Nepal - National Forest Inventory Nepal, 2014

Forest Research and Training Centre (FRTC)

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Identification

SURVEY ID NUMBER
NPL_2014_NFI_v01_M_v01_A_ESS

TITLE
National Forest Inventory Nepal, 2014

COUNTRY

Name	Country code
Nepal	NPL

STUDY TYPE
Forest resource survey

SERIES INFORMATION
In Nepal, the first national forest inventories (NFI) were carried out during 1960s that sequentially followed second and third in 1980s-90. That was extended to the hilly areas in 1994, field work completed in 1998 and result published in 1999. More information is available in the document "State of Nepal's forests" in the adjacent documentation.

ABSTRACT
The Forest Research and Training Centre (FRTC) implemented Forest Resource Assessment (FRA) Nepal Project (2010–2014) with financial and technical assistance from the Government of Finland. The project objectives were to strengthen institutional capacity, maintaining an updated forestry sector information system, and employ data sharing among forestry stakeholders.
The project was designed to carry out a national-level forest resource assessment, with an overall objective of providing comprehensive and up-to-date national-level forest resource information to support forest policy formulation, forestry sector decision-making and international reporting.
The NFI datasets are consistently used in Nepal's Forest reference levels, UNFCCC national communications as well as on MRV process for jurisdictional emission reduction programs such as FCPF EF and LEAF ER. Forest resource information are gathered using both Remote Sensing and ground-based inventory sampling. Open Foris Collect is used for data entry, R and excel tools are used for analysis for carbon stock and biomass. The recent technological advancements have helped to meet the national and international requirements on data integrity and data transparency.

KIND OF DATA
Sample survey data [ssd]

UNIT OF ANALYSIS
Fields/plots

Scope

NOTES
The FRA covers information primarily on forest cover, growing stock, biomass, carbon stock, biodiversity and forest disturbances. The assment provided comprehensive and up-to-date national-level forest resource information to support forest policy formulation, forestry sector decision-making and international reporting. Forest cover maps were prepared and classified as Forest, Other Wooded Land (OWL) and Other Land (non-forest) to support efficient satelite land monitoring system. This assessment established permanent sample plots for regular monitoring. Beside, this initiative strengthened significant institutional capacity to conduct periodic forest resource assessment in the future.

KEYWORDS

Keyword
Forest Resource Assessment
Forest Reporting

Coverage

GEOGRAPHIC COVERAGE
National

UNIVERSE
The country was divided into five different subpolations representing different eco-regions, such as Terai, Churia, Middle Mountains, High Mountains and High Himal. The universe is the tree populations across the country, included trees in and outside forest land in all five subpopulations.

Producers and sponsors

PRIMARY INVESTIGATORS

Name	Affiliation
Forest Research and Training Centre (FRTC)	

PRODUCERS

Name	Role
Food and Agriculture Organization	Other producer

FUNDING AGENCY/SPONSOR

Name	Role
Government of Finland	Funder

Sampling

SAMPLING PROCEDURE
A hybrid approach of two phased stratified systematic cluster sampling design was adopted in the forest inventory through interpretation of satellite images at the first phase and measurement of forest characteristics in the field at the second phase. Five physiographic regions named- Terai, Churia, Middle Mountains, High Mountains and High Himal were considered as strata.
At the first phase, a total of 9,230 clusters were laid out systematically at the nodes of 4 km × 4 km square grids placed across the country. Each cluster was composed of six plots. The first of the six plots was situated at a grid node and two other plots were each locatedl 150 and 300 m respectively, northward of that plot. A parallel set of three plots was situated 300 m east of the first three. Clusters were numbered sequentlly from west to east, followed sequentially from south to north across the country. Within each cluster, plots were numbered from south to north, assigning plot numbers 1, 2 and 3 to the west and 4, 5, and 6 to the east. In some cases, where plots crossed international borders, fewer than six plots were identified. In this way, 55,358 viable plots inside Nepal were identified longitudinally, then latitudinally, and by cluster number. Each plot was classified according to FAO Land Use Classes and reachability through visual interpretation of Google Earth imagery.
The second phase samples were a sub-sample of the first phase samples. A total of 450 clusters (1,553 plots) in Forest were measured. Altogether, 2,544 plots including 1,553 in Forest and 105 in Other Wooded Land were permanently established and assessed whereas 886 plots on Other Land were measured.
Each plot consisted of four concentric circular nested subplots (CCSP) of different radius, four vegetation subplots, four shrubs and seedlings subplots, and four soil pits. Seedlings, saplings and shrubs were measured in four circular subplots, each with a radius of 2 m, located 10 m away from the center of the plot in each of the four cardinal directions (North, East, South and West). Species-wise stem counting, and mean height estimations were carried out for tree and shrub species having DBH less than 5 cm. Information on non-woody vascular plants was collected from four 1 m2 subplots, each located 5 m away from the center in the four cardinal directions. Dead wood was assessed in a circular subplot with a radius of 10 m from the plot center. Fourteen categories of natural and anthropogenic forest disturbances were assessed through field observations of both their occurrence and intensity (severe, moderate, minor) in the 20 m radius subplot. Four soil pits per forest stand were prepared to identity soil texture and to determine soil stoniness. Soil, litter and debris were collected as composite samples by combining the materials collected at all soil pits.

Measuring trees: Subplot radius 4 m- DBH limit (cm) 5.0-9.9; subplot radius 8 m- DBH limit (cm) 10.0-19.9; subplot radius 15 m- DBH limit (cm) 20.0-29.9; subplot radius 20 m- DBH limit (cm) >30.0. More information is available in the adjacent documentation.

DEVIATIONS FROM THE SAMPLE DESIGN

For the first phase, due to the difficult terrain and inaccessibility, independent ground verification for mapping could not be conducted in High Mountains, High Himal and the central part of Middle Mountains. Instead, the validation work had to rely heavily on visual interpretation of Google Earth images and independent assessments using forest inventory plots.
For the second level of sampling the sampling deviation rate among different Physiographic Region were- Terai- 22%, Churia- 36%, Middle Mountain- 54%, High Mountain- 57% and High Himal- 69%.

RESPONSE RATE

Nepal followed the two phased sampling strategy, in the first phase total 55,358 first phase sample plots was distributed as followings per physiographic regions: Terai-7,533, Churia-7,132, Middle-Mountain-16,139, High-Mountins-11,307 and High-Himal-13,247. 100% plot data collected by remote sensing techniques using high-resolution imagery and Google earth Engine.
The second phase sample was a sub-sample of the first phase sample for field data collection. A total of 3036 forest plots were allocated among five physiographic region: Teria-224, Churia-748, Middle-Mountain-936, High-mountain- 978 and High Himal 150. Among those Teria-175, Churia-477, Middle-Mountain-433, High-mountain- 421 and High Himal 47 plots were measured. So the response rate for each Physiographic Region was- Teria-78%, Churia-64%, Middle-Mountain-46%, High-mountain- 43% and High Himal 31%.

WEIGHTING

The same weights are assigned to all sampling units (bar those possibly with missing information). It is important to note that a whole cluster plot is considered a unit of analysis.

Data Collection

DATES OF DATA COLLECTION

Start	End
2010-01	2014-07

DATA COLLECTION MODE

Field measurement

Data Processing

DATA EDITING

Open Foris Collect was used for data collection, management and processing. Field data collected using mobile devices and submitted to the central unit to be uploaded in Collect database. Data validation is conducted as an automatic computer checking to ensure that the data entered is sensible and reasonable. For checking the completeness and for avoiding data entry errors, data entry program in Collect has been used in addition to validation in RStudio and Microsoft Excel as well.
To reduce errors while entering the category type of variables into the database, the data entry application only allows selecting variable values from the predetermined closed lists stored into database.

Data Appraisal

ESTIMATES OF SAMPLING ERROR

Each sample cluster was allocated systematically in all physiographic regions or strata. Reliability was estimated in terms of standard error of the mean stem volume. While designing this assessment, 95% confidence limit was set for the inventory result with the range of plus or minus 10% of the stem volume or biomass. The standard error for Forest was found to be 6.17 and percentage of error of mean stem volume was 7.34% at national level.

DATA APPRAISAL

The NFI was designed to collect national-level data on per hectare stem volume or biomass of forests with 10% accuracy at 95% confidence limit.

The tree attribute for physiographic regions were calculated for all stems >5 cm DBH while national-level calculation considered stems >10 cm DBH to make the national results comparable with previous assessments and for international reporting.

Access policy

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CONFIDENTIALITY

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

ACCESS CONDITIONS

NFI data inclduing tree level, cluster level and plot level attributes, volume calculation details, tree heights, biomass details are not sharable and may not be publishd in the FAM platform. At the most, NFI locations and calculated biomass information can be shared upon request.

CITATION REQUIREMENTS

DFRS 2015. Forest Resource Assessment 2010-2015, Department of Forest Research and Survey (DFRS), Kathmandu, Nepal

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DISCLAIMER

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Metadata production

DDI DOCUMENT ID

DDI_NPL_2014_NFI_v01_M_v01_A_ESS_FAO

PRODUCERS

Name	Affiliation	Role
Statistics Division	FAO	Metada producer

Data Dictionary

Data file	Cases	Variables