Landscape Restoration Evidence Series

SYSTEMATIC MONITORING FOR ASSESSING DEGRADATION AND TARGETING RESTORATION INTERVENTIONS

CIFOR

World Agroforestry

07

Land Degradation Surveillance Framework

Developed over several years of research across eastern and southern Africa, the Land Degradation Surveillance Framework (LDSF) was designed to provide a bio-physical baseline at landscape level, and a monitoring and evaluation framework for assessing processes of land degradation and the effectiveness of rehabilitation measures (recovery) over time.

Why systematic baselines?

Very little is known about the state of ecosystems across Africa, including land cover and vegetation trends. This is particularly important in understanding land degradation processes, predicting changes in climate and improving land management.

Systematic baselines of soil and ecosystem properties allows for a proper assessment of landscape performance and/or prediction of change over time.

The LDSF was developed in response to the need for:

Systematic and science-based assessment and monitoring of soil and ecosystem health at scale, using a robust and consistent indicator framework that is:

Specific: The indicator should be accurately described what is intended to be measured and should not include multiple measurements in one indicator.

Measurable: Regardless of who uses the indicator, consistent results should be obtained and tracked under the same condition.

Attainable: Collecting data for the indicator should be simple, straightforward and cost-effective.

Relevant: The indicator should be closely connected with each respective input, output or outcome.

Time-bound: The indicator should be a specific time frame.

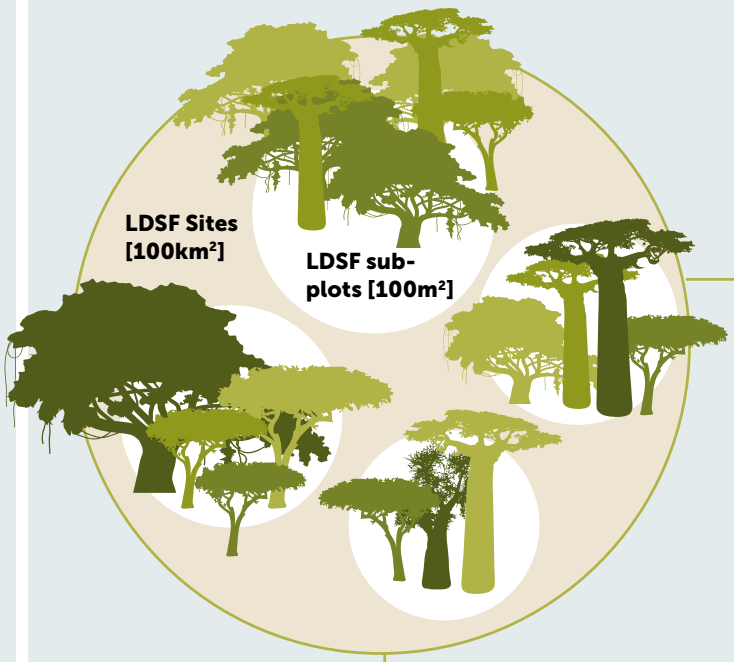
Some of the benefits of monitoring using tools such as LDSF include:

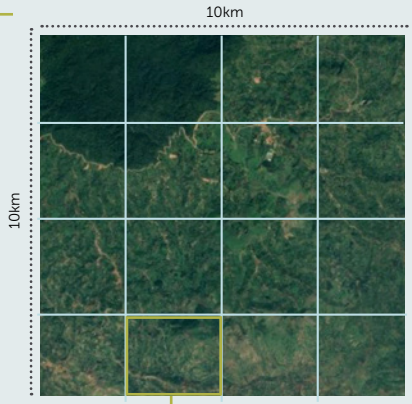
- Co-learning across and within communities – at multiple stakeholder levels
- Understanding what options work best for a particular context
- Contributing to SDGs & NDCs
- Reporting toward national restoration commitments and climate action targets
- Contributing to the project outcomes
- Generating evidence to leverage investments

Understanding the multiple drivers of degradation from social, economic and biophysical aspects, is key for designing appropriate and effective restoration options. It is also essential that monitoring restoration efforts becomes part of the project cycle and not seen as an additional burden.

DATA COLLECTION IN THE FIELD

Data is collected at multiple spatial scales to understand how the various indicators vary across the landscape. This nested hierarchical sampling design enables robust spatial statistics, important for setting baselines and for tracking changes over time



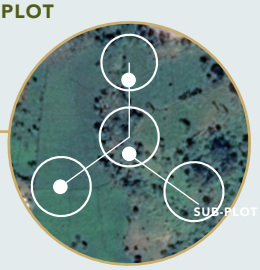


Sites [100km²] are selected at random across a region or watershed, or they may represent areas of planned activities (interventions). Each site is divided into 16 tiles of 2.5km x 2.5km each.

CLUSTER

Each plot consists of four **sub-plots [100m²]**.

PLOT



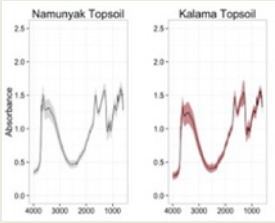
Within each tile, random centroid locations are generated for clusters. **Clusters [1km²]** are the basic sampling units and are made up of **10 plots [1000m²]**. Using each cluster centre-point, the sampling plots are randomized.

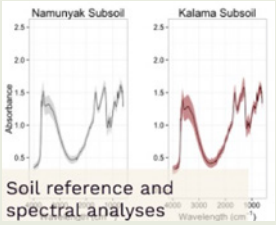
Field observations are made at the plot and sub-plot level. Each site has 160 plots and 640 sub-plots. The randomization applied in the LDSF minimises bias in the sampling as well as captures the biophysical variability in the landscape.

MEASURE

Land use and cover

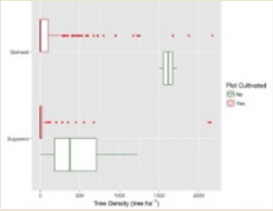
Land degradation

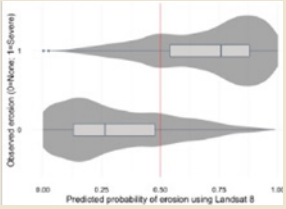




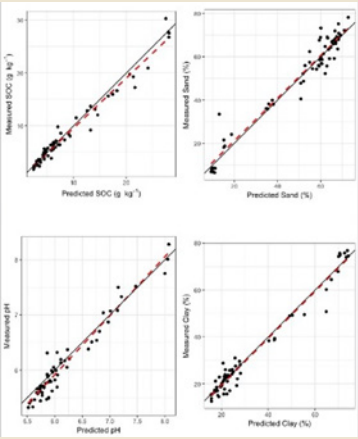
Soil reference and spectral analyses

ANALYSIS



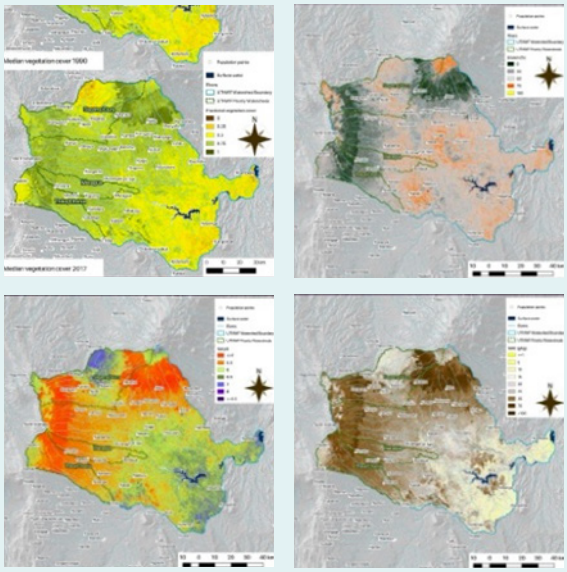


PREDICT



All data are subjected to advanced data analytics and robust statistical analysis. **Soil samples are analysed** using mid-infrared (MIR) spectroscopy, to predict key soil properties such as soil organic carbon, total nitrogen, pH, base cations and texture.

MAP / DIAGNOSE



The LDSF measures a wide range of indicators, that serve as a valuable biophysical baseline.

Indicators measured with the LDSF

Land cover

- Vegetation structure (LCCS)
- Vegetation types
- Woody vegetation
  - Shrubs
    - Density
    - Distribution
    - Diversity
  - Trees
    - Density
    - Distribution
    - Diversity
- Herbaceous vegetation
  - Type
  - Cover rating
- Rangeland health module
  - Grass species diversity and distribution
  - Annual to perennial ratio
  - Bare ground

Land use

- Current
- Historical
- Ownership

Impact on habitat

Land degradation

- Soil erosion prevalence
- Soil water conservation measures
- Root-depth restrictions
- Rock/stone cover

Topography/landform

Soil health

- Soil organic carbon (SOC)
- Total nitrogen
- Infiltration capacity
- Soil pH/acidity
- Texture (sand and clay)
- Cumulative soil mass
- Earthworm presence

Data-driven network of LDSF sites (each site is 100 km2, with 160 sampling plots) One systematic framework across multiple projects, donors, initiatives.

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Further resources

- Land Degradation Surveillance Framework flyer
- Blog: The Land Degradation Surveillance Framework (LDSF)

This evidence series was developed by researchers and practitioners spearheading the new Landscape Restoration TPP, with support from GLF **www.globallandscapesforum.org**