

**MONITORING REPORT FORM (CDM-MR) \***  
**Version 01 - in effect as of: 28/09/2010**

**CONTENTS**

- A. General description of the project activity
  - A.1. Brief description of the project activity
  - A.2. Project participants
  - A.3. Location of the project activity
  - A.4. Technical description of the project
  - A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity
  - A.6. Registration date of the project activity
  - A.7. Crediting period of the project activity and related information
  - A.8. Name of responsible person(s)/entity(ies)
- B. Implementation of the project activity
  - B.1. Implementation status of the project activity
  - B.2. Revision of the monitoring plan
  - B.3. Request for deviation applied to this monitoring period
  - B.4. Notification or request of approval of changes
- C. Description of the monitoring system
- D. Data and parameters monitored
  - D.1. Data and parameters used to calculate baseline emissions
  - D.2. Data and parameters used to calculate project emissions
  - D.3. Data and parameters used to calculate leakage emissions
  - D.4. Other relevant data and parameters
- E. Emission reductions calculation
  - E.1. Baseline emissions calculation
  - E.2. Project emissions calculation
  - E.3. Leakage calculation
  - E.4. Emission reductions calculation
  - E.5. Comparison of actual emission reductions with estimates in the registered CDM-PDD
  - E.6. Remarks on difference from estimated value

\* as contained within the document entitled "Guidelines for completing the monitoring report form (CDM-MR)" (EB 54 meeting report, annex 34).

**MONITORING REPORT**  
**Version 01 Date 12/01/2012**

**REFORESTATION OF DEGRADED LAND BY MTPL IN INDIA**  
**UNFCCC REFERENCE NUMBER: 5016**  
**FIRST MONITORING PERIOD: 25/06/2001 TO 24/06/2011**  
**(FIRST AND LAST DAYS INCLUDED)**

**SECTION A. General description of the project activity**

**A.1. Brief description of the project activity:**

>>

1. Purpose of the project activity and the measures taken to reduce greenhouse gas emissions;

The proposed CDM project activity by Mangalam Timber Products Limited (MTPL) involves carbon sequestration of degraded land through reforestation activities. Many discrete parcels of degraded land that is owned by small and poor farmers/ tribal who do not have the capability of plantation without any external financial support and technical guidance are reforested under Farm Forestry Scheme. The project encompasses 12437 parcels of land measuring 14969.46 hectares owned by 12002 farmers distributed in seven districts across three states Orissa, Andhra Pradesh and Chattishgarh, majority being in Orissa which constitutes almost 83% area of the project, 14% in Andhra Pradesh and only 3% in Chhatishgarh.

The project not only helps in sequestration of CO<sub>2</sub> but also has several other beneficial effects towards empowering the poor farmers/ tribal generating additional income from the proceeds of the wood sale. MTPL agrees to buy back the harvested timber at prevailing market price or minimum rate mentioned in the agreement or at the rate fixed by Orissa Forest Development Corporation whichever is higher at the time of harvest.

The farmers who own the land are mainly poor farmers/tribal who does not have the capability of growing plantation of their own without any external financial support and technical guidance. They do not have capital to invest for plantation without any return for five years. The project activity has been able to create appreciable impression among the farmers in the region who have approached MTPL for assistance with good farming practices and help them regenerate their degraded land.

2. Brief description of the installed technology and equipments;

The species selected for sequestration is Eucalyptus (*E. tereticornis*). The species belong to family Myrtaceae of Angiospermae. This hybrid manifests good hybrid vigour for growth and volume production. It is selected due to its coppicing and drought resistant quality. The species has far greater rooting depth of 3 metres and offers greater capillary action. There is also a considerable increase in the water holding capacity of the soil.

Small pits (40-45 cm in diameter and 30-35 cm in depth) are dug manually for tree planting. Rows are aligned and pits are dug at a spacing of 3m × 1.5m with an aim to accommodate about 1000 plants per acre. The plant of 30-45 cm (excluding container height) with girth of 1-2 cm at collar region is used for planting. The plantations are protected from grazing/browsing animals by means of live fencing. The plants are harvested when they are 5 years old & onwards.

3. Relevant dates for the project activity (e.g. construction, commissioning, continued operation periods, etc.).

The start date of the project activity is 25.06.2001. Details of the year wise plantation of 14969.46 hectares are shown in below table.

Year-wise plantation in different districts (All figures in hectares)										
S No	State	District	2001	2002	2003	2004	2005	2006	2007	Total
1	Orissa	Nabarangpur	156.26	465.48	428.80	778.12	819.73	695.95	1115.91	4460.25
2		Koraput	361.95	517.07	723.06	1200.56	1468.48	1541.34	1399.94	7212.40
3		Malkangiri	2.37	18.33	49.48	150.61	169.84	141.34	176.03	708.00
4	Andhra Pradesh	Vishakhapatnam					215.18	734.32	900.88	1850.38
5		Vizianagaram					38.16	20.30	1.39	59.85
6		Srikakulam				34.42	210.11	6.55		251.08
7	Chhatisgarh	Bastar					102.11	260.63	64.76	427.50
		<b>Total:</b>	<b>520.58</b>	<b>1000.88</b>	<b>1201.34</b>	<b>2163.71</b>	<b>3023.61</b>	<b>3400.43</b>	<b>3658.91</b>	<b>14969.46</b>

4. Total emission reductions achieved in this monitoring period.

Total emission reductions achieved in this monitoring period are 4,274,928 tCO<sub>2</sub>e

#### A.2. Project Participants

>>

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Indicate if the Party involved wishes to be considered as a project participant (Yes/No)
India	Mangalam Timber Products Limited (Private Entity)	No

#### A.3. Location of the project activity:

>>

The project activity is spread across seven districts namely Nabarangpur, Koraput & Malkangiri in Orissa, Vishakhapatnam, Vizianagaram & Srikakulam in Andhra Pradesh and Bastar in Chhatisgarh. Project boundaries are geographically delineated and represented through GIS maps of each discreet parcel. The spread of parcels in each bank area is represented through GIS coordinates of the each area as under:

Geographic delineation - GIS Maps & Coordinates bank area wise									
S No	Bank Area	No of Parcels	Unique ID No of farmers	Map ID No	No of Maps	GIS Coordinates of Bank Area			
						Latitude		Longitude	
						From	To	From	To
1.	NABARANGPUR								
1	Nandahandi	160	NNH001 to 136	N 01	1	19 09 22.2 N	19 17 02.3 N	82 37 01.2 E	82 46 14.8 E
2	Nabarangpur	285	NNP001 to 262	N 02 – N 05	4	19 09 53.5 N	19 19 33.6 N	82 18 13.4 E	82 40 02.1 E
3	Sindhiguda	139	NSG001 to 130	N 06	1	19 09 25.3 N	19 16 09.0 N	82 31 58.0 E	82 40 26.0 E
4	Rajoda	152	NRJ001 to 148	N 07	1	19 08 43.0 N	19 17 02.8 N	82 09 49.2 E	82 21 23.9 E
5	Tumberla	19	NTB001 to 024	N 08	1	19 19 40.8 N	19 22 21.5 N	82 32 15.0 E	82 37 02.1 E
6	Kosagumuda	138	NKM001 to 136	N 10–N 11	2	19 08 56.8 N	19 19 12.5 N	82 08 46.9 E	82 16 48.6 E
7	Jotabal	136	NJB001 to 134	N 11 – N 12	2	19 20 23.0 N	19 27 00.7 N	82 24 05.1 E	82 30 35.7 E
8	Kathargada	156	NKG001 to 152	N 13 – N 14	2	19 05 07.0 N	19 10 03.6 N	82 40 59.6 E	82 46 23.8 E
9	Kumuli	207	NKL001 to 192	N 15 – N 16	2	19 03 19.1 N	19 11 00.1 N	82 38 35.9 E	82 43 40.0 E
10	B Singpur	165	NBS001 to 157	N 17 – N 18	2	18 58 25.8 N	19 07 43.8 N	82 35 03.9 E	82 42 22.2 E
11	Sanmosigaon	281	NSM001 to 282	N 19 – N 21	3	19 11 47.2 N	19 19 46.1 N	82 20 26.1 E	82 29 36.7 E
12	Chalanguda	218	NCG001 to 204	N 22 – N 25	4	19 01 59.3 N	19 12 32.8 N	82 29 51.4 E	82 39 53.7 E
13	Dhamnahandi	64	NDH001 to 061	N 26	1	19 04 47.7 N	19 07 50.5 N	82 16 51.9 E	82 19 13.9 E
14	Raighar	357	NRG001 to 400	N 27 – N 29	3	19 49 19.9 N	19 58 40.8 N	81 33 01.2 E	82 45 42.8 E
15	Jharigaon	317	NJG001 to 321	N 30 – N 33	4	19 31 57.2 N	19 45 55.0 N	82 11 26.0 E	82 27 25.2 E
16	Dhodra	207	NDD001 to 211	N 34 – N 37	4	19 32 38.7 N	19 46 50.8 N	82 10 22.4 E	82 21 13.6 E
17	Kotagaon	183	NKT001 to 187	N 38 – N 40	3	19 19 16.4 N	19 28 06.2 N	82 09 56.2 E	82 21 26.9 E

18	Umerkote	135	NUK001 to 144	N 41 – N 43	3	19 37 04.1 N	19 44 07.8 N	82 04 43.3 E	82 17 10.9 E
19	Sosahandi	147	NSH001 to 141	N 44 – N 45	2	19 00 50.0 N	19 10 23.7 N	82 26 07.1 E	82 33 37.9 E
20	Singsari	68	NSS001 to 069	N 46 – N 48	3	19 23 01.9 N	19 35 01.4 N	82 03 42.1 E	82 21 26.8 E
21	Turudhi	55	NTD001 to 060	N 49	1	19 53 04.1 N	19 59 23.8 N	81 50 53.3 E	81 56 14.1 E
22	Chandili	53	NCD001 to 053	N 50	1	19 00 26.6 N	19 06 44.6 N	82 12 12.2 E	82 21 38.8 E
23	Kundei	30	NKN001 to 032	N 51	1	20 01 13.0 N	20 04 12.2 N	81 46 55.8 E	81 59 29.1 E
24	Borigumma	24	NBG001 to 025	N 52	1	19 00 07.1 N	19 08 25.5 N	82 34 50.1 E	82 41 41.9 E
25	Kodinga	58	NKD001 to 058	N 53 – N 54	2	19 14 56.4 N	19 24 09.6 N	82 15 43.0 E	82 22 28.7 E
26	Tentulikuthi	198	NTK001 to 175	N 55	1	19 14 07.1 N	19 19 23.5 N	82 40 45.2 E	82 45 31.7 E
27	Maidalpur	115	NMP001 to 118	N 56 – N 58	3	19 24 16.1 N	19 33 25.1 N	82 13 15.0 E	82 38 57.3 E
Total:		4067			58				
<b>2. KORAPUT</b>									
1	Boipariguda	317	KBG001 to 314	K 01 – K 02	2	18 40 33.8 N	18 49 39.4 N	82 16 28.1 E	82 28 16.2 E
2	Ramgiri	287	KRG001 to 291	K 03 – K 05	3	18 41 57.0 N	18 52 17.5 N	82 10 30.6 E	82 21 08.9 E
3	Kundra	418	KKN001 to 416	K 06 – K 07	2	18 49 36.8 N	19 00 08.1 N	82 16 56.0 E	82 25 05.6 E
4	Digapur	357	KDG001 to 355	K 08 – K 09	2	18 46 09.3 N	18 53 03.9 N	82 18 06.2 E	82 30 18.2 E
5	Dongerpaunsi	407	KDP001 to 399	K 10 – K 11	2	18 50 49.5 N	19 01 00.6 N	82 21 38.3 E	82 27 39.1 E
6	Ambaguda	103	KAG001 to 100	K 12	1	18 56 27.9 N	19 00 22.8 N	82 30 15.1 E	82 37 54.0 E
7	Kusumi	345	KKS001 to 344	K 13 – K 14	2	18 59 06.1 N	19 06 13.4 N	82 19 39.1 E	82 28 45.8 E
8	Phamphuni	277	KPP001 to 277	K 15 – K 16	2	18 50 05.7 N	18 57 50.4 N	82 25 01.2 E	82 31 11.4 E
9	Nandapur	586	KNP001 to 575	K 17 – K 20	4	18 29 03.1 N	18 44 47.9 N	82 29 35.4 E	82 53 01.6 E
10	Padwa	213	KPD001 to 238	K 21 – K 22	2	18 16 07.2 N	18 37 45.7 N	82 34 47.7 E	82 46 53.3 E
11	Lamtaput	248	KLP001 to 262	K 23 – K 25	3	18 29 00.4 N	18 46 14.3 N	82 30 33.3 E	82 40 03.1 E
12	Mathalput	129	KMP001 to 136	K 26	1	18 43 22.3 N	18 49 59.8 N	82 53 49.0 E	82 58 58.0 E
13	Jolaput	147	KJP001 to 166	K 27	1	18 25 16.6 N	18 31 42.2 N	82 33 32.1 E	82 39 10.9 E
14	Semiliguda	218	KSG001 to 220	K 28 – K 30	3	18 33 02.6 N	18 42 56.2 N	82 46 11.4 E	82 56 58.1 E
15	Koraput	48	KKP001 to 057	K 31 – K 32	2	18 47 10.8 N	18 53 10.3 N	82 38 09.9 E	82 52 43.4 E
16	Podagada	257	KPG001 to 330	K 33 – K 34	2	18 47 35.0 N	18 56 50.3 N	82 41 00.4 E	82 59 29.8 E
17	Kakiriguma	65	KKG001 to 066	K 35 – K 36	2	18 52 04.4 N	18 59 58.0 N	82 53 06.2 E	83 04 05.2 E
18	Dasmantpur	208	KDS001 to 223	K 37 – K 38	2	18 58 07.7 N	19 09 29.6 N	82 49 53.3 E	83 00 05.3 E
19	Pottangi	93	KPT001 to 105	K 39	1	18 27 45.6 N	18 34 19.0 N	82 51 39.1 E	83 00 11.1 E
20	Sunki	141	KSN001 to 178	K 40	1	18 22 38.1 N	18 30 43.4 N	82 55 22.2 E	83 04 05.1 E
21	Jeypore	82	KJR001 to 081	K 41	1	18 54 04.0 N	18 59 26.7 N	82 29 17.0 E	82 35 40.0 E
22	Sunabeda	43	KSB001 to 043	K 42	1	18 38 34.6 N	18 45 27.0 N	82 45 30.2 E	82 53 37.3 E
23	Onkadili	11	KOD001 to 011	K 43	1	18 30 01.5 N	18 34 29.1 N	82 25 09.0 E	82 27 01.0 E
Total:		5000			43				
<b>3. MALKANGIRI</b>									
1	Pangam	90	MPG001 to 091	M 01 – M 02	2	18 22 58.1 N	18 33 34.8 N	82 01 43.4 E	82 10 03.2 E
2	Maithili	144	MML001 to 157	M 03	1	18 28 51.0 N	18 36 52.2 N	82 04 29.0 E	82 13 30.2 E
3	Malkangiri	254	MMG001 to 253	M 04 – M 06	3	18 19 50.8 N	18 29 37.6 N	81 55 17.3 E	82 06 15.2 E
4	Kudumulguma	26	MKG001 to 034	M 07	1	18 15 31.4 N	18 26 22.0 N	82 05 29.6 E	82 11 23.8 E
Total:		514			07				
<b>4. VISAKHAPATNAM</b>									
1	Arkuvalley	746	VSA001 to 1316	VS 01 - 02	2	18 10 22.6 N	18 23 20.4 N	82 01 28.9 E	83 10 41.2 E
2	Kinchunmanda	750	VSK001 to 1099	VS 03 - 04	2	18 08 34.9 N	18 26 37.8 N	82 39 49.9 E	82 52 49.8 E
3	Paderu	409	VSP001 to 1219	VS 05 - 06	2	18 01 19.5 N	18 12 43.9 N	82 32 24.7 E	82 50 51.7 E
Total:		1905			06				
<b>5. VIZIANAGARAM</b>									
1	Sallur	54	VZS001 to 096	VZ 01	1	18 24 58.5 N	18 31 24.8 N	83 00 12.0 E	83 11 48.1 E
2	Gajpatinagaram	2	VZG001 to 002	VZ 02	1	18 30 54.2 N	18 31 05.6 N	83 07 31.3 E	83 07 39.7 E
Total:		56			02				
<b>6. SRIKAKULAM</b>									
1	Kottur	73	SKT001 to 081	S 01	1	18 37 33.4 N	18 43 23.58 N	83 46 34.9 E	83 49 23.9 E
2	Veergatham	220	SVG001 to 308	S 02 - 03	2	18 40 10.4 N	18 46 24.8 N	83 35 56.0 E	83 41 38.0 E
3	Palkonda	53	SPK001 to 058	S 04 - 05	2	18 32 06.7 N	18 44 14.7 N	83 41 59.6 E	83 52 00.4 E
4	G L Puram	5	SGL001 to 005	S 06	1	19 02 23.9 N	19 03 11.2 N	83 33 35.4 E	83 39 51.1 E
Total:		351			06				
<b>7. BASTAR</b>									
1	Bastar	351	BBS001 to 351	B 01– B 02	2	19 06 17.7 N	19 19 05.5 N	81 45 20.9 E	81 59 45.3 E
2	Lohaniguda	90	BLH001 to 090	B 03 – B 05	3	19 04 48.3 N	19 16 05.5 N	81 35 01.9 E	81 57 35.2 E

3	Bhanpuri	44	BBH001 to 044	B 06	1	19 17 02.4 N	19 21 07.4 N	81 43 11.5 E	81 48 38.7 E
4	Kesharpal	38	BKP001 to 038	B 07 – B 08	2	19 20 04.0 N	19 25 25.9 N	81 43 52.9 E	81 54 51.7 E
5	Bokaband	12	BBK001 to 012	B 09	1	19 14 08.7 N	19 14 38.7 N	82 03 29.5 E	82 06 06.5 E
6	Bojawand	9	BBJ001 to 009	B 10	1	19 12 54.6 N	19 13 49.3 N	82 07 07.0 E	82 09 23.6 E
	<b>Total:</b>	<b>544</b>			<b>10</b>				
	<b>Grand Total:</b>	<b>12437</b>	<b>Parcels</b>		<b>132</b>	<b>Maps</b>			

#### A.4. Technical description of the project

>>

The technological details are as follows:

**Nursery Technique:** Seeds of Eucalyptus are first treated with broad based fungicide and equal amount of fine quality sand for sowing. Such treated seeds are sown on nursery mother beds of size 10 m long & 1 m wide. Beds are covered with paddy straw to protect the seeds from wind and rain besides encouraging better germination as straw provides optimum micro-environmental condition for germinating seeds. Seedlings of 2-5 leaf stage are transplanted into polythene bags filled with excellent quality soil, sand and well decomposed farm yard manure in the ratio of 2:1:1. Transplanted seedlings are provided with partial shade and sufficient water so that within 10 days most of the seedlings get acclimatized and begin to grow in polythene bags. Timely watering, weeding, shifting & grading will be done. Seedlings of 30-45 cm will be obtained in 3-5 months time. Insecticides/pesticides will be used only in case if there is considerable damage to plants.



**Site Preparation:** Deep repeated ploughing mostly with country plough or tractor ploughing by exceptional farmers is done one month prior to planting. Rows are aligned and pits are dug at a spacing of 3m × 1.5m with an aim to accommodate about 1000 plants per acre. Small pits (40-45 cm in diameter and 30-35 cm in depth) are dug manually for tree planting.

**Planting Techniques:** The plant of 30-45 cm (excluding container height) with girth of 1-2 cm at collar region is used for planting. The plants with container are dipped in bucket of water mixed with termiticides/ insecticides just before planting. This helps in keeping better moisture within the ball of earth & keeps the insects/termites away. The plant are held in one hand & the polythene bag is cut with sharp knife/blade and completely removed in such a way that the plant roots are intact in ball of soil.

The sapling is planted in such a way that the root collar region is well within the soil, as it is softest portion should not be exposed to sunlight. After planting soil around the plant is thoroughly compacted and is preferably done by using both feet without causing injury to plant.



**Plantation management:** The plantations are protected from grazing/browsing animals by means of live fencing. Termites are the major insects that cause severe damage to growing plants but is controlled by using Chlorpyrifos 20% EC. Timely weeding and soil-working is done to boost-up the plant growth.

**Harvesting:** Harvestation is carried out first time normally after completion of 5 years felling cycle and thereafter thrice at 4 years felling cycle. The trees are felled, 6' (approx) billeted and transported to mills for further use.

**A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:**

>>

A/R project 5016 is based on the approved baseline and monitoring methodology titled "Afforestation and reforestation of degraded land", AR-ACM0001 (Version 04), Sectoral Scope: 14.

**A.6. Registration date of the project activity:**

>>

01 August, 2011 (Date of registration action 17 October, 2011)

**A.7. Crediting period of the project activity and related information (start date and choice of crediting period):**

>>

30 years of fixed crediting period starting from 25/06/2001

**A.8. Name of responsible person(s)/entity(ies):**

>>

The person(s)/entity(ies) responsible for completing the monitoring report form (CDM-MR) is

Organization:	Mangalam Timber Products Limited
Street/P.O.Box:	9/1 R.N.Mukherjee Road
Building:	Birla Building, 7th Floor
City:	Kolkata
State/Region:	West Bengal
Postfix/ZIP:	700 001
Country:	India
Telephone:	+91 33 2243 8857, 3293 9131/32
FAX:	+91 33 2243 8709
E-Mail:	<a href="mailto:psprasad@mangalamtimber.com">psprasad@mangalamtimber.com</a>
URL:	<a href="http://www.mangalamtimber.com">www.mangalamtimber.com</a>
Represented by:	Mr P. S. Prasad
Title:	Dy. General Manager (Quality Assurance & Projects)
Salutation:	Mr
Last Name:	Prasad
Middle Name:	Shankar
First Name:	Prem
Department:	Quality Assurance & Projects
Mobile:	+91 9903941332
Direct FAX:	---
Direct tel:	---
Personal E-Mail:	<a href="mailto:premshankarp@yahoo.com">premshankarp@yahoo.com</a>

## **SECTION B. Implementation of the project activity**

### **B.1. Implementation status of the project activity**

>>

1. The starting date of operation of the project activity.

Plantation activities started on 25/06/2001. The year wise details of plantation have been delineated under section A1.

2. The information regarding the actual operation of the project activity during this monitoring period, including information on special events,

The reforestation under the project activity has been implemented using single species of Eucalyptus. 100% Eucalyptus seedlings raised in MTPL's nurseries were supplied to the farmers and planted in the fields, no other species has been used.

Annual measurements of DBH & tree height are carried out for 100% trees in permanent sample plots of 20mx20m size identified within each of the 1305 sample parcels selected. Method of locating sample plots within sample parcel is explained in the "Sample Plot Measurement Process". The sample plot is marked within each sample parcel in different direction as maintained in sample plot register to avoid any bias in measurement. The location once chosen does not change in subsequent monitoring.

Counting of trees is done across the entire sample parcel and not only within the 20mx20m sample plot in order to obtain more accuracy. Number of trees is counted on completion of 1<sup>st</sup> year of establishment that takes care of all mortality and subsequent replantation which is done after 3 months of planting.

Special event such as harvestation / coppicing is recorded in sample plot register. Sample plot register is available for verification.

3. A brief description of: (i) events or situations that occurred during the monitoring period, which may impact the applicability of the methodology, and (ii) how the issues resulting from these events or situations are being addressed.

There has been no event or situation during the monitoring period which may impact the applicability of the methodology.

### **B.2. Revision of the monitoring plan**

>>

The monitoring plan has not been revised

### **B.3. Request for deviation applied to this monitoring period**

>>

No request for deviation has been applied to this monitoring period

### **B.4. Notification or request of approval of changes**

>>

No notification or request of approval of changes from the project activity has been initiated.

## **SECTION C. Description of the monitoring system**

>>

The Monitoring Plan designed for A/R-CDM Project (5016) establishes monitoring procedures to calculate net anthropogenic GHG removals by sinks considering the project boundary, changes in the carbon pools, forest establishment and management for project and leakage emissions.

All data collected in the field are registered and recorded. The monitoring of all relevant activities for this project activity strictly followed the Monitoring Plan presented in the PDD.

**Monitoring of the actual net GHG removals by sinks:**

S No	Data Parameter	Data Unit	Recording frequency	Monitoring system
1	Stratum ID	Alpha numeric	before the start of project	Unique ID no has been assigned to each strata and being maintained throughout the monitoring period. Plot location is established through GIS coordinates of each plot using satellite remote sensing and GIS techniques.
2	Confidence Level	%	before the start of project	For the purpose of QA/QC and measuring and monitoring precision control
3	Precision Level	%	before the start of project	For the purpose of QA/QC and measuring and monitoring precision control
4	Standard deviation of each stratum	-	before the start of project	Used for estimating numbers of sample plots of each stratum
5	Number of sample plots	-	At start of the project	No of permanent sample plots calculated as 1041. However, to further reduce uncertainty in estimates, 1305 samples have been selected as indicated in registered PDD.
6	Sample plot ID	Alpha numeric	At start of the project	Unique ID has been assigned to each permanent sample parcel.
7	Sample Plot location	GIS coordinates	As & when sample plot identified.	Sample plot location established through GIS coordinates of each plot using satellite remote sensing and GIS techniques.
8	Number of Trees	Number	On completion of 1 <sup>st</sup> year after establishment	Counting 100% trees in each sample parcel on completion of 1 <sup>st</sup> year of establishment. Record is maintained in Sample Plot Register.
9	Survival rate	%	On completion of 1 <sup>st</sup> year after establishment	Survival rate is calculated as % of tree planted and no of trees available in sample parcel.
10	Diameter breast height	Cm	Annually	Measuring DBH every year in 20mx20m sample plot in each sample parcel and maintained in Sample Plot Register.
11	Tree height	M	Annually	Measuring Tree height in 20mx20m sample plot every year in each sample parcel and maintained in Sample Plot Register.
12	Biomass Expansion Factor	Dimensionless	As & when IPCC modify the	IPCC GPG for LULUCF Table- 3A.1.10



			values.	
13	Carbon Fraction	tC(tdm)-1	As & when IPCC modify the values.	IPCC default value = 0.5 t C t <sup>-1</sup> d.m.
14	Root to shoot ratio	Dimensionless	As & when IPCC modify the values.	IPCC GPG for LULUCF Table- 3A.1.8
15	Area of slash and Burn	ha	As & when incident happen.	During regular visit to sites field officers will keep watch for slash & burn. If observed area and date shall be recorded by them and reported to CDM Manager.

Roles & responsibilities with reporting structure of various personnel engaged in monitoring of CDM project is established as laid down below. In order to ensure that the personnel involved in monitoring are competent to perform monitoring, competency mapping has been done in terms of qualification, experience & training. The personnel are also imparted training from time to time on plantation activity & subsequent monitoring procedures, records of training are available for verification.

Roles & responsibilities of the personnel	
Designation	Responsibilities
Head- Plantation & Administration	<ul style="list-style-type: none"> <li>• Planning &amp; resource management of entire plantation activities.</li> <li>• Training on planting &amp; nursery techniques – changes &amp; developments</li> <li>• Planning &amp; development of mist chamber.</li> <li>• Deployment &amp; supervision of all staff &amp; managers of Plantation Deptt.</li> <li>• Soil testing</li> <li>• CDM data and record keeping arrangements</li> <li>• Ensuring availability of trained personnel for CDM data collection</li> </ul>
CDM Manager (Head Office)	<ul style="list-style-type: none"> <li>• Entire documentation for CDM activities</li> <li>• Resource management for GIS mapping of plantation sites.</li> <li>• Custodian for all GIS data, maps and satellite images</li> <li>• Quality control of monitoring system</li> <li>• Training on CDM monitoring &amp; measurement procedures like tree height and DBH measurements</li> <li>• Audit check of data</li> <li>• Arranging calibration of measuring devices</li> <li>• Arranging for validation and verification of the project</li> <li>• Liaisoning with all external agencies like DNA, DOE and consultants.</li> </ul>
Manager (Plantation)	<ul style="list-style-type: none"> <li>• Execution of Tripartite agreement</li> <li>• Execution of carbon rights (CER authorization contract)</li> <li>• Maintaining record of area planted year wise in plantation register</li> <li>• Updating plantation register</li> <li>• Updating Sample plot register</li> <li>• GPS mapping of the plantation sites</li> <li>• Calibration and maintenance of measuring devices</li> <li>• Quality control of data collection</li> </ul>
Area Incharge	<ul style="list-style-type: none"> <li>• Joint verification of plantation sites to ensure fulfilment of eligibility criteria</li> <li>• Identification of sample plots</li> <li>• Growth monitoring in sample plots in terms of no of trees, tree height</li> </ul>

	& DBH <ul style="list-style-type: none"> <li>• Conducting meeting with the farmers to educate them on the scheme</li> <li>• Train, guide and assist farmers for plantation</li> <li>• Soil sample collection.</li> </ul>
Field Officers	<ul style="list-style-type: none"> <li>• Assistance in recording GPS coordinates</li> <li>• Measurement of tree height &amp; DBH</li> <li>• Sample plot measurement.</li> </ul>
Accounts & CDM Record Officer	<ul style="list-style-type: none"> <li>• Plantation accounts</li> <li>• Compilation of all data received from Area Incharges</li> <li>• Proper upkeep of plantation &amp; CDM records &amp; ensuring their correctness</li> <li>• Sample plot monitoring records.</li> </ul>

Details of competency of the personnel involved in monitoring activity like their educational qualification, experience, training & specialization etc are furnished in the table below:

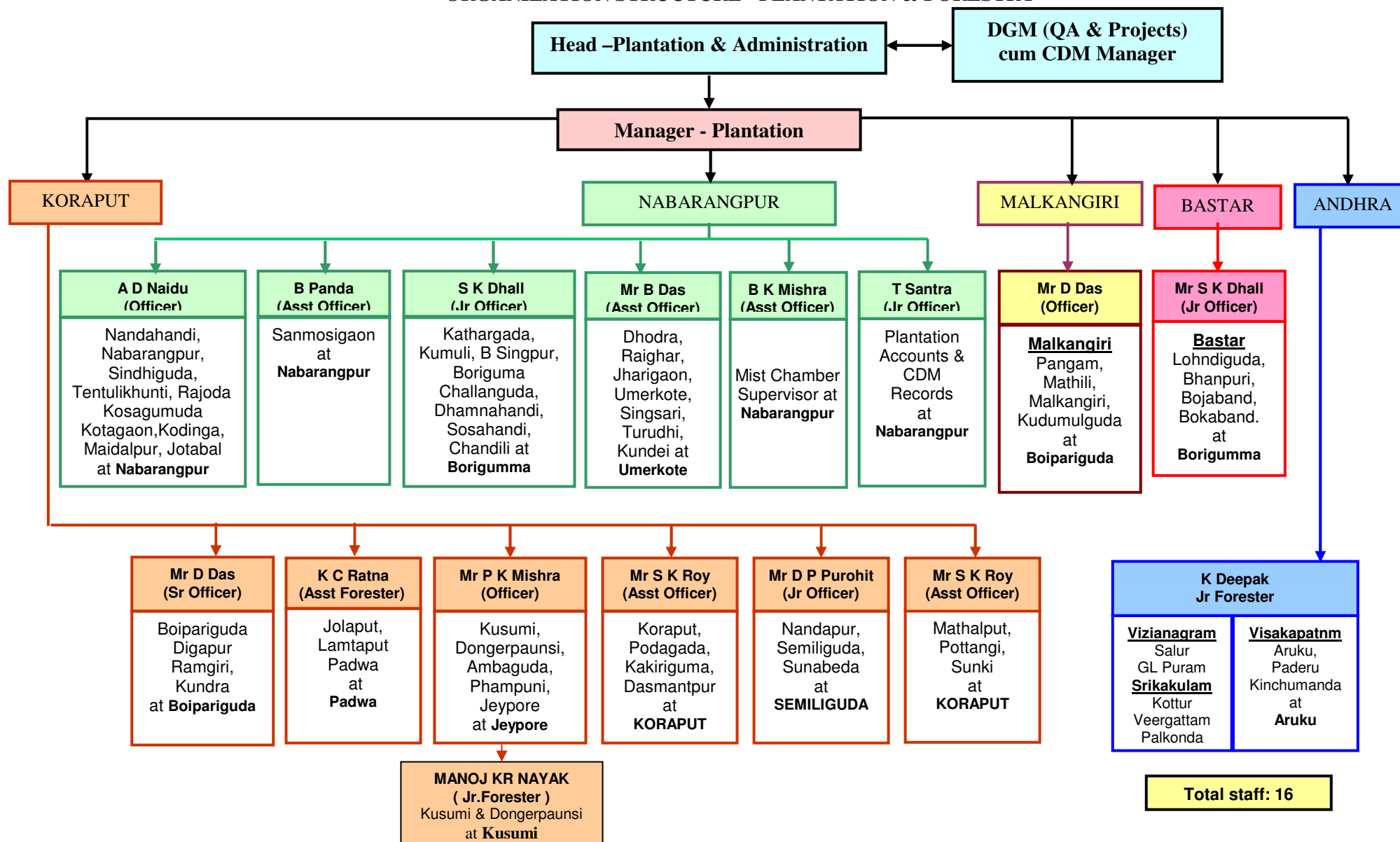
S No	Name of personnel	Designation	Qualification	Experience in years	Field of experience/ Specialization/ Training
1	Shri D G Hegde	Head-Plantation & Administration	B Sc (Horticulture)	30 years	Entire experience in plantation activity at MTPL, UNILEVER & FINLAYS, Columbia. One month training at Silsoe College of Agriculture, UK.
2	Shri P S Prasad	DGM (QA & Projects) cum CDM Manager	BE (Mechanical)	32 years	4 yrs in AR-CDM Project, 4 yrs in ISO Management Systems and remaining in Steel & Wagon manufacturing. Training in development of CDM projects and Lead Auditor for QMS (ISO 9001) & Social Accountability (SA 8000)
3	Shri G V D Prasad	Manager-Plantation	B Comm (Hons)	24 years	Entire experience in plantation activity at MTPL except 1 year at J K Paper. Training on AR-CDM Sample Plot measurement process.
4	Shri A D Naidu	Area Incharge	BA	11 years	Entire experience in plantation activity at MTPL. Training on AR-CDM Sample Plot measurement process.
5	Shri B Das	Area Incharge	Matric	26 years	Entire experience in plantation activity at MTPL. Training on AR-CDM Sample Plot measurement process.
6	Shri S K Dhall	Area Incharge	BA	19 years	Entire experience in plantation activity at MTPL. Training on AR-CDM Sample Plot measurement process.
7	Shri D Das	Area Incharge	Matric	26 years	Entire experience in plantation activity at MTPL. Training on AR-CDM Sample Plot

					measurement process.
8	Shri S K Ray	Area Incharge	B.A, LLB	06 years	Entire experience in plantation activity at MTPL. Training on AR-CDM Sample Plot measurement process.
9	Shri P K Mishra	Area Incharge	M.A, LLB	11 years	Entire experience in plantation activity at MTPL. Training on AR-CDM Sample Plot measurement process.
10	Shri Brundaban Panda	Area Incharge	HSC	15 years	Entire experience in plantation activity at MTPL. Training on AR-CDM Sample Plot measurement process.
11	Shri D P Purohit	Area Incharge	HSC	10 years	Entire experience in plantation activity at MTPL. Training on AR-CDM Sample Plot measurement process.
12	Shri B K Mishra	Supervisor, Mist Chamber	BA	12 years	Entire experience in plantation/ nursery activity at MTPL. Training on AR-CDM Sample Plot measurement process.
13	Shri Trishul Santra	Accounts Officer	B Com	06 years	Entire experience in Plantation Accounts and CDM record maintenance. Training on AR-CDM Sample Plot measurement process.
14	Shri K Deepak	Jr. Forester	HSC	14 years	Entire experience in plantation activity at MTPL. Training on AR-CDM Sample Plot measurement process.
15	Shri M.K.Nayak	Jr. Forester	HSC	10 years	Entire experience in plantation activity at MTPL. Training on AR-CDM Sample Plot measurement process.
16	Shri K.C.Ratna	Asst. Forester	Matric	26 years	Entire experience in plantation activity at MTPL. Training on AR-CDM Sample Plot measurement process.

Organisation structure for Plantation department is furnished below:

# MANGALAM TIMBER PRODUCTS LIMITED

## ORGANIZATION STRUCTURE - PLANTATION & FORESTRY



\* as contained within the document entitled "Guidelines for completing the monitoring report form (CDM-MR)" (EB 54 meeting report, annex 34).

## SECTION D. Data and parameters

### D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors

*(Copy this table for each data and parameter. To report multiple values, a table may be used)*

<b>1. Data / Parameter:</b>	Sample plot
Data unit:	Number
Description:	Number of sample plots
Source of data used:	As required by the approved methodology, the total sum of samples (n) is estimated as per a criterion of Neyman of fixed levels of accuracy and costs, according to Wenger (1984). The results show that a total of 1041 plots are sufficient. However, to further reduce uncertainty in estimates, 1305 samples have been selected (n).
Value(s) :	1305
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Net removal by sinks
Additional comment:	Please refer sample plot calculation

<b>2. Data / Parameter:</b>	Sample plot ID
Data unit:	Alpha Numeric
Description:	Sample plot ID
Source of data used:	Sample Plot Register
Value(s) :	Numeric series ID has been assigned to each permanent sample plot
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emissions
Additional comment:	Numeric series ID assigned to each permanent sample plot

<b>3. Data / Parameter:</b>	Confidence Level
Data unit:	%
Description:	Confidence Level
Source of data used:	-
Value(s) :	95
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	
Additional comment:	For the purpose of QA/QC and measuring and monitoring precision control

<b>4. Data / Parameter:</b>	Precision Level
Data unit:	%
Description:	Precision Level
Source of data used:	-
Value(s) :	± 10
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	

\* as contained within the document entitled "Guidelines for completing the monitoring report form (CDM-MR)" (EB 54 meeting report, annex 34).

Additional comment:	For the purpose of QA/QC and measuring and monitoring precision control
---------------------	---

<b>5. Data / Parameter:</b>	Standard Deviation of each stratum
Data unit:	dimensionless
Description:	Standard Deviation of each stratum
Source of data used:	-
Value(s) :	30
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	
Additional comment:	Used for estimating numbers of sample plots of each stratum

<b>6. Data / Parameter:</b>	<b>Biomass Expansion Factor (BEF)</b>
Data unit:	Dimensionless
Description:	Biomass Expansion Factor
Measured /Calculated /Default:	Default
Source of data:	IPCC GPG for LULUCF Table- 3A.1.10
Value(s) of monitored parameter:	Please refer to “CER calculation sheet” and excel spreadsheets of measurement registers
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Net removal by sinks
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	Any change by IPCC is periodically updated.
Calculation method (if applicable):	NA
QA/QC procedures applied:	NA

<b>7. Data / Parameter:</b>	<b>Carbon Fraction (CF)</b>
Data unit:	tC (tdm)-1
Description:	Carbon Fraction
Measured /Calculated /Default:	Default
Source of data:	(IPCC default value = 0.5 t C t <sup>-1</sup> d.m.)
Value(s) of monitored parameter:	0.5
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Net removal by sinks
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	Any change by IPCC is periodically updated.
Calculation method (if applicable):	NA
QA/QC procedures applied:	NA

<b>8. Data / Parameter:</b>	<b>Root to Shoot Ratio (R)</b>
Data unit:	Dimensionless
Description:	Root to Shoot Ratio
Measured /Calculated /Default:	Default
Source of data:	IPCC GPG for LULUCF Table- 3A.1.8

Value(s) of monitored parameter:	0.27
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Net removal by sinks
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	Any change by IPCC is periodically updated.
Calculation method (if applicable):	NA
QA/QC procedures applied:	NA

## D.2. Data and parameters monitored

*(Copy this table for each data and parameter. To report multiple values, a table may be used)*

Copy this table for each data and parameter. To report multiple values, a table may be used.

1. Data / Parameter:	Area of stratum i ( $A_i$ )																											
Data unit:	ha																											
Description:	Actual planted area is measured for each stratum using satellite remote sensing and GIS techniques.																											
Measured /Calculated /Default:	Measured																											
Source of data:	Spatial database																											
Value(s) of monitored parameter:	<p>Project stratification is based on year of plantation. Strata wise total area planted is given in the table below:</p> <table><tr><th>Strata no</th><th>Year of Plantation</th><th>Area Planted (Ha)</th></tr><tr><td>Strata 1</td><td>2001</td><td>520.58</td></tr><tr><td>Strata 2</td><td>2002</td><td>1000.88</td></tr><tr><td>Strata 3</td><td>2003</td><td>1201.34</td></tr><tr><td>Strata 4</td><td>2004</td><td>2163.71</td></tr><tr><td>Strata 5</td><td>2005</td><td>3023.61</td></tr><tr><td>Strata 6</td><td>2006</td><td>3400.43</td></tr><tr><td>Strata 7</td><td>2007</td><td>3658.91</td></tr><tr><td></td><td>Total:</td><td>14969.46</td></tr></table> <p>For details refer Annexure 1: ER Sheet.</p>	Strata no	Year of Plantation	Area Planted (Ha)	Strata 1	2001	520.58	Strata 2	2002	1000.88	Strata 3	2003	1201.34	Strata 4	2004	2163.71	Strata 5	2005	3023.61	Strata 6	2006	3400.43	Strata 7	2007	3658.91		Total:	14969.46
Strata no	Year of Plantation	Area Planted (Ha)																										
Strata 1	2001	520.58																										
Strata 2	2002	1000.88																										
Strata 3	2003	1201.34																										
Strata 4	2004	2163.71																										
Strata 5	2005	3023.61																										
Strata 6	2006	3400.43																										
Strata 7	2007	3658.91																										
	Total:	14969.46																										
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project removal																											
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA																											
Measuring/ Reading/ Recording frequency:	Every five years after 1 <sup>st</sup> verification.																											
Calculation method (if applicable):	NA																											
QA/QC procedures applied:	Review of measured data carried out by CDM Manager as and when data are collected.																											

<b>2. Data / Parameter:</b>	<b>Total Area of all sample plots in Stratum i (<math>A_{sp,i}</math>)</b>
Data unit:	ha
Description:	Area of sample plots in each stratum is measured using satellite remote sensing and GIS techniques.
Measured /Calculated /Default:	Measured
Source of data:	Spatial database

Value(s) of monitored parameter:			
	Strata	Total no of Sample Plots	Total area of sample plots (Ha)
	Strata 1	45	60.74
	Strata 2	74	87.89
	Strata 3	102	126.09
	Strata 4	180	224.60
	Strata 5	265	294.72
	Strata 6	321	345.23
	Strata 7	318	353.07
	Total:	1305	1492.34
For details refer Annexure 1: ER Sheet.			
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project removal		
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA		
Measuring/ Reading/ Recording frequency:	Every five years after 1 <sup>st</sup> verification.		
Calculation method (if applicable):	NA		
QA/QC procedures applied:	Review of measured data carried out by CDM Manager as and when data are collected.		

<b>3. Data / Parameter:</b>	<b>Tree height (H)</b>
Data unit:	M
Description:	Measurement of height of the trees contained in 20mx20m sample frame identified within permanent sample plots. Location of sample frame has been systematically chosen and remains unchanged during each monitoring to avoid any bias.
Measured /Calculated /Default:	Measured
Source of data:	Project database
Value(s) of monitored parameter:	For values refer to “Sample Plot Register” contained in ER Sheet attached as Annexure 1.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project removal
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	<p>1. Type: Abney’s Level - ID No MT/AL-01 Calibration frequency – Annually, Date of last calibration: 16.04.2011, Validity – One year till 15.04.2012,</p> <p>2. Type: Measuring Tape- 3m Calibration frequency – Annually, Date of last calibration: 16.04.2011, Validity – One year till 15.04.2012, For details of calibration please refer to Annexure 3</p>
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	Not applicable
QA/QC procedures applied:	Sample Plot Measurement Process, Procedure no: FFS-



	P-04, (Clause no 5.1 Procedure for measuring tree height) – Annexure 2
--	--

<b>4. Data / Parameter:</b>	<b>Diameter at breast height (DBH)</b>
Data unit:	Cm
Description:	Measurement of DBH of the trees contained in 20mx20m sample piece identified within permanent sample plots. Sample piece location has been systematically chosen and remains unchanged during every monitoring to avoid any bias.
Measured /Calculated /Default:	Measured
Source of data:	Project database
Value(s) of monitored parameter:	For values refer to “Sample Plot Register” contained in ER Sheet attached as Annexure 1.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project removal
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Type: Steel scale – 30 cm, Calibration frequency: Annually, Last calibrated on: 16.04.2011, Validity: One year till 15.04.2012, For details of calibration please refer to Annexure 3
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	Not applicable
QA/QC procedures applied:	Sample Plot Measurement Process, Procedure no: FFS-P-04, (Clause no 5.2 Procedure for measuring DBH) - Annexure 2

<b>5. Data / Parameter:</b>	<b>Number of Trees (Tree<sub>i,n</sub>)</b>
Data unit:	Number
Description:	No of trees are counted manually by field officers in first year of plantation and thereafter at each harvesting across the sample parcels.
Measured /Calculated /Default:	Measured
Source of data:	Project Database
Value(s) of monitored parameter:	For values refer to “Sample Plot Register” contained in ER Sheet attached as Annexure 1.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project removal
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	No of trees counted manually and recorded
Measuring/ Reading/ Recording frequency:	On completion of 1 <sup>st</sup> year after establishment.
Calculation method (if applicable):	Not applicable
QA/QC procedures applied:	Sample Plot Measurement Process (Procedure no: FFS-P-04)

<b>6. Data / Parameter:</b>	<b>Survival rate</b>
-----------------------------	----------------------

Data unit:	%
Description:	Survival rate is calculated as % of tree planted and no of trees available in sample parcel.
Measured /Calculated /Default:	Calculated
Source of data:	Recorded data
Value(s) of monitored parameter:	For values refer to “Sample Plot Register” contained in ER Sheet attached as Annexure 1.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project removal
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	On completion of 1 <sup>st</sup> year after establishment.
Calculation method (if applicable):	-
QA/QC procedures applied:	Sample Plot Measurement Process (Procedure no: FFS-P-04)

<b>7. Data / Parameter:</b>	<b>Coppicing area</b>
Data unit:	ha
Description:	Coppicing area
Measured /Calculated /Default:	Measured
Source of data:	Recorded data
Value(s) of monitored parameter:	-
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project removal
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	Each coppicing event
Calculation method (if applicable):	Field measurement
QA/QC procedures applied:	NA

<b>8. Data / Parameter:</b>	<b>Years of monitoring activity (<math>t_2</math> and <math>t_1</math>)</b>
Data unit:	yr
Description:	Years of the monitoring activity
Measured /Calculated /Default:	Default
Source of data:	Recorded data
Value(s) of monitored parameter:	-
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project removal
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	Each Monitoring year
Calculation method (if applicable):	NA
QA/QC procedures applied:	NA

<b>9. Data / Parameter:</b>	<b>Land title</b>
Data unit:	NA
Description:	Land ownership of the farmers is ensured through availability of Land Patta or Passbook in respect of individual farmers at the time of each verification.
Measured /Calculated /Default:	Document: Land Patta/ Passbook
Source of data:	Individual farmer
Value(s) of monitored parameter:	-
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	-
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	5 years
Calculation method (if applicable):	NA
QA/QC procedures applied:	Review of measured data is carried out by Manager (Plantation)

<b>10. Data / Parameter:</b>	<b>Carbon Right</b>
Data unit:	-
Description:	Availability of “Authorization of farmers for claiming Carbon Credit” from individual farmer is ensured at the time of each verification.
Measured /Calculated /Default:	Document: Authorization letter
Source of data:	Individual farmer
Value(s) of monitored parameter:	-
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	-
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	At each verification
Calculation method (if applicable):	NA
QA/QC procedures applied:	Review of measured data is carried out by Manager (Plantation)

<b>11. Data / Parameter:</b>	<b>Available Grazing Land (AGL)</b>
Data unit:	Acre
Description:	Land available for grazing under the control of PP
Measured /Calculated /Default:	Calculated
Source of data:	Survey
Value(s) of monitored parameter:	Available grazing land under the control of PP is 2548.42 acres as against the required area of 2409.57 acres.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Leakage emission
Monitoring equipment (type, accuracy	NA

class, serial number, calibration frequency, date of last calibration, validity)	
Measuring/ Reading/ Recording frequency:	At each verification
Calculation method (if applicable):	NA
QA/QC procedures applied:	NA

<b>12. Data / Parameter:</b>	<b>No of existing animals (<math>H_{Existing,g,k,t}</math>)</b>
Data unit:	Head
Description:	Number of head of animal type g existing on parcel k and / or being fed by fodder produced on parcel k before displacement of animals in year t
Measured /Calculated /Default:	Estimated in displacement plan and monitored
Source of data:	Survey
Value(s) of monitored parameter:	Cows/ Bufallos = 659 nos Goats = 508 nos
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Leakage emission
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	Determined at year of displacement
Calculation method (if applicable):	NA
QA/QC procedures applied:	NA

<b>13. Data / Parameter:</b>	<b>No of displaced animals (<math>H_{g,k,t}</math>)</b>
Data unit:	Head
Description:	Number of head of animal type g displaced and/or the number of animals of type g fed by fodder for which production is displaced to parcel k in year t.
Measured /Calculated /Default:	Estimated in displacement plan and monitored
Source of data:	Survey
Value(s) of monitored parameter:	Cows/ Bufallos = 1863 nos Goats = 3020 nos
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Leakage emission
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	Determined at year of displacement
Calculation method (if applicable):	NA
QA/QC procedures applied:	NA

<b>14. Data / Parameter:</b>	<b>Biomass Burning (<math>E_{BiomassBurn,t}</math>)</b>
Data unit:	t C/yr
Description:	Loss of above ground biomass carbon due to biomass burning
Measured /Calculated /Default:	Calculated
Source of data:	Survey
Value(s) of monitored parameter:	Please refer to “CER calculation sheet” and excel spreadsheets of measurement registers
Indicate what the data are used for	Project emissions

(Baseline/ Project/ Leakage emission calculations)	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	ER Sheet
QA/QC procedures applied:	NA

<b>15. Data / Parameter:</b>	<b>Deviation from planting</b>
Data unit:	-
Description:	Deviation from planting
Measured /Calculated /Default:	Measured
Source of data:	Recorded data
Value(s) of monitored parameter:	-
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project removal
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	NA
Measuring/ Reading/ Recording frequency:	During implementation phase
Calculation method (if applicable):	-
QA/QC procedures applied:	NA

*Note: Replantation is done against any mortality after 3 months of plantation. No of trees taken in calculating survival % is the number of standing trees counted after completion of 1<sup>st</sup> year which includes trees replanted. There is no practice of replantation in subsequent years/coppicing. Mortality in subsequent years impacts the survival rate accordingly. Hence project removal is not affected by “replantation” and therefore no need to monitor “replantation”.*

## SECTION E. Emission reductions calculation

### E.1. Baseline emissions calculation

>>

The baseline net greenhouse gas removal by sink is calculated by using the equation given in the methodology. The baseline net GHG removal by sink is determined as follows:

$\Delta C_{BSL} = \Delta C_{BSL,tree}$	
$\Delta C_{BSL}$	Baseline net greenhouse gas removable by sinks, tCO <sub>2</sub> -e
$\Delta C_{BSL,tree}$	Sum of the carbon changes in above ground and below ground biomass of trees in the baseline; tCO <sub>2</sub> -e

For those strata without growing trees the methodology conservatively assumes that,  $\Delta C_{BSL,tree}$ , baseline = 0.

For those strata with a few growing trees, baseline, is estimated using stock change method.

$$\Delta C_{BSL,AG/BG,j,t} = \sum_{j=1}^J (C_{j,i,t2} - C_{j,i,t1}) / T$$

$$C_{j,i,t} = C_{AB\_tree,j,i,t} + C_{BB\_tree,j,i,t}$$

$$C_{AB\_tree,j,i,t} = A_{BSL,i} * V_{tree,j,i,t} * D_j * BEF_{2,j} * CF_j$$

$$C_{BB\_tree,j,i,t} = C_{AB\_tree,j,i,t} * R_j$$

$\Delta C_{BSL,AG/BG,i,t}$	Annual carbon stock change in above-ground and below-ground tree biomass for stratum $i$ , time $t$ ; t C yr <sup>-1</sup>
$C_{j,i,t2}$	Total carbon stock in living biomass of trees of species $j$ in stratum $i$ , calculated at time $t2$ ; t C
$C_{j,i,t1}$	Total carbon stock in living biomass of trees of species $j$ in stratum $i$ , calculated at time $t1$ ; t C
$T$	Number of years between times $t2$ and $t1$ ; yr
$C_{AB\_tree,j,i,t}$	Carbon stock in above-ground tree biomass of species $j$ in stratum $i$ , at time $t$ ; t C
$C_{BB\_tree,j,i,t}$	Carbon stock in below-ground tree biomass of species $j$ in stratum $i$ , at time $t$ ; t C
$A_{BSL,i}$	Area of baseline stratum $i$ ; ha
$V_{tree,j,i,t}$	Pre-project tree stem volume for species $j$ , stratum $i$ , at time $t$ ; m <sup>3</sup> ha <sup>-1</sup>
$D_j$	Basic wood density for species $j$ ; t d.m. m <sup>-3</sup>
$BEF_{2,j}$	Biomass expansion factor for conversion of stem biomass to above-ground tree biomass for tree species $j$ ; t d.m t <sup>-1</sup> d.m
$R_j$	Root-shoot ratio appropriate for biomass stock, for species $j$ ; t C t <sup>-1</sup> C
$i$	1, 2, 3, ... $MB$ strata in the baseline scenario
$j$	1, 2, 3, ... $J$ tree species in the baseline scenario
$t$	1, 2, 3, ... $t^*$ years elapsed since the start of the A/R CDM project activity

The carbon stock in living biomass of pre-project growing trees is expected to increase in the absence of the proposed A/R CDM project activity, due to continuous growth of the living trees. The carbon stock in the living biomass of pre-project trees has been predicted using equation from Brown et al.<sup>1</sup> (1989) for dry forest in India.

Dry matter (kg) =  $\exp(-1.996 + 2.32 * \ln(\text{dbh cm}))$

From the dry matter, the carbon stocks have been estimated using the formulae from the applied methodology. The BEF of 3.4 has been taken from the table 3A.1.10 of the IPCC good practice guidance for LULUCF. The BEF has been chosen from the default values in the absence of any national data in this regard. The default value is that of a tropical broadleaf forest having a range of BEF from 2.0 to 9.0.

Estimation of Baseline net GHG removals by Sinks (tonnes of CO <sub>2</sub> )								
Year	2001	2002	2003	2004	2005	2006	2007	Total
2001	2.93	0	0	0	0	0	0	2.93
2002	2.94	4.74	0	0	0	0	0	7.68
2003	2.95	4.75	6.42	0	0	0	0	14.12
2004	2.96	4.76	6.44	10.39	0	0	0	24.55
2005	2.97	4.78	6.46	10.42	11.72	0	0	36.35
2006	2.98	4.79	6.48	10.45	11.77	14.18	0	50.64
2007	2.99	4.81	6.49	10.49	11.81	14.22	16.98	67.79
2008	3.00	4.82	6.51	10.52	11.85	14.27	17.04	68.01
2009	3.01	4.83	6.53	10.55	11.90	14.32	17.09	68.23
2010	3.02	4.85	6.55	10.59	11.94	14.37	17.14	68.45
							<b>Total:</b>	<b>408.75</b>

<sup>1</sup> Brown, S. 1997. Estimating biomass and biomass change of tropical forests: a primer. FAO Forestry Paper 134, Rome, Italy

### Formulae for estimation of actual net GHG removals by sinks:

The Actual net greenhouse gas removals by sinks represent the sum of the verifiable changes in carbon stocks in the carbon pools within the project boundary, minus the increase in GHG emissions measured in CO<sub>2</sub> equivalents by the sources that are increased as a result of the implementation of an A/R CDM project activity, while avoiding double counting, within the project boundary, attributable to the A/R CDM project activity. Therefore,

$$\Delta C_{\text{ACTUAL}} = \Delta C_p - \text{GHG}_E \quad \text{.....(12)}$$

where	
$\Delta C_{\text{ACTUAL}}$	Actual net greenhouse gas removals by sinks; t CO <sub>2</sub> -e.
$\Delta C_p$	Sum of the changes in above-ground and below-ground biomass, dead wood, litter and soil organic carbon stocks in the project scenario; t CO <sub>2</sub> -e.
$\text{GHG}_E$	Increases in GHG emissions as a result of the implementation of the proposed AR CDM project activity within the project boundary; t CO <sub>2</sub> -e.

Based on the approved methodology applied, the aboveground biomass and belowground biomass are the pools to be accounted for.

### Estimates of carbon stock changes in living biomass of planted trees

BEF method as presented in Section II.5.1 of the approved methodology applied is used. Above ground biomass shall be estimated through the following steps:

**Step 1:** Measuring the diameter at breast height (DBH) at 1.3m above ground and height of trees in permanent sample plots. The average DBH and height at different ages is taken from the project data base which has been computed on the basis of actual measurement of trees in all 1305 permanent sample plots spread across the entire project area.

**Step 2:** Estimating the volume of the commercial component of trees based on locally derived equations, expressed as volume per unit area, m<sup>3</sup>/ha:

$$V = -2.4726 + 0.4354 B \times H \quad (n = 125, R^2 = 0.9956)$$

(For volume equation refer page 226 of the book titled “Volume Equations for Forests of India, Nepal and Bhutan” published by Forest Survey of India, 1996)

**Step 3:** Choosing BEF, root-shoot ratio, wood density and other parameters:

The wood density has been taken from project data base which is the average density of Eucalyptus species computed on the basis of actual field measurement. Values of BEF and Root-shoot ratio for Eucalyptus are taken from table 3A.1.10 of IPCC GPG for LULUCF:

Species	Wood density	BEF	Root to shoot ratio
Eucalyptus sp.	0.60672	2	0.27
Reference	Project data base	IPCC GPG for LULUCF Table- 3A.1.10	IPCC GPG for LULUCF Table- 3A.1.8

**Step 4:** Converting the volume of the commercial component of trees into carbon stock in aboveground biomass and belowground biomass via basic wood density, BEF root-shoot ratio and carbon fraction, given by:

$$C_{AB\_tree,l,j,i,sp,t} = V_{l,j,l,sp,t} * D_j * BEF_{2j} * CF_j$$

where	
$C_{AB\_tree,l,j,i,sp,t}$	Carbon stock in above-ground biomass of tree $l$ of species $j$ in plot $sp$ in stratum $i$ at time $t$ ; t C tree <sup>-1</sup>
$V_{l,j,l,sp,t}$	Stem volume of tree $l$ of species $j$ in plot $sp$ in stratum $i$ at time $t$ ; m <sup>3</sup> tree <sup>-1</sup>
$D_j$	Basic wood density of species $j$ ; t d.m. m <sup>-3</sup>
$BEF_{2j}$	Biomass expansion factor for conversion of stem biomass to above-ground tree biomass for species $j$ ; dimensionless
$CF_j$	Carbon fraction of biomass for tree species $j$ ; t C t <sup>-1</sup> d.m. (IPCC default value = 0.5 t C t <sup>-1</sup> d.m.)
$l$	Sequence number of trees on plot $sp$
$i$	1, 2, 3, ... MPS strata in the project scenario
$J$	1, 2, 3, ... SPS tree species in the project scenario
$t$	1, 2, 3, ... $t^*$ years elapsed since the start of the A/R CDM project activity

## E.2. Project emissions calculation

>>

### Estimation of GHG emissions within the project boundary

The increase in GHG emissions as a result of the implementation of the proposed A/R CDM project activity within the project boundary can be estimated as:

$$GHG_E = \sum_{t=1}^{t^*} E_{BiomassBurn,t}$$

where	
$GHG_E$	Increase in GHG emissions as a result of the implementation of the proposed A/R CDM project activity within the project boundary; t CO <sub>2</sub> -e
$E_{BiomassBurn,t}$	Non-CO <sub>2</sub> emissions due to biomass burning of existing woody vegetation as part of site preparation during the year $t$ ; t CO <sub>2</sub> -e
$t$	1, 2, 3, ... $t^*$ years elapsed since the start of the A/R CDM project activity

There will be no biomass burning during site preparation, thus there will be no GHG emissions from biomass burning, i.e.,  $E_{BiomassBurn,t} = 0$ ;

So,  $GHG_E = 0$

As per vegetation survey few trees along with scattered herbs & shrubs have been found in almost 1483 parcels spreading across 2938 hectares of the project area. Because of degraded nature of land majority of parcels are barren without any woody vegetation. Herbs and shrubs that grow during rains, dries and disappear automatically with the onset of summer. During site preparation at the best these herbs and shrubs are cleared which is maximum 5% of the total area. Existing woody biomass are essentially not removed at all. So,  $E_{biomassLoss} = 0$

## E.3. Leakage calculation

>>

“Leakage (LK) represents the increase in GHGs emissions by sources which occurs outside the boundary of an AR CDM project activity which is measurable and attributable to the AR CDM project activity”.

Based on the applied approved consolidated afforestation and reforestation baseline and monitoring methodology AR-ACM001 (Version 4) following potential sources of leakage (LK) are identified:

- GHG emission due to activity displacement
- GHG emission due to increase in use of wood posts for fencing



Estimation of leakage :

$$LK = LK_{ActivityDisplacement}$$

Where	
LK	Total GHG emissions due to leakage; t CO <sub>2</sub> -e
$LK_{ActivityDisplacement}$	Leakage due to activity displacement; t CO <sub>2</sub> -e

#### a. Estimation of $LK_{ActivityDisplacement}$

Some lands planted in the proposed A/R CDM project activity had grazing animals. Thus, as the result of the project activity, grazing may be temporarily or permanently displaced from the project sites to other locations. The displacement may result in leakage if the new grazing areas are obtained by converting stocked areas, particularly forests, to grazing land, results in degradation or deforestation of other forests and loss of vegetation on other lands.

##### a.1 Estimation of $LK_{Conversion}$ (Leakage due to conversion of land to grazing land)

The pre-project animal population and the number of months of grazing of different livestock groups on lands, both within the project boundary and outside the project boundary that are under the control of the project participants, have been surveyed using Participatory Rural Appraisal (PRA). Altogether 1863 (659+1204) cows & buffalos and 3020 (508+2512) goats were found within and outside the project boundary those are likely to be displaced by project activity. Grazing land outside the project boundary, well under the control of animal owners, for displaced animals has been found 2548.42 acres against the required area of 2409.57 acres calculated on the basis of dry matter intake. Leakage calculation sheet ensure sufficient AGL with all individual animal owners. A summary of district wise land area available and land area required for displacement due to grazing is presented in the table below:

S No	Districts	No of animals likely to be displaced by the project activity				Available grazing land outside the project boundary under the control of the animal owners (AGL), Acres	Area required (Acres)
		Animals within project boundary		Animals outside project boundary			
		Cows/ Bufallo	Goats	Cows/ Bufallo	Goats		
1	Nabarangpur	187	140	333	627	710.40	657.01
2	Koraput	218	171	488	920	945.05	902.18
3	Malkangiri	33	27	75	140	145.05	138.03
4	Vishakhapatnam	179	135	259	674	616.72	586.77
5	Vizianagaram	6	4	7	21	18.00	17.62
6	Srikakulam	15	8	19	50	47.00	44.57
7	Bastar	21	23	23	80	66.20	63.39
	<b>Total:</b>	<b>659</b>	<b>508</b>	<b>1204</b>	<b>2512</b>	<b>2548.42</b>	<b>2409.57</b>

The annual biomass intake of the animals over the project lands and existing grasslands is estimated using equation (4) in the A/R methodological tool “Estimation of GHG emissions related to displacement of grazing activities in A/R CDM project activity” and the required area to accept displaced animals is estimated using equation (5) of the methodological tool.

$$DMI_{TOTAL,k,t} = \frac{\sum DMI_g * (H_{existing,g,k,t} + H_{g,k,t})}{1000} * 365$$

DMI <sub>TOTAL,k,t</sub>	Total dry matter intake of grazing animal on parcel k in year t ; tdm /year
DMI <sub>g</sub>	Daily dry matter intake per grazing animal of animal type g ; kg d.m./head/day
H <sub>existing,g,k,t</sub>	Number of head of animal type g existing on parcel k and/or being fed by fodder produces on parcel k before displacement of animals in year t; head
H <sub>g,k,t</sub>	Number of head of animal type g displaced and/or the number of animals of type g fed by fodder for which production is displaced to parcel k in year t; head

DMI<sub>g</sub> is taken from Table 3 in methodological tool.

$$\text{Area}_{\text{required},k,t} = \frac{\text{DMI}_{\text{TOTAL},k,t}}{\text{ANPP}_k}$$

Area <sub>required,k,t</sub>	Total area of land required for year t to sustain the grazing activities displaced to parcel k; (ha)
DMI <sub>TOTAL,k,t</sub>	Total dry matter intake of grazing animals on parcel k in year t ;td.m/yr
ANPP <sub>k</sub>	Above ground net primary productivity of parcel k in tones dry matter, td.m./ha/yr

The default value for annual net primary production (ANPP) i.e. 8.2 tonnes d.m. ha<sup>-1</sup>” from Table 3.4.2 of IPCC good practice guidance LULUCF was used as in the calculation. Daily Dry matter intake has been taken as 21.6 kg/head/day for cows/buffalos and 4.6 kg/head/day for goat from Table 3 of A/R methodological tool “Estimation of GHG emissions related to displacement of grazing activities in A/R CDM project activity” (version 02).

Leakage calculation indicates that sufficient grassland land exists under the control of the project participants that can adopt displaced animals even if all pre-project animals are displaced to existing grasslands outside the project boundary. Therefore,  $LK_{\text{Conversion}} = 0$ .

As per EB42, monitoring of leakage associated with the use of fencing posts is not required as it is considered insignificant.

#### E.4. Emission reductions calculation / table

>>

For detailed emission reduction calculation please refer ER sheet attached as Annexure 1. However summary of emission reduction calculation is furnished in the table below:

Year	Total carbon (tC/yr)	Total carbon change (tC/yr)	Actual GHG Removal from Project Activity (tCO <sub>2</sub> e/ yr)	Soil Organic Carbon (tCO <sub>2</sub> e/ yr)	Baseline Net GHG Removal (tCO <sub>2</sub> e/ yr)	Project Emissions (tCO <sub>2</sub> e/ yr)	Leakage (tCO <sub>2</sub> e/ yr)	Net Anthropogenic GHG Removal (tCO <sub>2</sub> e/ yr)	Total number of tCERs
2001	340.45	340.45	1248.33	954.40	2.93	0	0	2,199.80	
2002	5165.79	4825.34	17692.90	2789.36	7.68	0	0	20,474.58	
2003	23596.58	18430.79	67579.56	4991.82	14.12	0	0	72,557.26	
2004	71632.11	48035.53	176130.27	8958.63	24.55	0	0	185,064.36	
2005	175407.49	103775.38	380509.73	14511.91	36.35	0	0	394,985.29	
2006	292912.80	117505.31	430852.81	20772.95	50.64	0	0	451,575.12	
2007	433492.92	140580.12	515460.43	27444.02	67.79	0	0	542,836.66	
2008	664580.36	231087.44	847320.61	27444.02	68.01	0	0	874,696.62	
2009	821741.50	157161.14	576257.53	27444.02	68.23	0	0	603,633.31	

2010	872978.78	51237.28	187870.01	27444.02	68.45	0	0	215,245.58	
<b>Total:</b>	<b>3361848.77</b>	<b>872978.78</b>	<b>3200922.18</b>	<b>162755.14</b>	<b>408.75</b>	<b>0</b>	<b>0</b>	<b>3,363,268.57</b>	<b>3,363,269</b>
<b>Average per Annum:</b>			<b>320092.22</b>	<b>16275.51</b>	<b>40.88</b>	<b>0</b>	<b>0</b>	<b>336,326.86</b>	<b>336,327</b>

#### **E.5. Comparison of actual emission reductions with estimates in the CDM-PDD**

>>

This section shall include a comparison of actual values of the emission reductions achieved during the monitoring period with the estimations in the registered CDM-PDD.

<b>Item</b>	<b>Values applied in ex-ante calculation of the registered CDM-PDD</b>	<b>Actual values reached during the monitoring period</b>
<b>Emission reductions (tCO<sub>2</sub>e)</b>	<b>4,363,591</b>	<b>3,363,269</b>

#### **E.6. Remarks on difference from estimated value in the PDD**

>>

Please provide an explanation of the cause of any **increase** in the actual emission reductions achieved during the current monitoring period (e.g. higher water availability, higher load plant factor, etc), including all information (i.e. data and/or parameters) that is different from that stated in the registered CDM-PDD.

-----

#### **History of the document**

<b>Version</b>	<b>Date</b>	<b>Nature of revision</b>
01	EB 54, Annex 34 28 May 2010	Initial adoption.
<b>Decision Class:</b> Regulatory <b>Document Type:</b> Guideline, Form <b>Business Function:</b> Issuance		