

# Thailand - National Forest Inventory (Thaiform) Harmonized for REDD+ Forest Reference (Emission) Levels 2013-2017 (Cycle 3)

**Department of National Parks Wildlife and Plant Conservation (DNP), Ministry of  
Natural Resources and Environment**

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## Identification

### SURVEY ID NUMBER

THA\_2013-2017\_NFI-R3\_v01\_M\_v01\_A\_ESS

### TITLE

National Forest Inventory (Thaiform) Harmonized for REDD+ Forest Reference (Emission) Levels 2013-2017 (Cycle 3)

### COUNTRY

Name	Country code
Thailand	THA

### STUDY TYPE

Forest resource survey

### SERIES INFORMATION

Thailand started implementing full scale National Forest Inventory in 2003 with the THAIFORM project supported by the International Timber Trade Organization (ITTO). This first NFI consisted in sampling clusters of five 0.1 ha circular plots. In the three phases of the project, from 2003 to 2010, clusters were first placed on a 20 km square grid across all lands (phase one), completed by 10 km grid inside forests in phase two (in-between the 20 km grid clusters), and additional plots on a 5 km grid in several protected areas in phase three. Between phase one and two, the responsibility of conducting THAIFORM moved from the Royal Forest Department (RFD) to the Department of National Parks, Wildlife and Plant Conservation (DNP). In 2011-2012, a partial remeasurement of the forest plots on the 10 km grid was carried out but limited to the center plot of each cluster. This campaign is acknowledged as NFI cycle 2 but was later dropped from the REDD+ Forest Reference (Emission) Levels (FREL/FRL) harmonization process.

### ABSTRACT

Thailand NFI cycle 3 was implemented from 2013 to 2017 by the Department of National Parks, Wildlife and Plant Conservation (DNP). Its original purpose was monitoring forest resource in protected areas. The inventory built on cycles 1 and 2 with the remeasurement of forest plots in 10 and 5 km grids, but also added around 2,600 plots in selection of protected areas on a 2.5 km grid for greater understanding of the forest resource in these parks. In addition to the plots measured by DNP, 176 plots were measured by the Royal Forest Department in forest outside protected areas. This data was used to report on the status of the forest, including number of trees, their distribution per diameter class, volume, biomass stocks as well as biodiversity indicators. In 2018-2020, with support from FAO, this data was re-analyzed, with the data from Cycle 1 to generate carbon stocks for the country's key forest types. During this process, the data was harmonized, few corrections were made to data entry errors and the plots from the 10 km grid only were kept for better consistency across cycles. Since the number of plots measured in the different cycles was not the same, especially much less plots were remeasured outside protected areas, a stratified approach was used to calculate forest carbon stock. In each plot, field crews inventoried all the standing vegetation, i.e. trees, seedling, sapling, rattan, and bamboo, as well as standing and lying dead wood. At plot level, access notes, reference points, geomorphological conditions and land use were reported. This survey consists of the inventory plots from the 3rd NFI cycle on the 10 km grid, harmonized for the REDD+ FREL/FRL. The Department of National Parks, Wildlife and Plant Conservation is the organism responsible for the series of NFIs. More information can be found in the FREL/FRL submission to the UNFCCC: <https://redd.unfccc.int/submissions.html?country=tha>

### KIND OF DATA

Sample survey data [ssd]

### UNIT OF ANALYSIS

Sampling circular plots of 0.1 ha located on a 10 by 10 km grid across the whole country in forested lands. The plots were further subdivided in concentric subplots. More details are available in Thailand first REDD+ FREL/FRL submission to the UNFCCC (see Documentation).

## Scope

### NOTES

The third inventory cycle combines inventory plots from DNP and RFD. Measurements target:

1. Site description (human activities and disturbances, land use, wildlife habitat, slope, elevation, etc.)

2. Access notes
3. Vegetation description (lichen, moss, herb, shrubs, tree-seedlings, trees, saplings, rattan, bamboo, climbers)
4. Tree characteristics (Girth at breast height, tree total height, crown, timber quality, etc.)
5. Dead wood inventory.

The harmonization process for Thailand REDD+ FREL/FRL focused on aboveground trees characteristics and this dataset is limited to items 1 (land use) and 5 above.

#### KEYWORDS

Keyword
forest
carbon
tree biomass

## Coverage

#### GEOGRAPHIC COVERAGE

National coverage

#### UNIVERSE

Trees >1.3 m height and >15 cm girth at breast height.

## Producers and sponsors

#### PRIMARY INVESTIGATORS

Name	Affiliation
Department of National Parks Wildlife and Plant Conservation (DNP)	
Ministry of Natural Resources and Environment	Government of Thailand

#### PRODUCERS

Name
Food and Agriculture Organization of the United Nations
Royal Forest Department
Ministry of Natural Resources and Environment
Kasetsart University Faculty of Forestry
International Tropical Timber Organization

#### FUNDING AGENCY/SPONSOR

Name
Government of Thailand

## Sampling

#### SAMPLING PROCEDURE

The sampling procedure of NFI cycle 3 is based on a systematic 10 km grid across all forests, as designed in the NFI cycle 1. Due to the change of responsibility on NFI from the Royal Forest Department to the Department of National Parks, Wildlife and Plant Conservation, it was reduced to protected forests and only a few plots were remeasured outside protected areas for the cycle 3.

The original cycle 1 design was a cluster of 5 circular plots with 0.1 ha area each organized in a cross shape. This approach

was discontinued at cycle 2 and since then only the center plot was measured. The number of plots measured was 572 in protected forest and 154 in non-protected forests, for a total of 726 plots. The reference areas for this cycle are 6.350 and 9.995 M.ha for unprotected and protected forest respectively.

For the purpose of National level carbon stock, the non-visited plots were not replaced and the discrepancy in sampling size between protected and non-protected areas was addressed by reconsidering the approach from systematic to stratified. This shift is considered not harmful to potential bias as the non-remeasured plots didn't follow any particular trend or pattern.

#### RESPONSE RATE

According to the ITTO project report for the NFI Cycle 1, around 12% of the plots in Tropical Evergreen Forest could not be measured. No corrections were made to compensate this lack of data, and as Tropical Evergreen Forest is the highest carbon stock forest type, the overall carbon stock is considered conservative. Several plots were not visited for budgetary reasons as the cycle 3 original purpose was to report on protected areas independently. Few plots were also not measured because they were not accessible. No correction was made as the number of plot missing is considered small.

#### WEIGHTING

Trees were measured in one 0.1 hectare circular plot per cluster. A scale factor 10 was applied to plot level calculations to convert results per plot into results per hectare.

The plots were stratified into Evergreen and Deciduous forest types and protected vs non-protected forests. Variables such as biomass were calculated per forest type and protection status, then a weight was applied to reflect the difference in sampling intensity between protected and non-protected forests (See the technical annex to the first FREL/FRL from Thailand submitted to the UNFCCC in 2021).

## Data Collection

#### DATES OF DATA COLLECTION

Start	End
2013-01	2017-12

#### DATA COLLECTION MODE

Field measurement [field]

## Data Processing

#### DATA EDITING

All the information collected on the field was entered in paper field forms then manually entered in an MS Access database. For the REDD+ FREL/FRL submission the data was then loaded into R and a sequence of scripts were designed to read the data, perform quality control checks and calculate forest carbon stocks. The full sequence of data checks, corrections and calculations was:

Conversion MS Access to CSV:

1. Converting the data from MS Access database to individual CSV tables for each database.
2. Loading the plot table of all the databases simultaneously and concatenating into a simple table.
3. Removing plot duplicates when different databases hosted the same plot measured during the same NFI cycle.
4. Converting plot ID from GPS coordinates based on the CRS Indian75 to the CRS WGS 84 using a table of equivalence.
5. Converting remaining plot ID from GPS coordinates based on the CRS Indian75 to the CRS WGS 84 using GIS based transformation of CRS.
6. Converting all the GPS coordinates (not plot ID) from to WGS84 UTM48 to WGS84 UTM47 to have all the plots available under one CRS.
7. Loading and preparing shapefiles for administrative boundaries and protected areas in R.
8. Assigning province, region and protected areas name and type to each plot based on GIS and visual interpretation for plots falling outside the country boundaries (the country shapefile may not be completely accurate).
9. Correcting protected areas duplicates due to bad geometries (some areas overlapped resulting in plot being duplicated).
10. Adding NFI grid spacing from 'tblCluster' to plot.
11. Adding land use name from 'tblLanduse' to plot.
12. Correcting inventory year.
13. Loading the tree table from all the databases simultaneously and concatenating into a single table.
14. Removing tree duplicates (cf. 03).
15. Checking and correcting DBH and H (No outlier found).
16. Adding tree species and family name based on 'tblPlant' and 'tblPlantFamily' concatenated from Cycle 1 and 3 to include

all species codes.

17. Adding tree wood density from the Global Wood Density database based on species and genus.

18. Calculating AGB from Chave and Thai equations

19. Calculating the sum of the tree AGB per ha for each plot.

20. Detecting and correcting/removing outliers at plot level

## Data Appraisal

### ESTIMATES OF SAMPLING ERROR

All the national level estimates were provided with a 95% confidence interval taking into consideration the sampling error. The formula was based on Stratification design (Cochran 1977). Error due to the biomass equation choice was not included in the sampling error, as not indicator was provided with the models. However, the equations were validated to minimize the error, and details provided in the technical annex to the first FREL/FRL. No QAQC remeasurement of plots was performed to test for measurement error.

## Access policy

### CONTACTS

Name
Director of the Department of National Parks, Wildlife and Plant Conservation

### CONFIDENTIALITY

The confidentiality conditions will be based on the external repository.

### ACCESS CONDITIONS

Data available from an external repository. The access conditions will be based on the conditions of the external repository.

## Metadata production

### DDI DOCUMENT ID

DDI\_THA\_2013-2017\_NFI-R3\_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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