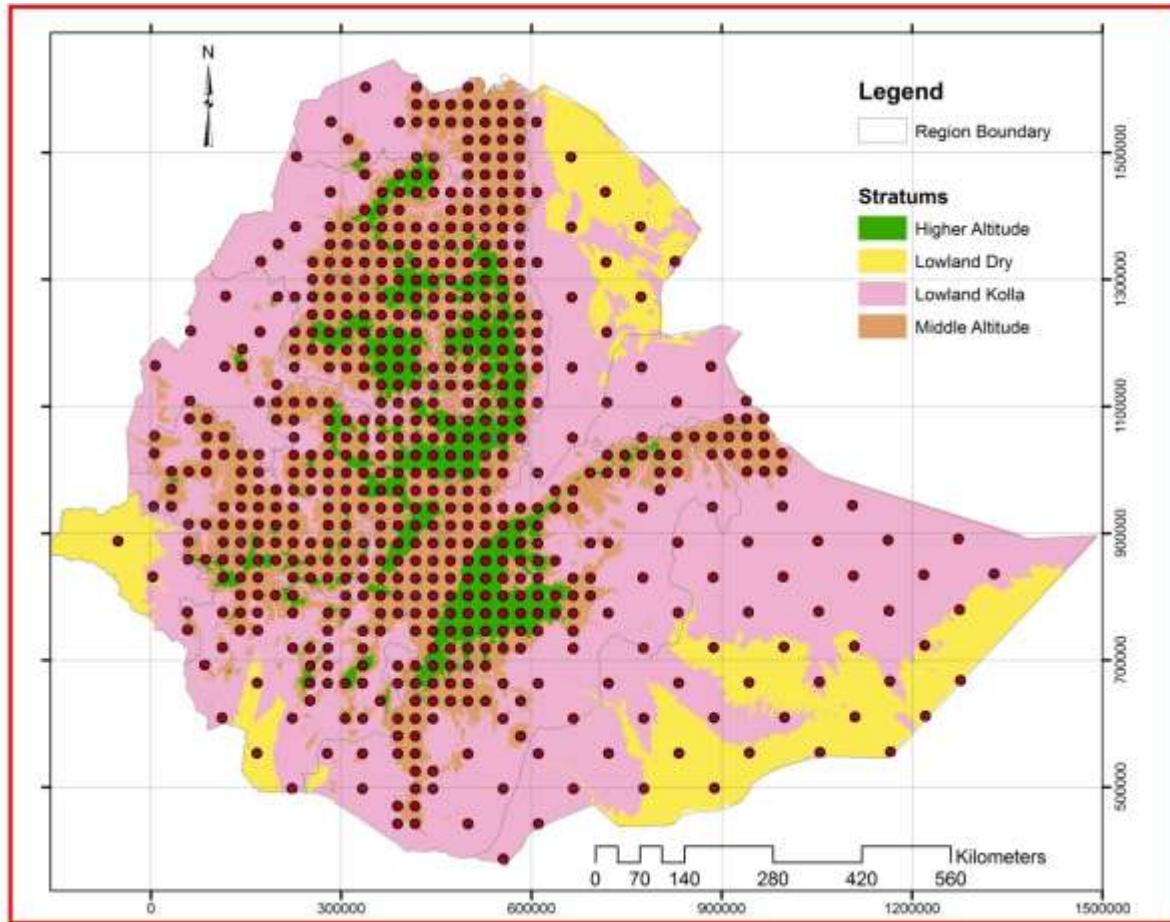
# Land Use/Cover Classification

- The classification system used to define land use/cover classes (LUCC) is based on a dichotomous approach
- The global classes include Forests, Other wooded land, other land and inland water
- National Classes: Forests, Woodlands, Other Wooded land, Other land and inland water

# Stratification (4 strata)



# SAMPLING INTENSITY



630 Sampling Units  
(This map has now been modified so that more SUs fall in the forest and woodland categories)



# Land Use/Land Cover Mapping

## - Mapping Framework

- Developing Methods
- Capacity Building

## - Operation of Mapping

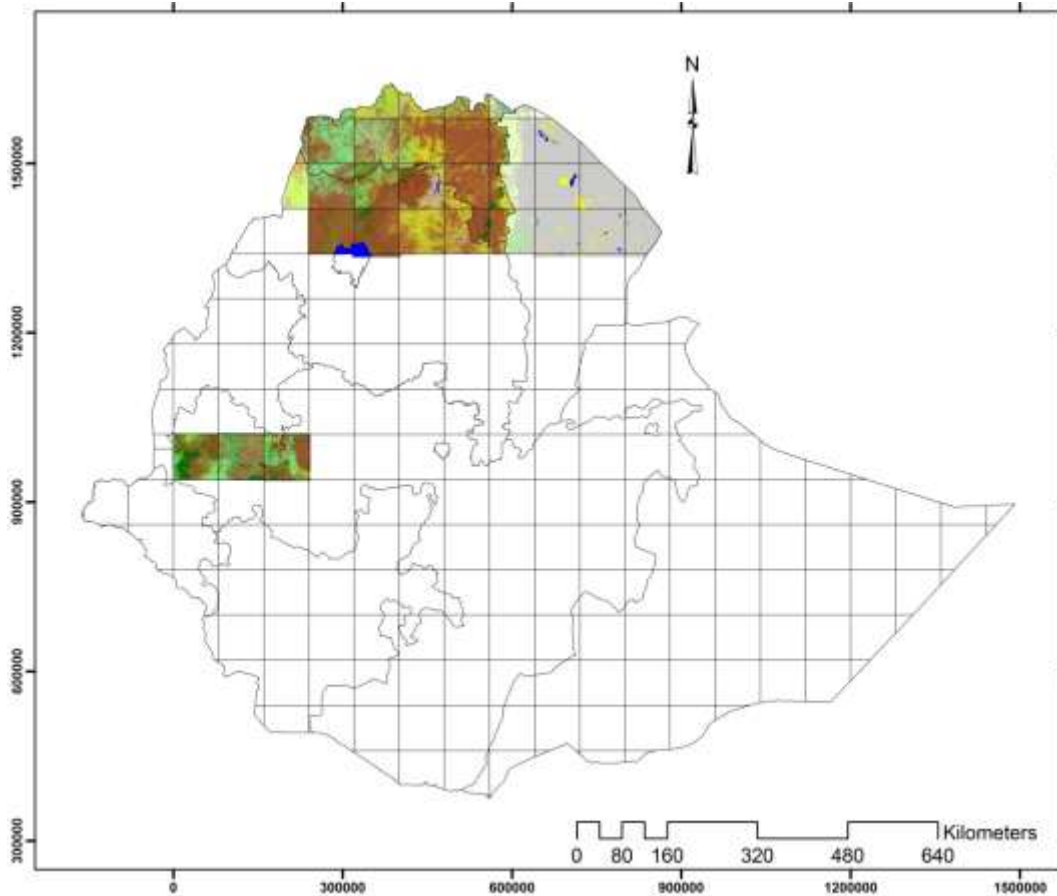
Wall to wall approach image analysis

Accuracy Assessment and Remapping

## - Image and Software Used

Landsat 8, ERDAS and ArcGIS 10.1

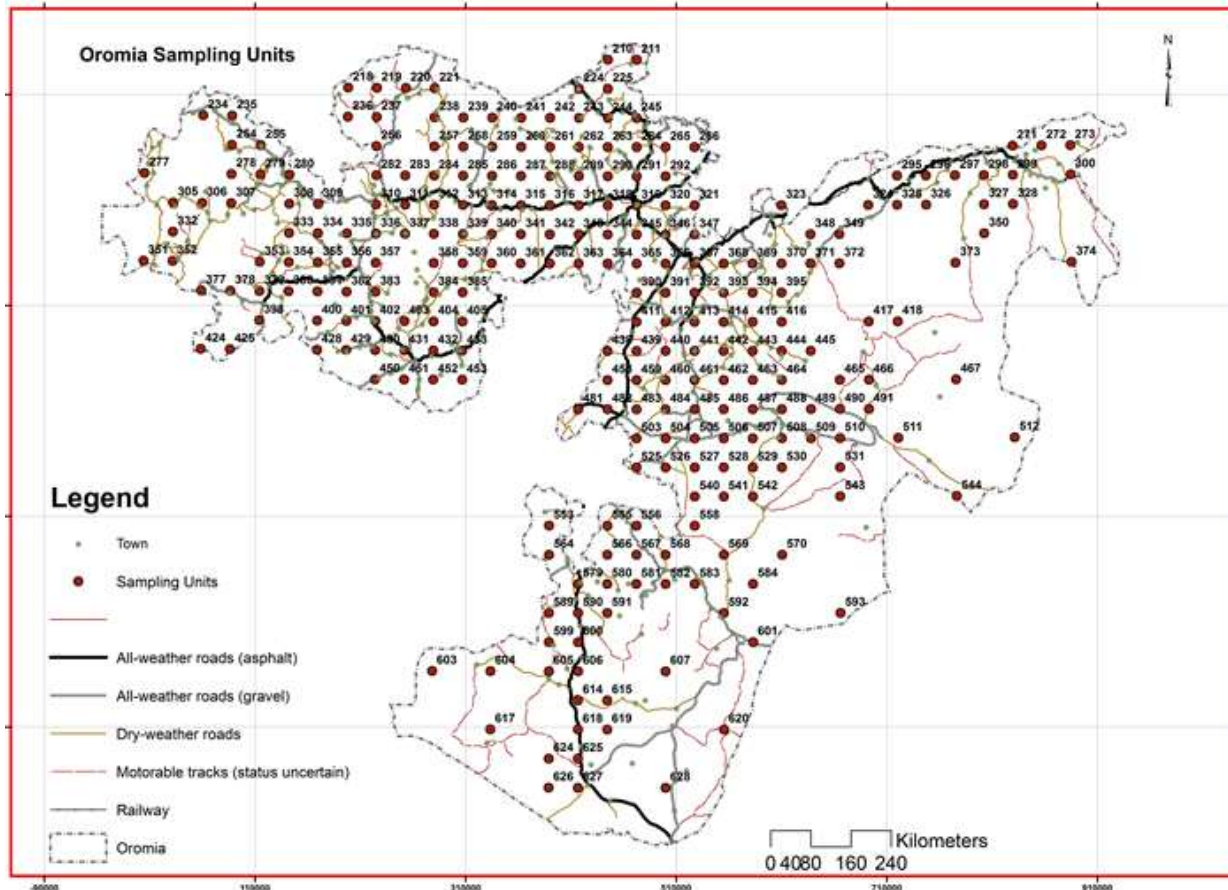
# Land Use/Land Cover Mapping



Land use/Land cover mapping grids (Mapping activity going on!)

# Oromia State (Lessons)

- Oromia Region will be our testing area for the NFI

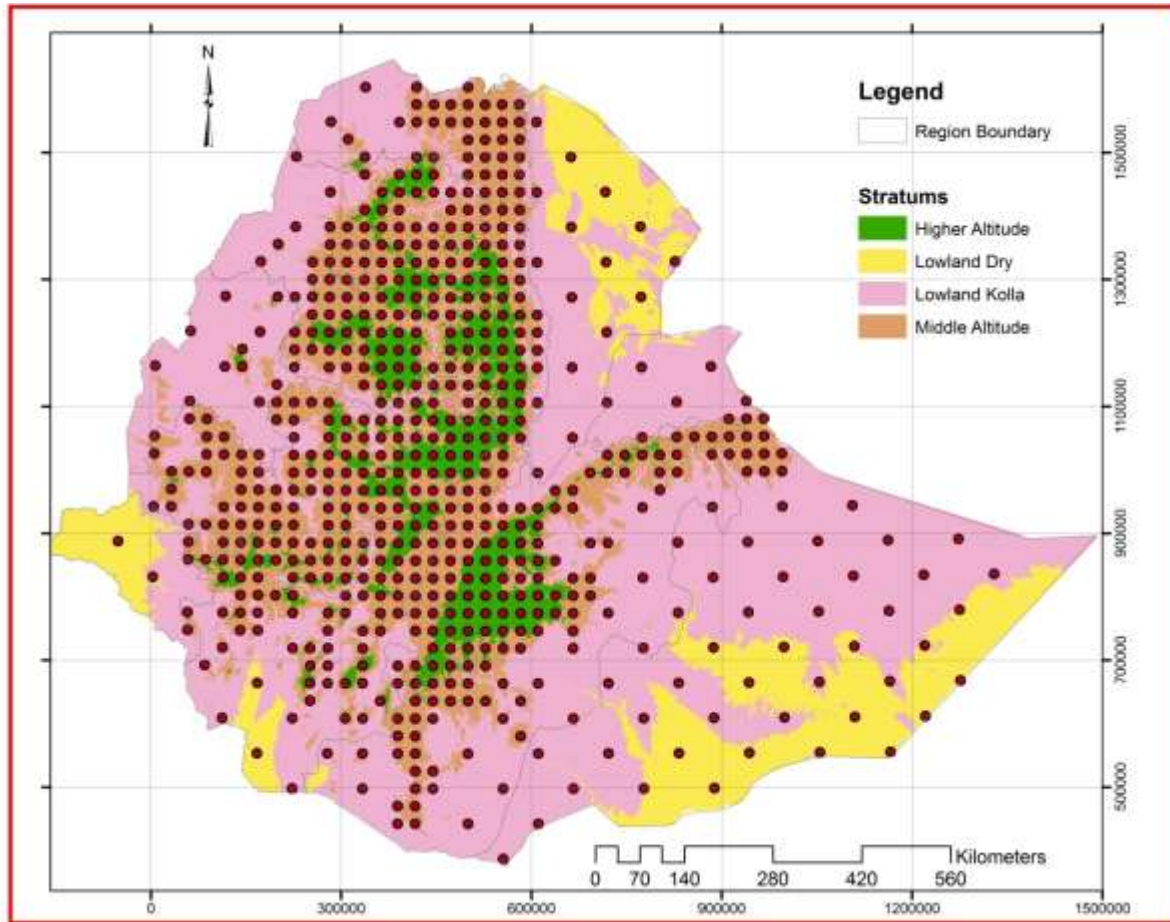


Oromia SUs

# Description of the sampling unit (SU)

- The sampling design adopted for the NFA in Ethiopia is systematic.
- **630 SUs** distributed nation-wide, each sampling units having a cluster of plots and subplots.
- Data is collected in the field through:
  - **Observations,**
  - **Measurements, and**
  - **Interviews;** at different levels within the limits of the sampling units (SU) and in smaller subunits.

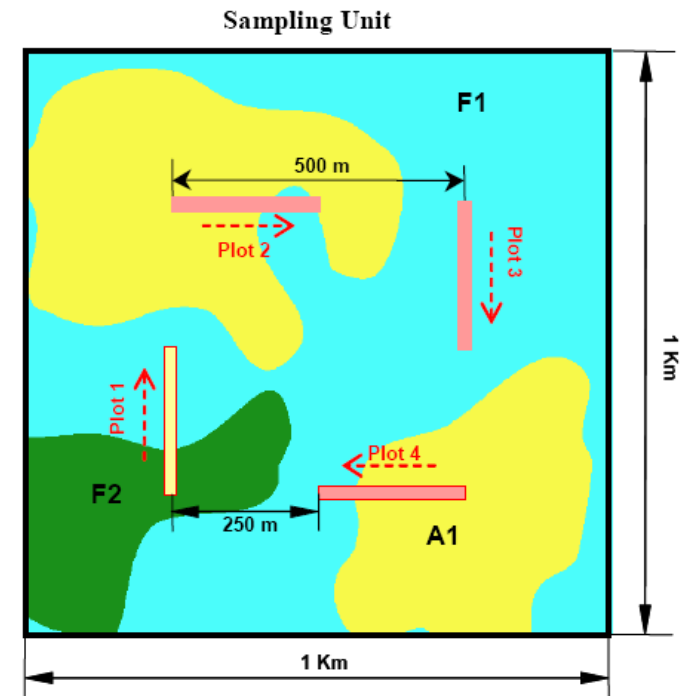
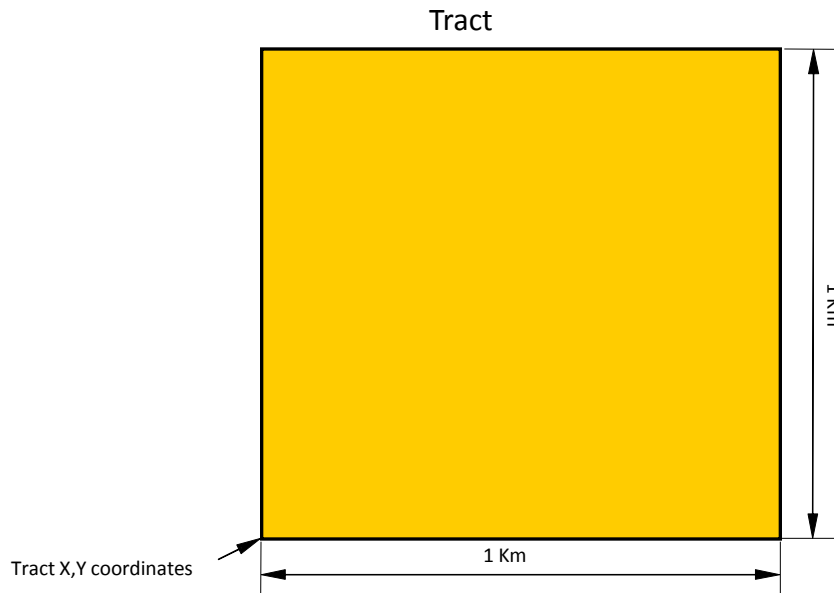
# SAMPLING INTENSITY



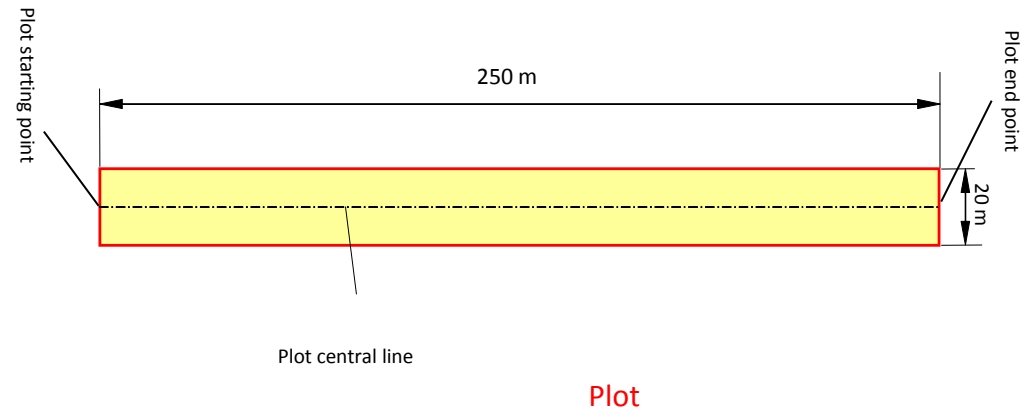
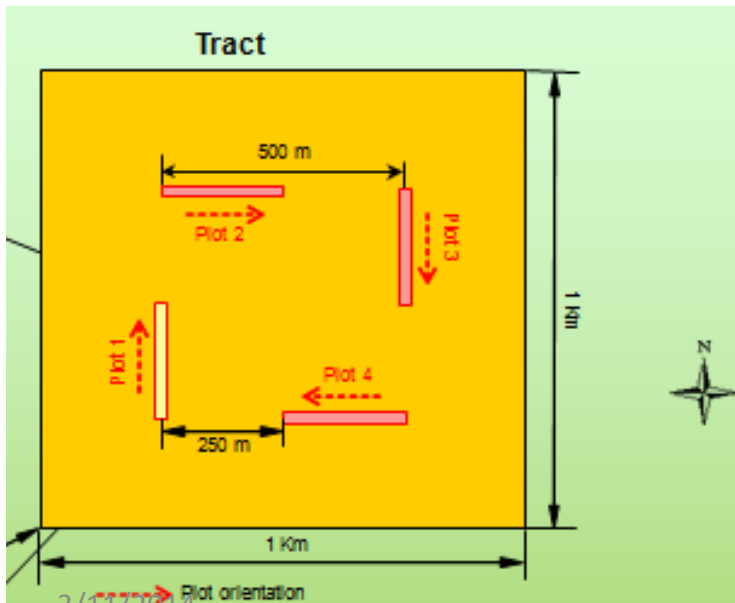
630 Sampling Units

# The sampling unit (SU)

- Is also called 'Tract'. It is a square surface area of 1 km x 1 km.
- The coordinates of the south-west corner of the SUs correspond to those of the points selected in the systematic sampling frame.



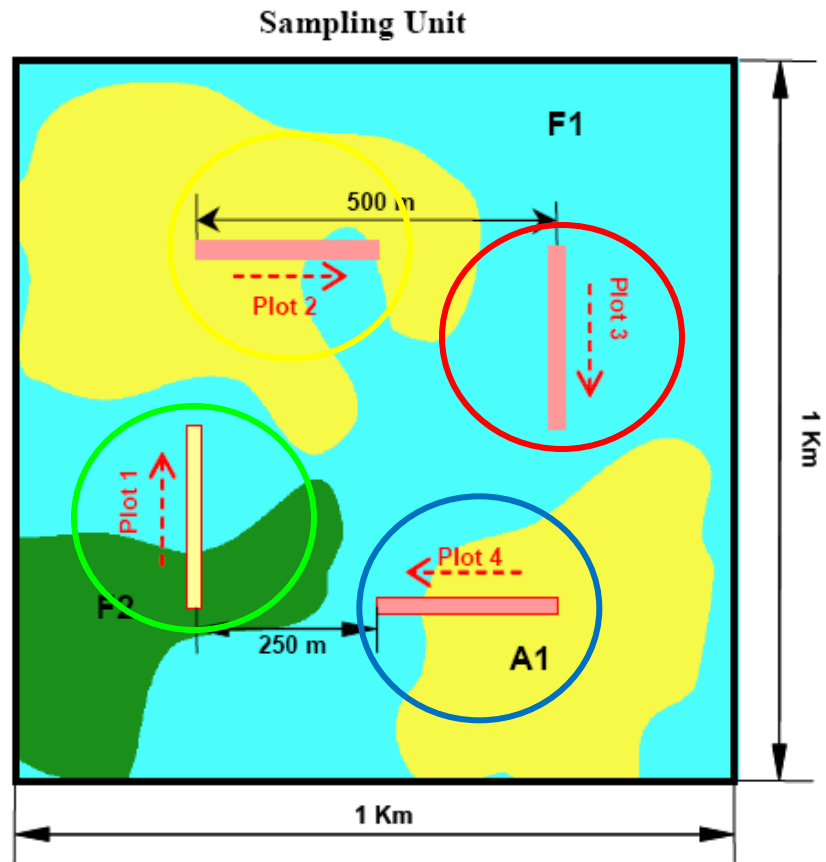
- Each SU contains four main field plots.
- The plots are rectangles, with surface areas measuring 20m wide and 250m long within the SU.
- They are numbered clockwise from 1 to 4



3/11/2014

Livingstone, Zambia

# Orientation of the plots

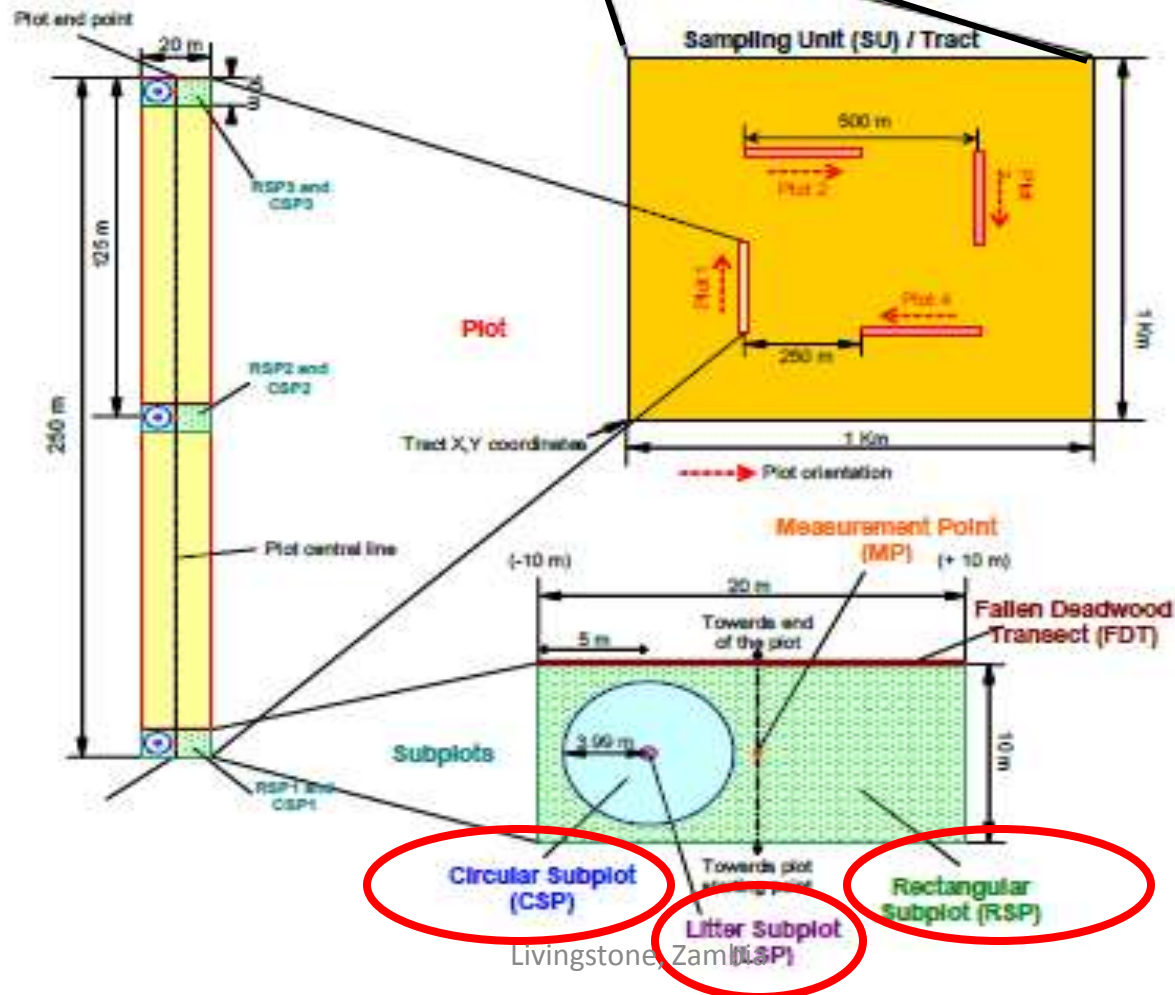


Plot	Location of the starting point of the plot, within the 500 m inner square	Orientation	Bearing
Plot 1	South-West corner	South-North	0 / 360 degrees
Plot 2	North-West corner	West-East	90 degrees
Plot 3	North-East corner	North-South	180 degrees
Plot 4	South-East corner	East-West	270 degrees

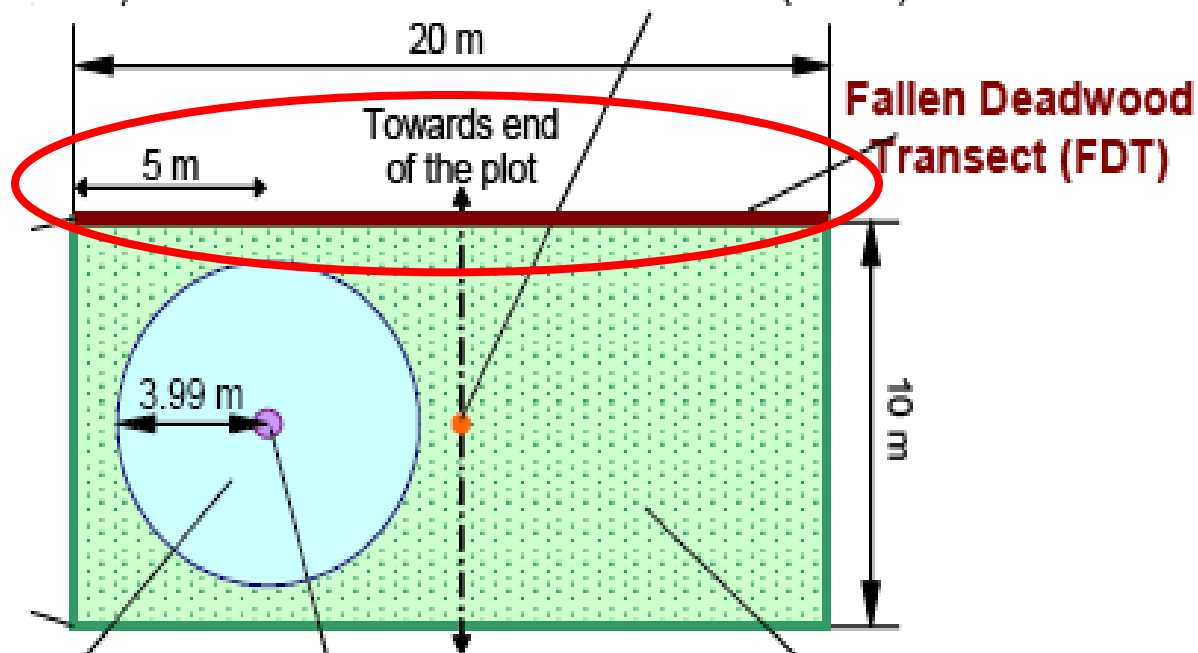


- **Three sets of subplots** are delimited within each plot, corresponding to different data collection levels
- **3 Rectangular Subplots (RSP)**, 20 m x 10 m (200 m<sup>2</sup>), corresponding to level 1
- **3 Circular Subplots (CSP)**, with a radius of 3.99 m (50 m<sup>2</sup>), corresponding to level 2, located in the left-hand half of the rectangular subplots
- **3 Litter Subplots (LSP)**, also circular but smaller with a radius of 18 cm (about 0.1 m<sup>2</sup>), corresponding to level 3, located in the centre of the Circular Subplots

# Sampling Unit 1



- Fallen deadwood branches will be observed along a 20m transect (**FDT**) at the end of each RSP



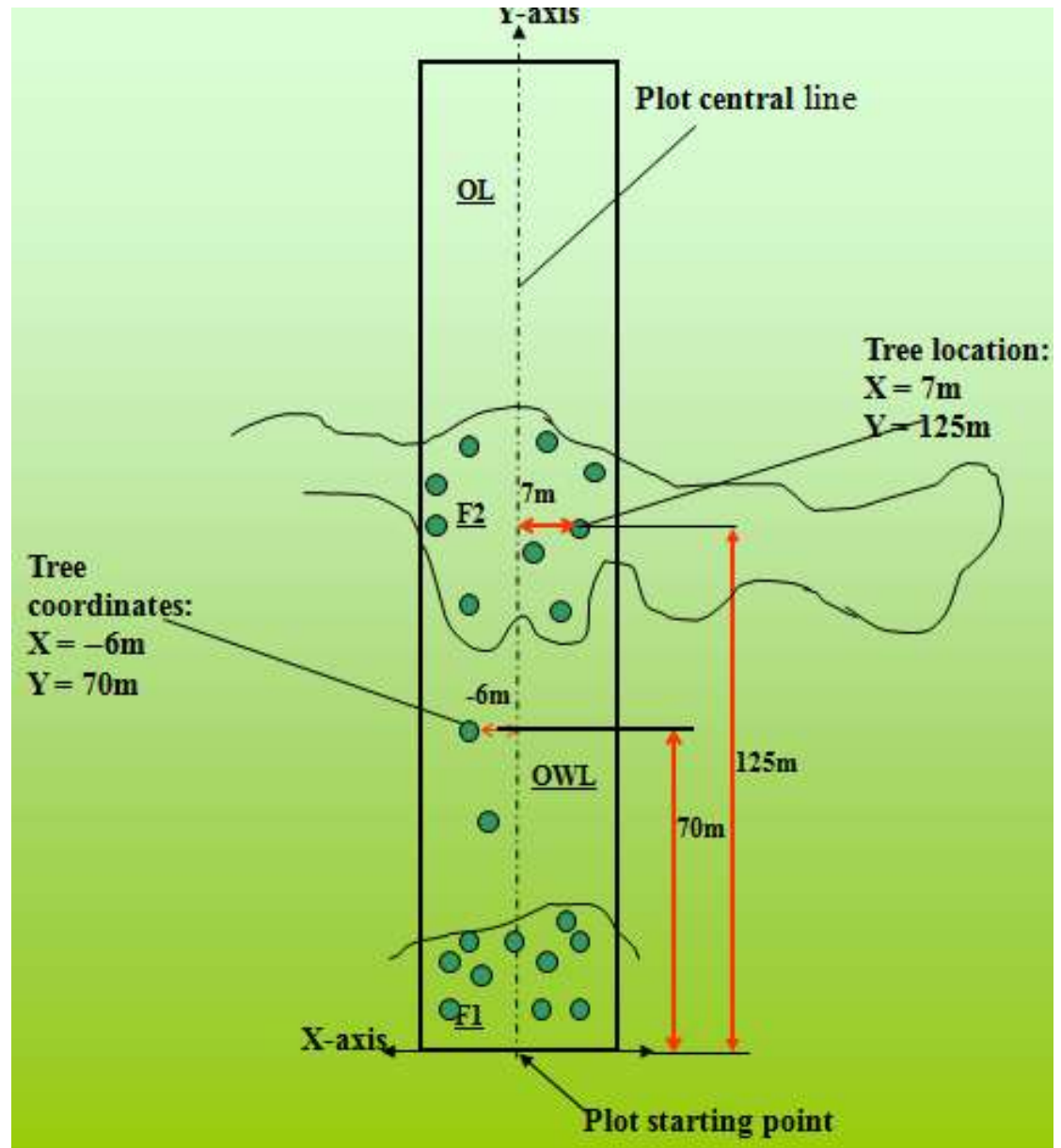
# Measurements and expected results

- At the **SU level** measurements or observations could includes:
  - Location (province, AEZ)
  - Population (permanent and nomadic)
  - Proximity to infrastructure (road, market...)
  - Access to SU
  - Environmental services,
  - Pests and diseases,
  - Invasive and threatened species
  - Etc.
- Field **Form F1** will be used

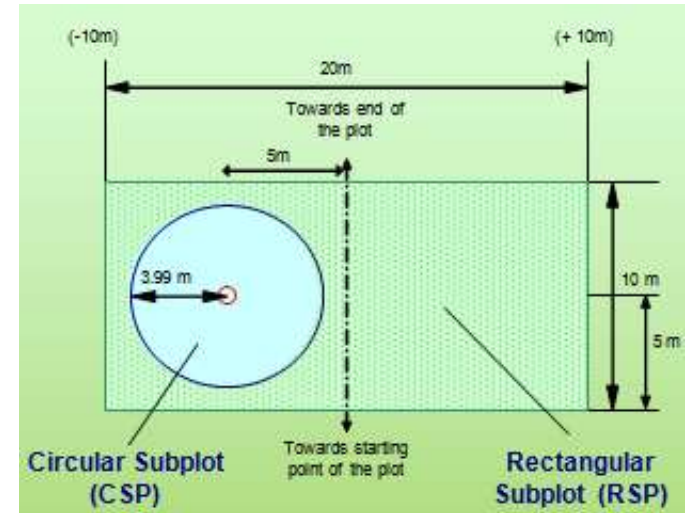
- At the **Plot level** measurements or observations include:
  - Land use cover sections
  - Trees  $\geq 20$  cm (in forest)
  - Trees  $\geq 10$  cm (TOF)
    - Species, Dbh, height, health condition, branches, position, etc
- Field **Forms F2, F3, F4 and F5** will be used



# Measuring position of trees



- At the **Subplots level** measurements or observations include:
- **RSP:**
  - Trees with dbh  $\geq 10\text{cm}$
  - Shrubs
  - Non-Wood Forest Products
  - Etc
- Field **Form F3 and F4** will be used



- **CSP**
  - regeneration count (Dbh  $< 10\text{ cm}$  and height  $\geq 1.30\text{ m}$ ) data are collected at this level (in forest, OWL and woodlots).
- Field **Form F4** will be used

- Litter Subplot (**LSP**):
  - Data is collected on litter, which includes all non-living biomass, litter depth, litter composition.
- Field **Form F4** will be used
- Fallen deadwood transect (**FDT**):
  - Measurements of fallen deadwood branches ( $\geq 2.5\text{cm}$ ) are done along the transect lines.
- Field **Form F4** will be used
- Measurement Point (**MP**):
  - Topographic and soil data is collected.
- Field **Form F4** will be used



# The record formats to be used

- Field form F1 (F1a & F1b)
- Field form F2
- Field form F3 (F3a & F3b)
- Field form F4 (F4a, F4b, F4c and F4d)
- Field form F5
- Field form F6 (F6a & F6b)

Thank You