



AGÊNCIA
PORTUGUESA
DO AMBIENTE

The Soil Carbon Inventory in the 6th National Forest Inventory in Portugal

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MINISTÉRIO DO AMBIENTE,
DO ORDENAMENTO DO TERRITÓRIO
E ENERGIA

The APA and ICNF Protocol of Cooperation

- **The National Forest Inventory was identified as one of the key sources of information for GHG Reporting**
 - However, it's design revealed some imperfections that could be fixed in future editions of the NFI
- **The Portuguese Environment Agency (APA) signed a Protocol with the Institute for Nature Conservation and Forests (ICNF), where**
 - The design of the NFI would be updated to include some additional specifications
 - APA, via the Portuguese Carbon Fund, would finance all the work and participate in the design of the NFI
 - ICNF, as the sectoral agency, would be responsible for the design of the NFI, the tendering processes and the control the project

6th National Forest Inventory “innovations and upgrades”

Previous Versions

- **Module 1: Forest Areas**
 - Only total area per forest type was assessed
 - Comparison with previous inventories was only possible for net-forest area changes

6th National Forest Inventory

- **Module 1: LULUCF Areas**
 - All LUs are assessed, including all UNFCCC categories
 - Systematic grid (500x500m)
 - Same grid/legend for ≠ years fully consistent time series
 - LUC for all possible X→Y
 - 1995, 2005, 2010, (2015)
 - **Sub-module: land-use in 1970 and land-use change 1970-1995**
 - Forest paper maps (~1970)
 - Crops paper maps (>1960s)

6th National Forest Inventory “innovations and upgrades”

Previous Versions

- **Module 2: “Classic” NFI**
 - All classic variables (heights, diameters, etc.) are measured:
 - 2x2km grid (forest plots ~8.000 plots) or
 - 4x4km grid (shrubland with trees plots ~2.000 plots)
 - 4x4km grid (shrubland plots ~2.000 plots)
 - Derived variables such as volumes and biomass were estimated based on the best equations available at the time

6th National Forest Inventory

- **Module 2: “Classic” NFI**
 - Same approach
 - Technical corrections and time series consistency
 - Recalculation of NFI-4 and NFI-5 results for volumes and biomass to reflect:
 - Revised areas per forest type
 - Current volume and biomass equations

6th National Forest Inventory “innovations and upgrades”

Previous Versions

6th National Forest Inventory

- **Module 3: Soil Carbon Inventory**
 - Measurements on selected plots in the 2x2km grid of the NFI
 - All land-uses will be sampled
 - Designed to be “LUCAS compatible”

NFI-6 State of Play

Module	State of Play
1 – Land-use and Land-use change	Grid for 1995, 2005, 2010 (completed) Grid for 2015 (expected conclusion June 2016)
1.1 – Land-use 1970	Planned for 2015 (expected conclusion December 2015)
2 – Classic NFI	Field work ongoing (expected June 2015) Calculations and presentation of results (expected conclusion December 2015)
3 – Soil C Inventory	Planned for 2015 (expected conclusion June 2016)

Soil Carbon Needs

Need to answer to two questions:

- What are the emission factors associated with changes in land-use?
 - **NFI Soil Carbon Inventory designed answer this question only**
- What are the emission factors associated with changes in management within a certain land-use?

Sampling design

- **~900 sampling plots will be selected over the same systematic grid used for biomass sampling (2x2km)**
- **Selection of plots will include:**
 - **Representation of the 19 LU classes we use in Portugal**
 - **Higher focus on forest land, cropland and grassland (75% plots)**
 - **Representation of the 2 main climate types (Atlantic and Mediterranean)**
 - **Representation of the main litologies**
 - **Complementarity with LUCAS plots**
 - **~480 plots**

“2 tier” Samples

	Intensive plots	Simple plots
Number of plots	275	625
Soil layers sampled	0-10cm 10-20cm 20-30cm	0-10cm 10-30cm
Litter (for calibration of module 2)	250 plots	No
Bulk density	5 per layer	5 per layer
% of stones	1 per layer	1 per layer
%sand, %silt and %clay	1 per layer	No
Total carbon, organic carbon and carbonates	1 per layer	1 per layer
Other parameters	1 per layer (pH, N, P, K)	No

Soil samples will be catalogued, stored and made available for future analysis