

**Project Update: February 2023**

**UPDATE #1: EQUIPEMENT**

Thanks to the Rufford Grant, I got to equip myself for the summer fieldwork.



From top-left to bottom-right: 1-Binoculars for wildlife mapping, mainly birdwatching (Woodpeckers, Condors, Caburés). 2-Sieves to prepare soil samples for organic matter quantification and other nutrients analysis. 3-Rainy notebooks so there is no

excuse to go out to collect data! 4-A tape to measure the tree diameters at breast height. 5-GPS to track waypoints. 6-Cruiser crutch: an instrument to measure the Basal Area (the cross-sectional area of trees at breast height) of plots. Densiometer to measure the canopy openness of a plot

**UPDATE #2: OBJECTIVE ONE ACCOMPLISHED!**

Before selecting the different ranches to work with, I interviewed key informants to collect information and local knowledge on management practices (what is the universe of ranches, what productive schemes are implemented throughout the province, what managers could facilitate information on paddock's history of use, etc). In total, 10 interviews were carried out in a 3-month period. This information was crucial to understand the context and setting of silvopastoral systems in Tierra del Fuego. The following table shows the key informants that were interviews.

<b>Area</b>	<b>Institution</b>	<b>N° of interviews</b>
<b>Union</b>	RENATRE	1
<b>Public entity</b>	Ministry of Agriculture, Livestock and Fisheries of the Argentine Republic	3
<b>Research entity</b>	INTA	3
<b>Private</b>	Private landowners	3
		10

In Tierra del Fuego, the combination of precipitation, temperature and thermal amplitude generate environmental gradients that vary from north to south between the forest-steppe ecotone zone, the deciduous forest zone of *Nothofagus antarctica* (ñire) and *N. pumilio* (lenga), and the evergreen forests of *N. betuloides* (guindo). These forests present different biological and physical characteristics (plant diversity, humidity, topography) which we believe have the power to determine or place limits on the development possibilities of certain socioeconomic activities (e.g., cattle ranching). Thus, our aim was to select establishments with silvopastoral use distributed along the latitudinal gradient of the island.

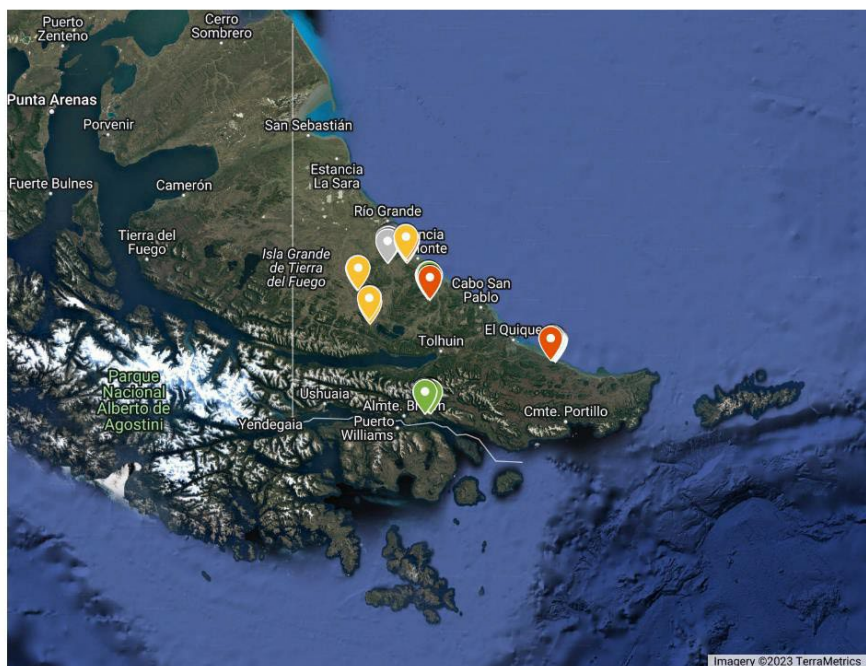
This study aims to evaluate the response of beech forests to management practices that take place in cattle ranches from Tierra del Fuego, Argentina, in order to facilitate the transition of local rural communities towards more sustainable productive models. For this, we aim to analyse the behaviour of environmental indicators in different situations of silvopastoral uses (gradient of intensity of use). Using satellite imagery and the outputs of the interviews, we identified in each establishment 20 plots. Because there is a relationship between canopy cover (CC) and intensity of silvopastoral use (ISU), plots were selected in 4 sites: (i) CATEGORY 1 - forests with 0-30% CC and high ISU, (ii) CATEGORY 2 - 30-50 % CC and high ISU, (iii) CATEGORY 3- 50-70% CC and low ISU and finally (iv) CATEGORY 4- > 70 % CC and low ISU.

The following map shows the plots that were sampled during the summer fieldwork 22-23.

# Rufford Update

Plots completed 2022-2023

- 1.0
- 2.0
- 3.0
- 4.0
- Otro / sin valor



The ranches that were sampled were “Estancia Viamonte”, “Estancia El Roble”, “Estancia Las Hijas”, “Estancia Guazú Cué”, “Estancia Harberton” and “Estancia Policarpo”. The following table shows some characteristics of these silvopastoral systems:

	Ranch (ha)	Size	Type of Livestock	Forest	Zone
Viamonte	51,291		Sheep & Cattle	<i>N. antártica</i> (ñire)	Ecotone
El Roble	13,301		Cattle	<i>N. antártica</i> (ñire)	Ecotone
Las Hijas	9,995		Cattle	<i>N. antártica</i> (ñire)	Ecotone
Guazu Cué	10,000		Sheep & Cattle	<i>N. antártica</i> (ñire)	Ecotone
Harberton	18,460		Cattle	<i>N. pumilio</i> (lenga) and <i>N. betuloides</i> (guindo)	Cordillera
Policarpo	22,054		Cattle	<i>N. pumilio</i> (lenga), <i>N. betuloides</i> (guindo), <i>Dimys winteri</i> (canelo)	Cordillera

## **UPDATE #3: OBJECTIVE 2 IN PROGRESS**

In each plot a linear transect was established (see Figure 1), strips of different widths associated with the transect and census boxes for each sampling unit. Advanced regeneration was measured in rectangular plots of 5 m<sup>2</sup> (5 x 1 m) considering DBH, height, shape and health, while initial regeneration (height < 1.3 m) was measured in rectangular plots of 1 m<sup>2</sup> (5 x 0.2 m) or variable area so as to enter at least one seedling per plot. Ground cover (bare soil, leaf litter, stones/rocks, woody debris and plants) and plant species composition were recorded using the point intercept method (1 m intervals). Complementary environmental variables such as soil erosion and compaction, and signs of wildlife presence (caves in the ground, cavities in logs, wild animal faeces, etc.) were recorded along the transect. Soil samples were

collected and subsequently for biochemical analysis such as nutrient concentrations, pH, organic matter, etc.

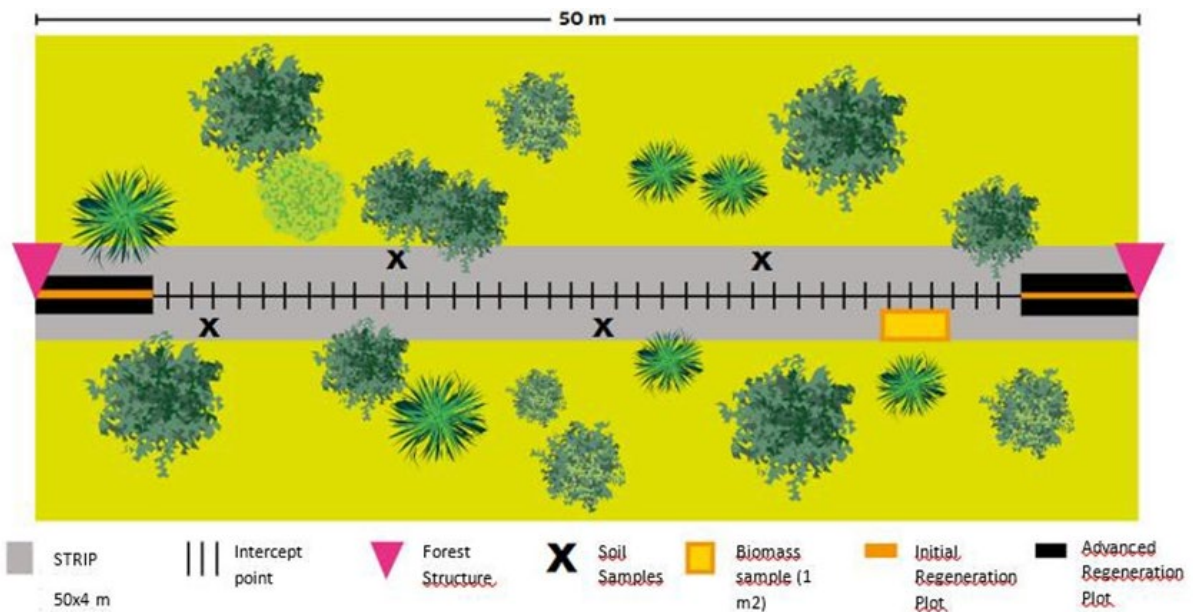


Figure 1: A scheme describing the fieldwork methodology.



The pictures show the methodology applied in the fieldwork. (1) The transect. (2) Measuring advanced regeneration. (3) Measuring diameter at breast height. (4) Taking soil samples. (5) Taking biomass sample. (6) Measuring the forest dominant height with the hypsometer. (7) Using the cruiser crutch to know which trees to measure for forest structure. Collecting floristic data using the intercept point method.

Throughout this fieldwork season (December 2022- February 2023) we were able to sample +100 plots in five different ranches. In 3 weeks (distributed throughout the fieldwork season) we travelled +3,500 km by car; walked +100 km (to go from a waypoint to another) and received the collaboration of 10 people (most of them as volunteers).

The biophysical conditions we found throughout the island were really different, yet cattle signs were present in almost every forest patch. In the following pages you can find pictures that represent the different forests we sampled. We found forests with different disturbances apart from cattle: fires, wood harvest/cutting, turnovers, etc. And we also registered signs of biodiversity (holes in the bark, animal faeces, birdwatching, etc). The following pictures show some examples:

In order of appearance: *Berberis mycrophilla* ("Calafate"), *Fistulina antarctica* ("Lengua de Vaca"), *Glaucidium nanum* ("Cabure"), *Laterna* sp. Fungi, a fungi whose name we don't know, *Aegorhinus vitulus* ("Caballito de Monte"), unknown spider, holes in the bark, fox faeces.



We are specially satisfied with the expedition we've carried out to Peninsula Mitre (Estancia "Policarpo") as this place has recently been declared protected area, so there is huge interest in conserving its natural resources. Regarding logistic issues, it is really difficult to access (+100 km of farm road, 10 km of quad or horse riding) and requires plenty of bureaucratic processes such as getting permissions from the Ministry of Environment. Yet the weather, which is known to be hostile, was incredible during the days we carried out the fieldwork. The forest we found there hasn't been sampled before by our research group, and we were surprised by the species and the type of forests we found (forests growing on top of peatlands, extense areas of Canelo regeneration, understories dominated by rushes, etc). We believe that the results will be really interesting.

## ÑIRE FORESTS

### CATEGORY 1 - OPEN



A: Ñire forest with open canopy due to "capado" practice: In the early twentieth century, ranchers converted thousands hectares of native forests into pasturelands by using the ring-barking method and then burned the área

### CATEGORY 2 – SEMI OPEN



B: Ñire forest with a canopy cover between 20-50%. This let's more sunlight reach the ground surface, increases temperature and decreases humidity.

### CATEGORY 3 – SEMI CLOSED



C: Ñire forest with a canopy cover between 50-70%. The trees in the picture are covered with what we call "Barba de Viejo". Although many observers believe it to be a parasite, it is actually an epiphytic species, like most lichens. Plus, they are a bioindicator of good air quality

### CATEGORY 4- CLOSED



D: Ñire forest with a canopy cover greater than 70%. The conditions below the canopy are: more shadow, cooler temperature and higher moisture.

## LENGA-GUINDO FORESTS

### CATEGORY 1 - OPEN



E: Guindo forest turnover: a common disturbance that opens canopy cover (-0-25%). These plots were the most challenging to establish the transect. We got trained in skipping fallen trees.

### CATEGORY 2 – SEMI OPEN



F: Mixed lenga-guindo forest with a semi-open canopy cover result of a less intense turnover. The coarse woody debris can be seen on the ground.



### CATEGORY 3 – SEMI CLOSED



G: Mixed lenga-guindo forest with a semi-closed canopy cover. These trees were old, with diameters greater than 2 m. Again, some fallen trees can be seen on the ground.

### CATEGORY 4- CLOSED



H: Guindo forest with a closed canopy which stops sunlight reaching the ground. Thus, there is practically no understory vegetation, yet these forests are used by cattle as shelter.