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Methodological Approach of the MRV Project to REDD+ Activities at Local (CBFMUGs) Level

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Acronyms and Abbreviations

AFO: Assistant Forest Officer
ANSAB   Asia Network for Sustainable Agriculture and Bio resources
BAU   Business as Usual Baseline
BZCFUGs: Buffer Zone Community Forest User Groups
CBFM: Community Based Forest Management
CBFMUGs: Community Based Forest Management Users Groups
CCB   Country Capacity Building
CF: Community Forest
CFI   Continuous Forest Inventory
CFOP: Community Forest Operational Plan
CFUGs: Community Forest User Groups
CoFM: Collaborative Forest Management
COPs   Conference of Parties
CSO: Civil Society Organization
DBH   Diameter at Breast Height
DBMS   Database Management System
DDC: District Development Committee
DFO: District Forest Office/Officer
DFRS   Department of Forests Research and Survey
DOF   Department of Forests
ESMF   Environmental and Social Management Framework
ESS   Environmental and Social and Safeguards System (ESS)
FAO   Food and Agricultural Organization of the United Nations
FAO FP   FAO Forestry Paper
FCPF   Forest Carbon Partnership Facility
DSCO: District Soil Conservation Officer
FECOFUN: Federation of Community Forest Users Nepal
FGD: Focus Group Discussion
FMU: Forest Management Unit
FRA   Forest Resources Assessment of Nepal Project
GHG   Greenhouse Gas Emissions
GIS   Geographic Information System
GLCN   FAO/UNEP Global Land Cover Network
GPG   International Panel on Climate Change: Good Practice Guidance
GPS: Geographic Positioning System
ICIMOD: International Center for Integrated Mountain Development
IPs: Indigenous Peoples
IPCC   Intergovernmental Panel on Climate Change
LCCS   Land Cover Classification System
LhFUGs: Leasehold Forest User Groups
M and MRV: Measurement and Monitoring, Reporting and Verification
MIS   Management Information System
MRV   Measuring, Reporting and Verifying
NAFIMS   National Forestry Information Management System
NFCAG   National Forest Carbon Action Group

NEFIN: Nepal Federation of Indigenous Nationalities
NGO: Non-Government Organization
NORAD: Norwegian Agency for Development Cooperation
PSP   Permanent Sample Plots
REDD   Reducing emissions from deforestation and forest degradation
REDD+   The REDD"+" is more than just avoided deforestation. It is tied to measurable and verifiable reduction of emissions from deforestation and forest degradation as well as sustainable management of forests, conservation of forest carbon stocks and enhancement of carbon stock
RL/REL   Reference Emission Level
R-PP: Readiness Preparation Proposal
SLMS   Satellite Land Monitoring System
UNFCC   United Nations Framework Convention on Climate Change
WISDOM   Wood fuel Integrated Supply and Demand Overview Mapping
WWF   World Wildlife Fund

Executive Summary

This working paper is part of the documentation being produced by the MRV Project Team and presents a segment of the work done so far (October 2013) by the MRV Project in relation to the specific tasks mentioned in Section 4 of the Terms of Reference of the contract between Agriconsulting Spa and the REDD Cell regarding:

- The elaboration of a national forest monitoring system which enables comparison of changes in forest area and carbon stocks (and their associated GHG emissions) and the baseline estimates used for the Nepal REL/RL;

- The potential for developing a REDD MRV system that additionally supports CFUGs, the public sector and other institutional models of forest resource management to achieve their diverse management objectives;

- The devolution of management functions and responsibilities (including forest inventory) of large areas of forest to Community Forestry User Groups, and the technical capacity development needs and potentials of CFUGs as they relate to both forest carbon and more conventional forest inventory and management issues;

- A compilation and analysis of REDD-related data generated as part of ongoing REDD projects in the country (e.g. the Hariyo Ban Project, the Multi-stakeholder Forestry Programme, and the NORAD-funded REDD project implemented by ICIMOD, FECOFUN and ANSAB).

Scope of this document is to present the MRV Project preliminary findings on local MRV approach and to stimulate the discussion on the proposed methodologies for follow-up.

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Introduction

Nepal's national REDD+ strategy needs to build on many community based forest management (CoFM) mechanisms being practiced since over three decades now. Over one third of Nepal's forests are under one or the other CoFM regime which clarifies the potential role of communities in Nepal's REDD+ implementation. CoFM and particularly the community forestry (CF) user groups have evolved as robust institutions with institutional arrangements and accumulated experiences of forest management planning and implementation. With realization of forest user groups' stake and potential role in REDD+, Nepal's R-PP has already justified the need of a hybrid (nested) approach which will enable the country to go for early participation in REDD+ at sub-national/local level while engaging in continuous improvement of its MRV institution and capacity for MRV system strengthening.

A nested approach is a flexible mechanism. It allows countries to start REDD+ efforts through sub-national activities and gradually move to a national approach, or for the coexistence of the two approaches in a system where REDD credits are generated by projects and governments, thus maximizing the potential of both approaches

Nepal's R-PP envisages local level implementation of specific REDD+ activities wherever CoFM areas exist. REDD+ initiatives and regular/periodic carbon monitoring will be undertaken by respective CoFM communities with capacity and technical support from local forest authorities.

In our vision, data collected will be transferred to sub-/national MRV system in a transparent manner, and the participating CoFM communities will be compensated based on an appropriate crediting system established under the REDD+ strategy. An appropriate mechanism for ensuring environmental and social safeguards will be implemented side by side which will consider both environmental conservation, and distribution of carbon and non-carbon benefits ensuring forest dependent interest groups/communities impacted due to REDD+ are benefitted in an equitable manner.

The R-PP also plans to share the carbon monitoring role with local bodies e.g. village development committees (VDCs) in case of "government managed forests" and with buffer zone council and groups in case of forests in "protected areas". The R-PP aims at community based ground inventory for all carbon pools in the long run however emphasizes on above/below ground biomass and soil carbon at initial stages.

Proposed methodological approach

The development of an MRV system at CFUG level is a challenging issue, both from the technical and the socio-economic view point. The purpose of this paper is to describe the various steps needed for its implementation.

The proposed approach will rely on three major actors, namely

1. The MRV team established at national level;
2. District Forest Officers and rangers;
3. Community Forest Users Group members.

The role of NGOs and civil society should also be taken into adequate consideration.

Schematically, the implementation of MRV at CFUG level includes the following steps:

MRV Phases	Step	Responsible body	Output / Product
Preparation	Step 1: Preparation phase	CFUGs / REDD Cell / MRV Section	A formal agreement between CFUGs and the REDD cell / MRV on the establishment of REDD+ activities in given communities.
Measurement of activity data	Step 2: Delineation of project boundaries	CFUGs / DFOs / MRV Section	A digital map with the boundaries of the project area.
	Step 3: Land use and land cover mapping	MRV Section/CFUGs/Local forest officers	The baseline LULC map, and the changes that occurred in the recent past, prior to the project initiation.
	Step 4: Stratification of the project area	MRV Section / CFUGs / Local forest officers	Project area stratification map
Measurement of emission factors	Step 5: Preparation for the field work and capacity building of local communities.	Local forests authorities / NGOs	Local communities are trained for field work.
	Step 6: Pilot inventory for variance estimation	MRV Section / CFUGs / local forest officers	Field sampling design established
	Step 7: Field work	CFUGs, local forest authorities	Field inventory executed
	Step 8: Quality assurance and quality control	Local forest authorities	Validated field data
	Step 9: Data processing and estimation of emission	MRV Section	Estimation of GHG emissions (REL)

MRV Phases	Step	Responsible body	Output / Product
	factors and GHG emission		
Reporting	Step 10: Analysis of trends	MRV Section	Trends in carbon emission balance established
	Step 11: Detection of leakage	MRV Section and local forest officers	Quantification of leakage
	Step 12: Estimation of net (deducting leakage) carbon emissions	MRV Section	Net carbon emission balance established
	Step 13:Collating and presenting the information on GHG emissions/removals.	MRV Section	A report in a REDD+ standard and documented format.
Verification	Step 14: Verification	Independent authority	Certified net carbon emissions
Payments of carbon credits	Step 15: Payments of carbon credits	MRV Section and designated REDD+ authorities	Carbon transactions in place
Follow-up	Step 16: Follow-up	MRV Section / REDD Cell	Sustainable REDD mechanisms are in place

Step 1: Preparation phase

This will include extensive consultation with CFUG members and information on the possible benefits and constraints related to REDD+ implementation in specific communities, a full explanation of the overall MRV process and the type and amount of work required for the CFUG.

In general the development of an appropriate REDD+ Environmental and Social Safeguards System (ESS) should comply with rules of Free, Prior, Informed Consent (**FPIC**), described as follows:

- **Free:** a process that is self-directed by the community from whom consent is being sought, non-encumbered by coercion, expectations or timelines that are externally imposed.

- **Prior**: refers to a period of time in advance of an activity or process when consent should be sought, as well as the period between when consent is sought and when consent is given or withheld.

- **Informed**: refers to the type of information that should be provided prior to seeking consent and also as part of the on-going consent process.

- **Consent**: refers to the decision made by indigenous peoples and other forest dependent communities reached through their customary decision-making process.

While planning the participation of CFUG into the REDD+ and MRV mechanisms, one important factor to be considered is the size of the project area. In Nepal, CFUGs tend to occupy individually small to very small areas. As will be presented in this brief concept note, the steps for achieving successful carbon credit compensation are complex and demanding. The current market price is around 5 US$ per ton of CO_2, and it is then necessary that a sufficient size in terms of area is put under REDD+ regime in order to compensate the costs and labour from both the local communities and Government bodies. This 'critical mass' cannot be estimated straight forward, as a precise quantification of the amount of avoided CO_2 emissions that can be achieved under different local conditions and management regimes, has not yet been established. However as a rule of thumb it is expected that project areas below 1,000 hectares are not profitable. This implies that the involvement of a 'federation' of CFUGs is required. This experience of a joint effort from several CF has been successfully implemented in three case studies carried out by ANSAB/ICIMOD/FECOFUN in three watershed areas.

The necessary arrangements and agreement between different communities poses several challenges which will have to be carefully handled to avoid possible conflicts and litigation. Such social arrangements should be handled by the local Forest Officers. Support from Ns GOs present in the area should also be considered in this phase.

Output of step 1: A formal agreement between CFUGs and the REDD cell / MRV Section on the establishment of REDD+ activities in given communities.

Responsible: CFUGs / REDD Cell / MRV Section

Step 2: Delineation of project boundaries

The CFUGs will indicate on the terrain the exact boundaries of the project area. These will be clearly identified to facilitate accurate measuring, monitoring, accounting and verification. A watershed might be a natural entity of a spatial project area. The boundaries will be identified and recorded through GPS and the coordinates will be used to prepare a map of the project area using GIS tools.

Output of step 2: A digital map with the boundaries of the project area.

Responsible: CFUGs / DFOs / MRV Section

Step 3: Land use and land cover mapping

As in the case of national MRV the GHG emission level is composed of activity data and emission level. Activity data refer to change over time of land use/land cover (LULC). Activity data can include negative changes (deforestation, forest degradation) or positive changes (enrichment

planting, forest protection, reforestation). In the case of CF, given the relatively small areas of the individual projects, activity data need to be assessed using high resolution satellite data. Possible sources of high resolution satellite data include: Geo-eye, Rapid-eye, SPOT, Aster (etc.). The choice of the more suitable satellite platform will be assessed by the MRV present Project, in order to suggest the best solution in terms of costs and benefits.

Step 3 will be organized as follows:

Step 3.1: Preparation of land use/land cover reference map

A land use/land cover map will be prepared for the project area using high resolution satellite, and will constitute the baseline map for change assessment (past and future). Such map must be prepared for the same reference year when the CF project starts. The interpretation work will be carried out by the MRV Remote Sensing team. The interpretation will start from the national land cover map that will be detailed at a higher spatial resolution (i.e. a reference scale of 25.000) and the legend will be extended to a further (hierarchical) level (e.g. specific vegetation types or floristic composition which may not be visible at national level, will be detailed at the local level).

The LULC map will be validated in the field with the assistance of CFUGs. In this process, whenever evident errors will be detected in the national land cover map, these will be corrected in the original map in order to improve its quality and grant consistency between the two levels. The LULC map will also be the base for stratification and design of the field work.

Step 3.2 Historical land use changes

For a correct estimation of activity data, historical land use changes are also needed. This will be done again by remote sensing, through the interpretation of historical images. The time gap between actual and historical images should be between 5 and 10 years, depending on local conditions and also on the magnitude of the changes of study area. The best option for which historical images type to use will also be assessed by the present MRV Project. In practice it is suggested that a specific REL approach should be developed at local level, keeping in mind the difference of scale of the study area. Special attention should be paid to the consistency between REL estimation at national and local level, for the reporting at country level.

Output of step 3: The baseline LULC map, and the changes that occurred in recent the past, prior to the project initiation.

The historical changes will be presented in form of a spatially explicit change map and as a LULC class to class transition matrix.

Both these two products will be combined with biomass calculations and their respective emission factors derived from the successive field measurements.

Responsible: MRV Section

Step 4: Stratification of the project area

Stratification is needed for organizing the field work in an efficient manner, and to reduce the variance, thus enhancing the precision of the volume and biomass calculations.

The criteria for stratification will be based on local specific condition and may vary between different CF areas. However, in principle, the following variables should be considered.

Land use, vegetation, soil, slope drainage, elevation, proximity to settlement, accessibility..

Additional parameters can include forest types, dominant tree species, forest density, age of trees, site quality.

Step 4.1 for stratification: the MRV RS team will outline a preliminary stratification of the study area, based on the baseline LULC map.

Step 4.2 for stratification: The proposed stratification map will be printed at a suitable scale (indicatively between 1:10,000 – 1:25,000).

The colour thematic map will be brought to the CF and will be discussed. At this stage there must be a discussion with the communities on the stratification (zoning) proposed and a comparison/integration with the existing Community Forest Operational Plan. The discussions will include the CFUGs, the local DFOs and the MRV team. At the end of this process the final stratification scheme will be defined and the preliminary map will be updated accordingly.

Output of step 4: Project area stratification map

Responsible: MRV Section / CFUGs / Local forest officers

Step 5: Preparation for the field work and capacity building of local communities.

An orientation program will be established for the crew members taking part in field measurements. DFOs and Rangers will be in charge of the training. Appropriate field manuals will be prepared, explaining in detail the sequence of field operations. The training will include basic field measurements, use of GPS and data recording and checking.

Output of step 6: Local communities are trained for field work.

Responsible: Local forests authorities / NGOs

Step 6: Pilot inventory for variance estimation

For a credible implementation of MRV and in general REDD+ assessment, proper precision limits for the carbon stocks must be defined. In general a precision of ± 10% at 95% probability is recommended. The number of sample plots required to achieve the desired precision depend on the variance of the population to be measured. If a reliable estimate of the variance is available from previous forest inventories, it can be used, otherwise a pilot inventory must be carried out, by

laying some 10 to 15 sampling plots per stratum. If a pilot inventory is carried out, it is advisable to involve members of CF in the measurements, as part of their capacity building.

Output of step 5: Field sampling design established

Responsible: CFUGs / Local forest officers

Step 7: Inventory design and field work

Field work will be carried out by local crews with assistance from DFOs and Forest Rangers, at least in the initial phase. It is expected that in the course of time, CF will become more and more self-sufficient. In this brief concept note, we do not go into the details of field measurements.

According to the ToRs for the MRV Project, at minimum the aboveground and belowground biomass will have to be calculated. For additional carbon pools like dead wood, litter, soil organic carbon a decision is still to be made.

Even if the sampling design may vary between the national and local field sampling, because of the scale difference, it is recommended that the same carbon pools are measured in both schemes. For this purpose, the carbon pools to be measured will have to be agreed together with the REL Project and the REDD Cell.

While assessing which carbon pools to include, one must find a balance between costs and benefits. For instance soil organic carbon measurement is quite demanding, as it requires the support of soil laboratory. Hence the relative importance of each carbon pool will have to be assessed, as well as which level of precision can be realistically achieved for each carbon pool.

Output of step 7: Field inventory executed.

Responsible: CFUGs, local forest authorities, MRV Section

Step 8: Quality assurance and quality control

The original data collected during the field campaign will be collected by the responsible DFOs and a preliminary assessment of data quality, completeness and consistency will be made. If some major gaps or inconsistencies are identified, they should be immediately corrected or re-measured.

When field work is completed, about 10% of the plots should be checked independently. New field data collected will be compared with the original data, and differences should be recorded. If the errors are found to be within a tolerable limit, original data are validated, otherwise, re-measurements will have to be carried out. The independent check should be carried out by DFOs and Forest Rangers. A report on data validation will be submitted to the MRV Section.

Output of step 8: Validated field data

Responsible: Local forest authorities

Step 9: Data processing and estimation of emission factors and GHG emissions

After the preliminary quality control described above, the DFOs will perform the data entry into a computer, and then upload the field data in the MRV central database. The MRV Section will be responsible for preparing the data entry computer program, including some internal data quality check. An interesting shortcut would be the use of palm top computers, for the direct data recording in the field, if skills and technologies are available.

The MRV system must also include procedures for transferring data from local offices to the central MRV database (preferably via internet). When no internet connection is available, alternative methods can be found (e.g. data are sent as spread sheet files or even paper documents to the central offices to be digitized). Once inserted in the central database, data will be further quality checked by the MRV data processing unit that will assess the overall reliability, and this will improve the quality of data (see also Step 8)

The original data will be processed at the central level, to produce estimates of the carbon pools and related GHG emissions.

The basic calculations will include:

- Calculation of individual trees volume
- Calculation of individual trees above ground and below ground biomass, using appropriate allometric equations
- Calculation of the carbon contents of additional carbon pools

The calculations above will generate estimations of the emissions factors (i.e. the difference in carbon stocks related to a given LULC change).

The emission factors will be combined with activity data calculated in step 3, to generate the Green House Gas Emissions, as follows

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GHG Emission = Activity data x Emission Factors.

This calculation will constitute the basis for Reference Emission Level (REL), the benchmark against which the MRV will be compared. The calculated results will be transferred to the corresponding CFUG for future reference.

Output of step 9: Estimation of GHG emissions (REL).

Responsible: MRV Section

Step 10: Analysis of trends

The activities presented so far will produce the first pillar of the MRV system: the measurement of Emission Level in the target year. As discussed above, the REL activities (estimation of Emission Level in a "business as usual" scenario) will provide the reference against which the current carbon emissions baseline for assessing the performance.

To do so, it is necessarily to estimate the REL. This is done through an historical analysis of the activity datvailable) emission factors, which are then projected to the target year using the appropriate models. This task is under the responsibility of the REL project, in meanwhile we provide here a possible approach that can be then replaced by the more accurate estimations done by the REL project at local level. This process include the detailed analysis of the changes occurred in the period of implementation of the REDD+. The assessment will be done at the beginning of the project and after two years from the start of the Project, and will include:

- A new satellite based map for the year (where t is the staring year) t+2. The new map must be based on the same procedures used for the map at t0 and on the same stratification system. This new map will provide the activity data (positive or negative changes) that have occurred between t_0 and t+2.
- Concurrently, a new field inventory will be carried out, using exactly the same methodology of inventory at t0. Field sample plots can be the same as t0 or a combination of old plots, re-measured, and new plots, to avoid possible bias or preferential treatment of old sample plots.
- The new activity data and emission factors will be combined in the same manner of the ones of t0 and new the new emissions will be calculated.

The comparison of the two emission levels will determine the level of carbon reduction emissions, and will be the basis for the calculations for the corresponding compensation for the Communities.

Output of step 10: Trends in carbon emission balance established

Responsible: MRV Section

Step 11: Detection of leakage

Leakage is defined as an increase in GHG emissions outside of the project area but directly attributable to the REDD project activities implemented inside the project area. Leakage is an important factor to be considered in the MRV. The concept of leakage is related to the idea that local communities involved in REDD activities could preserve the forest area designated under REDD mechanisms, but at the same time they could as well revert to deforestation and forest degradation in adjacent forest areas, outside REDD defined areas. In this case, the statistics derived from REDD committed areas may not reflect the true picture of carbon emission.

For the determining the possible leakage, the following monitoring measures are proposed;

- Extend the forest change monitoring, and ground samples to neighbouring areas using an appropriate buffer (e.g. 5 km.) or better carrying out a contextual land cover analysis, in order to determine which forest areas, within reachable distance, could be a potential source of leaking, and perform RS monitoring and ground samples in order to assess deforestation and forest degradation over time, in such potential leakage areas
- Potential leakage analysis will also be carried out at administrative unit level (e.g. District), in order to determine if Districts, where community based REDD actions are in place, show significant deviations from average deforestation and forest degradation average patterns., which might be an indication of leakage.

The potential leakage belt will be determined by the MRV technical team. Local experience of DFOs and forestry officers may also be beneficial at this stage. The potential leakage area will be treated in the same manner of the project area: i.e. LULC change monitoring comparing areas at t0 and t+2, and field inventory at t0 and t2, for the estimation of emission factors. A carbon emission factor due to leakage (if any) will be calculated.

The main difference with the inside the project area is that the field measurements will be carried out completely by an independent body (DFOs and local forestry officers), with no involvement of the local communities, in order to avoid any possible bias.

Output of step 11: Quantification of leakage

Responsible: MRV Section

Step 12: Estimation of net carbon emissions

The reduction of emission calculated in step 10 will be matched with the leakage detected in step 11. If leakage is present, the increase of emissions from leakage will be subtracted from the emission reduction, and this will be the net reduction.

The net reduction will be basis for verification and final carbon credits compensations. These tasks will be handled by the transaction component of the MRV system.

Output of step 12: Net carbon emission balance established

Responsible: MRV Section

Step 13: Verification

The dissemination of transparent estimates together with the data (both raw and processed), metadata, tools and documentation and the use of a transparent and replicable methodology respond to two major requirements of the MRV: the results must be available and suitable for an independent review when it will come to carbon claims, and they must be accessible by the stakeholders that must be able to monitor the whole process.

Social and environmental safeguards will also form an integral part of the verification, to ensure the sustainability of the entire process.

The Verification function will be designed to stimulate the participation of all the stakeholders and to allow verification processes through a set of web-based tools for data and metadata sharing and visualization (e.g. Web GIS), and user-friendly graphical user interfaces. Every step of the process and the methods used will be documented and disseminated on the web, according to an access permission policy that will be based on different levels of users. This set of tools will support (internal) Quality Controls and (external) Quality Assurance.

In the case of CF carbon credits, the verification task it is suggested that it should be assigned to an independent authority, preferably international. The task of the authority will be to certify the reliability of carbon credits claims.

Output of step 13: Certified net carbon emissions

Responsible: Independent authority

Step 14: Payments of carbon credits

This is the final step. Once the reduction of GHG has been measured, reported and verified, the MRV processes will be completed. The necessary transaction system is put in place and the corresponding payments can be released to each sub-national component in a transparent manner.

Output of step 14: Carbon transactions in place

Responsible: MRV Section and designated REDD+ authorities

Step 15: Follow-up

In future, step 7 to 15 will be repeated at t+4 and so on, to make the REDD+ mechanism sustainable over time.

Output of step 15: Sustainable REDD mechanisms are in place

Responsible: MRV Section / REDD Cell