

**Terms of Reference (ToR) for Consultancy Services for  
Re-measurement of permanent sample plots in Middle Mountain, High  
Mountain and High Himal regions for National Forest Monitoring  
(Budget Head 2.12.1.4.20 and 2.12.1.4.21)**

**1. Background**

Assessing forest resources and their changes is key to national and international environmental and developmental policy processes and is required by many international agreements, including the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD), the United Nations Convention to Combat Desertification (UNCCD), the UN Forest Instrument and the Sustainable Developments Goals (FAO). Consequently, the demand for reliable and up-to-date national forestry data and stronger analytical capacities at a national scale has grown considerably in recent years. In response, forums such as the 16th Conference of the Parties (COP16) have asked the UNFCCC to undertake activities to develop robust and transparent national forest monitoring systems for Reducing Emissions from Deforestation and Forest Degradation plus associated activities (REDD+). Similarly, the 21<sup>st</sup> Session of the Committee on Forestry (COFO21) recommended further work with member countries to prepare voluntary guidelines on national forest monitoring.

REDD+ readiness includes all the efforts required to define a national REDD+ strategy, including the policies and measures that a country will need to implement in the context of REDD+ activities, and the related capacity-building needs. This phase also includes the definition and selection of the elements underpinning the NFMS, and the testing and selection of methodologies for reliable, robust and transparent national MRV functions, a reliable Forest Reference Level as well as a Safeguards Information System (SIS) which demonstrates that the Cancun safeguards are

 



being respected. These are the basic readiness components that need to be in place for countries to be eligible for results based financial incentives under the REDD+ mechanism.

Nepal is one of the leading REDD+ countries under the World Bank's Forest Carbon Partnership Facility (FCPF) whose Emission Reduction Program Documents (ER-PDs) have been included into the Carbon Fund portfolio of the FCPF. Nepal completed implementation of the first phase of the REDD+ readiness project in 2015. Nepal's request for an additional readiness grant was approved by the 21<sup>st</sup> Participants Committee meeting of the FCPF in 2015. Nepal and the World Bank signed the grant agreement for additional readiness funding of USD 5.2 million in January 2017. This second phase of the readiness project will be completed in December 2019. Among other readiness activities, improvement of the national forest inventory and monitoring system for a robust and functional MRV system is one of the focused areas of the ongoing 2<sup>nd</sup> phase of REDD+ readiness. It is expected that Nepal will enter into implementation phase of the REDD+ at the latest January 2020 after negotiation and signing of the Emission Reduction Payment Agreement (ERPA) between the government of Nepal and the World Bank in 2019.

Under the second phase of REDD+ readiness, REDD IC is supporting the Forest Research and Training Centre (FRTC) the successor of Department of Forest Research and Survey (DFRS) to strengthen the National Forest Monitoring System to make it compatible to the requirements for REDD+ process which is very important for improving national forest reference level and establishment of a robust and functional MRV system. According to FRTC, re-measurement of the permanent sample plots in every five years is necessary for monitoring the change of condition of the forests.

The then DFRS implemented Forest Resource Assessment (FRA) Nepal Project (2010–2014). The project was designed to carry out 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. According to the results of this assessment, 44.74 percent of the total land area of Nepal is covered by forest area, which is combined area of forests (40.36%) and Other Wooded Land (4.38%). Middle Mountain physiographic region has highest percentage of forests (37.80%). This is followed by High Mountains and High Himal (32.25%), Churia (23.04%) and Terai 6.905). Similarly, Terai, Churia, Middle Mountains, and High Mountains and High Himal physiographic



regions share 1.47%, 3.50%, 9.61% and 85.42% of Other Wooded Land (OWL) of the country respectively.

Regular national forest monitoring is best conducted with sufficiently accurate and scientifically defensible estimates of forest attributes. The sampling design chosen to support the technical program used for an NFA requires a theoretical basis that can be implemented on the ground. Understanding the basic concepts of statistical design and estimation methods is a key component of the overall process for information management and data registration for NFAs.

For conducting the forest inventory, a two phased stratified systematic cluster sampling design was adopted during the FRA, 2010-2014. Five physiographic regions; Terai, Churia, Middle Mountains, High Mountains and High Himal were considered as strata. At the first phase, a total of 9,230 clusters (55,358 plots) were laid out systematically at the nodes of 4 km × 4 km square grids placed across the country. These plots were interpreted by using high resolution RapidEye imagery and Google Earth. At the second phase, a total of 2,544 sample plots (Forest: 1,553; OWL: 105; OL: 886) were measured in the field.

During field measurement, 837 plots were measured in the Middle Mountain regions, out of these, 433 were in Forest, 63 in OWL and 377 in Other Land. Similarly, 624 sample plots were measured in High Mountain and High Himal regions. Out of the measured sample plots (624), 468 (HM: 421 and HH: 47) were in Forest, 26 (HM: 21 and HH: 5) in OWL and 130 (HM: 115 and HH: 15) in OL.

For REDD+, a robust national forest monitoring and assessment (NFM) is required. This process is comprised of a set of interrelated activities of data collection, management, analysis, dissemination of information to stakeholders etc. Design of NFM depends on various factors such as country-specific requirements, available funds, and environmental conditions. The process usually includes a national forest inventory (NFI) for data collection.

NFI provides information on the state and trends of forest resources, their goods and services, and other related variables that support. It also defines the policy and trade decisions, science and field initiatives, national and international reporting, and direct and indirect contribution of forests to society like poverty alleviation. Regular updates are necessary because countries do change the set of elements, their specifications, designs and methods over period of time to address new emerging demands and to take advantage of new technologies.

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This TOR is developed for the consulting firm/s who are interested in this assignment to help FRTC/REDD IC for re-measurement of permanent sample plots in Middle Mountain, High Mountain and High Himal Physiographic regions for National Forest Monitoring System.

## 2. Objectives of the Assignment

The main objective of this assignment is to re-measure permanent sample plots in Middle Mountain, High Mountain and High Himal Physiographic regions for National Forest Monitoring System.

Specific objectives of the assignment include:

- Re-measurement of permanent sample plots established during the Forest Resource Assessment (FRA) 2010-2014 in Middle Mountain, High Mountain and High Himal physiographic regions to collect the various plot level biophysical attributes documented in FRA Field Manual for National Forest Monitoring System.
- Duly enter and validate the collected data in database system prepared by FRTC.
- Systematically analyze collected litter/debris samples to assess organic carbon and soil samples to assess bulk density and Soil Organic Carbon (SOC).

## 3. Scope of the work

This assignment is divided into two clusters:

Cluster 1: Sample plot measurement in Middle Mountain; (180 plots starting from the eastern part of Nepal)

Cluster 2: Sample plot measurement in High Mountain and High Himal region (120 plots starting from the eastern part of Nepal)

**Note:** There are two clusters. We are seeking separate two consulting firms under this ToR in a way that each firm should work in a different cluster since the work will be carried out in parallel in the two clusters. However, a firm can apply for both clusters if the firm can provide two separate teams for the targeted clusters, i.e. team of experts and crew members should not overlap between the clusters.



Following tasks need to be carried out for successful completion of this assignment:

### **3.1 Desk Review and analysis**

Desk review and analysis of FRA process in Nepal, latest FRA reports published as well as other relevant documents is very important for successful completion of this assignment. Consulting firm should thoroughly review all the process of navigation, measurement of variables in the sample plots, collection of soil and litter samples, recording and entering the measured data, data analysis and reporting.

### **3.2 Consultation with the technical committee and other stakeholders**

Regular consultations and discussions with technical committee formed to supervise and oversee this assignment under the leadership of FRTC is critical as the consulting firm will work under the guidance of the committee. Other related experts from FRTC as well as focal persons from the REDD IC, Department of Forest and Soil Conservation, Department of Plant Resources and Ministry of Forests and Environment (if any) should also be consulted regularly. Consultations with the relevant State Ministry officials, representatives of the Local Governments and local communities including the concerned CFUGs are also very important.

### **3.3 Sample plot navigation and identification**

Tally Sheets with GPS coordinates of the permanent sample plots established during the FRA 2010-2014 in Middle Mountain, High Mountain and High Himal region will be provided by the FRTC to the consulting firm. Field crew should identify and locate the pre-established permanent sample plots using the coordinates and procedure provided. The consulting firm should also re-mark the plot center as guided by Field Manual.

### **3.4 Measurement in the sample plots**

Measurement of the sample plots need to be carried out following the FRA field manual 2010 (revised in 2017). All the plot level biophysical attributes that are included in the manual must be collected properly.



About 300 permanent sample plots should be measured in Middle Mountain, High Mountain and High Himal region. This includes 180 sample plots in Middle Mountain (Cluster 1) and 120 sample plots in High Mountain and High Himal (Cluster 2).

### **3.5 Data entry and validation**

Plot level data collected in the field must be entered in the paper sheet (as well as electronically if possible) in the field as designed by FRTC. The consulting firm will be responsible for entering the data into the designated database system under the guidance of FRTC. FRTC will provide the manual for entering data into the database. The firm is also responsible for validating the data entry to ensure the consistency and correctness of collected.

### **3.6 Reporting and deliverables**

#### **3.6.1 Inception report with detail action plan and timeframe**

Inception report with detail action plan and timeframe as well as methodology shall be submitted within one week of the signing of the contract for the assignment. This should be presented at the inception workshop. After incorporating all the feedbacks, suggestions and inputs from the participants of the workshop, the inception report must be finalized and submitted to the REDD IC within one week of the inception workshop.

#### **3.6.2 Intermediate reporting**

The consulting firm shall submit intermediate progress report in every month from the start of the contract. The consulting firm shall also submit the completion report of the field works including all the information of plot level attributes measured in the field.

#### **3.6.3. Submission of dataset**

The consulting firm should submit the final dataset (both electronic and hard copies) to the REDD IC. Besides, consulting firm should also submit intermediate datasets of measured plots immediately after the measurement.



### 3.6.4 Final report

The consulting firm shall submit hard copies with digital copy of final report after completion of the activities. In addition to this, all relevant photographs taken, maps, and raw data used for completion of the assignment need to be submitted to the REDD IC.

## 4. Team composition and qualification of the consulting firm and experts

### 4.1 Qualification of the consulting firms

Consulting firms legally registered within the concerned authorities with clear mission, vision and objectives and registered in national VAT system are eligible to apply. Even in case of joint venture, each firm should have registered in national VAT system. The consulting firms should have relevant work experience in forest resource inventory (preferred National Forest Inventory) in Nepal. The consulting firm must have registered for at least five years with valid registration, Tax/VAT clearance, demonstrated annual transaction, audit and renewal.

### 4.2 Team composition, qualification and responsibilities of the team members

This assignment in each cluster should be coordinated by a team leader and the task of re-measurement of the sample plots should be carried out by at least five field crews in Cluster 1 and four crews in Cluster 2. Each field crew consists of four members; the crew leader, an assistant crew leader, a technical assistant all with forestry expertise and an ecologist. It is desirable that Local Resource Persons (LRPs) are hired to act as guides in the field. All the crew members should be experienced with standard forestry practices.

Additionally, firm should provide three Assistant Crew Leaders and three Technical Assistants for Cluster 1 and two Assistant Crew leaders and two Technical Assistants for Cluster 2 for Quality Assurance and Quality Control purpose.

Training on theoretical and practical aspects of the fieldwork must be provided to the crew before they are sent to the field. Roles, responsibilities and qualifications required for each of the team members are as following:

#### 4.2.1. Team Leader cum Forest Resource Assessment (FRA) Specialist



**Roles and responsibilities:** The Team Leader cum FRA Specialists will lead the team in close coordination with and under the guidance of the technical committee formed by MoFE for overseeing this assignment. The team leader will:

- Assess and analyze FRA documents, NFI system and other published or unpublished related documents;
- Develop a plan of actions with timeline of each of the actions after discussion with other team members;
- Coordinate the team and make sure that all the crew members are trained and capable to perform their respective jobs for the assignment;
- Prepare the inception report for presentation in the inception workshop;
- Coordinate consultation meetings and policy discussions at all levels;
- Manage all administrative, financial and other logistic issues of the assignment;
- Make sure that all the field data are recorded properly, and database is maintained;
- Prepare interim and final reports.

**Required qualification:** The team leader cum FRA specialist must be a Nepali national and have strong knowledge on forest resources assessment including sample plot measurement. He or She must have minimum qualification and experience as below:

- Hold at least postgraduate degree (Masters, preferably PhD) in forestry or related fields;
- Have at least 10 years working experience in designing and undertaking FRA including sample plot design; plot measurement and coordinating inventory activities;
- Good understanding of forest types, species distribution, sustainable management of forests, forest governance and community-based forestry and other relevant activities;
- Demonstrate technical capacity, including data entry and keeping, data analysis and report generation;
- Understanding of theory, principles guidelines and approaches of FRA;
- Good understanding of climate change, REDD+, biomass and carbon trading policies and related issues;
- Sound knowledge of forestry sector institutions, current program implementation arrangements and process in Nepal; and;

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- Writing, facilitation and communication skills in English and Nepali.

#### 4.2.2. Field Manager

Field manager will be assigned by FRTC to manage and coordinate the field works.

**Roles and responsibilities:** The field manager is responsible to arrange coordination between REDD IC, FRTC and Consulting firm.

#### 4.2.3. Field crew leaders

**Roles and responsibilities:** The crew leaders are responsible for organizing all the phases of the fieldwork, from the preparation to the data collection. He/she has the responsibility of contacting and maintaining good associations with the community and all the relevant stakeholders and he/she should keep a good overview of the progress achieved in the fieldwork. Other specific responsibilities include:

- Coordinate all FRA inventory works with the Field Manager, plan the measurements and provide the crew members with specific instructions about inventory actions and practical arrangements;
- Plan the field work, collect field forms and maps;
- Administer the location of clusters and plots;
- Plan the work division for the crew members;
- Contact local forestry officers, authorities and the community and request their assistance to contact local people, identify stakeholders, guides and workers;
- Take care of all the safety instructions while executing inventory in the field;
- Organize meetings after field work in order to sum up daily activities;
- Take care of logistics of the crew by organizing and obtaining information on accommodation facilities, recruiting local workers, organizing access to the clusters;
- Record and delineate both plot and forest stand-specific characteristics, disturbances and time measurements;
- Before departing from the plot ensure that field forms are correctly filled up and that collected data are reliable;

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- Enter or organize entering of field data in the field computer/field device as soon as possible after each working day; and
- Keep keen coordination with other crew leaders to assure unified conduct in all FRA actions.

**Required qualification:** The field crew leaders must be a Nepali national and have a strong knowledge and skills of forest resource assessment, and sample plot measurement. They should have minimum qualification of Bachelor's degree (preferably Masters') in forestry or related fields and have experience in similar assignments (FRA Field Measurements).

#### 4.2.4. Assistant Crew Leaders

Responsibilities of the assistant crew leader include:

- Sign out all equipment for measurements and keep responsibility on them;
- Properly fill the Tally and sample tree field forms, Dead tree field forms, Shrub and Seedling/Sapling Field form, and participate in the related measurements;
- Measure the bearing of tally trees and heights of sample trees, measure height of each sample tree by using Vertex IV and Transponder T3;
- Ensure that the equipment of the crew is always complete, in proper order and operational before, during and after the field measurement and take care of all equipment;
- Take pictures of the field activities for the documentation purpose;
- Assist FRTC/REDD IC on QA/QC of measurements and verification of their correspondence (if required);
- Takeover in the crew leader's absence;

**Required qualification:** The Assistant Crew Leaders must be a Nepali national and have a strong knowledge and skills of forest resource assessment, and sample plot measurement. They should have minimum qualification of a Certificate level in Forestry (preferably BSc) and have sufficient work experience in similar assignments (FRA field inventory).



#### 4.2.5. Technical Assistant (Forest Ranger)

Responsibilities of the technical assistant (Forest Ranger) include:

- Assist the assistant crew leader to measure the horizontal distance of trees from plot center by using loggers tape or Vertex IV and Transponder T3 with support of local helpers, if needed;
- Distinguish all the tallied trees, sample trees and their characteristics as per their different diameter threshold size within the CCSP according to the field manual;
- Measure diameter of each tallied tree within the CCSP as per the standard forestry practices;
- Assist the height measurements;
- Determine crown cover density at five points within CCSP i.e. at the plot center and at the four cardinal points 20 meters apart from a plot center, using a spherical densitometer;
- Quantify shrubs, saplings and seedlings within four sub-plots of each CCSP as per the instruction given by field manual;
- Measure dead wood (i.e., fallen stems, stem fragments and large branch fragments) from the plot with a radius of 10 m by determining the tip and base diameter along with the total length; and;
- Assist the crew leader to organize social survey and discussion, as per necessity.

**Required qualification:** The Technical Assistant must be a Nepali national and have a strong knowledge and skills of forest resource assessment, and sample plot measurement. They should have minimum qualification of a certificate level (ISc) in forestry with experience in forest inventory (preferably NFI).

#### 4.2.6. Ecologist

Responsibilities of the ecologist include:

- Collect biodiversity information's (both plant and animal) as per the instructions provided by the field manual;
- Identify the plant/wildlife species with support from local helpers;

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- In the tree measurements, assist the technical assistant in identifying the tree and shrub species, as per necessity;
- Collect samples ( herbarium/specimen) of unidentified plants or traces of wildlife and take pictures to document them;
- Assess the soil characteristics (e.g., soil depth, soil texture and proportion of coarse fractions) as per necessity with support from local helpers as per the instructions provided by the field manual;
- Collect wood debris, leaf litter and soil samples from the sub-plots as per the instruction provided by the field manual as per necessity with support from local helpers;
- Collect data on invasive alien species and forest diseases/pests as per the field manual;

**Required qualification:** The Ecologist and/or Taxonomists for this assignment must be a Nepali national and had should have minimum qualification of Bachelor's degree (preferably Masters') in Botany /Ecology/ Forestry/ Environmental Science Natural Resource Management. The candidates with degree in Botany/Ecology will be preferred. They should have sufficient work experience in identifying forest tree species, plant diversity, biodiversity assessment and ecological systems.

#### 4.2.7. Local Resource Persons

Responsibilities of the local resource persons include:

- Assist to take field measurements;
- Open ways to facilitate access and visibility to team members;
- Provide the common/local name of forest species, NTFP, vascular plants and wildlife;
- Inform about access to the cluster;
- Provide information about the local forest uses and management; and
- Assist to organize discussion at local level by contacting local authorities and community.

### 5. Inputs to the consulting firm

#### 5.1 Documents and consultations



FRTC and REDD IC will provide access to background documents to carry out the assignment. These include:

- Final reports of the relevant REDD+ readiness studies including MRV and FRL;
- Reports of ongoing NFI system and periodic reports of FRA in Nepal;
- Copy of original tally sheets of previous FRA to assist re-measurement.

Both FRTC and REDD IC will provide the consulting firm necessary help and support for organizing the consultations at all levels.

## 5.2 Equipment and Tally Sheet

FRTC will provide the necessary major equipment to the consulting firm necessary to carry out the field measurement of the sample plots in the field. The consulting firm should be responsible for proper use and safety of all the equipment provided. All the equipment provided for the work must be returned to FRTC in good condition. Consulting firm will be responsible for replacing any damaged or lost equipment.

FRTC also provide data collection sample tally sheets to the consulting firm for the purpose of data recording.

## 5.3 Trainings

All crew members should be trained by the consulting firm before the field work. REDD IC/FRTC will facilitate the consulting firm for the training and orientation for field crew members regarding field navigation, measurement, data collection and data entry in the field. Field crews will only be mobilized after they are trained properly for the job they will carry out.

## 6. Supervision, Monitoring and Quality control

REDD IC/FRTC will be responsible for supervision, monitoring and quality control of the data taken in the field. Supervision and monitoring of the work will be done simultaneously with the measurement activities conducted by the field crews. REDD IC/FRTC will supervise and facilitate the measurement process during the field inventory.



Re-measurement of about 10 percent of the sample plots that have been measured by the field crews will be carried out for quality control purpose from FRTC/REDD IC. The firm's measurement should be under the acceptable error limit determined by technical committee.

Consulting firm should be responsible for the arrangement of the field vehicle (four wheel drive with good condition), Assistant Crew Leaders and Technical Assistants for the QA/QC team as required. A separate cost estimate should be prepared by consulting firm as provisional fund for this purpose. FRTC/REDD IC will carry out the activities under the coordination and supervision of the technical committee formed for this assignment.

## **7. Defects liability**

The consulting firm is responsible for authenticity of the plot data collected in the field for the assignment. If discrepancies are found in the consulting firm's data, consulting firm should be responsible to correct properly with their own cost and time.

## **8. Intellectual Property Rights**

All the plot data collected in the field, daily field books, original sets of maps used, processed data and the database developed during this assignment will be the property of FRTC/REDD IC and must be submitted to the FRTC/REDD IC along with the final report by the consulting firm. The data should not be used for any other purpose or transferred to any third party for any reasons without the prior written consent of FRTC/REDD IC.

## **9. Selection Process and Criteria**

Selection process of the qualified consulting firm/s will start from advertising for "Expression of Interest (EoI)". The shortlisted consulting firms from the EoIs will be requested to submit the full proposal following THE WORLD BANK Procurement Regulations for IPF Borrowers, July 2016 Revised November 2017 and August 2018.

## **10. Work Schedule**

The assignment is expected to be completed by June 2019.

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## 11. Application Procedure

Eligible consulting firm/consortium of the consulting firms should submit “Expression of Interest (EoI)” with the following documents:

- Letter of EoI
- Profile of the consulting firm
- Copy of registration and renewal certificates
- Copy of annual audit report for last three years and tax clearance certificate
- Roster of potential experts with brief qualification and experience.
- Letter from partnering consulting firm/institution if joint venture is proposed.

The shortlisted consulting firms will be requested to submit the full proposal along with following documents:

- Full technical proposal for the assignment in a sealed envelope. The proposal should include commitment letters from the proposed experts along with duly signed CVs;
- Detail financial proposal for the assignment in a separately sealed envelope.

## Further Contacts

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