Papua New Guinea - Papua New Guinea Multi-Purpose National Forest Inventory (2016-2019)

Papua New Guinea Forest Authority

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Identification

SURVEY ID NUMBER
PNG_2019_MNFI_v01_M_v01_A_ESS

TITLE
Papua New Guinea Multi-Purpose National Forest Inventory (2016-2019)

ABBREVIATION OR ACRONYM
MNFI

COUNTRY

Name	Country code
Papua New Guinea	PNG

STUDY TYPE
Forest resource survey

SERIES INFORMATION
Before the implementation of the current National Forest Inventory (NFI), Papua New Guinea undertook various forest-related data collection activities, although these previous efforts were not a complete national coverage and were based on non-probability sampling. Historical efforts include the Forest Inventory Mapping (FIM) Project, conducted by the then Department of Forests with technical assistance from FAO and UNDP between 1973 and 1980, which focused on commercially valuable forest regions (Turia et al., 2022). This was followed by the National Resource Survey (NRS) in the early 1990s, and forest base mapping led by the Department of Environment and Conservation in the 1990s and early 2000s, though these lacked standardized field methodologies (Turia et al., 2022).

In addition, earlier forest inventory-related initiatives included the Forest Inventory Mapping System (FIMS) and the Forest Inventory Processing System (FIPS). These two systems were primarily designed to estimate timber volume for expected logging project areas based on pre-inventory surveys conducted prior to forest acquisition, rather than to support comprehensive national-level forest assessment. With support from the Japan International Cooperation Agency (JICA) under the PNGFA/JICA Phase II project, these systems were subsequently integrated and enhanced into the PNG Forest Resource Inventory Management System (PNG-FRIMS), implemented during the period 2014–2019.

The UN-REDD PNG National Programme, launched in 2011, further supported capacity building, remote sensing analysis, and plot stratification (Poesi, 2019). Additionally, earlier national planning tools such as the 1995 National Forest Plan, the 2006 PNGFA Inventory, and the 2015 Forest Base Map provided useful spatial or thematic inputs, but were not derived from a comprehensive national inventory framework (NFI Information Booklet, 2018). These efforts laid the groundwork for PNG’s first scientifically robust, statistically sound, and nationally representative NFI, officially launched in March 2016, with fieldwork beginning in May 2017 (Poesi et al., 2018).

ABSTRACT
Papua New Guinea’s National Forest Inventory (NFI) was initiated in 2016 as a strategic effort to generate reliable forest data to support national and international reporting commitments, sustainable forest management, and climate change mitigation under REDD+. The NFI is designed as a multi-purpose stratified sampling design aimed at collecting information on forest resources, biodiversity, carbon stocks, land use, and socio-economic parameters. It was implemented through a collaborative approach involving the Papua New Guinea Forest Authority (PNGFA), technical agencies, universities, and international partners. The stratified sampling design was based on a 4 km × 4 km grid, with an additional 2 km × 2 km grid applied in three selected smaller provinces to ensure adequate sampling intensity and representation. The NFI aimed to establish 1000 permanent sample plots nationwide. Field data collection includes biophysical measurements, biodiversity assessments, and socio-economic surveys, supported by Open Foris tools. Preliminary results show that forest ecosystems cover approximately 78 percent of the country’s land area, highlighting PNG's global significance in forest conservation. The NFI also contributes to building national capacity in forest monitoring and lays the foundation for long-term data-driven forest governance (PNG Forest Authority, 2018).

KIND OF DATA
Sample survey data [ssd]

UNIT OF ANALYSIS
Fields/plots

Scope

NOTES

The National Forest Inventory of Papua New Guinea covers multiple components, including forest structure and composition, above-ground biomass, biodiversity indicators, forest disturbances, land use and land cover, soil characteristics, and socio-economic information at the community level. The field survey is divided into biophysical, soil, and socio-economic modules, implemented through standardized data collection tools and protocols. In addition, the scope includes a faunal biodiversity component, implemented in accordance with the Faunal Biodiversity Protocol developed in 2023, to support the systematic collection of information on selected wildlife indicators (PNG Forest Authority Field Manual, 2018; PNG Forest Authority, 2018).

TOPICS

Topic
Forest Resource Assessment

KEYWORDS

Keyword
National Forest Inventory
Forest Resource Assessment
Forest Monitoring
Land Use Change Monitoring
Biomass and Carbon Stock Estimation
Biodiversity Assessment

Coverage

GEOGRAPHIC COVERAGE

National

UNIVERSE

The target population of the PNG National Forest Inventory includes all land areas within the national territory that fall under the defined forest strata of Papua New Guinea, based on a national forest classification developed from the 2015 Forest Base Map and refined through satellite imagery. It includes all natural forest types, including lowland, montane, swamp, mangrove, and dry forests; as well as other land cover types such as woodland, scrubland, grassland, and agriculture. Stratification was based on ecological zones, topography, and forest disturbance history to ensure representation of the country's diverse forest ecosystems and land use dynamics (PNG Forest Authority, 2018; PNG Forest Authority Field Manual, 2018). Areas with urban settlements, mining sites, and large water bodies were not considered for the sampling (Poesi, 2019).

The forest strata and classification underpinning the Forest Base Map are based on Hammermaster and Saunders (1995), “Forest Resources and Vegetation Mapping of Papua New Guinea”, ensuring consistency with the established national vegetation classification system. While the original classification provides detailed differentiation based on crown characteristics, the NFI maintains broader forest type categories to support operational feasibility and reporting consistency. The classification framework also explicitly takes into account Papua New Guinea’s national forest definition, including the treatment of savannah and woodland formations, which are aligned with national definitions while corresponding to “other wooded land” under FRA classifications.

Producers and sponsors

PRIMARY INVESTIGATORS

Name	Affiliation

Papua New Guinea Forest Authority	Papua New Guinea Government

PRODUCERS

Name	Abbreviation
Food and Agriculture Organization of the United Nations	FAO
United Nations Reducing Emissions from Deforestation and forest Degradation Programme	UNREDD+
New Guinea Binatang Research Centre	
Papua New Guinea University of Technology	PNGUoT
University of Papua New Guinea	UPNG
La Sapienza University of Rome, Italy	
The University of Queensland, Australia	
University of Tasmania, Australia	
University of Melbourne, Australia	
Forest Research Institute, Papua New Guinea	PNGFRI
Forest Practices Authority, Tasmania, Australia	FPA

FUNDING AGENCY/SPONSOR

Name	Abbreviation
European Union	EU
Mountain Partnership	
The Crawford Fund	

Sampling

SAMPLING PROCEDURE

The sampling design of the Papua New Guinea National Forest Inventory was developed to provide nationally representative data across the country's diverse ecological zones. A systematic, two-phase stratified sampling approach was adopted to ensure statistical validity, spatial coverage, and operational feasibility. The sampling frame was constructed using the 2015 PNG Forest Base Map, refined with remote sensing layers and validated through field observations (PNG Forest Authority, 2018).

The first-phase stratification used ecological criteria-such as forest type, topography, and disturbance history-to classify the national territory into representative forest strata. A 4 km × 4 km grid was overlaid on the national map, resulting in approximately 10 000 potential grid cells. In addition, a denser 2 km × 2 km grid was applied in three smaller provinces to increase sampling intensity and ensure adequate representation. From the combined sampling grid, 1000 sampling points were selected for field assessment using a spatially balanced random selection method, ensuring proportional representation across strata and regions. The selection of sampling points was further filtered to forest land categories to align with the objectives of the inventory (PNG Forest Authority Field Manual, 2018).

Each selected grid cell was assigned to a cluster, consisting of four circular plots arranged in a predefined spatial pattern. The reference point of each cluster is the center plot, from which three additional plots are established to form the cluster configuration. The plots within each cluster are located 300 meters apart, which is sufficient to treat them as independent sampling units. Each plot contains four concentric circular subplots with different radii to collect measurements at various scales (PNG Forest Authority, 2018, p. 12). Plots in a cluster are coded as C (Center), N (North), W (West) and E (East). Plot N is directly to the North from the center plot C. Angles between Plots N, W and E are 120 degrees (PNG Forest Authority Field Manual, 2018).

Trees with diameter at breast height (dbh) greater than or equal to 40 cm are measured within the plot radius of 25 m; trees with dbh greater than or equal to 20 cm within the radius of 15 m; trees with dbh greater than or equal to 10 cm within the radius of 10 m; and trees with dbh greater than or equal to 1 cm within the radius of 1 m. In addition, any trees with dbh

greater than or equal to 40 cm encountered in other subplot radii are also measured for both diameter and height. Stump and fallen deadwood measurements are conducted within the circle of radius 15 m. Regeneration subplots consist of four quadrats of 1 m × 1 m each, with their centers located 15.5 m from the plot reference point in the cardinal directions. Regeneration measurements include saplings and seedlings with diameter thresholds of 1 cm and above. For palms occurring within the plots, both diameter and height are measured when the dbh falls within the defined diameter thresholds. Bamboo measurements are conducted within the circle of radius 15 m. Understory, litter, and coarse woody debris (CWD) biomass samples are collected using 1 m × 1 m clip plots located outside the main plot, with subplot centers positioned 25.5 m from the plot center in the cardinal directions (PNG Forest Authority Field Manual, 2018).

WEIGHTING
No weight.

Data collection

DATES OF DATA COLLECTION

Start
2016

DATA COLLECTION MODE
Face-to-face [f2f]

DATA COLLECTION NOTES
Data collected from the field were submitted to the National Forest Inventory (NFI) Unit, where they underwent centralized checking and cleaning before being archived (Poesi, 2019). The use of the Open Foris Collect data collection tool enabled the application of predefined validation rules and logical checks during field data entry, contributing to initial data quality assurance (Poesi et al., 2018). While field validation was supported through these tools, final data editing was conducted at the national level by the technical team.

Field data were initially recorded using standardized field data sheets and subsequently entered into the Open Foris Collect database, where role-based user access rights were applied to manage data entry, review, and validation processes. Data entry was conducted manually, with particular attention given to species verification, especially for the botany component, to ensure taxonomic consistency and accuracy. In addition, the data management workflow includes the migration of validated datasets from Open Foris Collect to Open Foris Arena, alongside the adoption of Arena Mobile for field data collection in subsequent phases, supporting a gradual transition toward an integrated digital data collection and management environment.

Data Appraisal

ESTIMATES OF SAMPLING ERROR
Limited information is available for precision and bias estimation. Some clusters were not surveyed due to security risks and logistical challenges, which may introduce geographic limitations in the sampling coverage (Poesi, 2019).

Access policy

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CONFIDENTIALITY
The confidentiality conditions will be based on the external repository, owned by the country.

ACCESS CONDITIONS
Data available on an external repository. The access conditions will be based on the external repository, owned by the country.

CITATION REQUIREMENTS
National Forest Inventory, PNGFA, 2019

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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

DDI DOCUMENT ID
DDI_PNG_2019_MNFI_v01_M_v01_A_ESS_FAO

PRODUCERS

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

Data Dictionary

Data file	Cases	Variables