

Consultancy Report number 4, by Ophélie Ratel – 31.08.2020

Establishment of an updated land-use map of the San Juan de la Selva landscape, based on existing (recent) maps, and production of metrics of landscape dynamics

I. Land-use maps

The objective of this fourth product is to obtain an updated land-use map based on Fagan classification but with more recent data.

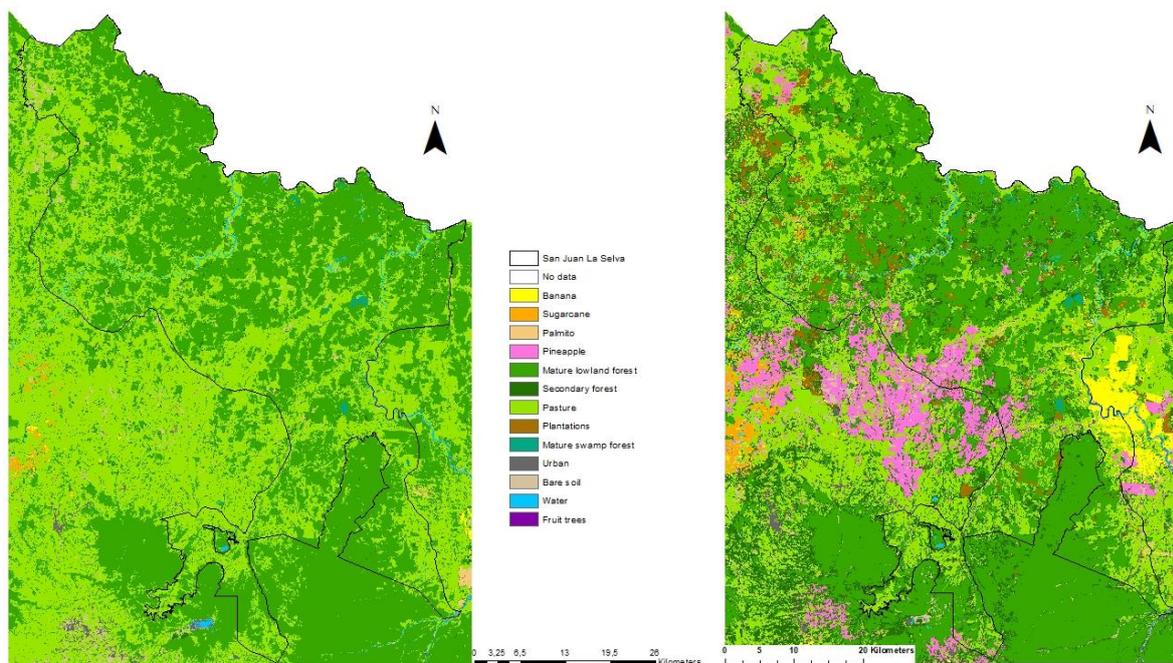
As a reminder, the land use maps prepared by Fagan correspond to the following years: 1986 – 1996 – 2001 – 2005 and 2011. Thanks to SINAC data, it has been possible to update the 2011 classification with 2013 land-use data, and then with pineapple and pasture data from 2017 we obtained a 2017 land-use classification.

To all these classifications, forest type information has been added using Steven Sesnie's classification.

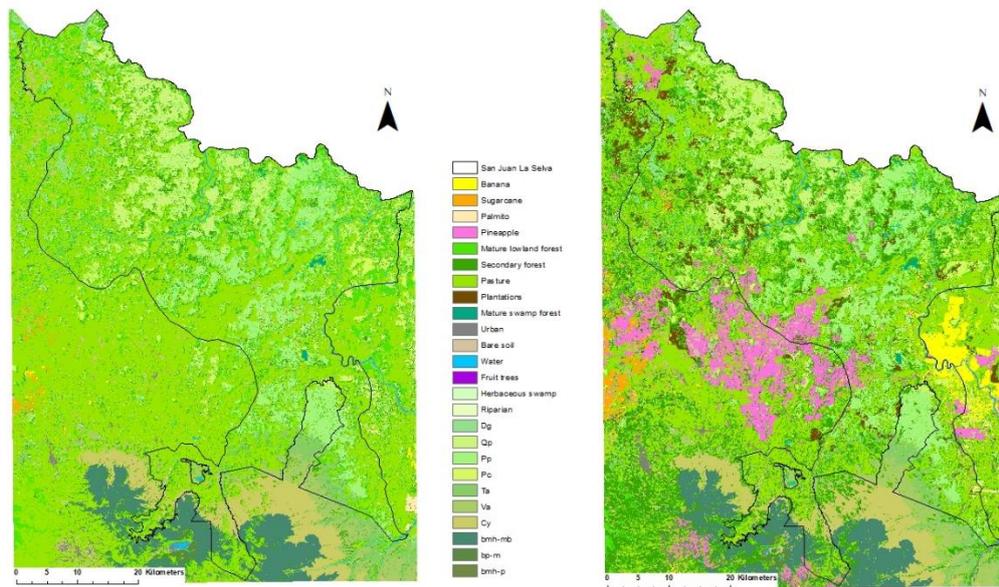
To summarise, we have land use maps with the following time series:

1986 – 1996 – 2001 – 2005 – 2011 – 2013 and 2017

On one hand with the classic Fagan classification (13 classes) and on the other hand, an accurate classification with forest type information (25 classes) *See appendix*. So there are 14 land-use maps in total.



Land-use classification in 1986 (on the left) and 2017 (on the right) with initial classification of Fagan et al., 2013.



Land-use classification in 1986 (on the left) and in 2017 (on the right) with Sesnie's forest types.

II. Landscape metrics

Using the Chloe software, landscape metrics have been calculated for each land-use year.

List of metrics:

- The proportions of each type of land use = pNV-i
- The interface proportions between two types of land use (=edge length) = pNC-ij
- Connectivity metric (AI = aggregation of pixels of the same type)
- Diversity/heterogeneity metrics: HET-frag, SHDI

In order to calculate a landscape dynamic, metrics were calculated at each time step (dates of the land use maps) taking into account the GPS coordinates of the plots having had at least 2 forest inventories on these dates in order to be able to calculate a delta and thus have an evolution of these metrics. This corresponds to 83 points (*See Appendix*). See file *BDD_plots_for_chloe_dynamic*.

The metrics were calculated twice, with or without taking into account the forest types. The aim was to see the effect of a more precise classification on landscape metrics, notably connectivity or fragmentation. There are one file per land-use year and per classification, so 14 files with a line per plots and a column per landscape metric (ex: *metrics_1986_classic* or *metrics_1986_forest-type*).

Finally, not all plots can be used for dynamic monitoring of landscape metrics because forest sampling was not always carried out on the same dates as the land-use maps.

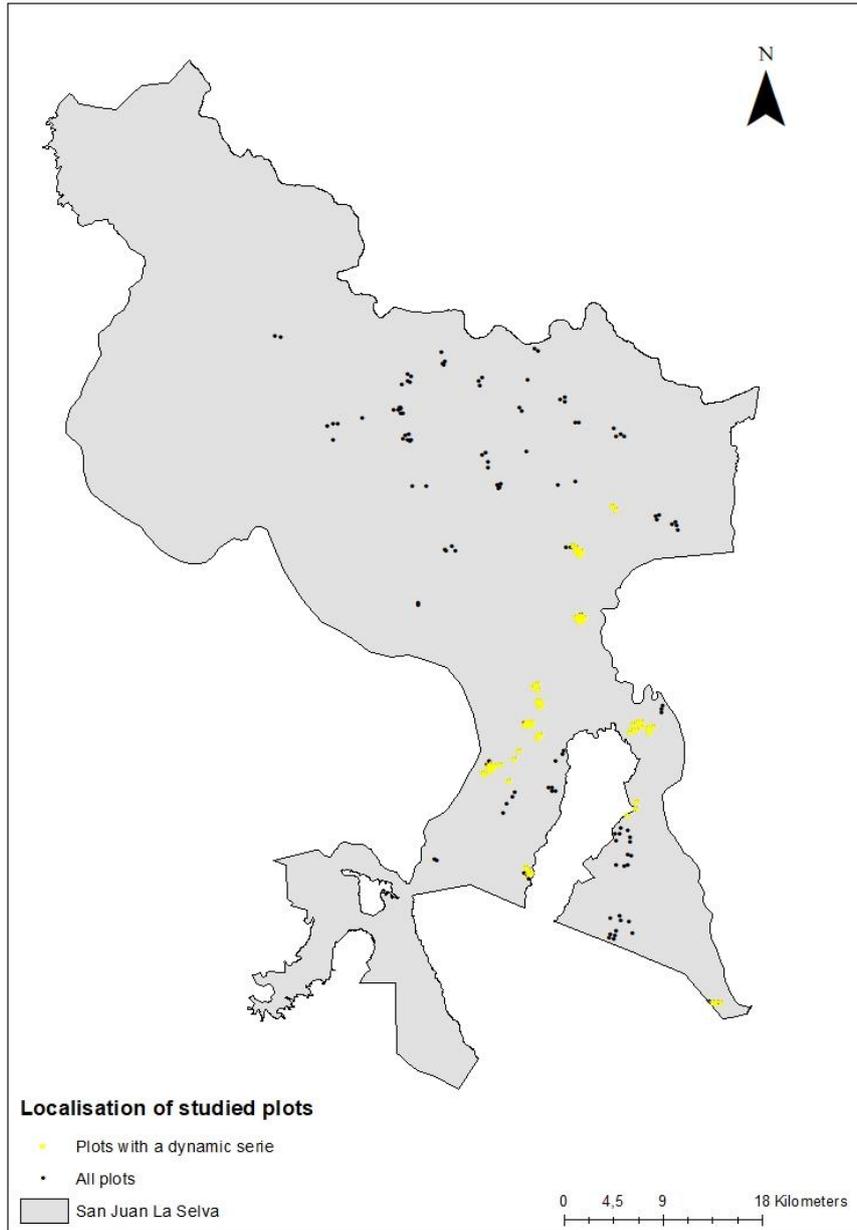
Other landscape metrics can be calculated later, and the final objective is to calculate the dynamics of these metrics and link landscape metrics to internal variables (growth, biomass...).

Files *metrics_classic_column* and *metrics_classic_line* will be used for temporal metrics analysis with R.

Appendix

Here are the land-use classes:

- 1--Banana
- 2--Sugarcane
- 3--Palmito
- 4--Pineapple
- 5--Mature lowland forest
- 6--Secondary Forest
- 7--Pasture
- 8--Tree plantations (non-native and native)
- 9--Mature swamp forest
- 10--Urban
- 11--Bare soil
- 12--Water
- 13--Fruit trees (Citrus)
- 14--Herb. Swamp = Herbaceous swamps and floodplains
- 15--Riparian = forested areas retained along rivers and streams
- 16--Dg = *Dialium guianense*, *Brosimum alicastrum*, *Sclerolobium costaricense*
- 17--Qp = *Qualea paraensis*, *Dipteryx panamensis*, *Vochysia ferruginea*, *Couma macrocarpa*, *arborescent palm spp.*
- 18--Pp = *Pentaclethra macroloba*/arborescent palm spp.
- 19--Pc = *Pentaclethra macroloba*, *Carapa guianense*, *Welfia georgii*
- 20--Ta = *Tapirira guianensis*, *Dendrobangia boliviana*/arborescent palm spp.
- 21--Va = *V. allenii*/*Macrohasseltia macroterantha*
- 22--Cy = *Cyathea spp.*, *Guarea spp.*
- 23--bmh-mb = Lower montane forest
- 24--bp-m = Pre-montane rain forest
- 25--bmh-p = Montane forest



Location of plots: all plots (black point) and plots with a temporal time series (yellow stars).