LITTER CARBON STOCK VARIABILITY IN THE SPANISH FOREST

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INTRODUCTION

Litter is a key parameter in the biogeochemical cycle linking the tree part to the water and soil part. Litter decomposition is a major pathway of nutrient fluxes and determines the organic matter input to forest soils and has a strong influence on forest productivity and soil nutrient status. It can be considerably altered under global warming and land use practice but little is known about its variability in the different bioregions and forest types.

Litter varies according to different species and forest type. Decomposition rate, along with carbon (C) and nitrogen (N) cycles in forest ecosystems, is affected by changes in temperature and humidity ground, which in turn can be influenced by forest management.

The main objective of this study is to quantify production and chemical composition (carbon and nitrogen) of litter in Spain comparing the stock in the four different bioregions and forest types.

Table 1. Characteristics of the data set (596 plots)

	Biomass (kg/m2)	Carbon (%)	Carbon (kg/m2)	Nitrogen (g/kg)
Mean	6.51	48.43	3.22	10.44
Standard Deviation (S.D.)	4.67	5.24	2.45	3.48
Coefficient of variation (CV) (intra-plot)	0.57			
Coefficient of variation (CV) (inter-plot)	0.72	0.11	0.76	0.33
Maximum	33.9	69.1	16.67	22.31
Minimum	0.11	25.65	0.05	2.9

MATERIALS AND METHODS

A litter inventory was carried out in sample plots located in Spain belonging to the network of the European transnational survey (ICP Forest Level I) of forest condition in Europe (16 x 16 km grid, 620 plots).

Biomass, carbon and nitrogen stock of litter were obtained in 596 plots along the country between 2014 and 2017. Fresh litter was collected from 4 containers (50x50 cm size) placed 6 meters from the center of the plot in the 4 orientations (N, S, E, and W). Fresh litter from each container was enclosed in bags, then litter with diameter >2 mm was sorted out, oven dried at 70ºC and weighted. Afterward, all bags are gathered in a simple sample and sent to the laboratory. LECO combustion analysis method was used for determining the concentration of Carbon and Nitrogen.

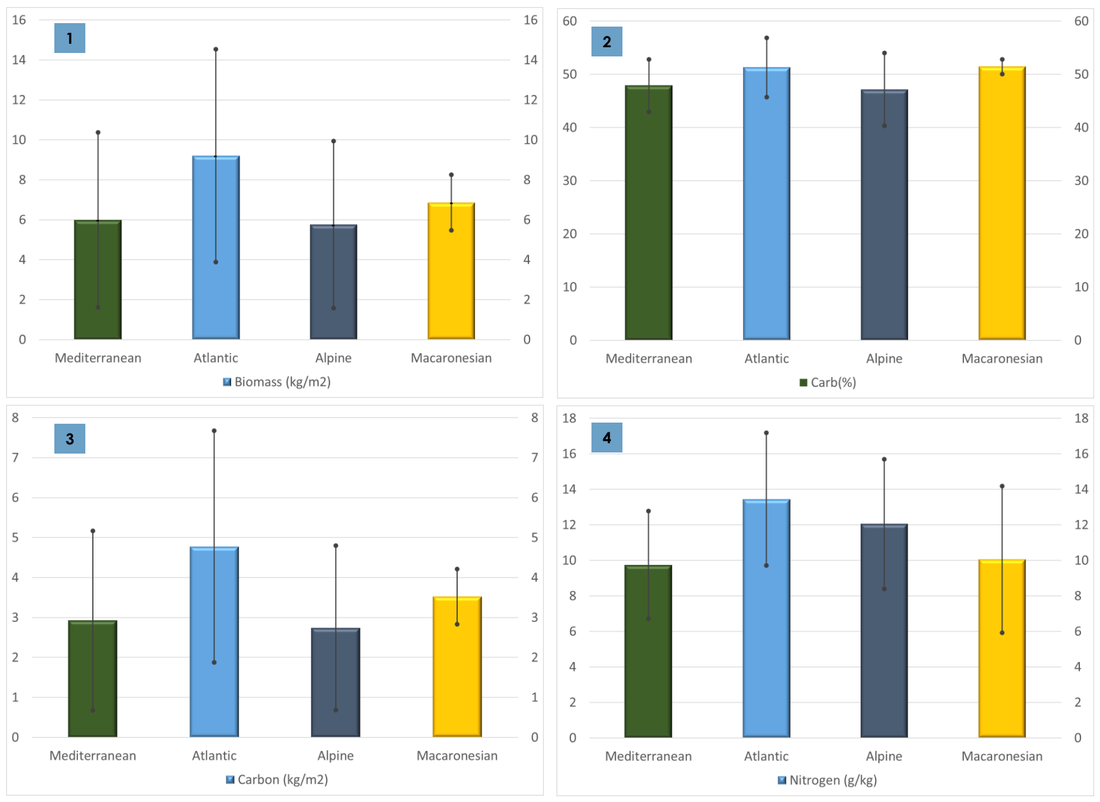


Figure 1, 2, 3 & 4. Biomass, carbon (%), carbon (kg/m²) and nitrogen average and standard deviation per bioregion (Mediterranean, Atlantic, Alpine and Macaronesian).

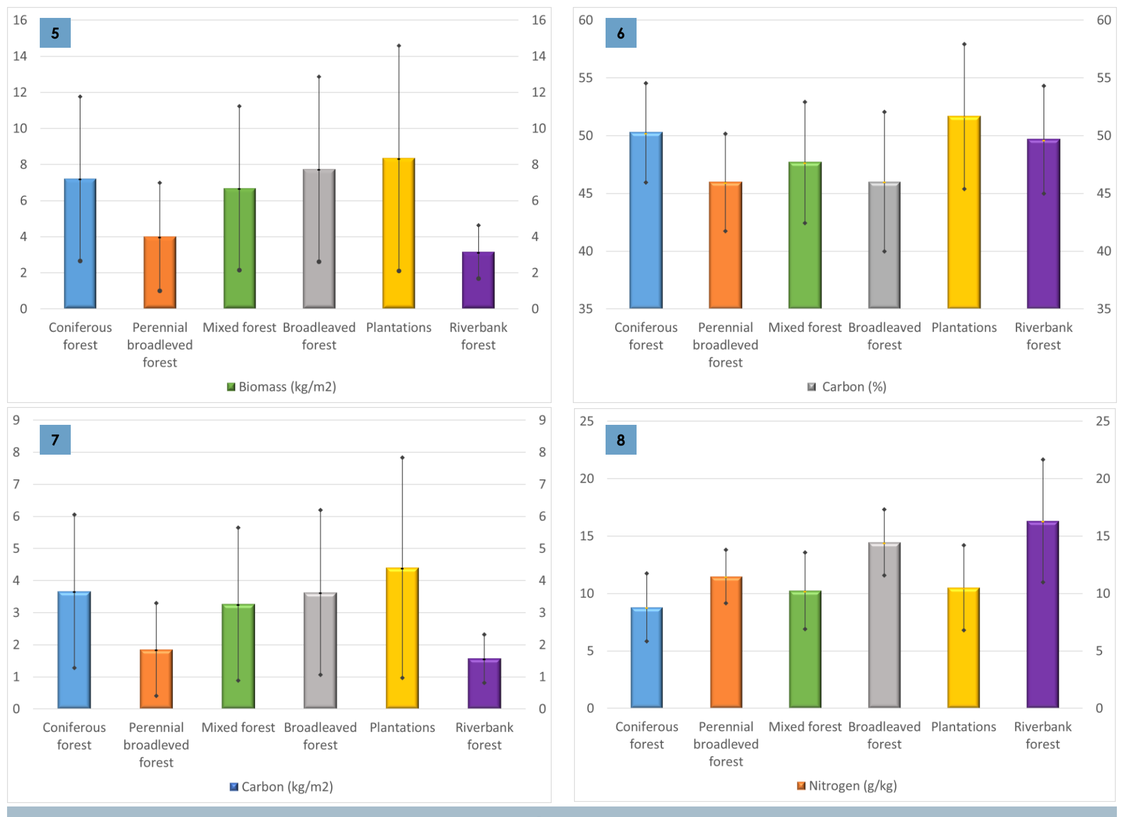
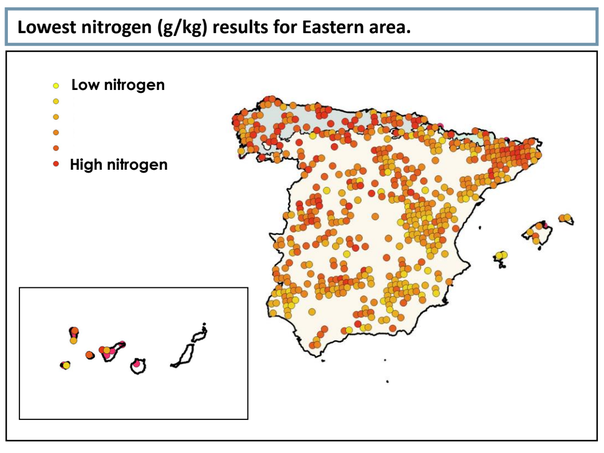
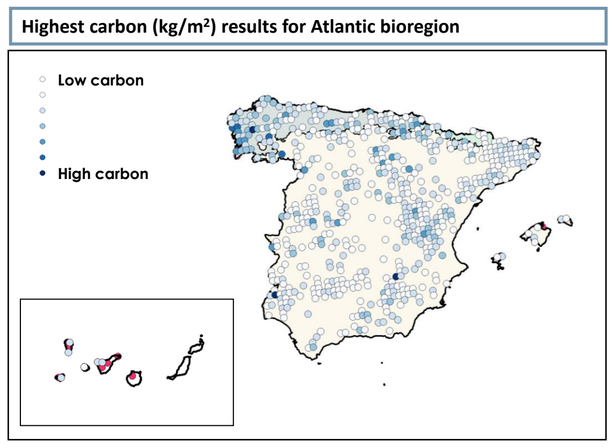


Figure 5, 6, 7 & 8. Biomass, carbon (%), carbon (kg/m²) and nitrogen (g/kg) average and standard deviation per forest type.

Lowest nitrogen (g/kg) results for Eastern area.



Highest carbon (kg/m²) results for Atlantic bioregion



RESULTS

The results show a high variation intra-plot and inter-plot in biomass ratio, therefore also in carbon.

Atlantic bioregion biomass (kg/m²) is 60%, 54% and 34% higher than Alpine bioregion, Mediterranean bioregion and Macaronesia bioregion respectively. Applying carbon percentage, carbon (kg/m²) is 74%, 63% and 35% higher. Regarding the nitrogen (kg/m²), Atlantic bioregion is also better, improving 11%, 38% and 34% the other three bioregions.

The highest biomass rate regarding forest type are plantations, following by coniferous forest (-7%) and broadleaved forests (-14%). Both coniferous and broadleaved forest show 17% lower carbon (kg/m²) than plantations. In case of nitrogen (g/kg), riverbank forest shows the best results, surpassing broadleaved (-12%) and perennial broadleaved (-30%) forests.

We gratefully acknowledge ESMA for thoroughly processing the samples and taking pictures.