

Costa Rica - National Forest Inventory of Costa Rica, 2014-2015

National System of Conservation Areas (SINAC, Sistema Nacional de Áreas de Conservación), German Agency for Technical Cooperation (GIZ, Agencia Alemana de Cooperación Técnica), Ministry of Environment and Energy (MINAE, Ministerio de Ambiente y Energía)

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Identification

SURVEY ID NUMBER

CRI_2014_2015_NFI_v01_M_v01_A_ESS

TITLE

National Forest Inventory of Costa Rica,
2014-2015

COUNTRY

Name	Country code
Costa Rica	CRI

STUDY TYPE

Forest resource survey

SERIES INFORMATION

Pilot study conducted in Costa Rica during 2000–2001 that used a low-intensity sampling approach to produce national-level forest inventory information (Inventario forestal piloto 2001, Kleinn et al. 2001).

ABSTRACT

Costa Rica's first National Forest Inventory (INF-CR) plays a strategic role for the State Forestry Administration (AFE). Its main purpose is to fulfil two key responsibilities: firstly, to comply with the legal requirement to inventory and assess the country's forest resources, as well as their utilization and industrialization; and secondly, to provide the basis for the Monitoring, Reporting and Verification (MRV) system required by the national REDD+ strategy.

The INF-CR aims to generate essential information for the sustainable management of forest resources, ecosystem services, and trees outside forests. Furthermore, it is designed to be repeated periodically, enabling the estimation and reporting of changes in forest cover and carbon stocks, which are indispensable for meeting national and international commitments.

Under the Forestry Law Regulations, sustainable forest management is defined as the management of forest resources to meet current needs without compromising the ability of forests to continue providing goods and services to future generations.

The overall objective of the INF-CR is to determine the stock, characteristics, and condition of the country's forest resources in order to guide planning and decision-making regarding their management and administration. Its specific objectives include measuring forest cover by forest type, assessing growing stock, biomass and carbon, estimating deforestation, forest degradation and recovery, strengthening the REDD+ MRV system, and supporting national forest planning.

KIND OF DATA

Sample survey data [ssd]

UNIT OF ANALYSIS

Fields/Plots

Scope

NOTES

The following variables were measured and recorded, and are grouped into four categories:

1. Dasometric Variables of Individuals

Within the UMP, all trees and lianas with a diameter at breast height (DBH) greater than 10 cm are identified and measured:

- Diameter at breast height (DBH).
- Height: Total height and commercial height are measured on at least two trees per 10 cm diameter class.
- Spatial position: The relative location (X, Y) of each tree within the plot boundaries is recorded.
- Count: The total number of trees meeting the minimum diameter criterion is determined.

2. Species Composition

- Botanical identification: Each individual is identified by its common and scientific name, with standardized alphanumeric codes assigned for biodiversity analysis.

3. Site and Environment Characterization Variables

Although these variables refer to the plot area, they document the environmental context and conservation status:

- Forest integrity: Evidence of natural disturbances (landslides, fires, wind damage, floods) or anthropogenic disturbances (logging, stumps, trails, presence of barbed wire fences).
- Geophysical variables: The slope of the terrain (in percentage) is measured and the topographical position (ridge, valley, plain, etc.) is identified.
- Protected areas: Presence of water bodies such as rivers, streams, brooks or springs.
- Succession stage: Classification of the site as mature or secondary forest.

4. Carbon and Soil Variables (Associated with the Primary Sampling Unit (PSU))

Specific points are located within or on the edges of the PSU to collect data on other carbon pools:

- Deadwood: Quantified along a 20-metre transect located equidistant from the centre of the PSU.
- Soils: Samples are collected to determine bulk density and total organic carbon content.
- Litter: Its depth (in cm) is measured and samples are collected for weighing at the corners of the PSU.

TOPICS

Topic
Environmental Study
Forest Inventory
Forest Assessment

KEYWORDS

Keyword
Forest Resources
Forestry
Biomass
Volume

Coverage

GEOGRAPHIC COVERAGE

National coverage.

UNIVERSE

Six land-cover types were defined as the target population for sampling, with each forest type considered a separate stratum for the design of the National Forest Inventory (NFI).

The distribution of the target population among the six strata was as follows:

- Mature forest: 40.05 percent
- Secondary forest: 24.33 percent
- Mangrove forest: 0.94 percent
- Palm forest: 1.22 percent
- Tree-covered grassland: 31.54 percent
- Forest plantations: 1.93 percent

The total area of the target population was 38 668.96 km², representing approximately 75.7 percent of the country's total

land area (51 100 km²).

Producers and sponsors

PRIMARY INVESTIGATORS

Name
National System of Conservation Areas (SINAC, Sistema Nacional de Áreas de Conservación)
German Agency for Technical Cooperation (GIZ, Agencia Alemana de Cooperación Técnica)
Ministry of Environment and Energy (MINAE, Ministerio de Ambiente y Energía)

PRODUCERS

Name	Abbreviation
Food and Agriculture Organization of the United Nations	FAO
Central American Commission for Environment and Development (CCAD, Comisión Centroamericana de Ambiente y Desarrollo)	CCAD

FUNDING AGENCY/SPONSOR

Name	Abbreviation
German Agency for Technical Cooperation (GIZ, Agencia Alemana de Cooperación Técnica)	GIZ

Sampling

SAMPLING PROCEDURE

The inventory applies a stratified systematic sampling design based on a regular grid of points stratified by land use and land cover type. The plots to be surveyed were selected systematically with a random start (Cochran 1977) across the national territory from a 10,166-point grid with a spacing of 2.5 km between points (Ortiz et al. 2013).

An initial pre-sampling phase was used to refine the estimate of basal area variability in order to calculate the sample size more accurately, validate travel and measurement times, and assess the effectiveness of the field forms and instruments. For this initial phase, a 5x5 km grid (2048 points) was used to select sites, establishing specific distances according to the stratum (e.g. 25 km for mature forest and 10 km for wooded grassland); 107 sites were successfully established and measured. Results are available in the Downloads section.

During the second phase, a primary plot and subplots of varying sizes were established within the plot boundaries to measure dasometric and edaphic variables, as follows:

1. Primary sampling unit (PSU) measuring 20 × 50 m (1,000 m²). Trees with a diameter at breast height (DBH) greater than 10 cm were identified and measured. Total height and commercial height were also measured for at least two trees per 10 cm diameter class.
2. Secondary sampling unit (UMS) of 10×20 m (200 m²). Trees with a DBH between 2 and 9.9 cm were identified and measured. Total height was also measured on at least two trees per 2 cm diameter class.
3. Tertiary sampling unit (UMT). This plot consists of three circular subplots, each with a radius of 1 m, located at the ends and centre of the PSU's baseline. Regeneration (trees, shrubs, palms and tree ferns) with a total height of 1.5 m or more and a DBH of less than 2 cm is recorded here.
4. Quaternary sampling unit (UMC). This is a 1 m² plot located randomly in the south-western half of the PSU. The abundance (count) of herbaceous plants is measured by taxonomic groups.
5. Litter sampling unit (UMH). This plot consists of four square subplots, each 50 cm on a side (0.25 m²) and located at each of the corners of the PSU. In each subplot, the depth (in cm) of the litter is measured at the centre and at two opposite corners. The litter from each subplot is collected and weighed, then mixed, and a composite sample of 1000 grams is taken.
6. Deadwood sampling unit (UMMm). This component was measured along a 20 m transect located at equal distances from the central point of the PSU.
7. Soil sampling. A composite soil sample was taken to determine organic and total carbon, and a soil cylinder was taken to

determine density.

Secondary, tertiary and quaternary plots, fallen deadwood and litter plots are established in forest strata (mature and secondary forests) and in palm forests and mangrove stands only where site conditions permit. In wooded grassland strata and forest plantations, only the PSU is established.

RESPONSE RATE

The response rate was 97.9 percent. 280 plots from a sample of 286 plots were measured.

WEIGHTING

The weighting criterion was the size of the stratum.

Data collection

DATES OF DATA COLLECTION

Start	End
2013	2014

DATA COLLECTION MODE

Field measurement [field]

DATA COLLECTION NOTES

All the technicians took part in a training course before starting the fieldwork. Routine checks were carried out to assess the consistency, integrity and completeness of the dasometric, dendrological and positioning data.

The quality assessment of the forest inventory data was carried out by an independent team, which visited and corrected 10 percent of the plots established for each stratum.

Data Processing

DATA EDITING

Data processing was undertaken by an international external company with expertise in forest inventory data management. The workflow was implemented in Microsoft Excel using specialized macros designed to automate data validation, consistency checks, error detection, and the generation of derived variables.

Data Appraisal

ESTIMATES OF SAMPLING ERROR

The uncertainty assessment included only sampling errors derived from the probabilistic sampling design. Non-sampling errors were not quantified and were therefore excluded from the uncertainty analysis (Programa REDD/CCAD-GIZ - SINAC. 2015.).

Access policy

CONTACTS

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CITATION REQUIREMENTS

Programa REDD/CCAD-GIZ - SINAC. 2015. Inventario Nacional Forestal de Costa Rica 2014-2015. Resultados y Caracterización de los Recursos Forestales. Preparado por: Emanuelli, P., Milla, F., Duarte, E., Emanuelli, J., Jiménez, A. y Chavarría, M.I. Programa Reducción de Emisiones por Deforestación y Degradación Forestal en Centroamérica y la República Dominicana (REDD/CCAD/GIZ) y Sistema Nacional de Áreas de Conservación (SINAC) Costa Rica. San José, Costa Rica. 380 p.

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Metadata production

DDI DOCUMENT ID

DDI_CRI_2014_2015_NFI_v01_M_v01_A_ESS_FAO

PRODUCERS

Name	Abbreviation	Affiliation	Role
Statistics Division	ESS	Food and Agriculture Organization of the United Nations	Metadata adapted for FAM

Data Dictionary

Data file	Cases	Variables
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