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MOREFORESTs

Management of Resources on Forestlands through
Enhanced Sustainable Technologies

Version 1.0

ANNEX 5: Reforestation Monitoring Guidelines

ANNEX 5: REFORESTATION MODEL GUIDELINES

Why Reforestation Model Guidelines?
- Participating local government units (LGUs), farmers and households need clear and transparent information for decision making and which measures to apply
- Forestry extension workers must have a handout and extension kit for assisting People's Organizations (POs) and farmers in the selection of site, model, species and management system
- It would be used as reference for monitoring of reforestation success

Innovative Approaches
- Comprehensive description of site selection, technical specifications, cost norms and monitoring standards for approved forest rehabilitation models
- Transparent information on material and labor subsidies, monitoring criteria and payment schedule
- Menu for participating LGUs, POs and households to choose from during land use planning process
- One forest rehabilitation model applies to one forest compartment, with minimum and maximum eligible area; functions as monitoring and subsidy payment unit
- Reference for monitoring of reforestation success and eligibility for subsidy payment

Applications as of now
- Standard for over 20,000 ha reforestation, ANR/enrichment planting and agroforestry in the Visayas
- Similar guidelines have been applied to around 300,000 ha of reforestation in China

GIZ Environment and Rural Development Program (EnRD)
CBFM, ForClim, REDD and CBFMMP Projects

REFORESTATION MONITORING GUIDELINES
Version 2012 08 02

1.   Introduction

These Reforestation Monitoring Guidelines apply to all German-assisted forest rehabilitation projects (CBFM, ForClim, REDD, with some modifications for CBFMMP). The Financing Agreements between GIZ, DENR and LGUs/POs foresee three subsidy installments (for details pls. refer to Annex 1 Refo Model Details): first installment upon acceptance of seedlings, second installment three months after planting, and the third installment 2 years after planting. Before any payment, the following criteria shall be monitored:

(1)   Before payment of the seedling subsidy (resp. liquidation of mobilization fee), verification of seedling delivery: required numbers, species and quality according to the corresponding reforestation models, plus compartment map with GPS coordinates.

(2)   Before the first labor subsidy installment three months after planting: GPS check of actually planted area, adherence to prescribed design (species, spacing), number of established plants per ha resp. per compartment (survival rate).

(3)   Before final labor subsidy payment two years after planting: number of established plants per ha resp. per compartment (survival rate).

The monitoring of seedling delivery will mainly be the task of the GIZ consultants, while the monitoring of areas actually reforested and the survival rate shall be the task of DENR field staff. The respective roles and responsibilities of GIZ, DENR and LGUs/POs including the agreed compensation of the DENR monitoring teams should be outlined in a Memorandum of Understanding (example see Annex 2).

The monitoring unit shall be the *compartment* (i.e. management unit or block), consisting of the same rehabilitation model and planted at the same time. For practical reasons one compartment should be between 5 ha and 20 ha. The M&E teams shall prepare a report for each checked compartment, stating the required information such as area planted, tree number/ha and qualitative data. The report has to include a statement if the respective installment can be released in full, if deductions shall be applied or improvements be made.

The reforestation monitoring shall be implemented in the following two steps:

1) Self-check by LGU or PO, if the compartment complies with M&E and payment criteria, if yes the LGU/PO submits a letter of request to the DENR to carry out the M&E check

2) Upon receipt of the letter of request and supporting documents (compartment maps with GPS readings) the DENR field staff will check the requested compartments and submit a report with recommendations to the LGU (payment or improvement). The monitoring shall be done *jointly by DENR and a representative of the GIZ TA team*. Before releasing the subsidy payments, GIZ requires the endorsement of the monitoring report by the GIZ TA team.

2.   General Monitoring Approach

2.1   Self-check by LGU/PO and Letter of Request to PENRO

When a LGU or PO has conducted the self-check and feels comfortable that a certain compartment will pass the monitoring criteria it shall submit a Letter of Request for monitoring to the respective DENR PENRO. A template is given in Annex 3. The Letter of Request has to stipulate the compartments to be monitored, with compartment ID, refo model, gross and net planted area, and if this is the first or second monitoring. In addition the LGU or PO shall confirm that it has carried out a self-check, that the GPS readings of the compartment boundaries are correct, the boundaries have been demarcated on the ground, and the plantation shows the required survival rate. The municipality/PO will provide a map at a suitable scale of the compartments to be monitored, showing the boundaries with GPS coordinates of the corners. Without these documents the DENR teams cannot start with the monitoring. The net planted areas stated in the letter of request will also be the basis for calculating the service fee for the M&E teams. A copy of the letter shall be submitted to the GIZ TA team.

2.2   First Check of Established Plantation

Three months after successful establishment of a compartment and upon request by the LGU/PO, the first M&E check shall be carried out. As a first step, the DENR M&E team *re-measures the compartment corners with the GPS* (based on the maps and coordinates provided by the LGU) and calculates the area actually planted. For compartments consisting of several sub-compartments (e.g. agroforestry areas), the M&E team can select a sample (at least 33% by area) of these sub-compartments and determines their area. If the area calculation of the sample tallies with the LGU measurement the team can accept the area of the whole compartment (a deviation of up to 5% is accepted). If the actual area is smaller, the team applies an overall reduction factor.

As a second step, the adherence to the reforestation design and the survival rate of planted seedlings will be checked. Annex 1 (Technical Description, Installments and M&E Criteria for Rehabilitation Models) and Chapter 3 of these Monitoring Guidelines will form the basis for the M&E.

2.3   Second and Final Check of Established Plantation

Around two years after planting and upon receiving another letter of request from the LGU/PO, the M&E team shall carry out the final acceptance check for the submitted project compartments. The monitoring procedures shall be the same as for the first M&E check, but only some prominent corner coordinates have to be re-measured to confirm they have not been changed. There is no further beating-up paid by the project after the final M&E check. If the area does not fully qualify, proportional deductions shall be made (see Chapter 4).

2.4   Compartment M&E Reporting

All findings of the monitoring check shall be documented on the *compartment field forms*, which will be an integral part of the DENR monitoring report. After finishing the monitoring of all requested compartments in one LGU, the joint DENR-TA M&E team

shall prepare a short and concise monitoring report according to the format shown in Annex 4 and submit it through the CENRO/PENRO to the respective LGU/PO. In order to solve any issues and misunderstandings immediately (especially concerning boundaries, coordinates or survival rate), representatives from the LGU/PO shall participate in the monitoring and voice out any need for clarification.

As stipulated in the MoU between GIZ, DENR and LGU/PO (Annex 2), upon receipt of the monitoring report from the PENRO, the municipality/PO shall pay field allowances to the DENR monitoring team equal to 200 PhP per ha of the compartment net area stated in the monitoring request. The amount is due irrespectively of the monitoring result, for each monitoring event requested by the LGU/PO. These field allowances shall be included in the disbursement requests to GIZ as monitoring costs, as stipulated in the respective Financing Agreements. For the CBFMMP the DENR is the Implementing Agency and monitoring is part of the counterpart contributions, thus no extra fees are foreseen.

3.   Technical Details of Survey Procedures

3.1   Boundary and Area Check

Figure 3-1 Example of Compartment Map with GPS Corner Coordinates
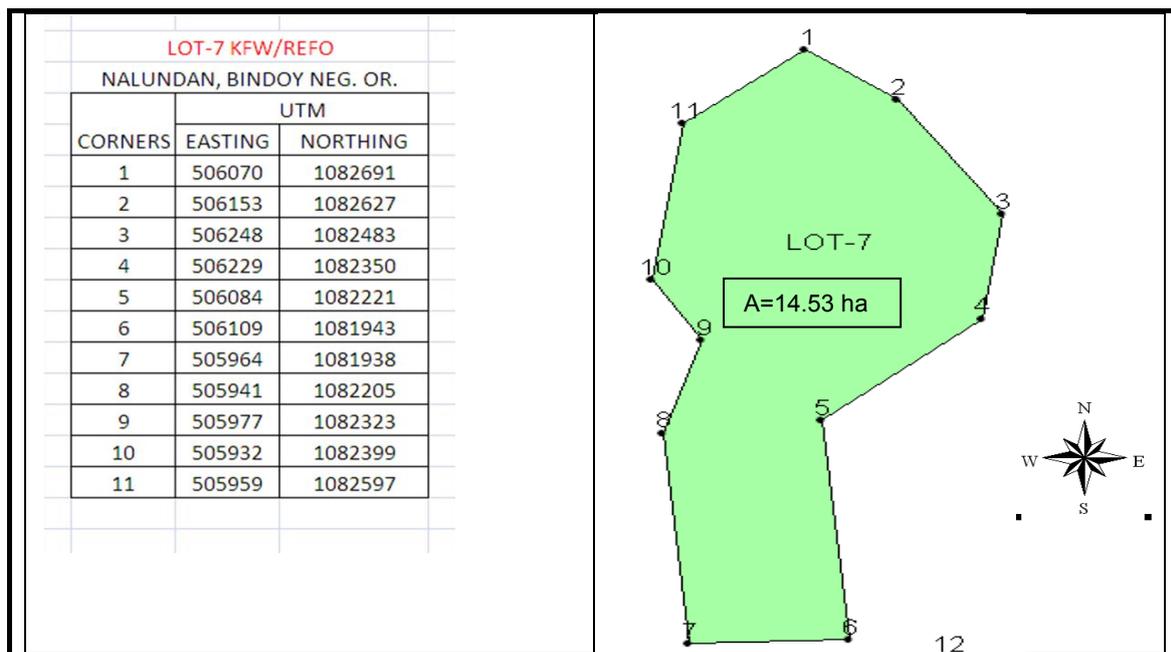
Based on the compartment map and GPS coordinates provided by the LGU/PO (example see Figure 3-1), the M&E team will locate and re-measure all corners with the GPS. As common standard Position Format UTM UPS and Map Datum Luzon Philippines shall be used (pls. verify the GPS settings before measuring).

In case the LGU (or especially the PO) does not have a GIS, they can also download the GPS data on the computer using the simple "Mapsource" program supplied together with the GPS. It allows downloading of waypoints, drawing of tracks, mapping, area calculation and superimposing the boundaries onto Google Earth (examples see Fig. 3-2 and 3-3).

Figure 3-2   GPS Data Downloading and Mapping with Mapsource

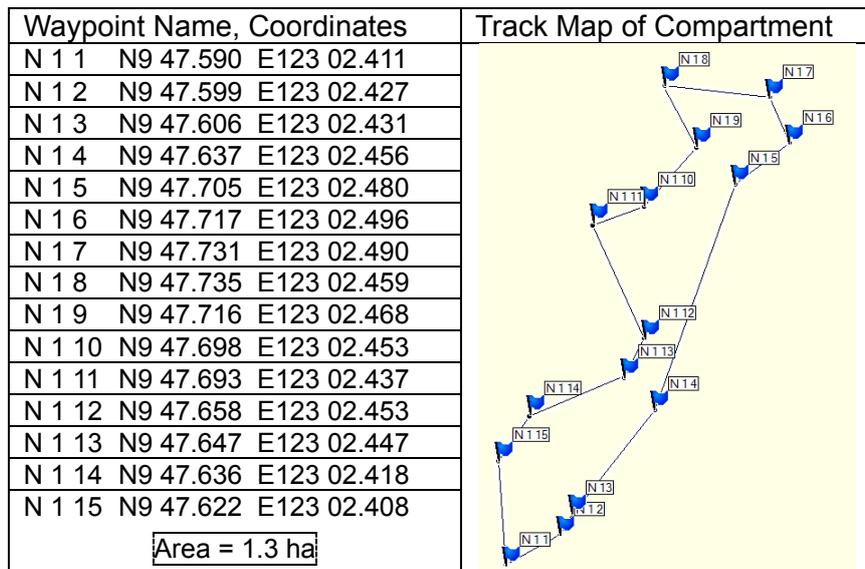| Waypoint Name, Coordinates	Track Map of Compartment
N 1 1 N9 47.590 E123 02.411	
N 1 2 N9 47.599 E123 02.427	
N 1 3 N9 47.606 E123 02.431	
N 1 4 N9 47.637 E123 02.456	
N 1 5 N9 47.705 E123 02.480	
N 1 6 N9 47.717 E123 02.496	
N 1 7 N9 47.731 E123 02.490	
N 1 8 N9 47.735 E123 02.459	
N 1 9 N9 47.716 E123 02.468	
N 1 10 N9 47.698 E123 02.453	
N 1 11 N9 47.693 E123 02.437	
N 1 12 N9 47.658 E123 02.453	
N 1 13 N9 47.647 E123 02.447	
N 1 14 N9 47.636 E123 02.418	
N 1 15 N9 47.622 E123 02.408	
Area = 1.3 ha	

Figure 3-3   Comparison of LGU Map and GIS Control Measurement Superimposed on Google Earth
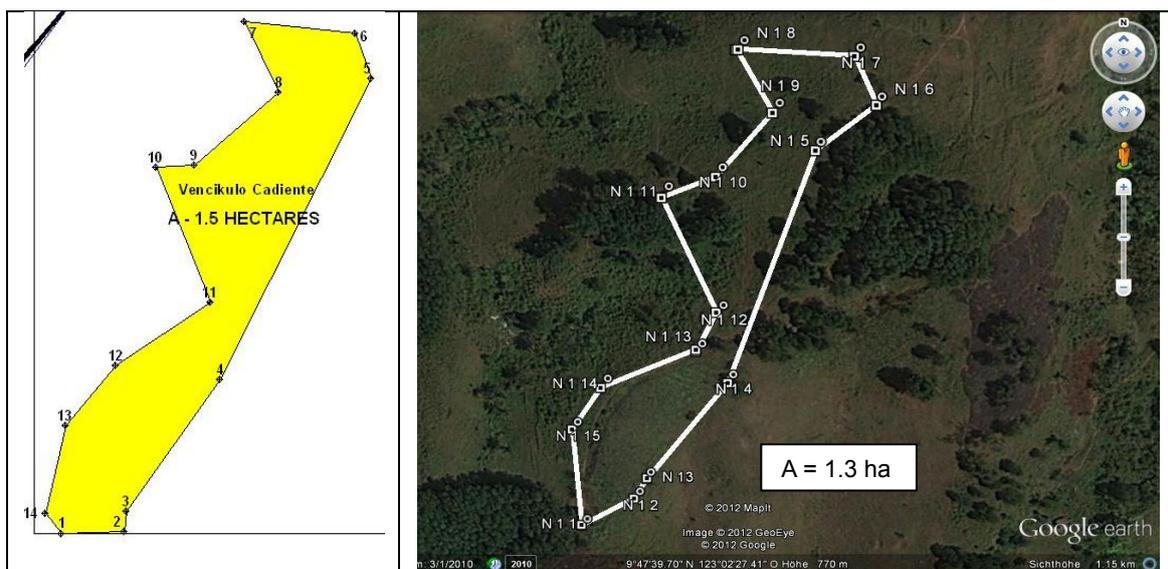
Either the Mapsource track map or the Google Earth track image can be used as easy-made compartment maps, both by the LGU/PO and the monitoring team.

3.2 Quality Control in Reforestation and ANR/Enrichment Planting

After the compartment boundary and net planting area has been determined, the adherence to reforestation design and survival rate shall be monitored. The usual approach to assess reforestation success is plot or line sampling. For plantations with regular spacing and more or less even distribution of species a sampling intensity of 5% is recommended.
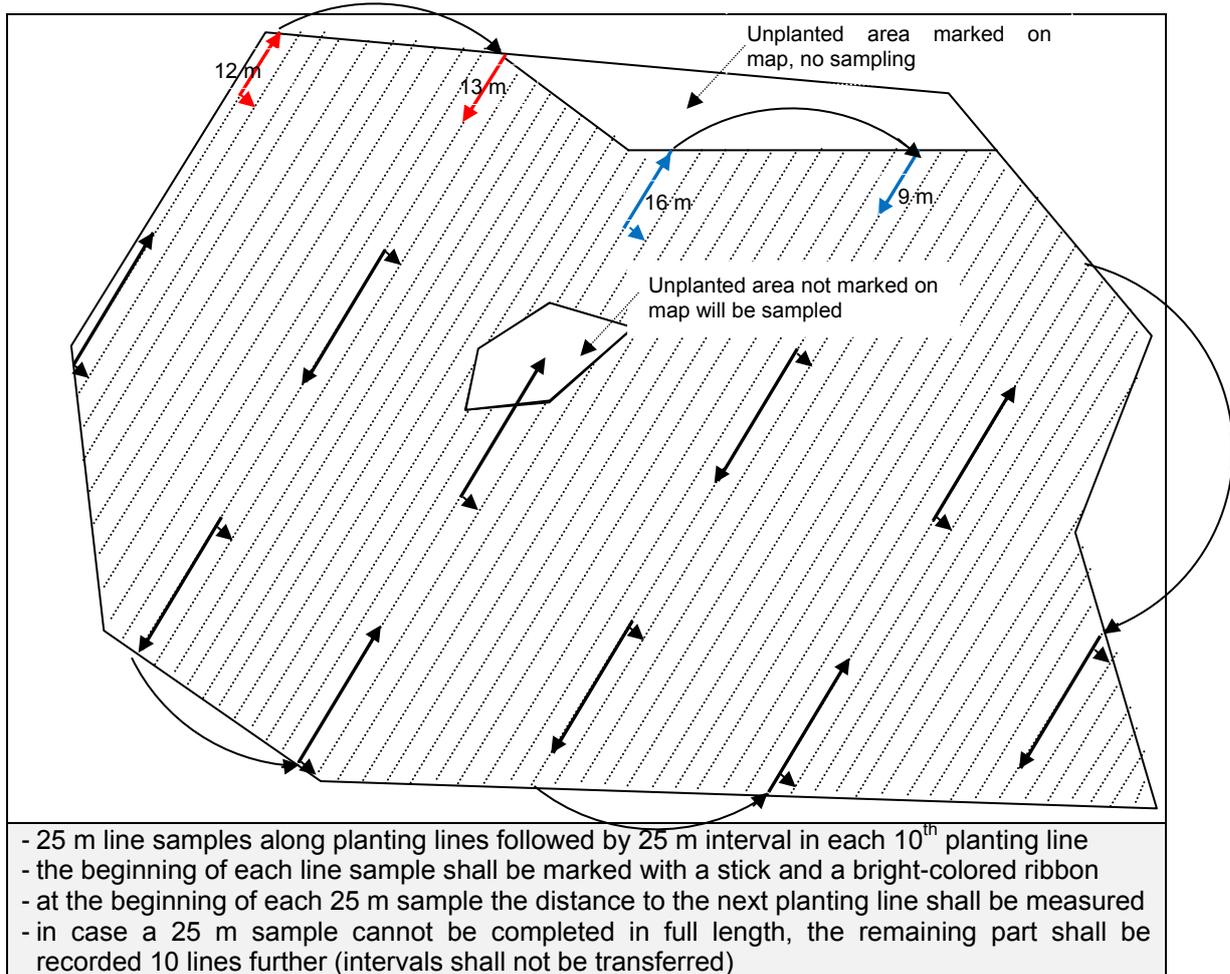
Under conditions like in the Philippines (dense undergrowth, limited mobility and visibility, steep slopes, only planting lines are kept open and accessible), line sampling has been proven to be the most suitable method. To reach a sampling intensity of 5%, also 5% of the overall length of planting lines within a compartment have to be checked. The recommended approach for models 1 to 4 (refo and ANR) is to alternate 25 m line sampling with 25 m interval in every 10th line, starting with the first line (pls. refer to Figure 3-4). This gives automatically a 5% sampling intensity regardless of the distance between lines and is well distributed over the whole compartment. Within 1 m left and right of the sampling line all planted/surviving trees will be recorded. Up to 10% eligible natural regeneration can be included in the sampling, to compensate for dead seedlings (within 1 m distance from the line, commercial species, between 0.2 m and 2 m high). The same line sampling approach applies also to ANR/enrichment planting, rattan and mangrove reforestations (25 m line sampling with 25 m interval in every 10th line).

For all models except Model 2 ANR/Enrichment Planting the whole compartment area will be sampled, unless specifically marked as "unplanted" on the map. To avoid samples with zero recordings (which will lower the average survival rate) all unplanted areas, rocky or swampy parts, fields etc. shall be marked on the LGU map and deducted from the gross compartment area. If not marked on the map as unplanted, all areas within the compartment shall be sampled. If gap planting with 3 x 3 m spacing is used for ANR/enrichment planting, only 40% of the compartment has to be planted, the remaining 60% can be natural regeneration.

The line sampling procedure is illustrated in Figure 3-4. The first 25 m line sample shall be established in the planting line next to an accessible GPS corner. The sample length shall be measured with a 25 m rope, followed by a gap with no recording of also 25 m, followed by another 25 m line sample and so forth until the compartment boundary. Then the M&E team will walk 10 planting lines towards the other end of the compartment and start a new row of 25 m samples. Please observe to measure *horizontal* distance, not slope distance, by adjusting the height of the rope (break chaining). To check also the distance between planting lines, at the beginning of each 25 m sample the distance to the next line (towards the other end of the compartment) is measured. While walking along the 25 m rope, all surviving seedlings with more than 0.2 m height are recorded by species (see M&E field form in Chapter 3). In case there is natural regeneration of commercial species within 1 m distance from the line, between 0.2 m and 2 m height, it can be recorded as substitute for the dead seedlings (for up to 10% of planted seedlings).

In case a 25 m line sample is so close to the compartment boundary that it cannot be recorded in full length (e.g. only 12 m recorded), the remaining part (13 m) shall be recorded at the beginning of the 10th line towards the other end (see Figure 3-4).

Figure 3-5 Illustration of Line Sampling Approach

- 25 m line samples along planting lines followed by 25 m interval in each 10th planting line
- the beginning of each line sample shall be marked with a stick and a bright-colored ribbon
- at the beginning of each 25 m sample the distance to the next planting line shall be measured
- in case a 25 m sample cannot be completed in full length, the remaining part shall be recorded 10 lines further (intervals shall not be transferred)

The average number of trees per 25 m sample will still have to be multiplied with the total possible number of 25 m samples per ha. The multiplication factor depends on the total length of planting lines per ha and differs from model to model. Table 3-1 shows the relevant multiplication factors by reforestation model.

Table 3-1 Line Sample Multiplication Factors by Reforestation Model

Refo Model	Distance between planting lines	Length of planting lines per ha	Number of possible 25 m samples / ha (multiplier)
1 Multi-purpose tree plantation	3 m	3,333 m / ha	133
2 ANR/enrichment planting			
- overall planting 10x2 m	10 m	1,000 m / ha	40
- gap planting 3x3 m	3 m	3,333 m / ha	133
3 Rattan enrichment	5 m	2,000 m / ha	80
4 Mangroves	2 m	5,000 m / ha	200

3.3 Quality Control in Agroforestry Areas

Agroforestry areas are often scattered into several small sub-compartments (see Fig. 3-6) and planted to many crops, unevenly distributed. The monitoring of all sub-compartments is not practical (too time consuming), especially since a denser net of field samples has to be applied considering the uneven planting. The recommended approach for this category is to record circular sample plots of 100 m² each (radius 5.64 m measured *horizontally* with a rope). The samples shall be distributed evenly over the (sub-) compartment following a 25 m x 25 m grid in East-West and North-South direction (see Fig. 3-7). The location of a sample plot shall be determined with compass and a 25 m rope (warning: never locate a sample just by personal judgment, subject for bias). The starting point shall be one GPS corner of the (sub-) compartment. Samples at the edge of a compartment shall be completely moved inside, i.e. measured at 20 m distance from the last sample. For circular sample plots on sloping ground the radius shall be measured horizontally by step-measurement (i.e. up-slope measurements are taken from the top of a central pole, and down-slope measurements taken from the bottom of the central pole). If a seedling is within the 5.64 m radius it is recorded, if outside it is disregarded.

Areas mapped as not suitable for planting (for example rocky, swampy or heavily eroded areas) and deducted from the total compartment area will not be sampled. The same applies also to small gullies or rocky areas, if their estimated percentage has been deducted from the area to be paid and sampled. If no deduction for unplantable areas has been made, then the whole compartment (including rocks and gullies) is subject to sampling.

Figure 3-6   Distribution of Agroforestry Areas in Bayawan, Negros Oriental and Possible Sample Selection (>30% of Area)
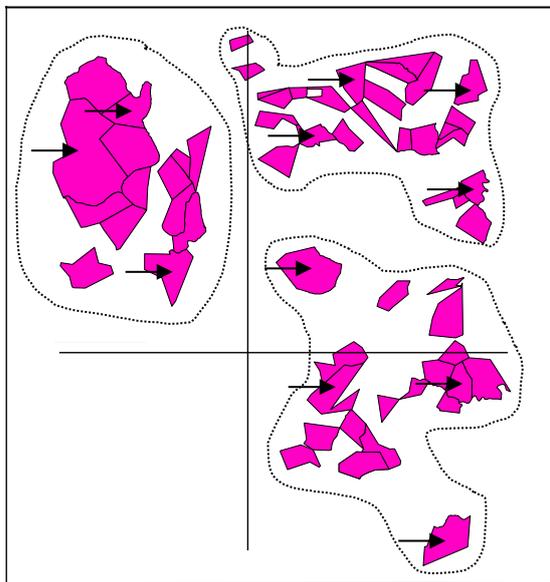
In case the individual agroforestry lots are small and scattered over a large area, they are considered sub-compartments of larger compartments. For monitoring purposes, all sub-compartments have to be listed together with their area, and a sample of at least 30% of the net planted area shall be selected from the list (distributed over the whole compartment area).

Often the farmers did not plant project seedlings in one coherent area only, but scattered all over their lot on suitable places. In this case the whole farm lot has to be monitored, to determine the actual number of seedlings planted.

The basis for monitoring is the number of seedlings resp. the allocated area per farmer. According to Annex 1 Reforestation Model Details, a minimum of 280 assorted permanent agroforestry seedlings per ha are required for the agroforestry model. If the farmer received seedlings for 1 ha and planted them on 1 ha, then the plant density has to be 280 per ha. If the farmer planted the seedlings for 1 ha on a lot of 3 ha, then the density has to be only 280/3 = 93 seedlings for the whole lot. The prescribed method is sampling (Fig 3-7), but if the M&E team prefers they can also carry out 100% inventory.

Figure 3-7 Illustration of Plot Sampling Approach for Agroforestry

- starting at a conveniently located GPS corner measure 25 m in N-S or E-W direction
- establish circular plot samples of 100 m^2 (r = 5.64 m), 25 m apart, in N-S or E-W direction, record all planted seedlings within plots
- in case a circular plot sample falls partly outside the compartment boundary (but center inside), the center will be moved to 20 m distance instead of 25 m
- all plot centers shall be marked with a stick and a bright-colored ribbon

The format for the compartment field form is outlined on the following pages.

COMPARTMENT MONITORING FIELD FORM *(Refo and ANR, version 2012 03 01)*

Province	Municipality	Barangay	Compart-ment No.	Sub-Comp. No. (if any)	Model	Project
1)						

¹⁾ Codes see attached page   O 1st M&E   O 2nd M&E

(I) Verification of Compartment Area

Gross area by LGU	Net planted area LGU	Gross area by M&E	Net planted area M&E
ha	ha	ha	ha

(II) Survival Check (5% sampling)
25 m line samples, 25 m space, every 10th planting line, seedlings have to be at least 20 cm high

Sample no.	Species …………….	Species …………….	Species …………….	Species …………….	Natural tree regeneration h = 0.2 - 2 m, distance <1m	Distance to next line, remarks	Sample total (number)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
Total						m	
Average per sample (total seedling number / number of samples)						m	
Average per ha (Model 1 Refo x 133, Model 2 ANR/Enrich x 40, Model 3 Rattan x 80, Model 4 Mangroves x 200). For Model 5 Agroforestry plot sampling is recommended							/ha
Survival rate = counted average per ha / model planting design (full planting Model 1 Refo 1,110 seedlings/ha, Model 2 ANR/Enrich 500/ha, Model 3 Rattan 1,000/ha, Model 4 Mangrove 2,500/ha. For Model 5 Agroforestry pls. refer to no. of seedlings provided							%

Remarks:………………………………………………………………………………………......

Head of M&E Team: …………..   ………………………   ……………………………..
                                              Date   Name   Signature

COMPARTMENT MONITORING FIELD FORM *(Agroforestry, version 2012 08 02)*

Province	Municipality	Barangay	Compart-ment No.	Sub-Comp. No. (if any)	Model	Project

¹⁾ | | | | | | | | | | | | | | | | | | |

¹⁾ Codes see attached page   O 1st M&E   O 2nd M&E

(I) Verification of Compartment resp. Sub-Compartment Area

Gross area by LGU	Net planted area LGU	Gross area by M&E	Net planted area M&E
ha	ha	ha	ha

(II) Survival Check
One 100 m^2 sample plot (r = 5.64 m) every 25 m, in E-W and N-S direction

Sample no.	Species	Species	Species	Species	Species	Species	Sample total
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
Total plants							
Sample average							
Plot average/ha¹⁾	/ha	/ha	/ha	/ha	/ha	/ha	/ha

Plot/sub-compartment gross area:…….....ha   Net planted area: …..……ha

Multiplier for plot average = gross area/net area (e.g. 3 ha/1 ha = multiplier 3): ……..   Corrected no./ha ²⁾:………

¹⁾ Calculated as sample average x 100   ²⁾ Required corrected no. is 280/ha for 1st and 224/ha for 2nd monitoring

Remarks: …………………………………………………………………………………………………..

Head of M&E Team: …………..   ………………………   ………………………..
                             Date   Name   Signature

Abbreviations and Conventions for Compartment Identification Code
In German-Assisted Forest Rehabilitation Projects

For compartment identification a 14 digit alpha-numeric code is used:

Province:	3 letter code
Municipality:	3 letter code
Barangay:	3 letter code
Compartment:	3 digit number
Sub-Compartment (if any):	2 digit code
Refo Model:	1 digit number
Project:	1 letter

Example: Province Negros Oriental, municipality Bindoy, barangay Lunas, compartment number 6, no sub-compartments, refo model 1 multi-purpose tree plantation, GIZ-supported CBFM

N	O	R	B	D	Y	L	U	N	0	0	6			1	C

Codes for Provinces and Municipalities:

<u>Panay:</u>

Aklan	AKL
Altavas	ALT
..Ibajay	IBA
Libacao	LIB
..Madalag	MAD
..Malinao	MAL
Barangays to be determined	

Antique	ANT
Anini-y	ANY
Barbaza	BAR
..Bugasong	BUG
..Culasi	CUL
..Laua-an	LAU
..Pandan	PAN
..Patnongon	PAT
San Remigio	SRE
Sebaste	SEB
..Tibiao	TIB
..Valderama	VAL
Barangays to be determined	

Capiz	CAP
Dumarao	DUM
Pilar	PIL
..Tapaz	TAP
Barangays to be determined	

Iloilo	ILO
..Calinog	CAL
Carles	CAR
..Janiuay	JAN
..Lambunao	LAM
Passi	PAS
Sara	SAR

Barangays to be determined

Negros:

Negros Occidental	NOC
Candoni	CAN
Cauayan	CAU
Ilog	ILG
Kabankalan	KAB

Barangays to be determined

Negros Oriental	NOR
Bayawan	BAY
Sta. Catalina	SCT
La Libertad	LLB
Bindoy	BDY

Barangays to be determined

Leyte Island:

Leyte province	LEY
Abuyog	ABU
Babatngon	BAB
Capoocan	CAP
Matag-ob	MAT
Ormoc	ORM
Tacloban City	TAC

Barangays to be determined

Southern Leyte	SLY
Bontoc	BON
Maasin	MAS
Silago	SIL
Sogod	SOG

Barangays to be determined

Codes for Forest Rehabilitation Models

Model 1 Multi-purpose tree plantation	1
Model 2 ANR/enrichment planting	2
Model 3 Rattan enrichment	3
Model 4 Mangroves	4
Model 5 Agroforestry	5

Project Code

CBFMMP, KfW supported	K
CBFM, GIZ supported	C
ForClim Panay, GIZ supported	F
REDD, GIZ supported	R