

Ecuador - National Forest Assessment of Ecuador, Round I

**Government of Ecuador, Ministry of Environment and Energy (MAE, Ministerio de
Ambiente y Energía)**

Report generated on: October 20, 2025

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Identification

SURVEY ID NUMBER

ECU_2009_2013_ENF_C1_v01_M_v01_A_ESS

TITLE

National Forest Assessment of Ecuador, Round I

ABBREVIATION OR ACRONYM

ENF R1

TRANSLATED TITLE

Evaluación Nacional Forestal de Ecuador, Ciclo I

COUNTRY

Name	Country code
Ecuador	ECU

STUDY TYPE

Forest Resource Survey

ABSTRACT

Ecuador's first National Forest Assessment (ENF) is a strategic, integrated, and multi-purpose initiative developed in response to the need for up-to-date and reliable data on the country's forest resources. Its main objective is to provide a comprehensive and continuous assessment of forest ecosystems while also collecting socio-economic information to support evidence-based decision-making and the development, strengthening, and updating of public policies in the forestry sector. In addition, the ENF contributes to the formulation of strategies for sustainable forest management in the country.

The ENF collected integrated information spanning biophysical, environmental, and socio-economic dimensions. The three main components were: the National Forest Inventory (NFI), which collected detailed biophysical data through a sampling design that incorporated a wide range of variables—including bioclimatic characteristics, floristic composition, and dendrometric and dasometric measurements—across plots distributed throughout the country; the biomass and carbon maps, for which carbon was quantified in different components and maps were generated; and the socio-economic component, which involved household and institutional surveys to better understand how local people interact with their natural environment.

For the first time, the resource category 'trees outside forests' was quantified at the national level. By including all land cover classes in its measurement framework, the National Forest Assessment provides a solid basis for monitoring future changes in land use and tree biomass across the landscape. Furthermore, the ENF's remit included the generation of information to facilitate access to international carbon markets.

KIND OF DATA

Sample survey data [ssd]

UNIT OF ANALYSIS

Fields/plots

Scope

NOTES

The National Forest Assessment (ENF) focused on three main components:

- National Forest Inventory (NFI): The study was designed to suit Ecuador's characteristics, based on bioclimatic criteria and floristic composition, using a stratified cluster sampling approach - identifying a stratum for each of the nine forest types listed in the Sampling section - with random selection of sampling units.
- Biomass and carbon maps: Carbon was quantified in different components (aboveground and belowground biomass, dead wood, and organic matter) using formulas, and partial carbon maps were generated.
- Socio-economic components: The relationships between forests and households, as well as public and private actors, were studied. Aspects such as land use, resource utilization, production systems, and organizational structures were included in

the analysis.

TOPICS

Topic
Forest inventory
Forest assessment
Forest survey
Timber production
Biomass stocks
Species diversity
Health of forest ecosystems
Timber forest ecosystems

KEYWORDS

Keyword
Forest
Volume
Biomass

Coverage

GEOGRAPHIC COVERAGE

National coverage

UNIVERSE

The forests and wooded areas of the nine forest types included in the study covered 13 038 367 hectares of the national territory as of 2012. These include natural forests, forests modified by human activity, mangroves, and flooded palm forests. There were 630 clusters, each with an area of 1.08 hectares, covering a theoretical area of 388.8 hectares nationwide.

Producers and sponsors

PRIMARY INVESTIGATORS

Name
Government of Ecuador, Ministry of Environment and Energy (MAE, Ministerio de Ambiente y Energía)

PRODUCERS

Name	Abbreviation	Role
Food and Agriculture Organization of the United Nations	FAO	Technical advising
Tropical Agricultural Research and Higher Education Center (CATIE, Centro Agronómico Tropical de Investigación y Enseñanza)	CATIE	Data analysis consultancy
National Institute of Agricultural Research (INIAP, Instituto Nacional Autónomo de Investigaciones Agropecuarias)	INIAP	Soil and biomass sample treatments

FUNDING AGENCY/SPONSOR

Name	Abbreviation
Government of Ecuador	

National Secretariat for Planning and Development (Secretaría Nacional de Planificación y Desarrollo)	SENPLADES
Food and Agriculture Organization of the United Nations	FAO
Ministry of Foreign Affairs of Finland (Utrikesministeriet)	
Reconstruction Credit Institute (Kreditanstalt für Wiederaufbau)	KfK

Sampling

SAMPLING PROCEDURE

L-shaped clusters were established, consisting of three subplots oriented to the north, with measurement areas differentiated by forest stratum (forest type). Each forest has a differentiated sampling effort due to site conditions:

- Andean Dry Forest (BSA, Bosque Seco Andino): subplot 3 600 m², cluster 10 800 m²
- Seasonally Tropical Dry Forests (BSP, Bosque Seco Pluvioestacional): subplot 3 600 m², cluster 10 800 m²
- Montane Evergreen Andean Forest (BSVAM, Bosque Siempreverde Andino Montano): subplot 3 600 m², cluster 10 800 m²
- Foothill Evergreen Forest (BSVPM, Bosque Siempreverde Pie Montano): subplot 3 600 m², cluster 10 800 m²
- Andean Cloud Forest (BSVCA, Bosque Siempreverde Ceja Andina): subplot 3 600 m², cluster 10 800 m²
- Lowland Evergreen Amazonian Forest (BSVTBA, Bosque Siempreverde Tierras Bajas de la Amazonía): subplot 3 600 m², cluster 10 800 m²
- Lowland Evergreen Chocó Forest (BSVTBC, Bosque Siempreverde Tierras Bajas del Chocó): subplot 3 600 m², cluster 10 800 m²
- Mangrove (Ma): subplot 2 400 m², cluster 7 200 m²
- Moretal (flooded palm forest) (Mo): subplot 2 400 m², cluster 7 200 m²

The secondary units nested within the clusters were:

- 20 × 20 m plots for trees with diameter ≥ 10 cm (BSA, BSP, BSVAM, BSVPM, BSVTBA, BSVTBC, Ma, Mo; except in BSVCA, where trees with diameter ≥ 5 cm were measured)
- 60 × 60 m plots for trees with diameter ≥ 20 cm (BSA, BSP, BSVAM, BSVPM, BSVTBA, BSVTBC, Ma, Mo; except in BSVCA, where trees with diameter ≥ 10 cm were measured)
- 50 × 50 cm plots for litter (all strata)
- 3.98 m circular plots for tree regeneration divided in two groups: 30 cm-1.3 m height, and 1.3 m height to diameter < 10 cm (all strata)
- 2 × 2 m plots for understory biomass (BSVAM, BSVPM, BSVCA, BSVTBA, BSVTBC, Ma, Mo) and measurement of bamboo height in BSVCA and BSVAM
- 5 × 5 m plots for understory biomass in BSA and BSP and measurement of Guadua bamboo in BSVTBA, BSVTBC, BSVPM
- 30 m line-intercept transect for coarse woody debris

For more information, consult the Methodology document for the pilot study of the ENF which was conducted in accordance with the REDD+ mechanism.

DEVIATIONS FROM THE SAMPLE DESIGN

A theoretical total of 1 890 sampling subunits was expected. However, due to accessibility issues (rocks, bodies of water in the different sampling units and subunits, and need for entry permits from local communities), only a portion of the plots could be measured: 80 percent of the expected tree sampling units, 70 percent of understory plots, and 60 percent of leaf litter and soil samples.

RESPONSE RATE

The sampling design included 630 clusters comprising 1 890 subplots. Due to access restrictions or unsuitable site conditions, full coverage of measurements was not achieved. Nonetheless, data collection was completed for 86 percent of the subplots for tree measurements, 57 percent for litter, 30 percent for deadwood, and 63 percent for understory vegetation.

WEIGHTING

Various expansion factors are applied to convert the values and volumes of carbon stocks per hectare based on the size of the sampling units:

- Dead leaves: 40 000
- Undergrowth: 400 and 2 500 depending on the forest type
- Large trees: 2.77
- Trees less than 20 cm: 25
- Fallen wood: 10 000

Adjustments are made for the effective measurement area, and the size of the forest type is taken into account for the calculations depending on the variable being analysed.

Data collection

DATES OF DATA COLLECTION

Start	End
2009	2013

DATA COLLECTION MODE

Field measurement [field]

Data Processing

DATA EDITING

To detect potential errors, a protocol was developed, which includes the following steps:

- Detection of out-of-range values: For example, in plots where only trees with a diameter at breast height (DBH) greater than 20 cm were supposed to be measured, values below 20 cm were flagged. Another example is the presence of zero values for DBH or height.
- Logical validation checks: A key example of this procedure is the review and correction of inconsistencies between total tree height and commercial height. The check took into consideration that the commercial height in Ecuador's forests is not the same as the total tree height, which is always greater than the height of the tallest part of each individual tree.
- Visual detection of outliers in relationships between variables: Graphical techniques, such as scatter plots of DBH versus total height, were used to identify trees with inconsistent relationships between variables, suggesting possible errors in one or both values.
- Harmonization of species (unique identification): Scientific names were reviewed to detect and correct synonyms and typographical errors in genus and species names.
- Identification of statistical outliers. Values for DBH, total height, and commercial height were standardized by species. Any standardized value exceeding an absolute value of 3.5 was considered an outlier and subsequently reviewed and deleted or imputed.

STATISTICAL DISCLOSURE CONTROL (SDC)

Endangered species or with commercial value are omitted from the database.

Data Appraisal

ESTIMATES OF SAMPLING ERROR

Sampling errors were estimated for all key variables (e.g., biomass, carbon stocks, tree volume) based on the sampling design. Standard errors and 95 percent confidence intervals were calculated using the sample variance and the number of plots per stratum. Regarding non sampling errors, the errors associated with instrumentation or measurements were mitigated through protocols, manuals, training, support, and monitoring of field teams.

Access policy

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CITATION REQUIREMENTS

MAE. Ministerio de Ambiente y Energía. Evaluación Nacional Forestal ciclo I. 2025.

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Metadata production

DDI DOCUMENT ID

DDI_ECU_2009_2013_ENF_C1_v01_M_v01_A_ESS_FAO

PRODUCERS

Name	Affiliation	Role
Ministry of Environment and Energy (Ministerio de Ambiente y Energía)	Government of Ecuador	Metadata producer
Statistics Division	Food and Agriculture Organization of the United Nations	Metadata adapted for FAM

Data Dictionary

Data file	Cases	Variables
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