

# Progress Update on the LDSF Field Surveys: Nicaragua Sentinel Landscape

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RESEARCH PROGRAM ON  
Forests, Trees and  
Agroforestry

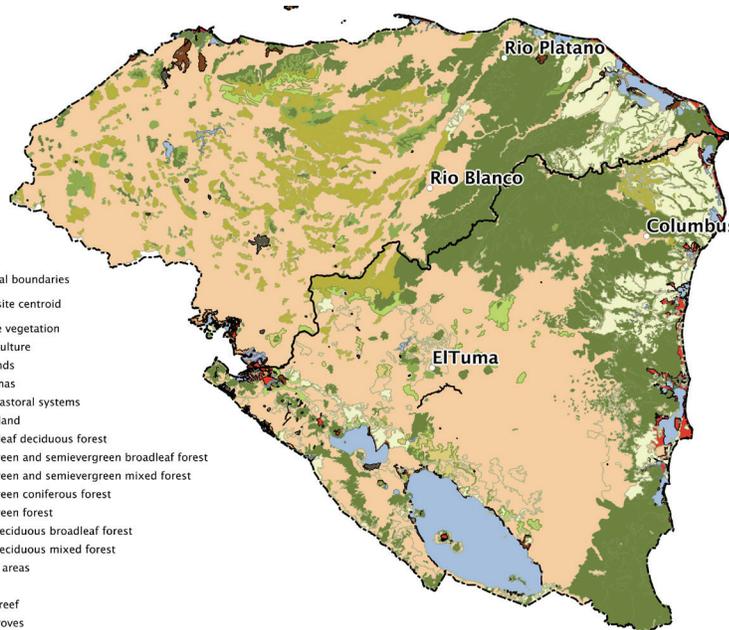
4 October 2013

## The Land Degradation Surveillance Framework (LDSF)

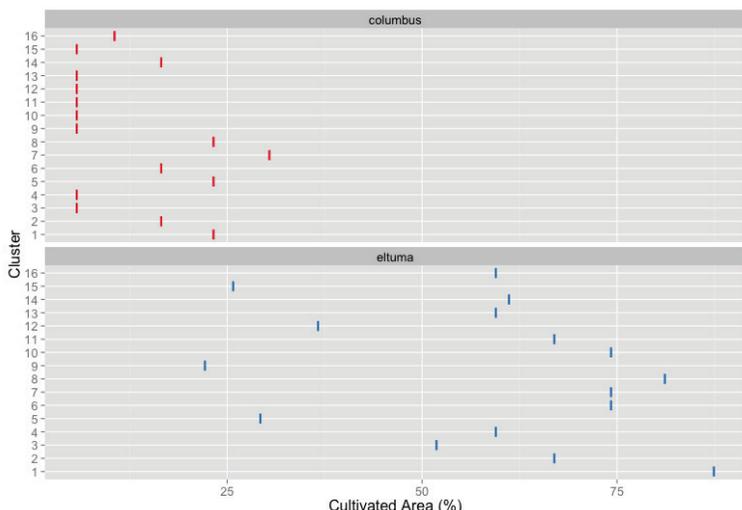
The LDSF was carried out at two sites within the Sentinel Landscape in Nicaragua: El Tuma La Dalia and Columbus Mine (map on the right). Field teams were trained by Tor Vågen and Leigh Winowiecki in June-July 2013. The El Tuma survey was completed on the 30th of July and the Columbus Mine survey was completed on the 30th of August. CATIE partners coordinated the field survey efforts.

The LDSF is a spatially stratified, randomized sampling design, developed to provide a biophysical baseline at landscape level and a monitoring and evaluation framework for assessing processes of land degradation and effectiveness of rehabilitation measures over time.

Measured variables include: land cover, tree and shrub densities, tree biodiversity, erosion prevalence, infiltration capacity, along with an assessment of impact to habitat and occurrence of soil conservation structures. Soil samples were also collected (>700 per site) and are being processed in Managua. Processed samples will be shipped to Nairobi and subjected to infrared spectroscopy and wet chemistry analysis. These combined data sets will be used to assess soil and ecosystem health for the landscape in more detail.



## Preliminary Results



### Cultivated area

Plot-level observations were recorded at 160 1000 m<sup>2</sup> plots per site. A generalized linear mixed effects model was used to estimate the area under cultivation at each 10,000 ha site.

In El Tuma, more than 50% of the site was cultivated, while estimates of cultivated area for Columbus Mine was less than 25%.

Major crops at El Tuma were coffee and basic grains. Major crops at Columbus Mine were maize, cassava and rice.

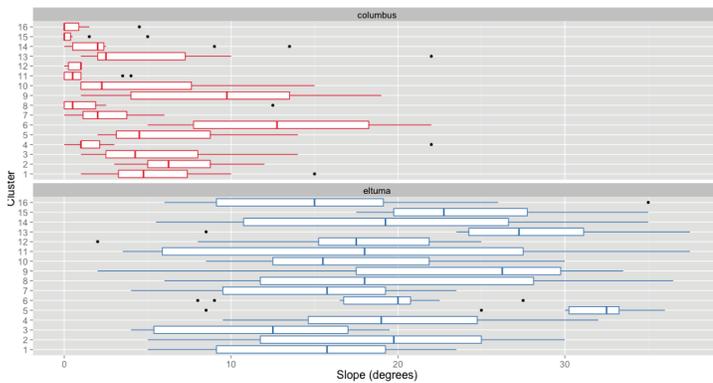
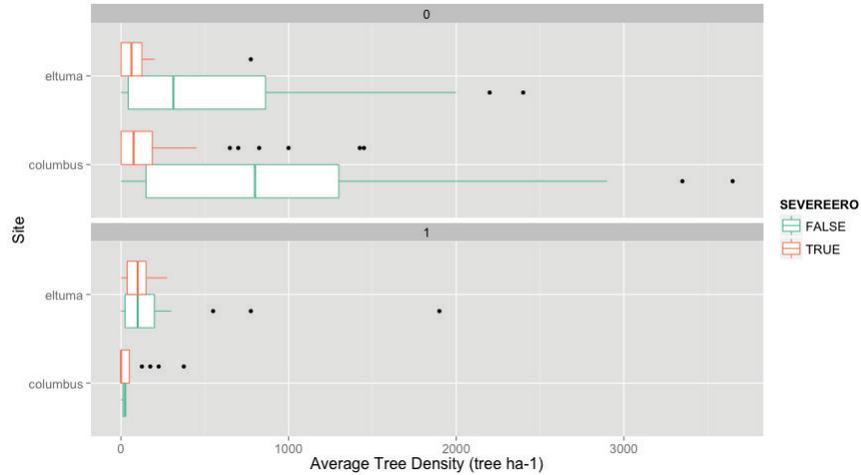
The graphic on the left shows percent cultivated area per cluster (n=16 per site).

# Linking metrics (preliminary highlights)

## Tree density and erosion prevalence in cultivated and semi-natural areas

Average tree density was 543 and 266 tree ha<sup>-1</sup> in Columbus Mine and El Tuma, respectively. In cultivated areas this number decreased for both sites.

The graphic on the right illustrates how erosion prevalence and tree density are linked, in both cultivated (1) and semi-natural (0) areas in the two sites. Erosion prevalence was highest in areas with low tree densities.



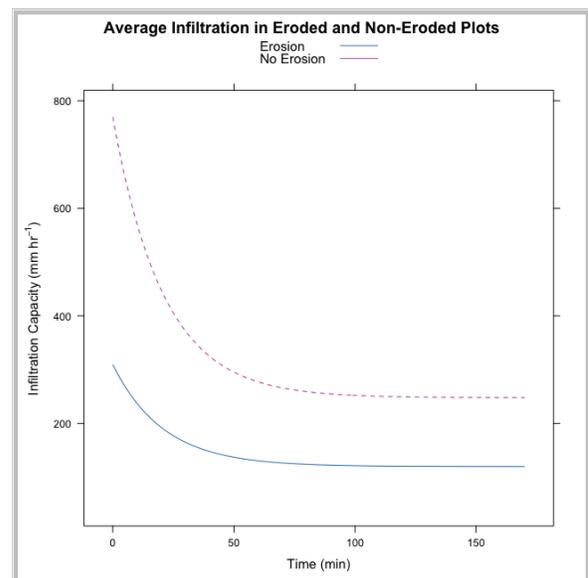
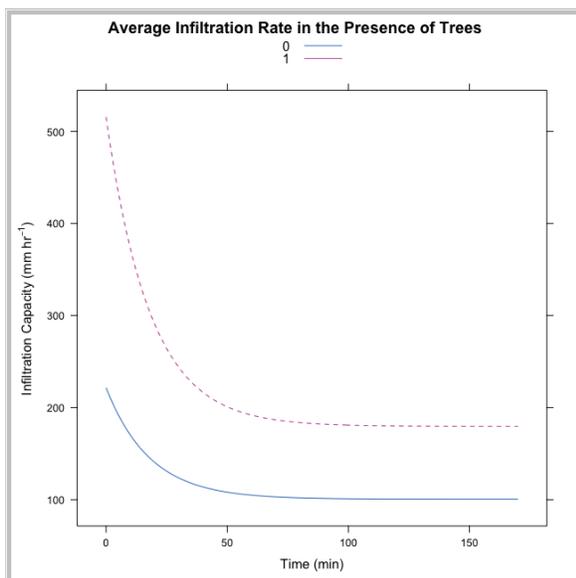
## Landscape attributes

Average slope at El Tuma (blue) was 19.2 degrees compared to 4.5 degrees at Columbus Mine (red) (left).

Average elevation at El Tuma was 870 m compared to 85 m at Columbus Mine.

## Infiltration capacity

Average infiltration capacity was modeled using non-linear mixed effect models. Results presented here are exploratory. Infiltration was higher in plots with trees (1) compared to plots without trees (0), as shown below. Further, infiltration was higher in non-eroded plots, compared to eroded plots (below right), reflecting the relationship between tree density and erosion prevalence mentioned above.



**Next Steps:** Data analysis with the team at CATIE in March; Analysis of soil samples in Nairobi; Linking with socio-economic and IFRI surveys; Combining datasets from other sentinel landscapes.