Spain - Fourth Spanish National Forest Inventory. Field data

Ministry for Ecological Transition and the Demographic Challenge (MITECO, Ministerio para la Transición Ecológica y el Reto Demográfico)

Report generated on: April 20, 2026

Identification

SURVEY ID NUMBER
ESP_2008_NFI_v01_M_v01_A_ESS

TITLE
Fourth Spanish National Forest Inventory. Field data

ABBREVIATION OR ACRONYM
NFI4

TRANSLATED TITLE
Datos de campo del Cuarto Inventario Forestal Nacional de España

COUNTRY

Name	Country code
Spain	ESP

SERIES INFORMATION
The first National Forest Inventory (NFI1), conducted between 1964 and 1977 by the State Forest Administration, provided the first consistent nationwide assessment of forest area, structural attributes, and dasometric and dendrometric parameters. It also established the volume equations that continue to underpin current inventory cycles. The second NFI (NFI2, 1986–1996) introduced a network of permanent sample plots, a systematic GIS-based methodology, and expanded the range of variables to include forest health, timber quality, woody understory, and site conditions. The third cycle (NFI3, 1997–2007) consolidated the use of a specific forest cartography at a 1:50 000 scale (MFE50), initiated the remeasurement of sample plots, and incorporated new objectives including variables related with biodiversity assessment and ecosystem valuation, thereby supporting the transition toward more integrated and multifunctional forest management.

ABSTRACT
The National Forest Inventory (NFI) is a program of the Ministry for Ecological Transition and the Demographic Challenge that provides harmonized, nationwide information on Spanish forests and their temporal dynamics, from diverse perspectives since it is a multo-objective intentory. The inventory is conducted on a ten-year cycle (as established in Article 28 of the Forestry Law), and after more than 60 years of implementation, it is currently concluding its fourth cycle (NFI4), which began in 2008.

The Fourth National Forest Inventory (NFI4) is based on the forest area defined by the Spanish National Forest Map (NFM25) (E 1:25 000), adding the tessera (i.e. basic unit, having a specific land use with homogeneous forest structure and forest type) belonging to each stratum (Vallejo and Sandoval 2013).The establishment of permanent sample plots since the second cycle (NFI2) ensures a continuous and robust data source for analyzing forest dynamics over time. The fundamental unit of the NFI is the sample plot, for which a wide range of variables is recorded. It provides case core information to assess indicators related to the bioeconomy, biodiversity conservation, forest hazards and non-wood forest products.

KIND OF DATA
Sample survey data [ssd]

UNIT OF ANALYSIS
Fields/plots

Scope

NOTES
The scope encompasses detailed measurements dealing with the multi-objective NFI. This includes:

- Site-related variables: location, slope, total canopy cover fraction, tree and shrub cover fraction, stand development stage.
- Dendrometric metrics: diameter at breast height (DBH), total height, crown diameter.
- Stand composition and structure: identification of tree and shrub species, species dominance, and regeneration data.
- Environmental variables: soil characteristics, erosion indicators, and land-use classification.
- Forest health: degree of damage, affected area, and causal agent for each sampled tree; phytosanitary conditions and

specialized information on certain stands, such as cork oak forests.
- Forest biodiversity: naturalness of the stand, cover types, vertical structure, natural elements (including tree microhabitats) and artificial elements, deadwood, invasive woody species, and browsing pressure.
- Non-timber forest products: data related to cork, pine nuts, and resin.
- Wood quality: data to assess the quality of wood from potentially productive species; Forest management.
- Stand age.

TOPICS

Topic
National Forest Inventory

KEYWORDS

Keyword
Forest production
Forest management
Land cover
Biodiversity

Coverage

GEOGRAPHIC COVERAGE

All forested lands within Spain: areas with tree cover, shrublands, pasturelands, temporarily deforested lands, and areas without vegetation but classified as forest-use according to Spanish national criteria.

Producers and sponsors

PRIMARY INVESTIGATORS

Name
Ministry for Ecological Transition and the Demographic Challenge (MITECO, Ministerio para la Transición Ecológica y el Reto Demográfico)

FUNDING AGENCY/SPONSOR

Name	Abbreviation
EU's Horizon 2020 Research and Innovation Programme (DIABOLO project)	
Instituto Nacional de Investigacion Agraria y Alimentaria (Research Contracts)	INIA
Ministerio para la Transición Ecológica y el Reto Demográfico	MITECO

Sampling

SAMPLING PROCEDURE

The sampling design is based on the stratification of forested areas according to their dasometric (forest measurement), structural, and botanical characteristics, or, in some cases, based on geographical or institutional criteria, always using the province as the unit of analysis.

Each stratum is formed by grouping forest areas (referred to as tesserae, patches, polygons, or units) with similar characteristics, whose boundaries are delineated at the working scale (typically 1:25,000). To carry out this grouping, a powerful Geographic Information System (GIS) is required.

The sample size in NFI2 was determined based on the logistics and organization of the data and fieldwork, rather than on

user requirements or statistical theory. Thus, the sampling points were set at the vertices of the kilometric Universal Transverse Mercator (UTM) grid, within areas classified as forested. This resulted in systematic sampling with random starting points and sampling intensity generally at a rate of one plot per square kilometer (100 hectares), proportionally distributed across strata based on their size.

Existing knowledge of the forest systems across various provinces assumed that the sampling intensity resulted in a relative error of less than 10 percent with a 95 percent confidence level for estimates of the total merchantable volume (with bark) of all tree species in a province. This assumption has proven accurate, with actual errors in most cases ranging between 3 percent and 6 percent.

As this is a continuous forest inventory, the NFI4 sample is based on the samples from NFI2 and NFI3. In total, the NFI4 comprises approximately 72 000 sample plots. As a general rule, all plots used in the previous inventory are revisited, adding those corresponding to newly forested areas, and excluding, only for stock calculations and not for change analysis, those that have become non-forested in the last 10 years.

Additionally, a separate set of plots is selected in deforested (non-wooded) areas, distributed in the same way as their wooded counterparts (at intersections of the kilometric UTM grid lines). These plots may be surveyed in full, partially, or not at all depending on available funding, as they are considered of less interest than wooded plots. The few trees found in these plots have not been included, since they contribute minimally to provincial totals and would introduce high sampling errors due to the above conditions. For this reason, the data provided for these areas is more limited and should be used with caution, given the higher sampling error and potential bias.

The information provided is categorized, in the first three sections, between wooded forest land and non-wooded forest land. From the latter, only the tables with the most relevant data have been selected.

DEVIATIONS FROM THE SAMPLE DESIGN
Less than 1 percent of the planned plots were not sampled due to access restrictions.

RESPONSE RATE
72 000 plots.

WEIGHTING
Plots are expanded to a per-hectare basis using an expansion factor of $10\,000/(\pi \cdot R^2)$, where R (in meters) is the radius associated with each concentric circle in the plot and determines the size class of trees to be measured. Weighting accounts for the proportion of forest area represented by each stratum, as defined by the SNFM25—Spain's official high-resolution forest map, which provides detailed information on land cover, forest types, canopy cover, and dominant tree species. As a result, stratified estimators are used to accommodate both the systematic sampling design and the stratification by forest type and province.

Data collection

DATES OF DATA COLLECTION

Start	End
2008	2024

DATA COLLECTION MODE
Field measurement [field]

DATA COLLECTION NOTES
Once the UTM sampling points that will become plots have been selected, the next step is to transfer them to the most modern and appropriate aerial photographs available. These photographs are then passed on to the fieldwork supervisor who, after proper planning, distributes them to the team leaders. These leaders, aided by general maps of the area, available information from the previous inventory, and the photos, travel in an off-road vehicle to the vicinity of the target point. Then, on foot and using stereoscopic observation of the photo pairs, along with the access sketches from NFI3 for repeated plots, they survey the identified terrain until they reach the plot. The location of the plot's center point, determined by a random decision without influence from topography, vegetation, operator preference, etc., is formalized by driving a tubular metal rod (rejón) into the ground, which is hidden when the team leaves. In repeated plots, this rod is already in the field and is located with the additional help of the azimuth and distance to previously measured trees from NFI3, which are re-identified, and with the use of a metal detector. If for any reason the rod cannot be found, the plot is treated as a new one. In some autonomous communities (administrative units), recent orthophotos are used instead of aerial photographs.

This method has the advantage of reduced costs—modern aerial surveys of any scale can be used to generate orthophotos—and of more accurate UTM point placement on the maps. However, it lacks stereoscopic vision, which is partly offset by taking old NFI3 photograms into the field as well. Once the team leader is positioned at the center of the plot, the measurement of the parameters selected for this inventory begins, following the guidelines written in a fieldwork instruction manual developed for the purpose. A detailed description of these procedures is provided in the NFI4 Methodological Summary (available at: https://iepnb.gob.es/sites/default/files/2025-06/Manual_ifn4_v5.pdf).It's worth noting that the sampling unit size (area to be surveyed) varies depending on the diameter of the trees (multi-radius plots).

Each plot record includes twelve information blocks:

- Identification (province, sheet, photogram, number, class, etc.)
- Classification by both photo-interpreter and field operator based on a series of parameters (land-use level, morphostructural level, species, occupancy, c ondition, etc.)
- Structure of age classes and origin of woody vegetation
- Dendrometry – the most important block – which includes polar coordinates and numbering of the trees (distinguishing between new and previously measured trees), botanical species, two diameter measurements, total height, quality, volume estimation form, phytosanitary condition, and special parameters. It also includes regeneration, woody shrub cover, and forest tree species present.
- Soil analysis – assessing stoniness, texture, organic matter content, pH, and soil type
- Risks – such as erosion or fire hazards
- Silviculture – documenting regeneration cuts and improvement treatments for canopy and soil
- Physiography – measuring and sketching the plot's terrain
- Access and reference itinerary – described in text and graphics
- Observations – where the operator can record any relevant notes about the plot measurement
- Control data – including team leader name, start time, etc.
- Photographic documentation – describing how the photographs were taken to illustrate the landscape and visualize forest structure

As can be easily understood, collecting this large volume of intricate data requires specialized personnel, complex measuring and recording equipment, and a detailed and thorough instruction manual. While it is impossible to describe all measurement techniques here, it is worth knowing that the measurements and notes—aside from some complex drawings—are entered into a rugged, high-capacity laptop using specially designed software made specifically for this project.

Data Processing

DATA EDITING

Once the field data are received in electronic format, they are first subjected to quality control procedures to ensure the consistency and coherence of the datasets before being used in two independent processes.

The first aims to quantify the changes in forest stands and individual trees over the period between inventories. It uses repeated plots located in the same place with the same trees. From this data and its corresponding processing, different types of growth—gross, net, annual, etc.—are calculated, as well as harvesting and mortality.

The second process produces tables of surface areas, forest stock, and dasometric and dendrometric indicators, among others, using a calculation method and table structure similar to those of NFI3.

The work firstly involves numerous cartographic operations to create surface area tables according to various concepts, as well as the location and extent of each of the strata into which the forests of each province have been divided.

Secondly, using the data from the electronic forms and the appropriate volume estimation equations, and after a complex process involving more than thirty different calculation programs, tables of other indicators and per-unit-area values for stock parameters are obtained, along with the relationships between them.

The basic unit for these computations is the stratum, from which the means and variances of the different variables are derived using the plots assigned to it during the cartographic procedure.

By integrating and processing information on the area and average values of the strata, the main provincial forest stock tables are obtained.

Statistical Disclosure Control (SDC)

The NFI4 dataset contains no personal data or identifiable information, as data collection is strictly performed at the plot level, with no reference to landowner identity or any sensitive attributes. Publicly available plot coordinates correspond to theoretical locations derived from a systematic sampling design (kilometric UTM grid); actual coordinates are confidential and only provided upon formally justified request. Internal identifiers are removed or pseudo-anonymized in the released datasets. The anonymization process complies with national statistical confidentiality standards and adheres to the provisions of Regulation (EU) 2016/679 (General Data Protection Regulation – GDPR) and Spain's Organic Law 3/2018 of December 5th on the Protection of Personal Data and Guarantee of Digital Rights.

Access policy

CONTACTS

Name	Email	URL
Ministry for Ecological Transition and the Demographic Challenge (MITECO, Ministerio para la Transición Ecológica y el Reto Demográfico)	buzon-bdatos@miteco.es	miteco.gob.es

CONFIDENTIALITY

Access to Metadata and NFI Reports resources do not require specific permissions as they are free resources. Whatever has been published in government web systems does not require specific permission.

ACCESS CONDITIONS

See http://inspire.ec.europa.eu/metadata-codelist/LimitationsOnPublicAccess/noLimitations

CITATION REQUIREMENTS

Área de Inventario y Estadísticas Forestales. Ministerio para la Transición Ecológica y el Reto Demográfico. Cuarto Inventario Forestal Nacional (NFI4). Ministerio para la Transición Ecológica y el Reto Demográfico, 2025.

Disclaimer and copyrights

DISCLAIMER

The user of the data acknowledges that the original collector of the data, the authorized distributor of the data, and the relevant funding agency bear no responsibility for use of the data or for interpretations or inferences based upon such uses.

Metadata production

PRODUCERS

Name	Abbreviation	Role	Affiliation
Ministry for Ecological Transition and the Demographic Challenge (MITECO, Ministerio para la Transición Ecológica y el Reto Demográfico)	MITECO	Metadata provider	
Statistics Division	ESS	Metadata adapted for FAM	Food and Agriculture Organization of the United Nations

Data Dictionary

Data file	Cases	Variables