CDM – Executive Board

PROJECT DESIGN DOCUMENT FORM FOR AFFORESTATION AND REFORESTATION PROJECT ACTIVITIES (CDM-AR-PDD) - Version 03

CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM FOR AFFORESTATION AND REFORESTATION PROJECT ACTIVITIES (CDM-AR-PDD) Version 03

CONTENTS
PROJECT DESIGN DOCUMENT FOR AFFORESTATION AND REFORESTATION PROJECT ACTIVITIES (CDM-AR-PDD)

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SECTION A. General description of the proposed A/R CDM project activity:

A.1. Title of the proposed A/R CDM project activity:

>> Title: Bagepalli CDM Reforestation Programme
Version: 1
Date: 26 September 2007

A.2. Description of the proposed A/R CDM project activity:

>> The purpose of the proposed A/R CDM project activity "Bagepalli CDM Reforestation Programme" is to implement a reforestation activity on the degraded land of 5 taluks of Chickballapur District of Karnataka, India. These lands are currently uncultivable lands, fallow lands or marginal croplands. They are all highly degraded. The majority of the lands are uncultivable or their productivity is very low due to scarcity of water resources and poor soil conditions for agriculture. The lands belong to the poorest farmers and agricultural labourers in the region who have had to make do with acquiring the worst kind of lands. Seasonal conditions have been the major factor causing fluctuation in the area under cultivation. The periodic drought and recurring scarcity have made any kind of land-based activity including agriculture very difficult.

The proposed reforestation activity on such degraded lands is of great promise. It will generate income to the marginal farmers, not only from the products but mainly from the sale of carbon credits. The proposed project activity will thus play a vital role in poverty alleviation. The project is thus designed to create long-term secure income for marginal farmers in the Bagepalli, Chickballapur, Chintamani Gudibanda and Siddalaghatta taluks of Chickballapur District, as well as creating a lasting tree cover in the region. It will thus have beneficial effect beyond the project boundary in that there may be beneficial effect on the local micro-climate as well as on community and biodiversity.

Chickballapur District is a very dry region. The rainfall is scanty, and the nominal forest area is just 9% of the total area of the old Kolar district (FSI,2005)[1]. In practice many of the forests are also themselves very degraded. The proposed project is essential for a District like Chickballapur. But the project proponents are not taking up any activities on Forest Department or Revenue lands belonging to the Government. The reforestation is only taking place on the marginal private lands of members of the Bagepalli Coolie Sangha organized by the Project Proponents.

Apart from producing fruits, and some small amounts of timber, firewood, fodder, and materials required for agricultural implements, the indirect benefits of the "Bagepalli CDM Reforestation Programme" will be by way of moisture conservation in the soil, prevention of soil erosion, improvement of soil fertility by the addition of organic manure, reduction of soil cutting due to run-off water from the hillocks, and maintenance of the regular flow of water in the streams.

The view of the project participant is that this A/R CDM project activity provides a substantial contribution to sustainable development.

- It will generate income and improve the environmental well-being of local marginal farmer families.

[1] Source: State of Forest Report, Forest Survey of India, Dehra Dun, India.

- It will improve the soil and provide water erosion control: the production of litter and nutrient recycling enrich the soil with organic matter and essential nutrients, and the trees act as a barrier to water run-off and roots hold the soil in place.
- It will sequester carbon dioxide (CO_2) and generate emission reductions in greenhouse gases (GHG) that can be measured, monitored and certified.
- It will decrease vulnerability to current climate change and climatic variability
- It will engage in capacity building through training and technical assistance.
- It will reforest 18,181 hectare with local mixed species trees on degraded lands in 5 taluks of Chickballapur District namely Bagepalli, Chickballapur, Chintamani, Siddalaghatta and Gudibanda.
- It will monitor and assess the project's environmental and socio-economic impacts.
- It will sell Certified Emission Reductions (lCERs)

The A/R CDM project activity is proposed on marginal farmer's lands that have land holdings of 0.2 to 1 hectare. These farmers do not have the financial wherewithal to invest in planting activities and wait for several years for the financial benefits to accrue. Without the pre-project investment from carbon credits, it is not an economically feasible proposition. With the sales of carbon credit however, and with the collection of non-timber forest products (NTFPs), timber, firewood and fodder in the first few years, farmers will have enough benefits to make the A/R CDM project activity sustainable.

The species for planting were chosen by participating local families who selected local species which are suited for the agro-climatic zone. The main species are *Mangifera Indica, Tamarindus indica, Syzygium cumini, and Tectona grandis.* Other species such as *Pongemia pinnata* (Kanniga*), Ficus ssp, Murraya koenigii* (Karepaku) or Indian Gooseberry (Nellikai) will be chosen by families depending on their soil and water conditions and personal preferences. No Invasive Alien Species (IAS) or Genetically Modified Organisms (GMO) will be used.

A.3. Project participants:

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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 (host)	Agricultural Development and Training Society (ADATS)	No
(*) In accordance with the CDM A/R modalities and procedures, at the time of making the CDM-AR-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

A.4. Technical description of the A/R CDM project activity:

A.4.1. Location of the proposed A/R CDM project activity:

A.4.1.1. Host Party(ies):

>>India

A.4.1.2. Region/State/Province etc.:

>> Bagepalli, Chickballapur, Chintamani, Gudibanda and Siddalaghatta taluks of Chickballapur District, Karnataka.

A.4.1.3. City/Town/Community etc:

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Villages in Bagepalli Taluk

Code	Cluster No.	Village	Hobli	Gram Panchayat
029	C001	Sakulavarapalli	Bagepalli Kasaba	Paragodu
033	C001	Devareddipalli	Bagepalli Kasaba	Paragodu
183	C001	Adepalli	Bagepalli Kasaba	Gantamvaripalli
184	C001	Puttaparthi	Bagepalli Kasaba	Gantamvaripalli
006	C003	Lagumaddepalli	Bagepalli Kasaba	Yellampalli
008	C003	Shankavarampalli	Bagepalli Kasaba	Yellampalli
008	C003	Neeragantapalli	Bagepalli Kasaba	Somnathpura
056	C003	Seegalapalli	Pathapalya	Somnathpura
014	C005	Nakkalapalli	Pathapalya	Somnathpura
015	C005	Somnathpura	Pathapalya	Somnathpura
016	C005	Gotlapalli	Pathapalya	Billur
032	C005	Billur MV	Pathapalya	Billur
020	C006	Billur HC	Pathapalya	Billur
021	C006	Mekalavaripalli	Pathapalya	Tholapalli
022	C006	Kallipalli HC	Pathapalya	Billur
057	C006	Upparlapalli	Pathapalya	Billur
094	C006	Mallepalli	Pathapalya	Billur
169	C006	Vangarlapalli	Pathapalya	Billur
191	C006	Goravanlapalli	Pathapalya	Margankunte
720	C006	Pichilavarapalli	Gulur	Kothakota
173	C007	Honnampalli	Gulur	Kothakota
174	C007	Pesalaparthi HC	Gulur	Margankunte
177	C007	Gunakalavaripalli	Gulur	Kothakota
179	C007	Madepalli	Gulur	Kothakota
186	C007	Maddakavaripalli	Gulur	Kothakota
187	C007	Kothakota	Gulur	Palyakere

787	C007	Banalapalli	Chellur	Palyakere
041	C011	Palyakere MV	Chellur	Palyakere
042	C011	Abravarapalli	Chellur	Palyakere
095	C011	Masanapalli	Chellur	Palyakere
154	C011	Chowdampalli	Chellur	Nallagutlapalli
194	C011	Peddarajapalli	Chellur	Nallagutlapalli
196	C011	Pedduru	Chellur	Nallagutlapalli
043	C012	Beerangavanlapalli	Chellur	Nallagutlapalli
045	C012	Pasupalavarapalli	Chellur	Nallagutlapalli
046	C012	Gundlapalli	Chellur	Nallagutlapalli
048	C012	Venkatapuram	Chellur	Nallagutlapalli
050	C013	Iddilavaripalli	Chellur	Puligal
051	C013	Bajjapuram	Chellur	Chelur
052	C013	Nallasanampalli	Chellur	Chelur
078	C013	Sherkhankote	Chellur	Naremaddepalli
160	C013	Byrappanapalli	Chellur	Naremaddepalli
189	C013	Shivapuram	Pathapalya	Naremaddepalli
066	C017	Gadivanlapalli	Pathapalya	Naremaddepalli
067	C017	Besthalapalli	Pathapalya	Rascheruvu
068	C017	Doddivaripalli	Pathapalya	Rascheruvu
071	C017	Rascheruvu HC	Chellur	Rascheruvu
090	C019	Rascheruvu MV	Chellur	Rascheruvu
091	C019	Ramasamipalli	Chellur	Rascheruvu
096	C019	Kondoripalli	Chellur	Thimmampalli
192	C019	Somakapalli	Chellur	Thimmampalli
195	C019	Egava Maddalakhane	Gulur	Thimmampalli
117	C024	Chencharayanapalli HC	Gulur	Thimmampalli
118	C024	Chencharayanapalli MV	Gulur	Thimmampalli
119	C024	Bommaiagaripalli	Gulur	Thimmampalli
120	C024	Gundlapalli	Gulur	Gorthapalli
121	C024	G. Maddepalli HC	Gulur	Gorthapalli
123	C025	Jeekavanlapalli	Gulur	Gorthapalli
134	C025	G. Cherulopalli	Gulur	Gorthapalli
135	C025	D. Kothapalli	Gulur	Gorthapalli
139	C028	Donnakonda	Gulur	Gorthapalli
140	C028	Sajjapalli MV	Gulur	Gorthapalli
141	C028	Sajjapalli HC	Gulur	Gorthapalli
142	C028	Egava D. Kothapalli	Gulur	Gulur
155	C028	Gorthapalli	Gulur	Gulur
193	C028	Siddapalli Thanda	Gulur	Gulur
110	C029	Saddapalli Digava Thanda	Gulur	Gulur
145	C029	Saddapalli	Gulur	Gulur
146	C029	Saddapalli Egava Thanda	Gulur	Marganakunte
151	C029	Koigutta Thanda	Gulur	Marganakunte
190	C029	Maraganakunte MV-A	Gulur	Marganakunte
170	C030	Maraganakunte MV-B	Gulur	Marganakunte
171	C030	Maraganakunte HC	Gulur	Marganakunte
172	C030	Narayanaswamykote	Gulur	Julapalya
180	C030	Pokamakalapalli	Gulur	Julapalya

198	C030	Gajilakothapalli	Mittemari	Julapalya
724	C031	Cheruvumundarapalli	Mittemari	Julapalya
703	C032	Julapalya A	Mittemari	Julapalya
708	C032	Julapalya B	Mittemari	Julapalya
709	C032	Julapalya C	Mittemari	Julapalya
710	C032	Bodikadirepalli	Mittemari	Julapalya
711	C032	Bandakindapalli	Mittemari	Julapalya
712	C032	Pedda Nagarlu	Mittemari	Julapalya
735	C035	Polanayakanapalli HC	Mittemari	Julapalya
740	C035	Polanayakanapalli MV	Mittemari	Julapalya
741	C035	Bathalapalli	Mittemari	Julapalya
742	C035	Poolakuntlapalli	Mittemari	Julapalya
743	C035	Bommasandra	Mittemari	Julapalya
744	C035	Kuntlapalli	Mittemari	Julapalya
745	C035	Sridharavarapalli	Mittemari	Julapalya
713	C036	Vadigiri	Mittemari	Julapalya
715	C036	Bandolapalli	Mittemari	Julapalya
716	C036	Nadimpalli	Mittemari	Julapalya
717	C036	Paipalya-A	Mittemari	Somnathpura
746	C036	Paipalya-B	Mittemari	Somnathpura
747	C036	Egava Netkuntlapalli	Pathapalya	Palyakere
088	C037	Digava Netkuntlapalli	Pathapalya	Palyakere
089	C037	Gollapalli	Pathapalya	Palyakere
092	C037	Gownavaripalli	Chellur	Julapalya
181	C037	Mandyampalli	Chellur	Mittemari
036	C038	Hosahudya	Mittemari	Mittemari
723	C039	Chinnarapalli	Mittemari	Mittemari
816	C040	Gwallapalli	Mittemari	Mittemari
817	C040	Surappalli	Mittemari	Mittemari
818	C040	Chinnampalli	Mittemari	Kanagamakalapalli
820	C040	Gubbolapalli	Mittemari	Kanagamakalapalli
821	C040	Muguchinnapalli	Mittemari	Kanagamakalapalli
005	C041	Vardaiagaripalli	Mittemari	Kanagamakalapalli
799	C041	Vanaganapalli	Mittemari	Kanagamakalapalli
801	C041	Buttavarapalli	Mittemari	Yellampalli
802	C041	Patrolapalli	Mittemari	Yellampalli
804	C041	Saprampalli	Mittemari	Kanagamakalapalli
805	C041	Solamakalapalli	Mittemari	Kanagamakalapalli
808	C042	Giripalli	Mittemari	Kanagamakalapalli
809	C042	Chinna Giripalli	Mittemari	Kanagamakalapalli
810	C042	Hanumantharayanapalli	Mittemari	Kanagamakalapalli
814	C042	Patlopalli	Mittemari	Kanagamakalapalli
815	C042	Jeeganapalli	Mittemari	Mittemari
794	C043	Appaswamy Thanda	Mittemari	Mittemari
795	C043	Kempaiah Thanda	Mittemari	Kanagamakalapalli
796	C043	Mittemari A	Mittemari	Mittemari
797	C043	Mittemari B	Mittemari	Mittemari
798	C043	Mittemari C	Mittemari	Mittemari
819	C043	Malligurki	Mittemari	Mittemari

826	C043	Papnepalli	Mittemari	Mittemari
827	C043	Merupalli	Mittemari	Kanagamakalapalli
824	C044	Nallamallepalli	Mittemari	Kanagamakalapalli
828	C044	Kothakota	Mittemari	Kanagamakalapalli
811	C045	Dommirigudisulu	Mittemari	Kanagamakalapalli
812	C045	Pillagutta	Mittemari	Kanagamakalapalli
822	C045	Kanagamakalapalli	Mittemari	Kanagamakalapalli
825	C045	Kodipalli	Mittemari	Kanagamakalapalli

Villages in Chickballapur

Code	Cluster No.	Village	Hobli	Gram Panchayat
301	C101	Susaipalya	Chickballapur Kasaba	Thippenahalli
302	C101	Badaganahalli	Chickballapur Kasaba	Thippenahalli
303	C101	Ankanagondhi	Chickballapur Kasaba	Thippenahalli
304	C101	Hanumanthapura	Chickballapur Kasaba	Thippenahalli
375	C102	Byreganahalli	Mandikal	Dodda Peyalagurki
307	C103	Hariharpura	Chickballapur Kasaba	Avalagurki
311	C103	Vadrepalya	Chickballapur Kasaba	Avalagurki
312	C103	Kavaranahalli	Chickballapur Kasaba	Avalagurki
313	C103	Kurlahalli	Chickballapur Kasaba	Avalagurki
318	C103	Sadenahalli	Chickballapur Kasaba	Gollahalli
320	C104	Kariganapalya	Chickballapur Kasaba	Gollahalli
322	C104	Beeraganahalli	Chickballapur Kasaba	Dodda Peyalagurki
323	C104	Ramaganapartny	Chickballapur Kasaba	Dodda Peyalagurki
354	C109	Kadirideyarapalli	Mandikal	Peresandra
355	C109	Yelagalahalli	Mandikal	Peresandra
357	C109	Haleperesandra	Mandikal	Peresandra
360	C109	Korenahalli	Mandikal	Peresandra
363	C110	Shettivarahalli	Mandikal	Peresandra
364	C110	Boyanahalli	Mandikal	Peresandra
365	C110	Dommarigudisalu	Mandikal	Peresandra
366	C110	Tumakunta	Mandikal	Peresandra
404	C121	Udigiri Nallapanahalli	Mandikal	Kammaguttahalli
405	C121	Vantur	Mandikal	Kammaguttahalli
416	C122	Renumakalahalli	Chickballapur Kasaba	Kammaguttahalli
418	C123	Gowdanahalli	Chickballapur Kasaba	Dodda Peyalagurki
421	C123	Haristhala	Mandikal	Dodda Peyalagurki
305	C124	Kothanur	Nandi	Kuppahalli
477	C124	Kuppahalli	Nandi	Kuppahalli
482	C124	Thirnahalli	Nandi	Kuppahalli
484	C124	Byranayakanahalli	Nandi	Nandi
430	C125	Devasthanada Hosahalli A	Chickballapur Kasaba	Harobande
432	C125	Soppahalli	Chickballapur Kasaba	Harobande
433	C125	Inminchenahalli	Chickballapur Kasaba	Dodda Peyalagurki
434	C125	Gundlugurki A	Chickballapur Kasaba	Manchanabale
435	C125	Gundlugurki B	Chickballapur Kasaba	Manchanabale
436	C128	Pathuru	Chickballapur Kasaba	Angarekhanahalli

445	C128	Marlakunte	Chickballapur Kasaba	Angarekhanahalli
446	C128	Honnapanahalli	Chickballapur Kasaba	Angarekhanahalli
450	C128	Angarekanahalli	Chickballapur Kasaba	Angarekhanahalli
452	C128	Seemanahalli	Chickballapur Kasaba	Angarekhanahalli
453	C128	Avulahalli	Chickballapur Kasaba	Angarekhanahalli
458	C129	Dodda Kirugambi	Nandi	Ajjavara
460	C129	Ajjivara	Nandi	Ajjavara
463	C130	Thimmanahalli	Nandi	Kondenahalli
464	C130	Kadiseeganahalli	Nandi	Kondenahalli
465	C130	Sreerampura	Nandi	Agalagurki
467	C130	Kanithahalli	Nandi	Kondenahalli
468	C130	Kondenahalli	Nandi	Kondenahalli
470	C131	Kuduvathi	Nandi	Kuppahalli
471	C131	Erenahalli	Nandi	Kuppahalli
472	C131	Angatta	Nandi	Kuppahalli
478	C132	Seegatenahalli	Nandi	Muddenahalli
479	C132	Gantiganahalli	Nandi	Muddenahalli
480	C132	Bandahalli	Nandi	Muddenahalli
481	C132	Bachalli	Nandi	Muddenahalli
489	C132	Suddahalli	Nandi	Muddenahalli
485	C133	Kanganahalli	Nandi	Muddenahalli
486	C133	Madirenahalli	Nandi	Muddenahalli
487	C133	Naskunte Hosur	Nandi	Muddenahalli
488	C133	Gowchenahalli	Nandi	Muddenahalli

Villages in Chintamani

Code	Cluster No.	Village	Hobli	Gram Panchayat
501	C201	Korlaparthi HC	Chilakalnerpu	Korlaparthi
503	C201	Gajalavaripalli	Chilakalnerpu	Korlaparthi
505	C201	K. Devaganahalli	Chilakalnerpu	Korlaparthi
506	C201	Bachaganahalli	Chilakalnerpu	Korlaparthi
518	C201	Masanahalli	Chilakalnerpu	Korlaparthi
563	C201	K. Gollahalli	Chilakalnerpu	Korlaparthi
514	C203	Kadirepalli Cross	Chilakalnerpu	Korlaparthi
515	C203	Papathimmanahalli HC	Chilakalnerpu	Korlaparthi
516	C203	Rampamthoti	Chilakalnerpu	Korlaparthi
517	C203	Bandepalli	Chilakalnerpu	Korlaparthi
519	C203	Papathimanahalli MV	Chilakalnerpu	Korlaparthi
521	C204	Nandanahosahalli	Chilakalnerpu	Mittehalli
522	C204	Chikka Kattigenahalli	Chilakalnerpu	Mittehalli
523	C204	Dodda Katigenahalli MV	Chilakalnerpu	Mittehalli
524	C204	Dodda Katigenahalli HC	Chilakalnerpu	Mittehalli
526	C204	Peddagutlapalli	Chilakalnerpu	Mittehalli
561	C204	Yerramareddipalli	Chilakalnerpu	Korlaparthi
940	C204	Seegalagudam	Chilakalnerpu	Korlaparthi
527	C205	Mittehalli MV	Chilakalnerpu	Mittehalli
529	C205	Appasanahalli	Chilakalnerpu	Mittehalli
531	C205	Basavapura	Chilakalnerpu	Burudugunta

566	C205	Kodegandlu	Chilakalnerpu	Kencharlahalli
533	C206	Shettinayakanahalli HC	Chilakalnerpu	Kencharlahalli
534	C206	Shettinayakanahalli MV	Chilakalnerpu	Kencharlahalli
537	C206	Marabanahalli	Chilakalnerpu	Kencharlahalli
554	C206	Kancharlapalli	Chilakalnerpu	Kencharlahalli
557	C206	Rasapalli	Chilakalnerpu	Mittehalli
565	C206	Kommepalli	Chilakalnerpu	Mittehalli
601	C221	Kethanayakanapalli	Ambasadurga	Shettihalli
604	C221	Mohammedpura A	Ambasadurga	Konapalli
605	C221	Mohammedpura B	Ambasadurga	Konapalli
615	C221	Kanganahalli	Ambasadurga	Kathriguppa
616	C221	Batharahalli	Ambasadurga	Kathriguppa
617	C221	Hussainpura	Ambasadurga	Kathriguppa
618	C223	Bommaikal MV	Ambasadurga	Upparpet
619	C223	Bommaikal HC	Ambasadurga	Upparpet
620	C223	Dodda Gutlahalli	Ambasadurga	Masthenahalli
621	C223	Thinnakallu	Ambasadurga	Upparpet
623	C223	Burugamakalapalli	Ambasadurga	Upparpet
625	C223	Yerraseeganahalli	Ambasadurga	Kathriguppa
627	C224	Dodda Kondarahalli	Ambasadurga	Upparpet
629	C224	Mailapura HC	Kaivara	Peramachanahalli
632	C224	Kendenahalli MV	Kaivara	Peramachanahalli
635	C224	Nallagutlapalli	Kaivara	Chinnasandra
636	C224	Chikka Kondarahalli	Kaivara	Upparpet
637	C224	Narayanapalli	Kaivara	Chinnasandra
661	C224	Kendenahalli HC	Kaivara	Peramachanahalli
662	C224	Mailapura MV	Kaivara	Peramachanahalli
547	C225	Kariyapalli	Munganahalli	Raguttahalli
553	C225	Gudipapanahalli	Munganahalli	Raguttahalli
634	C225	Seemanagutta	Munganahalli	Kadadalamari
958	C225	Yasagalahalli	Munganahalli	Raguttahalli
959	C225	Kodigal A	Munganahalli	Kadadalamari
960	C225	Kodigal B	Munganahalli	Kadadalamari
962	C225	Egava Nagarajahosahalli	Munganahalli	Raguttahalli
647	C227	Thippanahalli	Ambasadurga	Kotagal
648	C227	Veerapalli	Ambasadurga	Kotagal
650	C227	Chowdadepalli	Ambasadurga	Shettihalli
651	C227	Raguttahalli	Ambasadurga	Kotagal
936	C227	Gopalapura	Ambasadurga	Kotagal
652	C228	Burudagunte HC	Chilakalnerpu	Burudugunta
656	C228	Ulebale	Chilakalnerpu	Enegadale
657	C228	Deshwarapalli	Chilakalnerpu	Burudugunta
658	C228	Gadigavaripalli MV	Chilakalnerpu	Burudugunta
664	C229	Nimakailapalli	Murugamalla	Nandiganahalli
665	C229	Digavapalli	Murugamalla	Peddur
666	C229	Muddalahalli	Murugamalla	Nandiganahalli
667	C229	Gownicherlapalli	Murugamalla	Peddur
668	C229	Kothapalli	Murugamalla	Peddur
669	C229	Bodigundlapalli	Murugamalla	Peddur

670	C229	Korakanapalli	Murugamalla	Peddur
928	C244	Kotagal B	Ambasadurga	Gudisalapalli
930	C244	Gudisalapalli	Ambasadurga	Bhoomishettihalli
934	C244	Doddipalli	Ambasadurga	Kotagal
939	C244	Kurumarlapalli	Ambasadurga	Kotagal
568	C246	Vyjakooru	Kaivara	Santhekalahalli
680	C246	Byalahalli	Kaivara	Hirekattigenahalli
684	C246	Madabahalli	Kaivara	Peramachanahalli
986	C246	Virupakshapura	Kaivara	Santhekalahalli
991	C246	Beerajenahalli	Kaivara	Santhekalahalli
663	C248	Nallagutlapalli	Munganahalli	Raguttahalli
691	C248	Seetharamapuram	Munganahalli	Irigampalli
900	C248	S. Raguttapalli	Munganahalli	Raguttahalli
964	C248	Brahmanahalli	Munganahalli	Raguttahalli
966	C248	Madamangala	Munganahalli	Raguttahalli
569	C249	Siddepalli Cross	Murugamalla	Bhoomishettihalli
672	C249	Chilamkota	Murugamalla	Murugamala
967	C249	Yerrakota	Murugamalla	Murugamala
970	C249	Gudarlahalli HC	Murugamalla	Murugamala
971	C249	Gudarlahalli MV	Murugamalla	Murugamala
972	C249	Gudamarlahalli	Murugamalla	Bhoomishettihalli
567	C250	Krishnapuram	Munganahalli	Kadadalamari
600	C250	Hanumaiagaripalli	Munganahalli	Kadadalamari
696	C250	Soonappagutta HC	Munganahalli	Kadadalamari
697	C250	Soonappagutta	Munganahalli	Kadadalamari
926	C250	C. Gudlapalli	Chilakalnerpu	Enegadale
956	C250	Vangamala	Chilakalnerpu	Enegadale
698	C251	Seethahalli	Munganahalli	M. Gollahalli
952	C251	Digava Devappalli	Munganahalli	M. Gollahalli
953	C251	Egava Devappalli	Munganahalli	M. Gollahalli
975	C251	Munganapalli HC	Munganahalli	M. Gollahalli
976	C251	Munaganapalli MV	Munganahalli	M. Gollahalli
979	C251	Talarolapalli	Munganahalli	Batlahalli
981	C251	Bodampalli	Munganahalli	Batlahalli
645	C252	Pathakotha	Murugamalla	Peddur
687	C252	Egavakota	Murugamalla	Egavakota
688	C252	Hosahudya	Murugamalla	Egavakota
689	C252	Vempalli	Murugamalla	Peddur
690	C252	Digavakota	Murugamalla	Peddur
692	C252	Kondavenakapalli	Murugamalla	Egavakota
646	C253	Talagavara	Kaivara	Talagavara
683	C253	Nagendrahalli Colony	Kaivara	Peramachanahalli
912	C253	Peramachanahalli	Kaivara	Peramachanahalli
982	C253	Vaddahalli	Kaivara	Talagavara
984	C253	Mallikapura	Kaivara	Talagavara
989	C253	Kothur B	Kaivara	Masthenahalli
990	C253	Marappanahalli	Kaivara	Masthenahalli
572	C260	Y. Kapalli	Murugamalla	M. Gollahalli
923	C260	Palligadda	Munganahalli	M. Gollahalli

944	C260	Chowdareddipalya	Munganahalli	Peddur
945	C260	Lakkepalli	Munganahalli	M. Gollahalli
946	C260	Venkatarayanakote	Munganahalli	M. Gollahalli
947	C260	Guttapalya	Munganahalli	M. Gollahalli
951	C260	Kondliganahalli HC	Munganahalli	M. Gollahalli

Villages in Gudibanda

Code	Cluster No.	Village	Hobli	Gram Panchayat
201	C071	Somalapuram	Gudibanda Kasaba	Ullodu
203	C071	Karaganathamanahalli	Gudibanda Kasaba	Ullodu
208	C071	Ullodu	Gudibanda Kasaba	Ullodu
210	C071	Chowtathimannahalli	Gudibanda Kasaba	Ullodu
269	C071	Poovalamakalapalli	Gudibanda Kasaba	Ullodu
215	C073	Chikkathamenahalli	Gudibanda Kasaba	Beechaganapalli
216	C073	Koppukatenahalli	Gudibanda Kasaba	Beechaganapalli
217	C073	Sadashivanahalli	Gudibanda Kasaba	Beechaganapalli
218	C073	Eereddipalli	Gudibanda Kasaba	Beechaganapalli
219	C073	Giddapannahalli	Somenahalli	Varlakonda
227	C073	Balepalli	Gudibanda Kasaba	Beechaganapalli
224	C075	Singanapalli	Somenahalli	Thirumani
230	C075	Ganganapalli	Somenahalli	Somenhalli
231	C075	Jambigemaradahalli	Somenahalli	Somenhalli
232	C075	Chintakayalapalli	Somenahalli	Somenhalli
234	C075	Mallenahalli	Somenahalli	Somenhalli
237	C076	Kalyagaddapalli	Somenahalli	Thirumani
238	C076	Katenahalli	Somenahalli	Somenhalli
285	C076	Thirumani	Somenahalli	Thirumani
244	C077	Korepalli	Kasaba	Hampasandra
245	C077	Dhoomakuntapalli	Gudibanda Kasaba	Beechaganapalli
248	C077	Gandhamanagenahalli	Gudibanda Kasaba	Beechaganapalli
247	C077	Thattapalli	Gudibanda Kasaba	Hampasandra
258	C079	Pulasanavoddu	Gudibanda Kasaba	Hampasandra
260	C079	Yerrapalli	Gudibanda Kasaba	Yellodu
228	C080	Bandarlahalli	Gudibanda Kasaba	Beechaganapalli
263	C080	Ramaganahalli	Gudibanda Kasaba	Beechaganapalli
264	C080	Chikka Kurubarahalli	Gudibanda Kasaba	Beechaganapalli
265	C080	Gavikuntapalli	Gudibanda Kasaba	Beechaganapalli
267	C080	Dapparrthy	Gudibanda Kasaba	Beechaganapalli
268	C080	Beechaganapalli	Gudibanda Kasaba	Beechaganapalli
270	C080	Bathalapalli	Gudibanda Kasaba	Ullodu
252	C081	Gadacharlapallii	Gudibanda Kasaba	Hampasandra
266	C081	Kondavulapalli	Gudibanda Kasaba	Ullodu
271	C081	Lakkepalli	Gudibanda Kasaba	Hampasandra
272	C081	Pasupallodu	Gudibanda Kasaba	Hampasandra
273	C081	Kondireddipalli	Gudibanda Kasaba	Hampasandra
274	C081	Machapalli	Gudibanda Kasaba	Hampasandra
259	C082	Gundlahalli	Gudibanda Kasaba	Yellodu

275	C082	Nilugumba	Gudibanda Kasaba	Yellodu
278	C082	Yellodu	Gudibanda Kasaba	Yellodu
279	C082	Ambapura	Gudibanda Kasaba	Yellodu
280	C082	Kambalapalli	Gudibanda Kasaba	Yellodu
202	C083	Chinnapalli	Gudibanda Kasaba	Ullodu
204	C083	Brahmanahalli	Gudibanda Kasaba	Ullodu
209	C083	Ninchinabandapalli	Gudibanda Kasaba	Ullodu

Villages in Siddalaghatta

Code	Cluster No.	Village	Hobli	Gram Panchayat
429	C307	Pendlavarahalli	Busetihalli	Busettihalli
758	C307	Valasahalli	Busetihalli	Busettihalli
760	C307	Ammorathimmanahalli	Busetihalli	Busettihalli
776	C307	Ammagarahalli	Busetihalli	Busettihalli
777	C307	Busetihalli	Busetihalli	Busettihalli
884	C307	Dodda Gummanahalli	Busetihalli	Busettihalli
765	C309	Tharabahalli	Busetihalli	Pallicherlu
766	C309	Pallicherla HC	Busetihalli	Pallicherlu
767	C309	Pallicherla MV	Busetihalli	Pallicherlu
768	C309	Kanapanahalli	Busetihalli	Pallicherlu
770	C309	Saddahalli	Busetihalli	Pallicherlu
771	C309	Devappanagudi	Busetihalli	Abloodu
772	C309	Byreganahalli	Busetihalli	Pallicherlu
773	C309	Kotahalli	Busetihalli	Abloodu
507	C311	Venkatapura	Busetihalli	Dibburahalli
512	C311	Thalakayalakonda Digava	Busetihalli	Dibburahalli
560	C311	Thalakayalakonda	Busetihalli	Dibburahalli
778	C311	Bayapanahalli	Busetihalli	Dibburahalli
882	C311	Marlappanahalli	Busetihalli	Thimmanayakanahalli
761	C312	Mummenahalli	Busetihalli	Pallicherlu
762	C312	Marihalli	Busetihalli	Dodda Tekuhalli
763	C312	Chowdireddihalli	Busetihalli	Dodda Tekuhalli
849	C312	Somanahalli	Busetihalli	Pallicherlu
831	C321	Kadirinayakanahalli	Siddalaghatta Kasaba	Kothanur
834	C321	Chennahalli	Siddalaghatta Kasaba	Y. Hunasenahalli
835	C321	Hosahalli	Siddalaghatta Kasaba	Kothanur
840	C321	Chikka Dasenahalli	Siddalaghatta Kasaba	Y. Hunasenahalli
779	C322	Devaramallur	Siddalaghatta Kasaba	Devara Mallur
780	C322	Marappanahalli	Siddalaghatta Kasaba	Y. Hunasenahalli
782	C322	Sonnenahalli	Siddalaghatta Kasaba	Devara Mallur
838	C322	Varahunsenahalli A	Siddalaghatta Kasaba	Y. Hunasenahalli
839	C322	Varahunsenahalli B	Siddalaghatta Kasaba	Y. Hunasenahalli
500	C323	Egava Ganjigunta	Busetihalli	Ganjigunte
502	C323	Digava Ganjigunta	Busetihalli	Ganjigunte
511	C323	Alagurki	Busetihalli	Thimmanayakanahalli
846	C323	Chokkanahalli	Busetihalli	Ganjigunte

847	C323	Gonemardahalli	Busetihalli	Thimmanayakanahalli
848	C323	Bapanehalli	Busetihalli	Ganjigunte
851	C323	Gangahalli	Busetihalli	Ganjigunte
855	C324	Nallojapalli	Busetihalli	Thimmanayakanahalli
857	C324	Dadamghatta	Busetihalli	Thimmanayakanahalli
895	C324	Kudupukunte	Busetihalli	Thimmanayakanahalli
899	C324	Thimmanayakanahalli	Busetihalli	Thimmanayakanahalli
509	C325	Hale Ganjigunta	Busetihalli	Ganjigunte
541	C325	Lakkepalli	Busetihalli	Ganjigunte
544	C325	Pedda Bandaragatta	Busetihalli	Ganjigunte
545	C325	Chinna Bandaragatta	Busetihalli	Ganjigunte
558	C325	Vemagal	Busetihalli	Ganjigunte
788	C326	Subbarayanahalli	Sadali	Thimmasandra
793	C326	Byraganahalli	Sadali	Thimmasandra
866	C326	Thimmasandra A	Sadali	Thimmasandra
868	C326	Eegaletapalli	Sadali	Thimmasandra
869	C326	Thimmasandra B	Sadali	Thimmasandra
876	C326	Halehalli	Sadali	Thimmasandra
872	C327	Shettikere A	Sadali	Thimmasandra
874	C327	Kommasandra	Sadali	Thimmasandra
878	C327	Varasandra	Sadali	Thimmasandra
879	C327	Turukeshanahalli	Sadali	Thimmasandra
880	C327	Kondarasanahalli	Sadali	Thimmasandra
510	C329	Madepalli	Busetihalli	Ganjigunte
893	C329	Poolakuntlapalli	Busetihalli	Ganjigunte
897	C329	Nakkalahalli	Busetihalli	Thimmanayakanahalli
898	C329	Buriguvarapalli	Busetihalli	Thimmanayakanahalli
807	C331	Gandlachinte	Sadali	Dibburahalli
830	C331	Rappamalahalli	Sadali	Dibburahalli
833	C331	Nallacheruvapalli	Sadali	Dibburahalli
865	C331	Nakkalapalli	Sadali	Thimmasandra
867	C331	Karipalli A	Sadali	Thimmasandra
871	C331	Karipalli B	Sadali	Thimmasandra
800	C334	Iragappanapalli	Sadali	S. Devaganahalli
841	C334	Gadiminchenahalli	Sadali	S. Devaganahalli
859	C334	Niluvarathapalli	Sadali	Sadali
864	C334	Egava Jarugahalli	Sadali	Dibburahalli
894	C334	S. Kurubarahalli	Sadali	S. Devaganahalli
858	C335	Nallapalli	Sadali	Sadali
889	C335	Sonaganahalli	Sadali	Sadali
890	C335	Kotagal	Sadali	Sadali
891	C335	Kamannahalli	Sadali	Sadali
892	C335	Bandarlahalli	Sadali	Sadali

**PROJECT DESIGN DOCUMENT FORM
FOR AFFORESTATION AND REFORESTATION PROJECT ACTIVITIES (CDM-AR-PDD) - Version 03**

A.4.1.4.Detailed geographic delineation of the project boundary, including information allowing the unique identification(s) of the proposed A/R CDM project activity:

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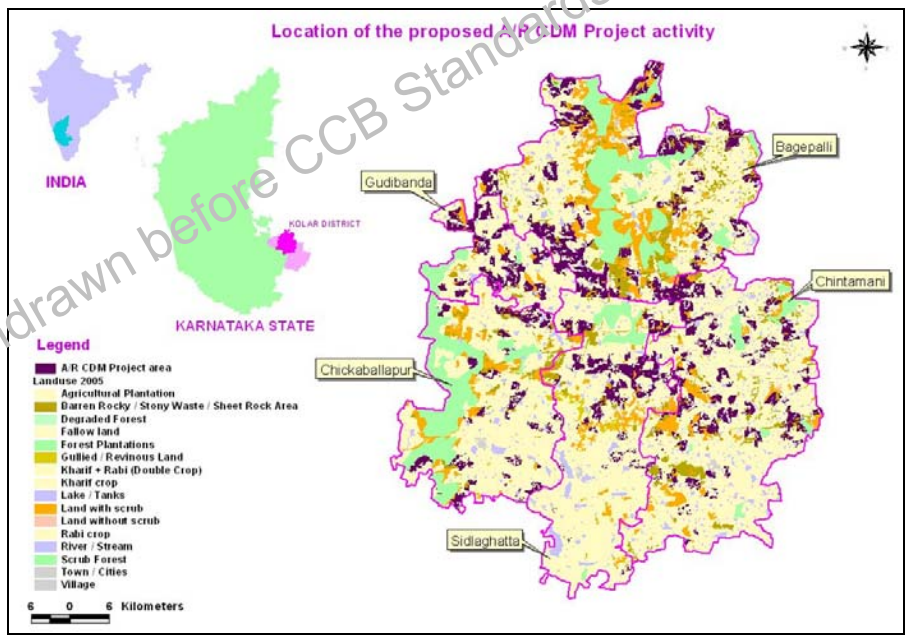
Geographical location: Chickballapur is the easternmost District of Karnataka. It is bounded in the north by Ananthapur District of Andhra Pradesh, in the east by Ananthapur, Chittoor and Cuddapah Districts of Andhra Pradesh and North Arcot District of Tamil Nadu, in the west by Bangalore Rural and Tumkur Districts of Karnataka and in the south by Chittoor District of Andhra Pradesh and Dharampuri District of Tamil Nadu. It is carved out of the old Kolar District and is situated between 12° 46' and 13° 58' north latitudes and between 77° 21' and 78° 35' east longitudes. Kolar District spans over a distance of about 135 kilometres from north to south and over roughly similar distance from east to west. The taluks are situated between the following latitudes and longitudes.

Taluk	Latitude	Longitude
Bagepalli	13°35' and 13°58' North	77°4' and 78°05' East
Chickballapur	13°2' and 31°39' North	77°33' and 77°5' East
Siddlaghatta	13°13' and 13°4' North	77°45' and 77°58' East
Gudibanda	13°36' and 13°47' North	77° 35' and 77°49' East
Chintamani	13°15' and 13°21' North	78° 51' and 78°1' East



Project boundary: The A/R CDM project contains more than one discrete area of land. It encompasses 15,339 parcels of lands in 471 villages. In all, the A/R CDM project involves 12,397 families on 18,181 hectare of land. The details of each parcel of land – unique geographical identification, the farmer's name, and the survey number of the land are enclosed in Appendix 1A-1E. A summary of the details are as follows:

	Area (Hectare)	No. of Villages	Member Families	Number of parcels
Bagepalli	6,395	163	3,910	5,011
Chickballapur	1,441	69	1,301	1,576
Chintamani	5,062	125	3,810	4,410
Gudibanda	1,471	30	1,144	1,264
Siddalaghatta	3,811	84	2,232	3,078
Total	**18,181**	**471**	**12,397**	**15,339**

Applying AR-AM0001 version 2 19th May 2006, each discrete parcel of land has a unique geographical identification. The boundary is defined for each discrete parcel. The discrete parcels of lands are defined by polygons, and to make the boundary geographically verifiable and transparent, the GPS coordinate for corners of large polygons are measured, recorded, archived and listed. Appendix 1A-1E provides details of all the parcels of land. Appendix 2 shows the cadastre maps of villages where planting will be done, with boundary of each of the parcel of land and the survey numbers which matches with the details given in Appendix 1. The project boundaries and geographical locations are indicated in Fig A2a-e.

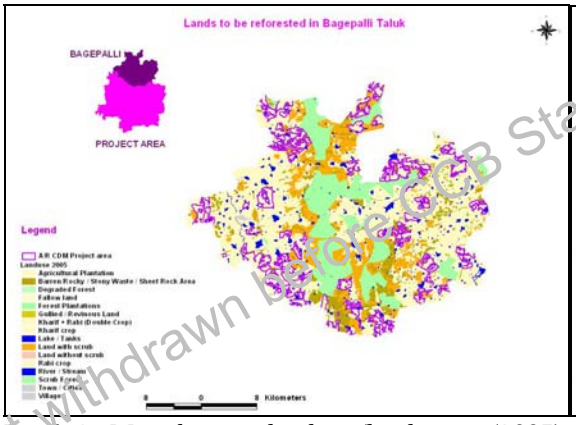


Fig A-2a Map showing land use/land cover (2005), and the lands to be reforested in Bagepalli taluk

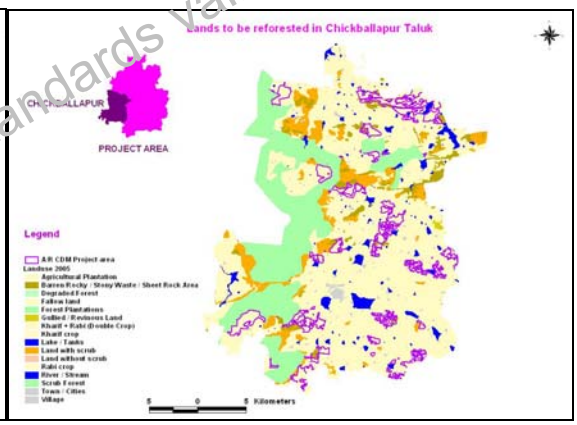
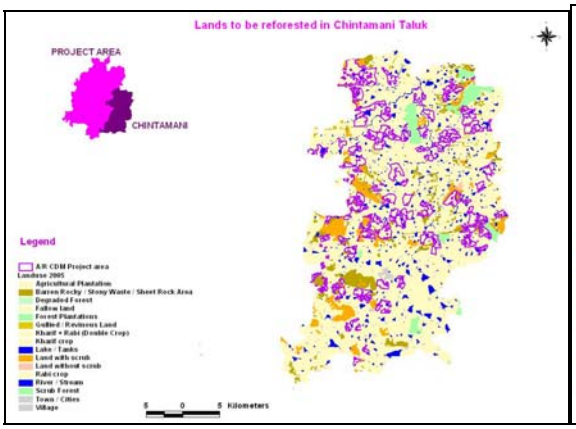


Fig A-2b Map showing land use/land cover (2005), and the lands to be reforested in Chickballapur taluk



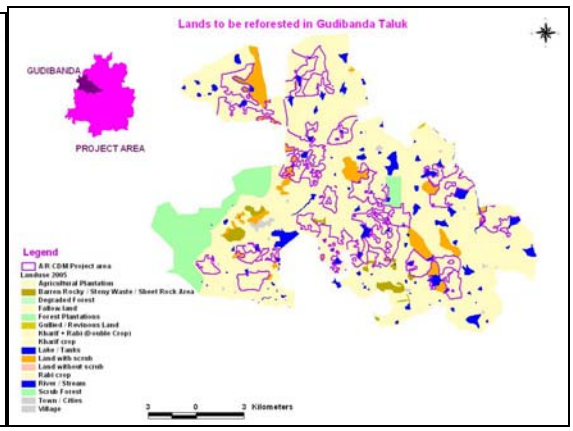


Fig A-2c Map showing land use/land cover (2005), Fig A-2d Map showing land use/land cover (2005),
and the lands to be reforested in Chintamani taluk and the lands to be reforested in Gudibanda taluk

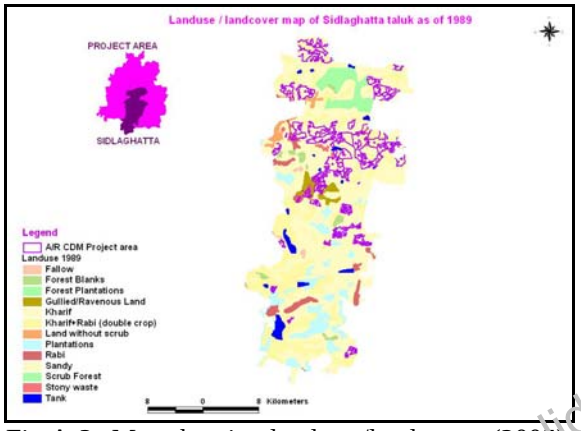


Fig A-2e Map showing land use/land cover (2005),
and the lands to be reforested in Siddalaghatta taluk

A.4.1.5. Description of the present environmental conditions of the area planned for the proposed A/R CDM project activity, including a brief description of climate, hydrology, soils, ecosystems (including land use):

>>

Climate: Chickballapur district has an agreeable climate. The year may be divided into four seasons. The dry season with clear bright weather is from December to February. The period from March to May constitutes the hot season and the south-west monsoon season is from June to about end of October. November is the retreating monsoon season. The average rainfall of the region is 786 mm and the maximum temperature of the district is 36° C and minimum is 16-18° C.

Table A-1: Average climate conditions in the taluks of project area

Taluk	Annual Rainfall* (mm)
Bagepalli	**679.2**
Chintamani	**690.1**
Chickballapur	**771.2**
Gudibanda	**808.3**
Siddalaghatta	**753.0**

*** - last 50 years average**

Hydrology and geology: There are no perennial rivers in the district. Most of these are small and carry water only during the rainy season. Three important rivers of the old Kolar District, namely, Palar, North Pinakini or North Pennar and South Pinakini or South Pennar and several of their tributaries take their birth in the district and flow in different directions receiving the drainage of the intermediate tracts of the District. The project area consists of immense expanse of peninsular gneisses rocks (Fig A-3). The schistose rocks in this region are poor aquifers and yield poor quality water in very less quantity. In the absence of major sources of water like rivers, the district depends heavily on groundwater. But the groundwater table has receded beyond 600 feet depth. This has

resulted in failure of most tube wells and has led to high fluoride content in drinking water, causing bone, dental and other physical deformities (Raju *et al*., 2004)[2].

Soils: The soils of Chickballapur district are divided into three types, viz., red, clay loam and laterite. Some black soil patches are also seen here and there. The red loam region extends from south to north of the district comprising of Chickballapur, major parts of Siddalaghatta taluk. The water table in this type of soils is between 400 to 500 feet deep. The gravelly soil region is found in parts of Gudibanda and Chintamani taluks. The water table in these types of soils is between 500 to 600 feet deep. The clay loam soil is found in Chickballapur and parts of Siddalaghatta and Bagepalli. Around Siddalaghatta, lateritic masses occur irregularly distributed in disconnected patches in the form of flat topped hills. The soils in Chickballapur district have a normal soil reaction and here and there they tend towards alkalinity. Due to land degradation many lands are uncultivable and may only improve after intensive soil treatment. The A/R CDM project activity will improve the soil by providing additional mulching material to the soil and providing shading, water retention capacity and prevention of soil erosion and surface soil runoff. As can be seen from the Fig A-3, most of the areas in the proposed project area situated in Chickballapur are classified as severe problem soils.

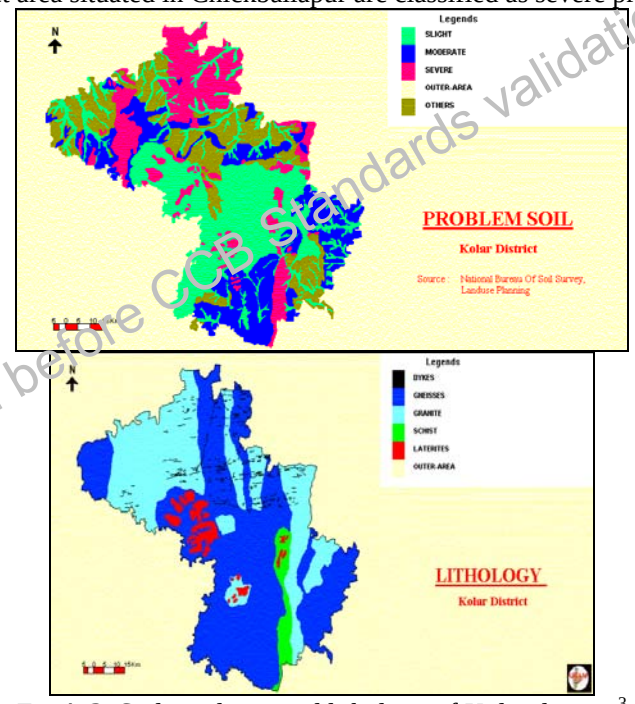


Fig A-3: Soil condition and lithology of Kolar district.[3]

Ecosystems

Composition of forests in the project area: The forests of Chickballapur are typical of the plain tracts of Karnataka. The stocking of the forests is poor. The trees are stunted and branchy, with diffused crown. The soil is poor and shallow and rains are scanty. Such conditions support only stunted growth. There are large extents of thorn forests. The forests have been heavily exploited in the

[2] K.V. Raju, N. Praveen, B.K. Anand,. 2004. Groundwater in Urban Market: Can it Sustain? A case study of Kolar city in south India. http://www.cerna.ensmp.fr/cerna_globalisation/Documents/Raju-paris.pdf

[3] Source: http://www.csre.iitb.ac.in/adi/maps/prob-s.gif; http://www.csre.iitb.ac.in/adi/maps/litholog.gif

past for extracting firewood and for manufacturing charcoal. Large extents of thorny, scrubby and deciduous forests were also cleared to plant mostly Eucalyptus hybrid under various schemes. The forests on inaccessible steep slopes, however, remain unworked. Even in the unexploited areas the vegetation is mostly stunted (Working plans, Kolar District, 2002).

The species commonly met with in the local language are known as Chigare, Pachali, Bikke, Kakke, Kagli, Dindiga, Naviladi, Sandal, Devadari, Kukarthi, Honne, Hunal, Bevu, Honge, Jagalaganti, Alale, Jalari, Mathi etc. Small bamboo (Medri) is found growing in some of the areas in valleys. Big bamboo (Dowga) is seen along the banks of rivers and streams at some places. The undergrowth mostly consists of Lantana, Badabakka, Devavare, Uelachi, Bandarike, and various Grasses. The forest types recognized in Kolar division as per the classification of Champion and Seth (1968) are as under:

5A / C3: Southern Tropical Dry Mixed Deciduous Forests: In this type of forests, dry deciduous species occur and tend to become thorny with increased heavy grazing. Poor quality bamboos are present in some pockets. Grass is conspicuous, herbs are scattered and climbers are few. The approximate extent of such forest is around 20 % of total forest area of Kolar Forest Division. The most common and characteristic trees found are *Anogeissus latifolia (Dindiga), Terminalia tomentosa (Mathi), Chloroxylon swietenia (Hurugalu), Santalum album (Srigandha), Melia composita (Hebbevu), Acacia catechu (Katha), Hardwickia binata (Kamara), Cassia fistula (Kakke), Diospyros montana (Jagalaganthi), Diospyros melanoxylon (Thupra).*

5A / DS 1 Southern Tropical Dry Deciduous Forests. In this type low broken cover of shrubby growth of 1 to 3 metres in height, is found. The trees usually develop branches from the base. The grass occurs through out the tract. The approximate extent of such forest is around 45% of total forest area of Kolar Forest Division. The floristic composition are *Acacia leucophloea (Bilijali), Albizzia amara (Chigara, Thugali), Dalbergia paniculata (Nayibeete, Pachali), Azadiracta indica (Bevu), Euphorbia antiquorum (Pirukalli, Mundukalli), Pterolobium indicum (Badubukalu), Cassia fistula (Kakke), Lantana camara (Lantana), Opuntia dillenii (Papaskalli).*

6A / C1 Southern Tropical Thorn Forests: These are low open forests with thorny, xerophytic species. *Acacia* species are characteristic of this type. The trees usually have short boles with low branching crowns. The lower canopy is made up of shrubs, mostly spiny and xerophytic. Climbers are few. The herbs and grass make up the lowest level. *Acacias* are met in combination with *Zizyphus* species and stunted *Anogeisus latifolia*. Patches of fleshy *Euphorbias* are not infrequent. The approximate extent of such forest is around 15% of total forest area of Kolar Forest Division. The floristic composition is *Acacia catechu* (Kaggali), *Acacia leucophloea* (Bilijali), *Acacia nilotica* (Jali), *Flacourtia indica* (Devadari), *Euphorbia nivulia*, *Chloroxylon swietenia* (Hurugalu), *Ixora arborea*, *Strychnos potatorum* (Chiligida, Chittadamara), *Cassia auriculata* (Thangadi), *Dodonea viscosa* (Kanagalu), etc.

6A / DS 1 Southern Thorn Scrub: In this type there is further degradation due to biotic and edaphic factors, resulting in the formation of almost thorny bush, with surviving trees seen here and there. Spiny, xerophytic climbers are met with. In further degraded areas grasses are more abundant. The approximate extent of such forest is around 20% of total forest area of Kolar Forest Division. The floristic composition is *Albizzia amara* (Chujjulu, Thugali), *Chloroxylon swietenia* (Hurugalu), *Wrightia tinctoria* (Hale), *Randia dumetorum* (Kare, Maggare), etc.

General condition of the forests: The rainfall being scanty and the rivers and streams remaining dry for a large part of the year, the area is for the most part, devoid of vegetation, and scarcity conditions are very common. Extensive plantations have been raised in the division since many years. However, because of relatively hostile conditions and inadequate post-planting cultural operations, indigenous species have generally not done well. Some of the exotic species introduced in these plantations such

as Karpuradagida or Nilgirigida (*Eucalyptus* species), Ballari jali (*Prosopis juliflora*), Sime thangadi (*Cassia siamia*), Sisso (*Dalbergia sisso*) and Sarvemara (*Casuarina equisetifolia*) have fared better in relatively favourable sites.

Repeated illicit felling of plants and even of coppice shoots has rendered the forests of the district almost barren. The soil is exposed to sheet and gully erosion, except in the areas where coppice and bushy growth still survives. *Lantana* has spread gregariously over the area. The weed has now become the major source of fuel in the absence of better species. Xerophytic condition prevails with its characteristic species. Several pure patches of *Shorea talura* (Jalari) occur in some state forests, like that of Sambar kaval. *Buchanania angustifolia* (Maradi) predominates yielding an important minor forest produce (Working Plan, Kolar district, 2002).

Fauna: Owing to the absence of thick forests, there is not much cover for wild animals. Wild game is practically unknown in the district. In the Nandi hill ranges, occasional visitations of panthers are known. Black bucks and deer are found, though in small number, in the unfrequented parts, which have a little forest growth. In the hill slopes and valleys, several kinds of reptiles are found, cobras being very common. The district has no sanctuary or national park. The wild animals and birds found in the district are, The Indian Gerbill, Mongoose, Blackbuck, Blackraped Hare, The Fourhorned Antelope, Palm squirrel, The Leopard, The Indian Wild Boar, Jackal, Indian Pangolin, Fox, Indian Otter, Jungle Cat, Ratel, Small Indian Civet, Slender Loris, The Common Palm civet, Porcupine, Striped Hyena, white tailed wood rat, Bonnet Macaque, Indian Bush Rat and Sloth bear.

A.4.1.6. Description of the presence, if any, of rare or endangered species and their habitats:

>> Banyan (Aala) or Peepal (Arali) are considered the keystone species. The updated list for India contains 483 species of animals listed as endangered or vulnerable.[4] The project activity southern dry deciduous forest eco-region contains seventy-five species of mammal fauna, of which 7 are on the red List:

Hipposideros hypophyllus, or Kolar leaf-nosed bat.

It was previously listed as Vulnerable. Improved information since then has resulted in the species being upgraded to endangered status. This recently described endemic species requires urgent follow-up studies to determine its distribution, population status and threats to its survival. The species is known from only two localities in the Chickballapur District. Extent of occurrence and area of occupancy are estimated as < 5,000 km^2 and < 500 km^2, respectively. Available habitat has decreased in quality and area (by at least 20%) over the last six years due to deforestation and mining activity.

- The critically endangered Salim Ali fruit bat *Latidens salimalii* is a near-endemic species in the region.
- *Cuon alpinus* – the wild dog
- *Melursus ursinus* – the sloth bear
- *Tetracerus quadricornis* – Chousingha
- *Bos gaurus* – Gaur
- *Ratufa macruora* – grizzled giant squirrel

[4] Export IUCN Red List August 1st 2007

Loris lydekkerianus – Slender Loris, though not endangered, is rare. It was spotted in Malur, Kolar District in 1981.
The Indian Star Tortoise *Geochelone elegans*, is listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and Schedule IV of the Indian Wildlife (Protection) Act 1972, making the trade of the species illegal.

The eco-region's bird fauna consists of about 260 species, of which two are near-endemic species. *Turdoides subrufus* Rufous babbler, and *Pycnonotus xantholaemus* Yellow-throated bulbul. The Yellow throated bulbul is on the vulnerable list.

Two species in this eco-region, the Indian Bustard (*Ardeotis nigriceps*) and Lesser Florican (*Eupodotis indica*), are globally threatened and warrant conservation attention.

Aquila clanga, or Greater Spotted Eagle, is endangered. It has been spotted in the area.

There is an endemic endangered plant species in the region listed on the Red List. It is:

- *Cycas Beddomei*, a medicinal plant, known from Cuddapah Hills in Andhra Pradesh State, north-west of Madras in eastern Peninsular India, and into Chickballapur District. Characteristically a species of dry, open hill slopes, in open grassy woodland or grassland.

A.4.2. Species and varieties selected for the proposed A/R CDM project activity:

>> The species for planting were chosen by participating local families who selected local species which are suited for this agro-climatic zone. The main species are *Mangifera Indica* (Mango), *Tamarindus indica* (Tamarind), *Syzygium cumini* (Jamun) and *Tectona grandis* (Teak). Other economically important dry land trees such as *Acacia* spp., *Azadirachta indica* (Neem), *Pongamia pinnata* (Kanniga), *Leucaena leucocephala* (Subabul), *Pterocarpus* spp. (Hardwoods) *Achras sapota (*Sapota*), Artocarpus* spp. (Jackfruit), *Terminalia* spp., *Dalbergia* spp. As well as *Ficus ssp, Murraya koenigii* (Karepaku) or Indian Gooseberry (Nellikai) will be chosen by families depending on their soil and water conditions and personal preferences.

A.4.3. Description of legal title to the land, current land tenure and rights to tCERs / lCERs issued for the proposed A/R CDM project activity:

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Legal title to the land: The land category is private land. The legal title of the parcels of land is held with individual farmers. The membership to the Coolie Sangha and the relationship to the legal title of the land is shown in Appendix 1. These farmers have legal title deeds to their lands with survey number and cadastre maps showing the boundaries. Copies of these *pahanis* and maps are available with the Tahsildar.
Current land tenure: All the participating private farmers have absolute title to the land.
Land use: Currently the private farmer's lands are uncultivable barren lands, fallow lands or marginal croplands.
Rights of access to the sequestered carbon: The individual families occupying or in any other way owning or managing their plot, will assign ADATS the right to manage the sequestered carbon on their behalf under legally binding carbon contracts. Under the carbon contract the individual family continues to hold the right to the carbon and must receive the exact full share of the proceeds of the sale of their lCERs.

A.4.4. Technology to be employed by the proposed A/R CDM project activity:

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Mangifera Indica is the leading fruit crop of India and considered to be the king of fruits. Besides delicious taste, excellent flavour and attractive fragrance, it is rich in vitamin A&C. The tree is hardy in nature and requires comparatively low maintenance costs.

Climate : Mango can be grown under both tropical and sub-tropical climate from sea level to 1400 m altitude, provided there is no high humidity, rain or frost during the flowering period. Places with good rainfall and dry summer are ideal for mango cultivation. It is better to avoid areas with winds and cyclones which may cause flower and fruit shedding and breaking of branches.

Soil : Mango comes up on a wide range of soils from alluvial to laterite provided they are deep (minimum 6') and well drained. It prefers slightly acidic soils (pH 5.5 to 7.5)

Varieties: Recently some mango hybrids have been released for cultivation by different institutes / universities.

Mallika - It is a cross between Neelam and Dashehari. Fruits are medium sized cadmium coloured with good quality, reported to be a regular bearer.

Amrapali - It is a cross between Dashehari and Neelam. It is a dwarf vigorous type with regular and late bearing variety. It yields on an average 16 t/ha and about 1,600 plants can be accommodated in one ha.

Mangeera - It is a cross between Rumani and Neelam. It is a semi vigorous type with a regular bearing habit. Fruits are medium sized with light yellow coloured skin, firm and fibreless flesh and sweet to taste.

Ratna - It is a cross between Neelam and Alphonso. It is a regular bearer and free from spongy tissue. Fruits are medium sized with excellent quality. Flesh is firm and fibreless, deep orange in colour with high TSS (19-21 Brix).

Arka Aruna - It is a hybrid between Banganapalli and Alphonso with regular bearing habit and dwarf in stature. About 400 plants can be accommodated per hectare. Fruits are large sized (500-700 gm) with attractive skin colour. Pulp is fibreless, sweet to taste (20-22 Brix). Pulp percentage is 73 and the fruits are free from spongy tissue.

Arka Puneet - It is a regular and prolific bearing hybrid of the cross between Alphonso and the Banganapalli. Fruits are medium sized (220-250 gm) with attractive skin colour, having red blush. Pulp is free from fibre, pulp percentage being 70 percent. Fruits are sweet to taste (20-22 Brix) with good keeping quality and free from spongy tissue. It is a good variety for processing also.

Arka Anmol - It is a semi-vigorous plant type from the cross between Alphonso and Janardhan Pasand. It is also a regular bearing and free from spongy tissues. Fruits ripen to uniform yellow colour. Keeping quality of the fruit is very good and it is suitable for export. It has got excellent sugar and acid blend and fruits weigh on an average about 300 g Pulp is orange in colour.

Propagation : Farmers should always get vegetatively propagated, true to type plants from recognised nurseries. Inarching, veneer grafting, side grafting and epicotyl grafting are the popular methods of propagation in mango.

Planting : Land should be prepared by deep ploughing followed by harrowing and levelling with a gentle slope for good drainage. Spacing varies from 7 m x 7 m, in the dry zones where growth is less, to 12 m x 12 m, in heavy rainfall areas and rich soils where abundant vegetative growth occurs. New dwarf hybrids like Amrapali can be planted at closer spacing. Pits are filled with original soil mixed with 20-25 kg well rotten FYM, 2.5 kg single super phosphate and 1 kg muriate of potash. One year old healthy, straight growing grafts from reliable sources can be planted at the centre of pits along with the ball of the earth intact during rainy season in such a way that the roots are not expanded and the graft union is above the ground level. Plants should be irrigated immediately after planting. In the initial one or two years, it is advisable to provide some shade to the young plants and also stake to make them grow straight.

Training and pruning : About one meter from the base on the main trunk should be kept free from branching and the main stem can be allowed thereafter spaced at 20-25 cm apart in such a way that they grow in different directions. Branches which cross over/rub each other may be removed at pencil thickness.
Fertiliser Application : In general, 170 gm urea, 110 gm single super phosphate and 115 gm muriate of potash per plant per year of the age from first to tenth year and thereafter 1.7 kg, 1.1 kg, and 1.15 kg respectively of these fertilisers per plant per year can be applied in two equal split doses (June-July and October). Foliar spray of 3% urea is recommended before flowering in sandy areas.
Irrigation : Young plants are watered frequently for proper establishment. In case of grown up trees, irrigation at 10 to 15 days interval from fruit set to maturity is beneficial for improving yield. However, irrigation is not recommended for 2-3 months prior to flowering as it is likely to promote vegetative growth at the expense of flowering.
Inter cropping : Inter crops such as vegetables, legumes, short duration and dwarf fruit crops like papaya, guava, peach, plum, etc. depending on the agro-climatic factors of the region can be grown. The water and nutrient requirements of the inter crops must be met separately.
Plant Protection : Mango is prone to damages by a large number of pests, diseases and disorders. The recommended control measures for most important and common among them are briefed below :
Mango hopper : Two sprays (at panicles emergency and at pea size of fruits) of carbaryl (0.15%), monocrotophos (0.04%) or phosphamidan (0.05).
Mealy bug : Ploughing inter spaces in November and dusting 2% methyl parathion @200 g per tree near the trunk and fixing 20 cm wide 400 gauge polythene strips around the trunk with grease applied on the lower edge in January as prophylactic measures and two sprays of monocrotophos (0.04%) at 15 days interval as control are needed.
Powdery mildew : Two to three sprays of wettable sulphur (0.2%) or Kerathane (0.1%) at 10-15 days interval.
Anthracrose : Two sprays of Bavistin (0.1%) at fortnight interval.
Malformation : One spray of 200 ppm NAA in October followed by deblossoming at bud burst stage in December - January.
Fruit drop : Regular irrigation during fruit development, timely and effective control of pests and diseases and spraying 20 ppm NAA at pea size of fruits.
Harvesting and yield : Graft plants start bearing at the age of 3 - 4 years (10-20 fruits) to give optimum crop from 10-15th year which continues to increase upto the age of 40 years under good management.
Post Harvest Management :
Storage : Shelf life of mangoes being short (2 to 3 weeks) they are cooled as soon as possible to storage temperature of 13 degree Celsius. A few varieties can withstand storage temperature of 10 degree Celsius. Steps involved in post harvest handling include preparation, grading, washing, drying, waxing, packing, pre-cooling, palletisation and transportation.
Packaging : Mangoes are generally packed in corrugated fibre board boxes 40 cm x 30 cm x 20cm in size. Fruits are packed in single layer 8 to 20 fruits per carton. The boxes should have sufficient number of air holes (about 8% of the surface area) to allow good ventilation.
These activities will be organised jointly by the Village Coolie Sangha Units.

Tamarindus indica belongs to Caesalpinoideae of the Leguminosae family, and is commonly referred to as Tamarind. The Tamarind tree is much loved throughout the semi-arid regions for its deep, cool shade and for its valuable pungent fruits. Less well known are its excellent leaf fodder and high quality timber. It can be grown on a wide range of soils, including slightly saline or alkaline; has a deep tap root and is drought-hardy. The species requires 500 mm annual rainfall to do well, but can be grown with 350 if watered for establishment. It propagates easily by direct sowing, seeding, cutting; it

is frost-tender, and relatively slow-growing. The Tamarind is a large tree (height 30m, dbh 1.6m) with a spreading crown up to 12m in diameter. It is a light demander, and grows best in the open. It is deep rooted, wind-firm, very sensitive to frost, and seedlings and saplings require special protection. It is drought resistant, and starts flowering at the age of about 10 years. It is grown on the soils ranging from gravelly to deep alluvial, and thrives best in deep loam which provides optimum conditions for development of its long tap root. It tolerates slightly alkaline or saline soil, and tolerates temperatures up to 47^0 C but is very sensitive to frost and fire. It can be raised by direct sowing in lines behind the plough or in patches of $45cm^2$ dug 30cm deep. The depth of sowing should be about 1.5 cm.
Nursery technique: Seed will be sown in large size poly bags in March – April. Germination starts with in a week and takes about a month to complete. Seedlings attain plantable size, 30cm and above, in the following rains when they are 14 months old. They need to be protected against frost during winter and drought in summer.
Planting practices: Tamarind will be raised as block plantations at spacing of 7 m x 7 m. Seedlings will be planted out in July or August when the soil is well soaked by monsoon rains and will also be fenced against cattle damage. Regular weeding is essential for good growth. The rate of growth of seedlings is moderate to slow. Trees start bearing fruit at 8-9 years and continue for 200 years or so. Well grown trees of 20 years may yield as much as 200 kg/tree/yr.

Syzygium cumini is in the Myrtaceae family and is sometimes referred to as Indian plum. It is high valued for its fruit and as a fodder tree, and produces strong, heavy timber. It grows in moist condition and tolerates water logging, but also survives and is productive, though may be stunted in semi-arid conditions on gravelly and stony sites. It is a large tree growing up to 30 metres in height and attaining 1.3 metres dbh. The tree inhabits a variety of soils from clayey to loamy sands, including swampy conditions. It is found under a wide range of sub tropical and tropical climates with temperature extremes of $2\text{-}45^0$ C and mean annual rainfall of 500-5000 mm.
Planting will be through nursery raised seedlings or stumps. Fruits are produced in abundance every year. Ripe fruits are collected from the trees or swept from the ground in June to August. No pre-treatment is required for germination. In nursery beds sowing is done in June to July. The germination % of fresh seed is high i.e. 90%. Planting out of entire transplants is done in July to August of the following year. For stump planting the stumps are prepared from 2-3 old plants depending upon their growth. The growth of seedlings is slow during the first year and comparatively fast during the subsequent years. In farmers field it is often planted on bunds. In this case it acts as windbreak around orchards. Syzygium will be planted on bunds at a spacing of 8 m. Thus approximately 50 trees will be planted on bunds per hectare.

Tectona grandis commonly called Teak, is a tall, deciduous timber tree, of the verbena family. The tree, which attains a height of about 30 m (about 100 ft), is native to India and the Malay Archipelago. The bluish to white flowers are arranged in terminal panicles, or clusters. The fruit is a drupe. Because of its durability and strength, teakwood is used throughout the world as lumber in shipbuilding and construction of furniture; outdoor teak furniture or garden products has been known to resist the attacks of insects and the corrosive effects of weather for hundreds of years.
Planting material of teak will consist of seedlings or stumps. Seedlings will be raised in nurseries and grown until they reach 30–40 cm in height. The seedlings are left to grow in the germination beds until they reach about 15–20 mm in diameter, then they are prepared for planting by pruning off both the shoot and root. These seedlings will be planted into the field after the first rains. Generally 25–50 mm of shoot is retained and about 150–200 mm of the root is left intact. This remaining material is known as a stump and is the most common planting method, because it can be stored for a period of time before planting, and gives more even height when planted in the field. Teak in its natural state grows on a variety of geological formations but the quality of growth depends on the depth, structure,

porosity, drainage and moisture holding capacity of the soil. Teak thrives best on soils that are neutral, or slightly alkaline, so the most favourable soils for growth and development usually have a pH of 6.5–7.5. Waterlogged, shallow and compacted soils should be avoided. On laterite soils, even if partly disintegrated, teak will always be stunted. Teak is a "calcicolous' species and requires a relatively large amount of calcium in the soil for growth and development. The teak seedlings will be planted on bunds at a spacing of 8x8 mts. Approximately 50 trees per hectare will be planted on the bunds.

Other economically important dry land trees are also being planted. They are *Acacia* spp., ***Azadirachta indica*** *(*Neem), *Pongamia pinnata* (Kanniga) *Mangifera indica*, (Mango) *Syzygium cumini* (Jamun) *Tamarindus indica* (Tamarind), *Grevillea robusta (*Silver Oak*), Pterocarpus* spp. (Hardwoods), *Artocarpus* spp. (Jackfruit), *Terminalia* spp., *Dalbergia* spp. etc in lesser numbers. All the participants will plant around 310 trees per hectare, with a typical plot of 1 hectare consisting of 260 *Tamarindus indica* (Tamarind) and *Mangifera Indica* (Mango) at a spacing of 7 m x 7 m in the field and 50 trees on the bunds at a spacing of 8 m consisting of syzygium cumini, Tectona grandis and other mixed species.

The costs are as follows:

		1st Year	2nd Year	3rd Year	3 Year Total
1	Cost of pitting, burning, red earth and sand for 260 pits per hectare family plot	5,200			5,200
2	Cost of 260 saplings of tamarind, mango, teak, neem, etc. per hectare family plot	9,100			9,100
3	Cost of replacing 52 saplings per hectare in the 2nd year		1,820		1,820
4	Cost of replacing 52 saplings per hectare in the 3rd year			1,820	1,820
5	Cost of building a 13,000 litre capacity field tank on family plot	15,000			15,000
6	Labour compensation for @ Rs 1,000 per annum x 3 years	1,000	1,000	1,000	3,000
7	Planting agave, Syzigium and Teak on the boundaries of each hectare family plot	500			500
8	Tractor hire for hauling water to fill the tanks during 5 summer months x 3 years	8,000	8,000	8,000	24,000
COST PER HECTARE FAMILY PLOT		**Rs 38,800**	**Rs 10,820**	**Rs 10,820**	**Rs 60,440**
		€ 700	**€ 195**	**€ 195**	**€ 1,090**

The technology to be employed consists of:

- Technically assessing the plot including soil type, water availability and interest and ability of the family to maintain the orchard
- Preparing the land including levelling, removing of boulders, bunding if necessary
- Making watering arrangements depending on water availability including construction of tanks in the fields and arranging for watering the plants for initial 3 years in summer months i.e. March-

June (4 months) twice a week. Arrangement for payments for water sharing from bore wells will be done.

- Digging of 310 pits per hectare for mixed species planting
- Applying of farmyard manure and red sand to the pits
- Joint procurement of saplings along with other project participants
- Planting and maintenance
- Annual sapling replacement if necessary
- Mapping the plot to be reforested: Using the GPS reading for each of the parcel of land, it will be integrated with GIS. Other details such as species planted, number of trees, year of planting, survival rate, permanent plots for each strata will be integrated. This will ensure transparency and aid in monitoring, verification and certification.
- Joint sale of CERs.
- Joint marketing of produce after 10-12 years

The environmentally safe and sound technologies and know-how which will be employed by the project are not being transferred to the host Party. The technology is indigenous and known to the A/R CDM project participant.

A.4.5. Approach for addressing non-permanence:

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In accordance with paragraph 38 and section K of the CDM A/R modalities and procedures[5], the following approach is selected to address non-permanence of the A/R CDM activity: 'Issuance of lCERs for the net anthropogenic greenhouse gas removals by sinks achieved by the project activity during each verification period, in accordance with paragraphs 45–50 of the CDM A/R modalities and procedures in 'Decision -/CMP.1 - Modalities and procedures for afforestation and reforestation project activities under the clean development mechanism in the first commitment period of the Kyoto Protocol.'

A.4.6. Estimated amount of net anthropogenic GHG removals by sinks over the chosen crediting period:

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Year	Estimation of baseline net GHG removals by sinks (tonnes of CO2 e)	Estimation of actual net GHG removals by sinks (tonnes of CO2 e)	Estimation of leakage (tonnes of CO2 e)	Estimation of net anthropogenic GHG removals by sinks (tonnes of CO2 e)
2009	276	43,456	8	43,172
2010	276	86,853	17	86,560
2011	276	158,336	22	158,038
2012	276	157,961	21	157,664
2013	276	158,337	10	158,051
2014	276	169,004	5	168,723
2015	276	179,671	1,554	177,841
2016	276	197,125	1,709	195,140

[5] Decision -/CMP.1 - Modalities and procedures for afforestation and reforestation project activities under the clean development mechanism in the first commitment period of the Kyoto Protocol.

2017	276	197,125	1,880	194,969
2018	276	197,125	2,068	194,781
2019	276	185,197	2,275	182,646
2020	276	173,270	2,502	170,492
2021	276	153,754	2,753	150,725
2022	276	153,754	3,028	150,450
2023	276	153,754	3,331	150,147
2024	276	156,034	3,664	152,094
2025	276	158,314	4,030	154,008
2026	276	162,044	4,433	157,335
2027	276	162,044	4,661	157,107
2028	276	162,044	4,661	157,107
Total (tonnes of CO_2 e)	5,520	3,165,203	42,632	3,117,051

A.4.7. Public funding of the proposed A/R CDM project activity:

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No public funding from parties included in Annex I is involved.

SECTION B. Duration of the project activity / crediting period

B.1 Starting date of the proposed A/R CDM project activity and of the crediting period:

>>
1st Jan 2008

B. 2. Expected operational lifetime of the proposed A/R CDM project activity:

>>
100-y-0-m

B.3 Choice of crediting period and related information:

>>

B.3.1. Renewable crediting period, if selected:

>>
3 x 20-y-0-m

B.3.2. Fixed crediting period, if selected:

>>
N/A

SECTION C. Application of an approved baseline and monitoring methodology

C.1. Assessment of the eligibility of land:

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To comply with the definition of afforestation or reforestation and eligibility of the land, the present A/R CDM project activity provides evidence that the land within the planned project boundary is eligible as an A/R CDM project activity by demonstrating that the land at the moment the project starts is not a forest. This is done first by showing that the land is below the forest national threshold (crown cover, tree height and minimum land area) for forest definition under decisions 11/CP.7 and 19/CP.9 as communicated by the respective DNA.

As per the host party India, forests are defined as (http://cdm.unfccc.int/DNA/ARDNA.html?CID=101)

- a single minimum tree crown cover value of 30 per cent
- a single minimum land area value of 0.05 hectare
- a single minimum tree height value of 5 m

The present A/R CDM project activity in fact has two sources of evidence that demonstrate that the current land use pattern on the lands under this A/R CDM project activity are not forests.

The first source is the recent 2005 land use maps for 5 taluks. For each of the taluk, the land use maps were overlaid on the project area. The source of these digitized satellite imagery maps is the Karnataka State Remote Sensing Application Centre. From the output, it can be seen that the project area is marginal croplands, fallow lands or wastelands (A-2a-e). Secondly, the Dry Land Development Programme (DLDP) Database also acts as Participatory Rural Appraisal evidence: The lands which are being brought under the present A/R CDM project activity are degraded and are being treated under a DLDP. Under the programme so far, 28,955 hectare of land has been treated. The local Participatory Rural Appraisal evidence based on our Dry Land Development Database thus also more than adequately confirms the GIS based evidence. Studies conducted also show that most of the area are not very projective for agriculture (Fig A-4).

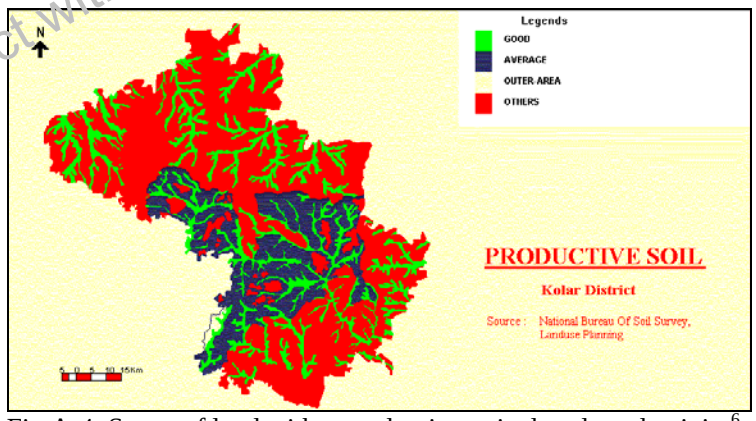

Fig A-4: Status of land with regard to its agricultural productivity[6]

[6] Source: NBSSLUP; http://www.csre.iitb.ac.in/adi/maps/prod-s.gif

The initial objective of the Dry Land Development Programme is to enable agricultural labourers to cultivate their scattered patches of marginal land and become subsistence farmers. The further objective is to shift from subsistence to sustainable land use practices. The DLDP is a pluralistic programme comprising a whole range of indigenously conceived soil & water conservation measures. Each individual land owner decides on the type of labour input needed on each separate field. The collective output of the labour of 20-25 determined persons in a work gang converts the marginal lands into productive fields.

The Dry Land Development Programme works carried so far are as follows:

DESCRIPTION	2002	2003	2004	2005	2006	Total	Unit
Cleared Shrubs & Boulders	2,032	2,948	3,743	2,053	2,733	13,509	Acres
Built New Contour Bunds	196,853	327,550	235,969	249,953	148,225	1,158,551	Metres
Strengthen Existing Bunds	19,952	26,850	34,894	38,478	34,432	154,606	Metres
Built Field Bunds	32,750	68,773	51,703	27,538	48,408	229,172	Metres
Checked Ravine & Gully	234	1,323	435	410	348	2,750	Number
Dug Diversion Channel	24,784	13,122	10,879	13,512	6,815	69,112	Metres
Built Retention Wall (Kanji)	17,236	34,958	38,805	38,775	15,235	145,009	Metres
Deepened Open Well	13	47	31	29	8	128	Number
Dug Farm Pond	17	10	36	12		75	Number
Dug Pits for Trees			4	84	100	188	Acres
Built Cattle Wall	1,291	5,268	9,254	7,822	14,821	38,456	Metres
Built Path/Road	548	520	280	849	906	3,103	Metres
Wasted Work	191	21	12	4	124	352	Acres

ADATS implements DLDP from the 3rd or 4th year of Coolie Sangha formation. Labour capital is made available for each Coolie Sangha Unit (CSU) to collectively work on their patches of dry land for 100 days every year. These person-days are divided according to land holding and the condition of each patch of land. The entire CSU then descends on each holding to do various labour intensive works from March to June every year. They split themselves into work gangs and descended on each person's holding to do labour intensive works. One person from each Member family goes to work. Each land owner decides on the actual soil and water conservation work needed on her or his land. ADATS Staff give technical advice and monitor the actual works. After that, Accounts Staff pay DLDP wages to the actual persons who work on the lands - i.e. the land owner does not receive any direct monetary benefit.

Soil & water conservation works: For the first 3-4 years, land is cleared of pebbles and boulders, and Soil & Water Conservation Works like stone contour bunding, ravine and gully check, diversion channels, etc. are taken up. Shrubs and grasses are allowed to grow on them. These soil and water conservation works are once again implemented, after a gap of 2-3 years, in order to tackle the new contours of erosion that would, in the meantime, have chequered the terrain.

In this manner, over a period of about 8 years, all the Coolie lands are cleared, levelled and bunded. Rain water is retained for a moment, moisture in the soil is increased, and soil erosion prevented. This makes the holdings cultivable, and yields as well as holdings dramatically increase.

The Dry Land Development Programme was started in 1986. Over the past 20 years (not every village implemented DLDP works every single year), Rs 93,805,020 worth of soil and water conservation works have been carried out on a total of 28,954 hectare of Coolie owned lands. The work carried out so far is as follows:

Hectares	Percent	Work Done	Value
6,589	23%	1 year work done	7,327,899
7,600	26%	2 years work done	16,902,157
6,009	21%	3 years work done	20,046,123
3,761	13%	4 years work done	16,729,704
2,416	8%	5 years work done	13,432,455
1,371	5%	6 years work done	9,148,059
699	2%	7 years work done	5,442,318
339	1%	8 years work done	3,016,692
112	0%	9 years work done	1,119,217
51	0%	10 years work done	560,700
7	0%	11 years work done	79,695
28,954			**Rs 93,805,020**

Land Survey: The established practice of Coolie Sangha is that as soon as a Coolie family joins the village CSU, all their landholdings are immediately surveyed and entered into the database. This data includes the extent of area, title in whose name the land stands, source of irrigation, gradient, quality of contour bunds, number of years of soil and water conservation works already carried out on the holding, and an estimate of the number of years of further work needed. ADATS and the Coolie Sangha need to implement an additional Rs 46,751,400 worth of soil and water conservation works on 21,469 hectare of Coolie owned lands over the next 5 years. 7,213 hectare (i.e. 34% of Coolie owned lands) are completely cleared of boulders, contour bunded and levelled, and another 3,526 hectare (16%) need just 1 more year of labour investment.

The DLDP also includes silt hauling onto coolie lands from the beds of irrigation tanks, compost making, seed treatment, promoting kitchen gardens, training women masons to build Smokeless *Chullas* (fuel efficient wood stoves), assisting sweeper women to set up vermicompost units to make manure from earthworms, and a host of other activities (http://www.adats.com).

From this it can be seen that land cover alone is sufficient to distinguish between forest and non-forest. Thus it can be seen that that proposed A/R CDM activity is on lands that are currently degraded land and not forests and that the land is below the forest national thresholds (crown cover, tree height and minimum land area) for forest definition under decisions 11/CP.7 and 19/CP.9 as communicated by the Indian DNA.

This is also decisive evidence that (ii.) The land is not temporarily unstocked as a result of human intervention such as harvesting or natural causes or is not covered by young natural stands or plantations which have yet to reach a crown density or tree height in accordance with national thresholds and which have the potential to revert to forest without human intervention.

In addition, the A/R CDM project activity must demonstrate that the activity is a reforestation or afforestation project activity. The present proposed A/R CDM project is a reforestation activity. Reforestation is the direct human-induced conversion of non-forested land to forested land through planting, seeding and/or the human-induced promotion of natural seed sources, on land that was forested but that has been converted to non-forested land. For the first commitment period, reforestation activities will be limited to reforestation occurring on those lands that did not contain forest on 31 December 1989.

… For reforestation project activities, the A/R CDM project activities must demonstrate that on 31 December 1989, the land was below the forest national thresholds (crown cover, tree height and minimum land area) for forest definition under decision 11/CP.7 as communicated by the respective DNA. The project area of the proposed A/R CDM activity was overlaid on the 1989 satellite imagery maps. The source of these digitized satellite imagery maps is the Karnataka State Remote Sensing Application Centre. The land use maps were overlaid over the project area to show the exact land use/land cover of the project area. It can be seen that none of the parcels of land coming under the Bagepalli CDM reforestation programme are forested in 1989. The output for each of the taluk is provided in Fig A-5a-e. As can be seen, none of the project area was forests during 1989. Thus the proposed project area is a reforestation activity.

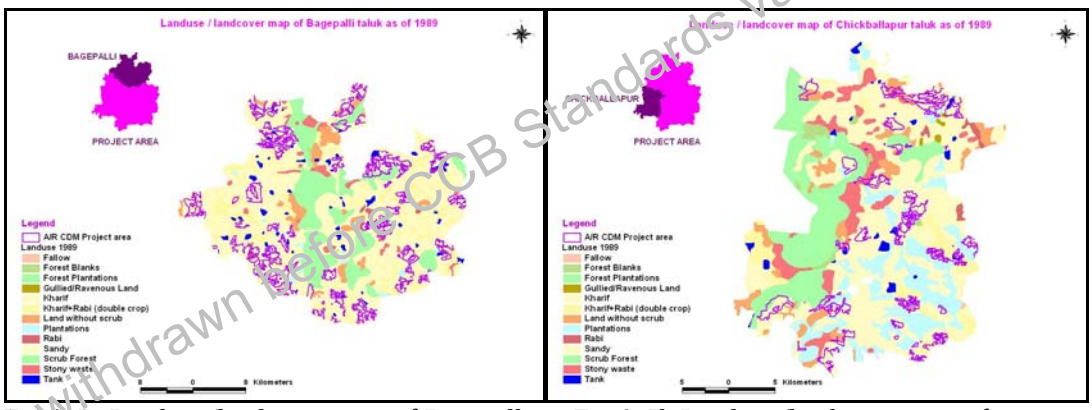

Fig A-5a Land use/land cover map of Bagepalli taluk of Kolar district in Karnataka in 1989

Fig A-5b Land use/land cover map of Chickballapur taluk of Kolar district in Karnataka in 1989

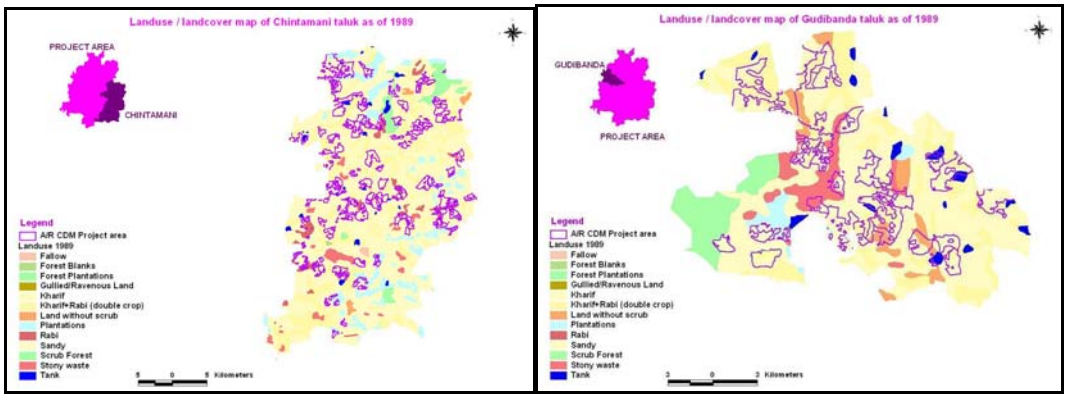

Fig A-5c Land use/land cover map of Chintamani

Fig A-5d Land use/land cover map of Gudibanda

taluk of Kolar district in Karnataka in 1989 taluk of Kolar district in Karnataka in 1989

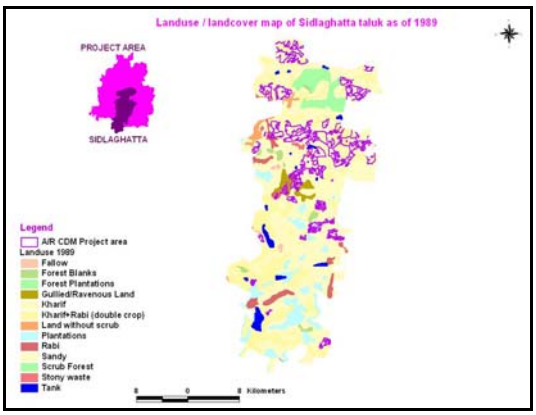

Fig A-5e Land use/land cover map of Siddalaghatta taluk of Kolar district in Karnataka in 1989

Dry Land Development Programme works going on since 1986 on these lands is also sufficient evidence to show that these lands were not forests during 1989 (Fig B-1 below).

Village level cadastre maps showing the parcels of land with survey numbers were prepared during 1890-60s by the Land Records and Settlement Department, Government of Karnataka. These lands show the private holdings of the farmers. The maps show the lands owned by the farmers, the contours of hills, water bodies, etc (Appendix 2). The maps show the survey numbers and these match the list of lands and survey number of the participating farmers. The maps show clearly that the land was below the forest national thresholds (crown cover, tree height and minimum land area) for forest definition under decision 21/CP.7 as communicated by the Indian DNA, in the sense that all the lands coming under this A/R CDM project activity are outside the Forest department area, and are listed as agricultural lands.

Thus the satellite imagery complemented by ground reference data is available to show beyond doubt that the proposed CDM A/R project area was not forests since 1989 till date.

Additional written testimony produced by following a participatory rural appraisal methodology is not required as this evidence provided is sufficient. As DLDP has been carried out since 1986 however, the DLDP Database acts as written testimony to back up this evidence from the satellite imagery. Thus to summarize: To demonstrate that the A/R CDM project activity is a reforestation activity the verifiable information provided is as follows:

- These lands have been uncultivable and barren. Dryland Development is being carried out on these lands since 1986 (Fig B-1). These records are available at the ADATS office. The work done by ADATS in the 5 taluks of Chickballapur can also be seen at the website http://www.adats.com
- The cadastre maps showing the parcel of privately owned farmer's lands with survey numbers, on which the A/R CDM project activity will be carried out, are available. These maps were prepared during 1890-1960s. Each parcel of land is registered with the land registrar (*Tahsildar*). Each plot of land has a survey number. Copies of these land registry documents (*pahanis*) are available at the taluk office. None of the plots are listed as being forest, nor are any trees mentioned on any of them.

- The integrated maps of land use and the project boundary as shown in Fig A-2 and Fig A-5 also show that these lands have not been forests currently and since 1989 respectively.

Thus it can be concluded without doubt that these lands have not been forests and are degraded drylands since 1989.

C.2. Title and reference of the approved baseline and monitoring methodology applied to the proposed A/R CDM project activity:

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AR-AM0001 version 2 19th May 2006.

The selected approved baseline and monitoring methodology is an integral part of the PDD.

C.3. Assessment of the applicability of the selected approved methodology to the proposed A/R CDM project activity and justification of the choice of the methodology:

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The chosen methodology AR-AM0001 version 2 19th May 2006 is applicable to the proposed A/R CDM project activity for the following reasons:

- The project activity does not lead to a shift of pre-project activities outside the project boundary, i.e. the land under the proposed A/R CDM project activity can continue to provide at least the same amount of goods and services as in the absence of the project activity. The proposed project area is currently degraded lands providing very little or no goods and services. Any level of reforestation on this degraded land would lead to an increase in goods and services. There will be no change in right of access to the plots or other management changes which would bar families with the right to their own land from using any part of it. As none of the land is common land there is no chance of landless families being prevented from using the land and thus being deprived of the goods and services they are getting.

- Lands to be reforested have to be severely degraded with the vegetation indicators below thresholds for defining forests, as communicated by the DNA consistent with decision 11/CP.7 and 19/CP.9, which is a single minimum tree crown cover of 30%; minimum land area of 0.05 and minimum tree height of 5 meters, and the lands are still degrading. The average aboveground biomass in the project area has been monitored and is 0.006 t/ha. Other parameters which define degraded land are: low soil carbon, low organic content of soil, lack of biomass growth and lack of water retention on the land. All these conditions apply as can be seen from Fig A-3 and A-4. As seen from the taluk maps in Fig A-2 and Fig A-5 and as shown in the DLDP Database, these lands are devoid of vegetation.

- Environmental conditions and human-caused degradation do not permit the encroachment of natural forest vegetation. The project area is degraded dryland which has been taken up for development under a Dry Land Development Programme. The land is being treated by removing boulders and creating bunds for soil and water conservation (Fig B-1). According to the State of Forest Report, the Kolar division has 1039.41 km^2 of forest area constituting 12.64% of the geographical area of the district. The reserved forests constitute 877.93 km^2, the protected forests 43.31 km^2, the unclassified forests 61.56 km^2 and the village forests 56.61 km^2.Kolar District has 7% of geographic area under forests accounting for 58200 hectare. Of them, 86% constitute open forests, which have a crown cover between 10-40%. The status of forests in Kolar has not changed since 1980s. The increase in area of forests of 1% has been due to plantations done on degraded forest lands under the social forestry

projects. None of this has occurred on project lands. Thus the environmental conditions and human-caused degradation of the parcels of land under this A/R CDM project activity do not permit natural regeneration or encroachment of natural vegetation.

- Lands will be reforested by direct planting and seeding of multiple species such as *Mangifera Indica* (Mango) *Tamarindus indica, Syzygium cumini and Tectona grandis.*

- Site preparation does not cause significant longer term net emissions from soil carbon. The only site preparation that is taking place is the Dry Land Development Programme, where the boulders are being removed and contour bunds prepared for soil and moisture conservation.

- Long rotation species such as *Mangifera Indica, Tamarindus indica* and *Syzygium cumini* will be planted which yield NTFPs along with Tectona grandis (Teak). Carbon stocks in soil organic matter, litter and deadwood should be expected to decrease more due to soil erosion and human intervention or increase less in the absence of the project activity, relative to the project scenario. This condition is also applicable. Being a very dry area and with a huge scarcity of biomass, the dry and fallen litter will be collected by the families as fuelwood. Thus litter will not form a major source of carbon stock. The increment in soil organic carbon will also be meagre in such dry arid land.

- Grazing will not occur within the project boundary in the project case.

Fig B-1: Dry land development work in the proposed A/R CDM project area

- In addition AR-AM0001 version 2 19th May 2006 lays out the procedure for determining the baseline scenario in section II.4., 'procedure for selection of most plausible baseline scenario'. This is addressed below. It leads to the conclusion that the baseline approach 22(a) (existing or historical changes in carbon stocks in the carbon pools with the project boundary) is the most appropriate choice for determination of the baseline scenario and that the land will remain degraded in the absence of the project activity.

C.4. Description of strata identified using the *ex ante* stratification:

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Stratification of the A/R CDM project activity is as follows:

- The proposed A/R project activity lands to be reforested are located in Chickballapur District which has 3 types of soils – red, clay loam and laterite.

- The project area is located in 5 taluks of Chickballapur – Bagepalli, Chickballapur, Siddalaghatta, Chintamani and Gudibanda. These taluks have the same climate, landform and vegetation type. Representative samples covering all the 5 taluks have been taken.
- The stratification is based on land capability classified by the NBSSLUP (Fig B-3). These were deduced from the soil map of old Kolar district. Land capability classification is an interpretative grouping of soils based on inherent soil characteristics, external land features and other environmental factors that limit the use of the land. The soil characteristics considered are soil type, water availability, soil depth and soil erosion status (Table B-2).
- The stratification is based on all these parameters and plots are allocated to one of the strata (Table B-2). Overall 14 type of land capability classes are present in the project area, of which 34% of the area is having moderately shallow, well drained, clayey soils on undulating interfluves with moderate erosion followed by 21% area under very deep, moderately well drained, clayey soils of valleys, with problems of drainage and slight salinity in patches and 13% area under very deep, well drained, gravelly loam soils, strongly gravelly in the subsoil on rolling lands. with moderate erosion.
- Field details of each parcel of land has been collected to record the vegetation, soil conditions, slope condition and erosion status.
- Sampling survey of representative land parcels were carried to determine the vegetation status, land use type and land cover. The vegetation parameters recorded were: vegetation cover (tree, shrubs, herbs).
- For trees, Girth at Breast Height (GBH), Height of the tree, crown cover and age of the tree were recorded.

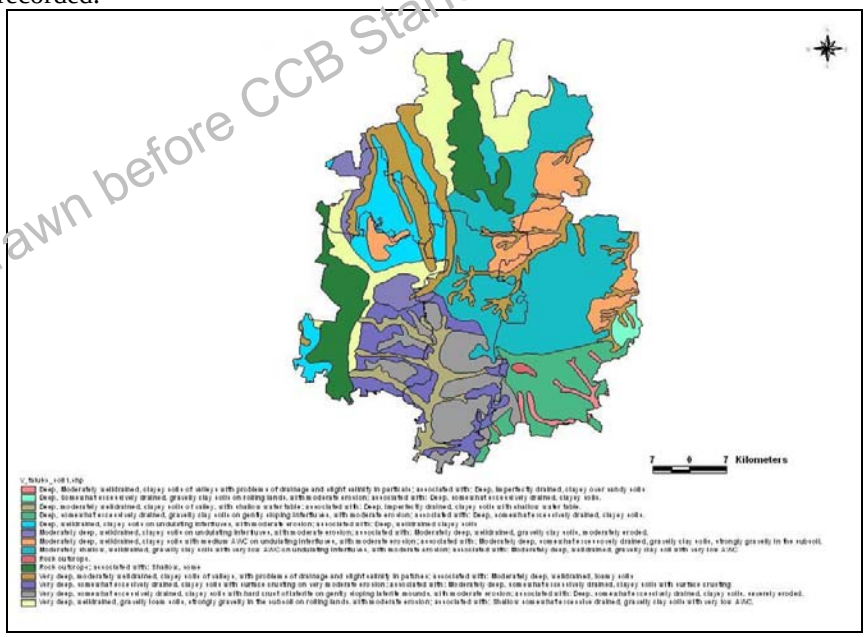

Fig B-2: Stratification of the project area based on land capability class

C.5. Identification of the baseline scenario:

C.5.1. Description of the application of the procedure to identify the most plausible baseline scenario (separately for each stratum defined in C.4., if procedures differ among strata):

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First we consider the plausible alternative land uses including alternative future public or private activities on the degraded lands such as any similar A/R activity or any other feasible land development activities, considering relevant national and or sectoral land-use policies that would impact the proposed project area, and land records, field surveys, data and feedback from stakeholders, and other appropriate sources. This is not done for different strata as there is no difference in baseline scenarios between the various strata.

a) The National Forest Policy of India (1988) envisages 33% of land area under forest/ tree cover. In the approach paper of the Tenth Five Year Plan a monitorable target has been fixed to increase forest/tree cover to the extent of 25% by 2007 and 33% by 2012.
b) The Indian Constitution has been amended to include forestry under concurrent list. Article 48-A states "The State shall endeavour to protect and improve environment and safeguard the forests and wildlife of the country." Article 51- A (G) enshrines as fundamental duty of each citizen "to protect and improve the natural environment including forest, lakes, rivers and wildlife, and to have compassion for living creatures". Similarly 73rd and 74th amendments of the Constitution authorized Panchayats and Urban local bodies to promote social forestry and urban forestry and tree plantations on vacant lands.
c) The National Forest Policy 1988 was adopted with the objectives to: i. have a symbiotic relationship between the tribal and forest, and to associate the forest dwellers in protection, regeneration and development of forests as well as sharing of benefits, ii. promote/popularise non-wood forest products and development of medicinal plants and bamboos, iii). increase productivity through adoption of clonal forestry, application of biofertilizers, adoption of IPM system and efficient forest product development, processing, utilisation and marketing and iv. Carry out detailed investment studies, harmonisation of demand and supply of forest products, and environmental impact analysis to rationalize and improve utilisation.
d) The National Agriculture Policy 2000 was adopted with the following objectives:
    a. Areas of shifting cultivation will receive special attention for their sustainable management
    b. Integrated and holistic development of rainfed areas will be promoted by conservation of rainwater through vegetative measures on watershed basis and augmentation of biomass production through agro and farm forestry with the involvement of the watershed committee.
    c. Agroforestry and social forestry that are prime requisites for maintenance of ecological balance and augmentation of biomass production in the agricultural systems will receive a major thrust for efficient nutrient cycling, nitrogen fixation, organic matter addition and for improving drainage. Farmers will be encouraged to take up farm/agroforestry for higher income generation by evolving technology, extension and credit support and removing constraints to development of agro and farm forestry.
    d. Creation of National Wasteland Development Board to afforest 5 million hectares of wasteland every year. The National Afforestation and Ecodevelopment Board set up by the Ministry of Environment and Forests will regenerate degraded forest land.
    e. Formulation of a number of externally aided social forestry projects and their implementation in States.

f. Concrete efforts are to be made to cover 15 million hectare of degraded forests under JFM (Joint Forest Management (JFM) was started for regenerating, protecting and equity sharing of forest resource. So far, 44,943 JFM Committees have been formed covering an area of about 11.629 m hectare of degraded forest land). vii. Private forestry development has to be encouraged by providing various inputs and legal & policy supports for increasing production and improving ecology and economy of the region.

g. Around 300 m hectare is the available productive land out of 328.27 m hectare total geographical area of the country. Actual forest cover is 63.73 m hectare of which only 37.73 m hectare are good forests. About 20 m hectare is covered under tree plantations (agroforestry, farm forestry, social forestry and other plantations). Thus, in order to achieve one-third area under forest/ tree cover, (100-37.73-20= 42.27, say 43) 43 m hectare of area is proposed to be covered under Greening programme in 10-year period as under

   i) 15 m hectare of degraded forest land to be covered under JFM.
   ii) 10 m hectare of irrigated area to be brought under commercial agroforestry
   iii) 18 m hectare of rainfed area to be brought under subsistence agroforestry.
   iv) Greening India Programme aims at achieving increased productivity, employment and income generation and food security to poverty stricken people.

Though there are a large number of policies, programmes and amendments to the Constitution for reforestation, implementation depends on the availability of funds. In India, the budgetary outlays under the forestry and wildlife sector in State Plans are around 1 per cent. This amount includes overseas development aid. The financial requirement for greening programme would be of the order of Rs.48,000 crores in 10 years. The annual requirement would be Rs. 4,800 crores against the current availability of Rs.1601 crores. There is shortage of funds to undertake such programmes. Additional funds requirement will have to be met from the plan budget of Central and State Governments and externally aided projects. It was envisaged that the external aid would come as an additional amount, but the domestic support was consequently reduced[7]. Thus funding for afforestation and reforestation is lacking in the country though there are ambitious policies and plans to cover a large area under tree cover. The funds for afforestation and reforestation in Kolar region were allocated for planting on forest lands under the Joint Forest Management. On an average, annually, during 1991-2005, 500 hectare has been planted in the taluks. Funding for planting on farmers lands from the programmes are limited. The overseas funding from JBIC for planting on forest lands under the JFM programme and the Forest Development Fund from the Central Government has come to an end. There are no funding for planting activities in Chickballapur district under any of the schemes in the coming years either on forest lands or on private lands. In addition, farmers do not get loans from banks for the purpose of reforestation activities as compared to agricultural activities. According to the mid term appraisal by the Planning Commission, the states have not been able to realize the full potential of this sector, particularly the poverty alleviation focus of the 1988 Indian Forest Policy. The strategy of the Forestry Sector should be two pronged – one, producing market oriented products on farms and two, protecting forests for environmental benefits and for sustaining the livelihood of the forest dwellers[8]. Lack of funds has been the major deterrent to the promotion of forestry activities. These activities listed above would be the only plausible alternative land uses including alternative future public or private activities on the degraded lands. There is no other similar A/R activity or any other feasible

[7]Source: http://planningcommission.nic.in/plans/planrel/fiveyr/10th/volume2/v2_ch9_1.pdf. Tenth five year plan 2002-07. Forests and Environment, Planning commission. Govt. of India.

[8]Report of the task force on greening India for livelihood security and sustainable development. Planning Commission, Government of India, July 2001. http://planningcommission.nic.in/aboutus/taskforce/tk_green.pdf

land development activities that would impact the proposed project area. The relevant national and sectoral land-use policies, listed above, and the land records, field surveys, data and feedback from stakeholders, already described above, all demonstrate that without the proposed A/R CDM project activity, the project area will not be reforested.

Secondly we show that under the plausible scenarios identified, the most plausible scenario is that the project areas would remain abandoned and degrading in absence of the project activity, by assessing the attractiveness of the plausible alternative land uses in terms of benefits to the project participants, consulting with stakeholders for existing and future land use, and identifying barriers for alternative land uses. As we have chosen the barrier approach from the A/R "Tool for the demonstration and assessment of additionality" to demonstrate additionality, we demonstrate that the project areas would remain abandoned and degrading in absence of the project activity, by assessing the attractiveness of the plausible alternative land uses in terms of benefits to the project participants, consulting with stakeholders for existing and future land use, and identifying barriers for alternative land uses. We do this by showing generally that similar lands, in the vicinity, are also not, and are not planned to be used for these alternative land uses. We show that there are apparent financial and/or other barriers, which prevent alternative land uses. The most plausible scenario is that the project areas would remain abandoned and degrading in absence of the project activity. The attractiveness of the plausible alternative land uses in terms of the benefits to the project participants is very low indeed. This is evidenced by the fact that the agricultural labourer families who are participating in this A/R CDM project activity have to work on other people's lands as the land which they will be reforesting under this A/R CDM project activity is so degraded. Similar lands in the vicinity, which are not under Dry Land Development Programme, are simply left as degraded lands and are not cultivated or reforested. The financial and other barriers which prevent these alternative land uses is the lack of investment capital. The only incentive to doing this reforestation activity is the funds which can be mobilised through registration as a A/R CDM project activity. Based on stakeholders interview, the only alternative to the project activity for the lands would be marginal agricultural cultivation. The crop productivities are low as these areas have low fertility and are dependent on rainfall (Fig A-3&A-4). Uncertain rainfall and continuous droughts in the area is causing financial loses to these marginal farmers. The project areas would thus remain either as barren and uncultivable lands, or fallow or marginal croplands in the absence of the project activity. DLDP has a low budget at its disposal which does not allow the land to be converted to alternative use. The relative attractiveness of cropping in terms of benefits to the local economy and communities' subsistence is low. A stakeholder's consultation for existing and future land use shows that the communities do not find cropping profitable especially on these degraded lands. At the same time there is no financial wherewithal to implement a reforestation programme on these degraded lands in the hope of creating a perennial crop which is more capable of withstanding the vagaries of the weather and climate. Thus whilst the project activity is in the long run more attractive than anything else, this must be seen as a relative gain as it will be a 10 year struggle to establish the trees at any decent level of productivity. This will not be possible without CDM revenues. The description of the DLDP works above also demonstrate amply that the barriers to alternative land use are too high. The DLDP cannot get families into reforestation activities. At the most some soil conservation work and levelling can be achieved for some marginal cultivation activities. There has only been one other programme around. The World Bank aided social forestry programme in the eighties had contributed to the supply of seedlings to farmers through decentralized nurseries for planting on revenue lands. In Southern and Eastern Kolar District, Eucalyptus was extensively planted on the mounds/ bunds as well as in the agricultural wastelands (Fig B-2). In the Chickballapur district comprising the project area, the area covered was negligible as seen in Fig B-2 and Fig A-5. Plantations account for 0.18-5% of the taluk area (Table B-1). These programs were aided by overseas developmental agencies, while domestic funds for such

programmes were minimal. A study by Shiva et al., (1981)[9], concluded that the primary objective of social forestry had not been achieved, i.e. the subsistence forest product requirements of the poorest rural communities were not being met. Instead, social forestry had been successful in motivating medium and large farmers to plant trees on their lands. The establishment of Eucalyptus plantations on private land is argued to have adversely affected landless agricultural labourers and marginal farmers by reducing local employment opportunities as well as fuel and fodder availability. The authors assign the failure of social forestry primarily to: 1) promoting tree cultivation without sufficient attention to species and the capacity of different socio-economic groups to grow these; and 2) assuming that increasing production of a commodity in a particular locality will also ensure increased local availability. The large-scale planting of Eucalyptus has caused severe decrease in the water table of the region. A survey of the various stakeholders for choice of species in the project area show that they do not prefer Eucalyptus, as they opine that it will further deteriorate the lands. They prefer horticulture species.

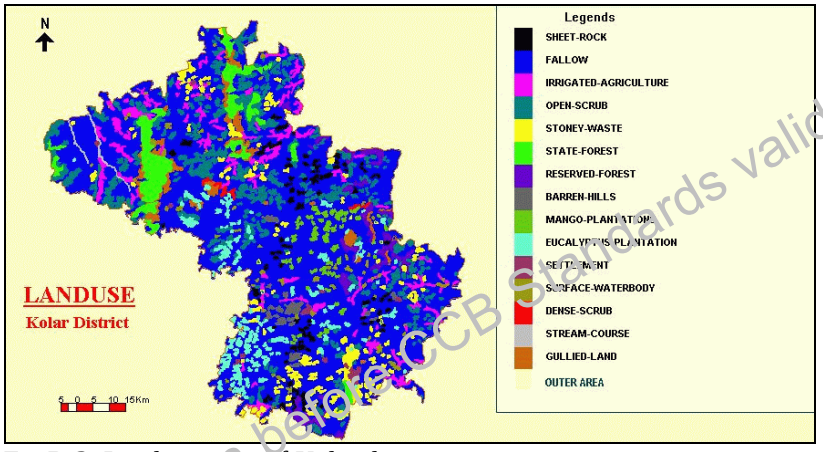

Fig B-3: Land use map of Kolar district

Currently some afforestation and reforestation is being done under the externally aided JBIC programme. The activity is limited to forest lands. The benefit of planting is to the Joint Forest Committees (JFMCs) and the forest department. Planting on degraded private lands are not being done. As mentioned above, even in the agroforestry model, only a few big farmers (with large land holding) were benefited while the marginal and poor farmers are not being benefited. The species planned for this proposed A/R CDM project activity are NTFP species which are indigenous to the region and will yield long-term benefit to the farmers. The scale of the A/R CDM project activity also means that some benefit may accrue to the local climate and ecological conditions, and precipitation in the local area may even increase. This scale of planting on private marginal lands has not been done before. Thus the proposed CDM is different from the very marginal and under-funded on-going forestry projects promoted by the forest department.

Thus the most plausible scenario is that the project areas would remain abandoned and degrading in absence of the project activity. The assessment of the attractiveness of two plausible alternative land uses in terms of benefits to the project participants (having consulted with stakeholders for existing and future land use, and identifying barriers for alternative land uses) is that similar lands, in the

[9] Shiva, V., Sharatchandra, H.C. & Bandyopadhyay, J. 1981. Social, Economic and Ecological Impact of Social Forestry in Kolar. Indian Institute of Management, Bangalore, India. http://www.odifpeg.org.uk/publications/greyliterature/socialforestry/shiva/ Shiva.pdf

vicinity to the proposed project activity parcels of land, are not planned to be used for these alternative land uses. There are barriers which prevent the alternative land use as described above. The proposed A/R CDM activity is different from the earlier social forestry programmes in the following way:

- Reforestation under this A/R CDM project activity is on degraded lands belonging to marginal farmers and agricultural labourers in the 5 taluks of Chickballapur District. These taluks have worse soil conditions than Southern and Eastern taluks, and do not lend themselves to the programmes described above.
- The species are selected by the participating families and the emphasis is on NTFP and local species.
- The aim is to establish long rotation farm forests, and not engage in short rotation cash crop plantations.
- There will be greater biodiversity benefits from this A/R CDM project activity as bund planting and mixed species will contribute to creating small protected habitats for flora and fauna.

C.5.2. Description of the identified baseline scenario (separately for each stratum defined in Section C.4.):

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The historical and existing land use/cover changes in their social-economic context are best observed by analyzing the Dry Land Development Programme records going back to 1986, looking at the satellite images of land use/cover from around 1990 and by drawing on the local knowledge of the project participants who have lived and worked in this area for 30 years. The key factor that influences the land use/cover changes over time in this region is climate change. The project area is a semi arid drought prone region. The project area skirts the southern border of the Rayalaseema desert belt and shares the same language, culture and social structure, as also the stark poverty that afflicts southern Andhra Pradesh. The region receives an annual rainfall of around 650 mm and is facing imminent desertification, with severely degraded soils. The dust brown rocky terrain is severely undulating, with small hill ranges and outcrops that stud the topography. There is no mineral wealth and only a very thin and fragile soil cover. Slopes in the region are not terraced and rainfall is not retained. This is an even bigger problem than low precipitation and erratic, spatial showers. Soil erosion is a definite problem (Fig A-3&A-4) and the age-old network of small and large irrigation tanks is getting visibly choked. These areas are undergoing soil and water conservation works under the DLDP. These lands are currently barren and uncultivable land, fallow land or marginal cropland. The degradation of the vegetation is clear in that the crown cover of the non-tree vegetation has decreased in the recent past for reasons other than sustainable harvesting activities. Basically climate change is causing rapid desertification. Soil degradation has occurred as erosion has increased continuously and no soil and water conservation works have really been able to stop it; soil organic matter content has decreased (see study by Ravindranath et al), and no natural encroachment of trees would occur as there are no on-site seed pools that may result in natural regeneration. Based on the baseline study (section B), the density of naturally occurring trees in the region is <1 tree/ha. There are no external seed sources that may result in natural regeneration; and there is no possibility of seeds sprouting and the growth of young trees occurring. As DLDP has been going on since 1986, this provides the required evidence of supplementary surveys on the project areas as well as similar surrounding areas for two different years covering a minimum time period of ten years. There are no national and/or sectoral land-use policies or regulations that create policy driven market distortions which give comparative advantages to afforestation/reforestation activities and that have been adopted before 11 November 2001. As can be seen from Table B-1, plantations in the taluks account for only 0.18-5% of the land use.

Table B-1: land use in the taluks of project area based on satellite imagery (%)

Taluk	Built-up	Agriculture	Plantation	Forest	Wasteland	Waterbody
Bagepalli	8.33	32.21	0.18	0.96	57.60	0.72
Chickballapur	2.82	49.16	2.42	4.78	39.47	1.36
Chintamani	5.65	47.74	0.56	0.12	45.60	0.33
Gudibanda	3.07	44.30	3.28	2.82	45.74	0.79
Siddlaghatta	5.05	47.64	5.23	0.70	41.08	0.31

Source: Mapping of fuel wood trees in Kolar district using remote sensing data and GIS. http://ces.iisc.ernet.in/energy/paper/fuelwood/fuelwood.html

No policies (implemented before 11 Nov 2001) significantly impact the project area, and therefore there is no reason why the baseline scenario cannot be "degraded land". Thus the methodology can be used. The scenario "lands to be planted are degraded lands and will continue to degrade in absence of the project" is the most appropriate plausible baseline scenario. To ensure transparency regarding the condition of degraded lands, all information used in the analysis and demonstration is archived at the ADATS head office in Bagepalli.

- The boundary of each of the parcel of land of the proposed CDM A/R project was determined and represented by the following:

  a) the survey number of the parcel of land. Copies of these land registry documents (*Pahanis*) have been provided by the local land registrar office (Tahsildar) to the farmers. Copies of these land registry documents (*Pahanis*) are available with the Tahsildar.

  b) Each parcel of land has been given a unique reference number, which has the code of the village and the farmer. The maps are available for all the parcels.

  c) Field survey as part of DLDP was done to study soil conditions, gradient and erosion status of 100% of the lands. The gradient of the land and the bund condition is recorded for each parcel of the land.

- Sampling surveys on representative land types were done which includes the crown cover, mean height of shrubs, herbs and trees, biomass stock sampling and soil type.
- These areas are degraded and are under different stages of DLDP. Ground survey shows that these lands are highly degraded and there is no possibility of natural encroachment. The soil conditions are hostile for natural regeneration. Currently these lands are barren uncultivated lands, fallow lands or marginal croplands. These lands have been non-forested since 1989.

Table B-2: Stratification of the proposed A/R CDM project area based on land capability class (in hectare)

Sl No.	Description	Bage-palli	Chicka-ballapur	Chinta-mani	Gund-ibanda	Siddala-ghatta	Total
1	Deep, moderately welldrained, clayey soils of valley, with shallow water table		296			300	596
2	Deep, somewhat excessively drained, gravelly clay soils on gently sloping interfluves, with moderate erosion			728		176	904
3	Deep, somewhat excessively drained, gravelly clay soils on rolling lands, with moderate erosion			378			378
4	Deep, welldrained, clayey soils on undulating interfluves, with moderate erosion	762	428		533	84	1807
5	Moderately deep, welldrained, clayey soils on undulating interfluves, with moderate erosion		80				80
6	Moderately deep, welldrained, clayey soils with medium AWC on undulating	489	78	153		137	857

	interfluves, with moderate erosion						
7	Moderately shallow, welldrained, gravelly clay soils with very low AWC on undulating interfluves, with moderate erosion	1505		2997		1688	6190
8	Moderately shallow, welldrained, gravelly clay soils with very low AWC on undulating interfluves, with moderate erosion ,	12					12
9	Rock outcrops	181	98				278
10	Very deep, moderately welldrained, clayey soils of valleys, with problems of drainage and slight salinity in patches	1005	168	753	881	991	3796
11	Very deep, somewhat excessively drained, clayey soils with surface crusting on very moderate erosion		108	54		274	436
12	Very deep, somewhat excessively drained, clayey soils with hard crust of laterite on gently sloping laterite mounds, with moderate erosion					161	162
13	Very deep, welldrained, gravelly loam soils, strongly gravelly in the subsoil on rolling lands. with moderate erosion	2200	186		58		2443
14	Very deep, welldrained, gravelly loam soils, strongly gravelly in the subsoil on rolling lands. with moderate erosion,	242					242
	Grand Total	6395	1441	5062	1471	3811	18181

C.6. Assessment and demonstration of additionality:

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Additionality test

The proposed project area is a collection of parcels of degraded land owned by marginal private farmers in the 5 taluks of Chickballapur District. The Dry Land Development Programme has been in place since 1986. As can be seen in Fig A-5, these lands have not been forests since 1989 according to the definition of forests given by India. Also currently these lands are not forests as shown in Fig A-2. These lands are degraded private lands and no natural regeneration will take place.

The steps as outlined in the EB additionality tool[10] may be followed to demonstrate that a proposed A/R CDM project activity is additional and not the baseline scenario, taking into account the conditions under which AR-AM0001 is applicable. The chosen approach is:

- Step 0: Preliminary screening based on the starting date of the project activity
- Step 1: Identification of alternatives to the A/R project activity (the possible baselines);
- Step 3: Barriers analysis; and
- Step 4: Impact of registration of the proposed afforestation or reforestation (A/R) project activity as an A/R CDM project activity.

STEP 0: Preliminary screening based on the starting date of the project activity

This step is not applicable. The crediting period will begin after registration.

[10] (cdm.unfccc.int/EB/Meetings/016/eb16repan1.pdf)

STEP 1: Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a: Define alternatives to the project activity

The project area being a semi-arid drought prone region receiving an annual rainfall of 650 mm, is facing desertification and soil degradation. The region has rocky terrain which is severely undulating, with small hill ranges and outcrops. There is only a very thin and fragile soil cover. Slopes in the region are not terraced and rainfall is not retained due to which soil erosion is a severe problem in this area. The proposed project area is undergoing soil and water conservation works under DLDP and the only alternative to this would be continued degradation of the land and continued barren conditions. Alternatively cropping could in some circumstances be taken up by the families. But neither DLDP nor marginal cropping is economically viable as the crop productivities are very low due to poor soil conditions and scarcity of water resources (Fig A-4). There has been a decrease in agricultural and pasture land, and there has been an increase in fallow degraded land (Kolar land use statistics, 2005)[11]. Seasonal conditions and climate change have been the main factor for decrease in cultivation area. The Employment Guarantee Act is very important in this region as unemployment is very high. The periodic drought and the recurring scarcity conditions have reduced the cultivated areas. To reap better benefits, slightly richer farmers install submersible borewells and cultivate some lands, and like marginal farmers, they leave the degraded unproductive lands fallow. This has led to overall collapse of the water table and further decrease in acreage under cultivation. The extent of all these types of degraded land during the years has not shown the most significant variation in the increase in the extent of fallow land. This is an indicator of increased degradation. Thus the lands to be reforested are severely degraded, with the vegetation indicators below thresholds for defining forests, and the lands are still degrading. As proved by the fact that DLDP works have to continue to be carried out on all these lands, these lands are economically unattractive as croplands. At the same time there is no financial wherewithal to take up alternatives. Thus the continuation of the current situation represents the only baseline alternative.

Sub-step 1b: Enforcement of applicable laws and regulations

The alternative described above is in compliance with all applicable legal and regulatory requirements. These laws and regulations have mixed objectives other than only land-use and related regulations, and include conservation of biodiversity, soil and water resources protection / conservation, cooking fuel security, and provision of basic minimum livelihood through granting of land title to agricultural labourers who have squatted the lands and obtained title to the land. National and local policies that have been implemented since the adoption of the modalities and procedures for the CDM are not taken into account.

National policies and programmes were launched in India for afforestation and reforestation in India, of which social forestry and the Joint Forest Management (JFM) order of 1990 are the major activities. According to the 10th Five years plan for the forestry sector by the Planning Commission, Government of India, the thrust for forestation especially on farm lands should be encouraged[12]. The following plans are suggested:

[11] Chitraranjan, H. Kolar district Gazetteer, karnataka Gazetteer, 2005

[12] Report of the task force on greening India for livelihood security and sustainable development, Planning commission, Government of India, July-2001. http://planningcommission.nic.in/aboutus/taskforce/tk_green.pdf

Promotion of forestry on private farmers' land: The National Forest Policy (1988) stressed that forest farming should be encouraged for meeting forest based industrial raw-material requirements. By avoiding duplication of species unhealthy competition may disappear between forestry and agroforestry sectors and farmers can start forest farming for their economic gains.

Poverty alleviation, tribal development and women's empowerment schemes to focus on private farm land: Forestry on agricultural lands has a potential to optimise production in the rainfed and semiarid regions. However, this has neither been stressed nor monitored in poverty alleviation, tribal development and women's empowerment schemes under implementation. Such programmes should be encouraged under the 10th five year plan.

Integrated watershed development programme: There is a serious problem of ecological deterioration in watershed areas. An integrated approach is needed for conserving, upgrading and using the natural resource base of land, water, plant, animal and human resources. Forestry on farm lands can play a dominant role in promoting livelihood opportunities and has to be taken up in the 10th five year plan.

These plans are not legally binding and meeting the goals and objectives of these programs depend on availability of funds. Funds from government have been limited for such programs. The national JFM program and social forestry concentrates on the forest areas rather than on such private degraded lands where the proposed A/R CDM activity takes place. Thus the baseline scenario is entirely in compliance with applicable legal and regulatory requirements but at the same time the fact that the legal requirements are in place does not mean that enough is being done.

STEP 3: Barrier Analysis: Determine whether the proposed project activity faces barriers that:
- Prevent the implementation of this type of proposed project activity; and
- Do not prevent the implementation of at least one of the alternatives.

PROJECT DESIGN DOCUMENT FORM FOR AFFORESTATION AND REFORESTATION PROJECT ACTIVITIES (CDM-AR-PDD) - Version 03

Barrier that would prevent the implementation of the type of proposed project activity from being carried out if the project activity was not registered as an A/R CDM activity.	**Sub-step 3a. How it prevents the implementation of this type of proposed project activity. How it would prevent potential project proponents from carrying out the proposed project activity if it was not expected to be registered as an A/R CDM project activity.**	**Sub-step 3b. How it does not prevent the implementation of the alternative.**	**Source of transparent and documented evidence.**
Investment barrier 1: Debt funding is not available for this type of project activity.	Perennial trees cost Rs 56,800 per hectare to establish. Agricultural banks do not give loans for these project activities as the marginal farmers do not have any collateral security to offer. The gestation period for tree crops is so long that these kinds of loans are not attractive to banks.	Annual cropping of marginal lands costs Rs 1,000-3,000 per hectare. This level of borrowing is available more readily from informal sources where collateral is not needed. Gestation periods are short and money that has been borrowed informally can be returned more quickly to the lender. The even more likely alternative of leaving the land in a degraded state costs nothing and is generally preferred.	Written documentation from ADATS including minutes from Board meetings, correspondence, feasibility studies, financial or budgetary information, etc; (www.adats.com) http://planningcommission.nic.in/reports/wrkpapers/wp_lease.pdf
Investment barrier 2: No access to international capital markets due to real or perceived risks associated with domestic or foreign direct investment in the country where the project activity is to be Implemented.	It is not possible to raise funds on the international or domestic capital markets for investments on marginal farmer's own private lands where the financial returns from planting activity are too low to allow the farmers to repay any loans. - Funding is generally not adapted to the long-term nature of forestry; - inappropriate policies, poor institutional capacity and difficult procedures, whether on the part of aid recipient countries or donors. - the low business orientation of forestry administrations, bureaucratic delays and unsuitable tenure policies, laws and practices	Local fund availability matches the baseline level of activity on highly degraded lands where people do not have time, skill or money to do more than just scratch the soil.	http://www.fao.org/documents/show_cdr.asp?url_file=/docrep/w3247e/w3247e04.htm
Investment barrier 3: Lack of access to credit	If credit were available over say 5 year periods, with loan moratorium for 4 years until the trees start yielding, then these kinds of project	Informal credit is enough to buy some millet for planting after some shallow scratching of the soil. Otherwise it is also simply left as wasteland.	http://planningcommission.nic.in/plans/planrel/appdraft.pdf

	activities would come up. But this form of finance is not available. - The credit is by banks has high transaction cost, complex procedure, corruption, one-time credit, poor recovery; overcrowding of lending in certain projects; poor targeting and selection of non-poor. - Need to mortgage land, which puts the only asset they have at risk.		
Institutional barrier 1: Risk related to changes in government policies or laws	This kind of activity can only be taken up on land where title to the land is secure as carbon rights need to be clearly defined.	Can also be taken up on any degraded land even where the title has not yet been obtained.	Zeeuw, 1997; Kirk, 1999
Institutional barrier 2: Lack of enforcement of forest or land-use-related legislation.	Though 18 million hectare of rainfed area is to be brought under subsistence forestry on private farmlands, lack of budget prevents it from implementation.	Business as usual is therefore for the land to remain degraded with no tree cover.	Planning commission[8]
Technological barrier 1: Lack of access to planting materials	The planting material has to be arranged a year in advance if there is no fund security the nursery order cannot be given. There is also no pre-existing technological base from which to establish own nurseries.	For the baseline marginal crops like millet and groundnut there is no lack of planting material. It is available from local markets.	
Technological barrier 2: Lack of infrastructure for implementation of the technology.	This kind of project activity needs a well organised infrastructure for raising and/or distributing saplings, making watering arrangements, digging the pits, and maintaining the trees as it is degraded lands. This infrastructure can only be built up with adequate funds.	The infrastructure required in the baseline activity is family based. The activity can be carried out with family labour and there is no need for transport, technical and other inputs.	Documents prepared by ADATS in the context of the proposed project activity. www.adats.com
Barrier related to local tradition 1: - Traditional knowledge or lack thereof, laws and customs, market conditions, practices.	The educational level of rural youngsters cannot match the know-how and finesse of urban youth. A clever alliance with the middle-class like an NGO or local extension officers or private	Superior knowledge of how to eke a living from degraded land does not result in adequate livelihood. Traditional knowledge is useless in the face of climate change and desertification.	

	entrepreneurs is required for this kind of project activity to be taken up. Lack of knowledge of how to do CDM project activities is a barrier.		
Barrier related to local tradition 2: Traditional equipment and technology.	Lack of the vital technical advice prevents implementation of the type of project such as is being proposed as a CDM project activity.	Only technically proven and tried and tested crops are used – millet and groundnut on degraded lands are relatively pest-resistent and no additional technical support is required to get a marginal crop. Rest of the last is left as wasteland.	
Barrier due to prevailing practice: - The project activity is the "first of its kind": No project activity of this type is currently operational in the host country or region.	Prevailing practice is to take the path of least resistance and let marginal farmers on marginal parcels of land continue slowly abandoning degraded lands. A huge effort by the marginal farmers and the NGO is required to overcome prevailing practice.	By definition the business-as-usual scenario is the easiest to do.	
Barrier due to local ecological conditions 1: Degraded soil (e.g. water/wind erosion, salination, etc.)	A great amount of effort has to be made to establish trees.	Though this barrier also affects marginal cropping on degraded lands too, it does not affect it as strongly. But on the whole more and more land is beinf left in degraded condition as barriers to cultivation are becoming higher and higher.	
Barrier due to local ecological conditions 2: Catastrophic natural and / or human-induced events (e.g. land slides, fire, etc)	This barrier does not affect the types of project such as this proposed project activity.	This barrier does not affect the baseline case.	
Barrier due to local ecological conditions 3: Unfavourable meteorological conditions such as drought.	Drought is a major barrier to the implementation of this project activity. Drought due to global climate change which causes increased desertification means that the proposed type of project activity has to overcome major barriers to see that the trees establish and flourish.	Though this barrier also affects marginal cropping on degraded lands too, it does not affect it as strongly, as the monetary loss in case of a drought is less.	
Barrier due to local ecological conditions 5: Biotic pressure in terms of grazing, fodder collection, etc.	Trees have to be very well protected, all through the year. Full time watch and ward is required for this type of project activity. Given that the harvest willl not mature	Marginal annual crops on degraded lands give a small income within 3 months. This is an incentive to protect the crop during its growth phase.	

	until the 4th or 5th year. This is a major barrier to implementation of the project activity in the absence of financial incentives in the first years.		
Barrier due to social conditions 1: Demographic pressure on the land (e.g. increased demand on land due to population growth)	This barrier affects the planned type of project activity as land prices are going up despite continued degradation. This is due to scarcity of land and the perception that land is an asset over and above its productive value. Some parcels of land but not all thus face the barrier that reforestation will conflict with the aim of keeping the land in degraded condition with minimum investment and selling it at an opportune moment.	This barrier does not apply to marginal annual cultivation. The crop matures in three months and no major investment is lost if the land is sold.	
Barrier due to local social conditions 2: Social conflict among interest groups in the region where the project takes place.	The class/caste structure of rural society makes it difficult for this type of project activity to be taken up without the adequate preparation of a congenial sociopolitical milieu. Social conflict between castes/classes makes it very difficult for small and marginal farmers to club their individual parcels of lands into viable units. Implementation details like common watering, etc. also demands the overcome of caste-class differences.	20 years of organisational work and the creation of village level Coolie Sangha Units (CSUs) has established a Collective Entity which can overcome the barriers. This also benefits the CDM Project .	http://www.epw.org.in/showArticles.php?root=2000&leaf=05&filename=1286&filetype=html www.adats.com
Barrier due to local social conditions 4: Lack of skills locally.	The project activity requires well organised and trained people to implement it; the training has to come as part of the pre-project phase. The lack of trained people amongst the implementing farmers is a barrier.	Cropping on marginal degraded land does not need new skills; traditional practices suffice.	
Barrier due to local social conditions 5: Lack of organisation of local communities.	The project activity requires a very well organised community infrastructure. The lack of an organised community structure is a	For cropping on degraded land in individual parcels, no community organisation is required.	http://www.unu.edu/unupress/unupbooks/80a03e/80A03E0c.htm

	barrier.		
Barriers relating to markets, transport and storage 3: Possibilities of large price risk due to the fluctuations in the prices of timber and non-timber products over the project period in the absence of efficient markets and insurance mechanisms.	There are yearly variations in price of NTFP products based on yield of the produce and yield of substitute products. The nearest informal local market and lack of any insurance for fluctuations, the financial returns to farmers is uncertain.	The produce from the land is sold in the nearby town.	http://www.deccanherald.com/deccanherald/jan252005/s2.asp
Barriers relating to markets, transport and storage 4: Absence of facilities to convert, store and add value to production from CDM activities limits the possibilities to capture rents from the land use under A/R CDM project activity."	The market for processed produce from the CDM activity would fetch higher returns to the farmers. An organized facility for processing, storage and value addition is currently not in place and is a barrier.	The produce from the land use will not be stored and sold immediately or used for subsistence.	

STEP 4: Impact of CDM registration
The approval and registration of the project activity as a A/R CDM project activity, and the attendant benefits and incentives derived from this registration, will alleviate the economic and financial and other identified barriers and thus enable the project activity to be undertaken.

The benefits and incentives are:

- The project will sequester CO_2. In the absence of the A/R CDM project activity, the land being private farmer's land will continue to remain degraded and no net GHG removals by sinks will take place.
- These farmers will be able to undertake reforestation activities on their marginal degraded lands which they will not be able to do without the CDM money which will flow after approval and registration. Loans for forestry activities for marginal farmers and agricultural labourers owning degraded land are not available as they cannot provide collateral security. Only the proposed A/R CDM activity will allow the project financing for the proposed reforestation activity by marginal farmers to be arranged, by creating the opportunity for ADATS to enter into an off-take contract with the proposed Annex 1 project participant on the basis of the lCERs to be generated by the project activity.
- The benefit of the reforestation programme is also that soil loss will be less as soil erodibility, surface slope gradients are less pronounced and shorter, soil cover increased, and conservation practices are adopted. The stock of soil affected by substantial erosion rate would otherwise over time, be converted to degraded soil and, if not restored, eventually result in a desert. As a consequence of the erosion process, sediment material would be further deposited in other parts of the landscape, water infiltration diminished, and runoff increased. Forests are one of the most protective types of soil covers that can help soil loss reduction. Thus approval and registration as a CDM project activity will overcome existing barriers to allow these benefits to flow.
- The successful implementation of this project and demonstrative effect may promote such activities in other parts of semi-arid region of the country and the region.

- New players who bring the capacity to implement a new technology/practice are attracted through a new kind of financing instrument.
- Ideas which were on paper can be implemented in practice and a proposed A/R CDM activity which was first conceived in 1995 can become reality.

C.7. Estimation of the *ex ante* baseline net GHG removals by sinks:

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Estimation of baseline net GHG removals by sinks

The proposed project area was stratified according to the land capability class as shown in Fig B-2. The carbon stock change in aboveground biomass and below ground biomass was estimated. The other carbon pools, dead wood, litter and soil organic matter were omitted. Aboveground biomass and below ground biomass for all the strata was calculated and determined at the taluk level.

- For Siddalaghatta taluk, the growing trees are zero and are hence set as zero (Table B-3 - below).
- For other taluks, Bagepalli, Chickballapur, Chintamani and Gudibanda, the sum of carbon stock changes in above-ground and below-ground biomass was determined based on the projection of their number and growth, based on growth models (yield tables) and allometric equations.

- Baseline analysis was done in each of the taluk based on the land capability class. They were analyzed at the taluk level as shown in Table B-3 below.

The baseline net greenhouse gas removals by sinks was calculated by:

$$\Delta C_{BSL,t} = \sum_i \sum_j \Delta C_{ij,t}$$

Where

i = strata, taluk level

j = tree species,

$\Delta C_{BSL,t}$ = the sum of the changes in carbon stocks in the living biomass of trees for year t

$\Delta C_{ij,baseline,t}$ = average annual carbon stock changes in living biomass of trees for stratum i species j

in the absence of the project activity, tonnes $CO_2 yr^{-1}$ for year t.

t = 1 to length of crediting period

Table B-3: Baseline carbon stock as determined by conduct of field studies in the proposed project area

Taluk	Total Project Area (Ha)	Baseline survey (Hectare)	Aboveground biomass (t B/ha)*	No. of trees in project area*	Average Age	MAI (t/ha/yr)***
Siddalaghatta	3811.18	38.6	0	0	0	0.0000
Chintamani	5062.41	48.4	0.2920	3870	9	0.0325
Bagepalli	6394.68	63.2	0.0014	101	9	0.0002
Gudibanda	1471.36	16.8	0.0100	88	10	0.0010
Chickballapur	1441.00	16.8	0.0009	257	6	0.0001
Total	**18180.64**	**183.8**	**0.0609**	**4316**		

* Total trees in project area based on sample survey conducted in 183 hectare.

** Based on equations developed for Indian tropical forests ($0.079+0.4149D^2H$). Source: Rai, S.N., 1980
*** The mean annual increment was determined based on the study conducted in the study area by stock change method.

In the baseline survey, 6 species were recorded, of which Pongamia pinnata was the dominant species accounting for 72% of the trees, followed by Tamarind with 17% of the trees. About 98% of the trees were found on the bunds, which will not be harvested. The average age of the trees is 10 years with a mean DBH of 22 cms and a mean height of 8 mts. The species recorded were Pongamia pinnata (71%), Tamarind (17%), Azadirachta India (4%) and Artocarpus indica, Eucalyptus and Tumbe (2% each). Biomass equation for Indian tropical forest was used for to estimate the standing biomass.

The allometric equation used for estimating the aboveground biomass is
V = $(0.079+0.4149D^2H)$[13]

Wood density D = 0.7 was used to convert volume (cum) to biomass (t) (Ravindranath *et al.*, 2006)[14]

Below ground biomass was determined by using the IPCC equation for tropical forests given by:
Y = exp[-1.0587+0.8836*ln(ABD)]; Where ABD is aboveground biomass[15]

There are approximately 4,125 trees in the project area based on the sample study conducted. Siddalaghatta taluk was without trees and the baseline carbon pool was set to zero. The carbon stock change of growing trees in each of the taluk trees was estimated separately. The annual change in carbon stocks were calculated based on stock change method given by the approved methodology (Table B-3). The average carbon increment of trees was taken as the increment in the next 30 years.

ID number	Data variable	Data unit	Value applied	Comment
1	the sum of the changes in carbon stocks in the living biomass of trees for year t, tonnes CO_2yr^{-1}	$\Delta C_{BSL,t}$		
2	strata, taluk level	*i*	14	
3	Tree species	*j*	6	
4	1 to length of crediting period - years	*t*	20	
5	average annual carbon stock changes in living biomass of trees for stratum i species j in absence of the project activity, in tonnes CO_2yr^{-1} for year t.	$\Delta C_{ij,baseline,t}$	276.4	
6	Volume	V	$(0.079+0.4149D^2H)$	
7	Wood density	D	*0.7*	

[13] Source: Rai, S.N. Regional volume tables for some tropical rain forest tree species of Karnataka, India, Karnataka Forest Department and Government of Karnataka, 1980
[14] Ravindranath N H., Murthy I. K., Sudha, P., Ramprasad V., Nagendra, M.D.V., Sahana, C.A., Srivathsa, K.G. and Khan, H. Methodological Issues In Forestry Mitigation Projects A Case Study Of Kolar District. Submitted for publication in Mitigation And Adaptation Strategies For Global Change.

[15] Table 4.A.4, GPG LULUCF, IPCC, 2004

8	Below ground biomass	BGB	Y = exp[-1.0587+0.8836*ln(ABD)]	
9	Above Ground Biomass	AGB	$(0.079+0.4149D^2H)$.	

Year	Annual estimation of baseline net anthropogenic GHG removals by sinks in tonnes of CO_2 e
2009	276
2010	276
2011	276
2012	276
2013	276
2014	276
2015	276
2016	276
2017	276
2018	276
2019	276
2020	276
2021	276
2022	276
2023	276
2024	276
2025	276
2026	276
2027	276
2028	276
Total estimated baseline net GHG removals by sinks (tonnes of CO2 e)	5520
Total number of crediting years	20
Annual average over the crediting period of estimated baseline net GHG removals by sinks (tonnes of CO2 e)	276

C.8. Date of completion of the baseline study and the name of person(s)/entity(ies) determining the baseline:

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20 September 2007
Agricultural Development & Training Society

CDM – Executive Board

PROJECT DESIGN DOCUMENT FORM
FOR AFFORESTATION AND REFORESTATION PROJECT ACTIVITIES (CDM-AR-PDD) - Version 03

SECTION D. Estimation of *ex ante* actual net GHG removals by sinks, leakage and estimated amount of net anthropogenic GHG removals by sinks over the chosen crediting period

D.1. Estimate of the *ex ante* actual net GHG removals by sinks:

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The actual net GHG removals by sinks is the sum of verifiable changes in carbon stocks, minus the increase in emissions of the GHGs measured in units of CO_2 equivalent by the sources that are increased as an attributable result of the implementation of the proposed A/R CDM project activity within the project boundary. The ex ante actual net GHG removals by sinks for the chosen crediting period are calculated annually, for each gas, pool, source, in units of CO_2 equivalent using the approach provided in CDMWF_AM_AR-AM0001_v2, the chosen approved baseline and monitoring methodology. A stepwise approach is used, and the components that are calculated are named. The numerical values and sources of all data used in the above calculation are listed.

The estimate of actual net GHG removals by sinks includes the carbon stock change in aboveground biomass and belowground biomass. The carbon stock changes in pools of soil organic matter, dead wood and litter are excluded. The increment in aboveground biomass that would be achieved by the proposed A/R CDM project activity was estimated based on growth curves derived from literature and field studies (Fig D-1). Growth curves for Syzygium was obtained from Rai, 1980[13] and for Teak from studies conducted by Forest Research Institute, Dehra Dun[16]. Growth curves for Tamarind and Mango was not available in the literature. Field studies were conducted in the study area to deduce the growth curves. The following allometric equation was used for calculating the above ground biomass which is based on height measurements. Y = -128.8+4.14H; where H=Height (Dugar *et al*., 1993)[17]
Using the biomass growth rates, the estimated biomass increment in aboveground biomass was calculated for each of the species separately. Tamarind and Mango will be planted as block plantations, while Teak and Syzygium will be planted on the bunds. Thus the CAI shown in fig D1 is the CAI calculated for the specific number of trees per hectare. There will be 260 trees Tamarind and Mango per hectare at a spacing of 7x7 m, and 50 Teak and Syzygium trees on the bunds at 8 m spacing. Harvest is not considered as Teak will be harvested by after 60 years and Tamarind and Mango will be not harvested.

[16] FRI. Growth and yield statistics of common Indian timber species, Forest Research Institute, Dehra Dun, India.
[17] Dagar, J.C., Gurbachan Singh. and Singh, N.T. Evaluation of crops in Agro forestry with Teak (*Tectona grandis),* Maharukh (*Ailanthus exelsa)* and Tamarind (*Tamarindus indica)* on reclaimed salt affected soils, 1993.

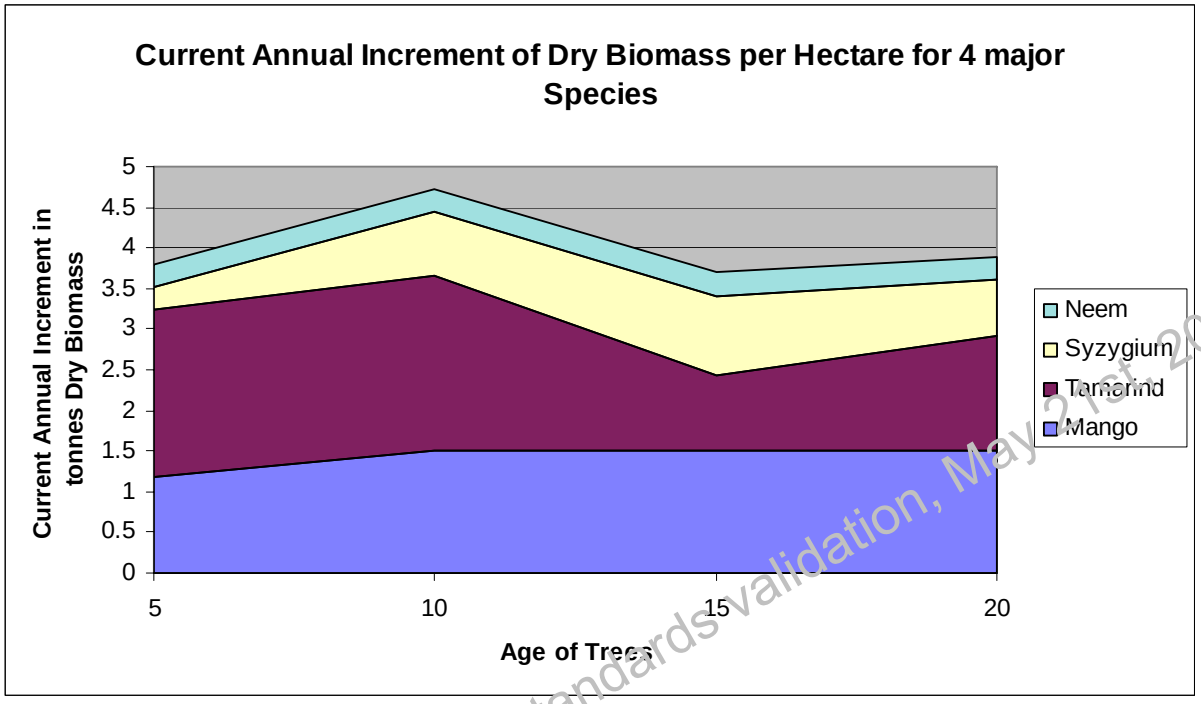

Fig D-1: Current annual biomass increment / hectare: 130 Tamarind, 130 Mango, 25 Teak, 25 Syzygium trees

Below ground biomass was calculated using the formula given for tropical trees in the Annex 4.A.4 in IPCC LULUCF GPG, 2004 and described in section C. Planting will be done in a span of 3 years at the rate of 5000 hectare during year 1, followed by 5000 hectare in the subsequent year, and 8181 in year 3, totaling 18 181 hectare. The carbon sequestration potential for each year based on the area that will be planted and the CAI was calculated separately and summed to estimate the cumulative carbon sequestration potential for the project area.

An estimate of the GHG emissions by sources was calculated from

i. decrease in living biomass of existing non-tree vegetation and
ii. Nitrous oxide emissions from nitrogen fertilization practices using organic manure.

A sample survey as done to estimate the area under shrubs in each of the 5 taluks. The shrubs were harvested in 14 hectares on 20 plots. The biomass of shrubs was estimated based on the methodology given in section C.

During the year of planting, farmyard manure will be applied to each of the pit at a proportion of 5 kg of organic manure (dung+vegetable waste+crop residue) :15 kg of red loam: 15 kg of sand. The N content of organic manure is 0.5%[18]. The CO_2e of N_2O induced by N input was calculated according to the procedure given in the approved methodology and discussed in section C.

[18] Mukherjee, H.N., Daji, J.A. and Raychaudhari, S.P. Manure and Fertilizer. Chapter 3 of Hand book of Agriculture. Indian Council Of Agricultural Research, New Delhi, 1961.

The actual net GHG removals by sinks is carbon stock change in aboveground biomass and below ground biomass minus the increase in CO_2e of N_2O emissions due to organic fertilizer application and decrease in living biomass of existing non-tree vegetation.

Table D-1: Estimation of actual net GHG removals by sinks

Year	Annual carbon stock change	Cumulative carbon stock change	Annual GHG emission	Cumulative GHG emission (tCO_2-e)	Annual actual net GHG removals	Cumulative actual net GHG removals
	(tCO_2yr^{-1})	(tCO_2)	(tCO_2-e yr^{-1})		(tCO_2-e yr^{-1})	(tCO_2-e)
2009	43,918	43,918	-231	-231	43,456	43,456
2010	87,836	131,754	-376	-607	86,853	130,309
2011	159,695	291,449	-376	-983	158,336	288,645
2012	159,695	451,144	-376	-1,358	157,961	446,606
2013	159,695	610,839	0	-1,358	158,337	604,943
2014	170,362	781,201	0	-1,358	169,004	773,947
2015	181,029	962,230	0	-1,358	179,671	953,618
2016	198,483	1,160,712	0	-1,358	197,125	1,150,742
2017	198,483	1,359,195	0	-1,358	197,125	1,347,867
2018	198,483	1,557,678	0	-1,358	197,125	1,544,992
2019	186,555	1,744,233	0	-1,358	185,197	1,730,189
2020	174,628	1,918,861	0	-1,358	173,270	1,903,459
2021	155,112	2,073,973	0	-1,358	153,754	2,057,213
2022	155,112	2,229,086	0	-1,358	153,754	2,210,968
2023	155,112	2,384,198	0	-1,358	153,754	2,364,722
2024	157,392	2,541,590	0	-1,358	156,034	2,520,756
2025	159,672	2,701,262	0	-1,358	158,314	2,679,070
2026	163,402	2,864,665	0	-1,358	162,044	2,841,115
2027	163,402	3,028,067	0	-1,358	162,044	3,003,159
2028	163,402	3,191,469	0	-1,358	162,044	3,165,203

D.2. Estimate of the *ex ante* leakage:

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Year	Estimation of leakage (tonnes of CO2 e)
2009	8
2010	17
2011	22
2012	21
2013	10

2014	5
2015	1,554
2016	1,709
2017	1,880
2018	2,068
2019	2,275
2020	2,502
2021	2,753
2022	3,028
2023	3,331
2024	3,664
2025	4,030
2026	4,433
2027	4,661
2028	4,661
Total (tonnes of CO_2 e)	42,632

SECTION E. Monitoring plan

E.1. Monitoring of the project implementation:

E.1.1. Monitoring of the project boundary:

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1.1.1. Field surveys on the actual boundary of each parcel of land where the reforestation CDM project activity will take place will be undertaken. The geographical positions (latitude and longitude of each land parcel) will be marked on the GIS platform.

1.1.2 The survey number of the parcel of land, the ownership of the land, and the unique reference number assigned by ADATS will be monitored annually by the ADATS team.

1.1.3 The actual boundary will be cross-checked to verify whether it is consistent with the description in section A, Appendix 1 and 2.If the actual boundary falls outside of the designed boundary in section A, Appendix 1 and 2, additional information for the part of lands that are beyond the designed boundary in section A will be provided; the eligibility of these lands as a part of the A/R CDM project activity will be justified; and the projected baseline scenario will be demonstrated to be applicable to these lands. Otherwise, these lands will not be accounted as a part of the proposed A/R CDM project activity. Such change in boundary will be informed to the DOE and subject to validation during the project. The measured geographical positions will be input into the GIS system and the eligible area of each stratum and sub-stratum will be re-calculated as necessary. The project boundary will be monitored periodically through the crediting period. If the boundary is changed during the crediting period, for instance, deforestation occurs on the project area, the specific location and area of the deforested land will be identified, the boundary will be modified and reported to DOE for subsequent verifications, the deforested area will be excluded from the project, and the lCERs resulting from that will subsequently be retired. Similarly, if the planting on certain lands within the project boundary fails, and other land uses take the place, these lands will be documented.

ID number[19]	Data variable	Data unit	Measured (m), calculated (c) estimated (e) or default (d)[20]	Recording frequency	Number of data points / Other measure of number of collected data	Comment
1.1.1	*Latitude Longitude of each plot*	*Lat Long*	*(m)*	*Once*	*If upto 1 hectare then plot mid point; if larger than 1 hectare then 4 corners*	
1.1.2	*Survey number and ADATS unique reference data including name, CSU number etc.*	*2 numbers ; one assigned by land registry, one by the NGO*	*-*	*Once*	*1 survey number and 1 set of NGO reference data per plot*	
1.1.3	*Project boundary*	*List of all plots*	*-*	*Annually*	*All plots*	*Check that they are within the project boundary*

[19] Please provide ID number for cross-referencing in the PDD.

[20] Please provide full reference to data source.

E.1.2. Monitoring of forest establishment:

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3. Monitoring of the forest establishment

To ensure the planting quality and confirm the practice described in section A is well-implemented, the following monitoring activity will be conducted every year after planting:

1.2.1.Confirm site and soil preparation are implemented based on practice documented in section A.

1.2.2.Survival checking: the initial survival rate of planted trees will be counted within three months after the planting, and re-planting will be conducted if the survival rate is lower than 90% percent.

1.2.3.Annual check of establishment will be done by the team. Replanting will be done in the subsequent year if the plants have not established during the first year. 100% check will be done by having self monitoring system by farmers. These will be recorded at each plot level and record maintained at the ADATS office.

1.2.4.Survey and check the area of planted species and planting year for each stratum and sub-stratum.

ID number[21]	Data variable	Data unit	Measured (m), calculated (c) estimated (e) or default (d)[22]	Recording frequency	Number of data points / Other measure of number of collected data	Comment
1.2.1.	*Planting quality*	-	-	*One time for each plot*	*Qualitative assessment against check box*	
1.2.2	*Check for Survival / Replacement*	-	*(m)*	*Every 3 months for 1st 2 years*	*% survival*	
1.2.3	*Check for*	-	*(m)*	*Annually*	*% survival*	

[21] Please provide ID number for cross-referencing in the PDD.

[22] Please provide full reference to data source.

	Tree Crop Establishment					
1.2.4.	*Species choice in each stratum*	*-*	*(m)*	*Annually*	*Number and species of trees per plot*	

E.1.3. Monitoring of forest management:

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Forest management practices that will be monitored are as follows:

1.3.1. Harvesting: harvested location, area, tree species, biomass removed
1.3.2 Fertilization: tree species, location, amount and type of fertilizer applied etc.

ID number[23]	Data variable	Data unit	Measured (m), calculated (c) estimated (e) or default (d)[24]	Recording frequency	Number of sample plots at which the data will be monitored / Other measure of number of collected data	Comment
1.3.1	*Harvesting*	*Kg Biomass removed*	*(m)and (e)*	*Annually*	*All*	
1.3.2	*Fertilization*	*-*	*(d)*	*Annually*	*Against check box of measures*	

E.2. Sampling design and stratification:

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a) Stratification and sampling for ex-post calculations

[23] Please provide ID number for cross-referencing in the PDD.

[24] Please provide full reference to data source.

To increase the accuracy and precision of measuring and monitoring in a cost-effective manner, stratification of the project area into relatively homogeneous units is done as follows. This is in accordance of the chosen methodology AR-AM0001 version 2.

Step 1*:* Assessing the key factors influencing carbon stocks in the above- and below-biomass pools, the project area has been stratified according to land capability classes. This will increase the accuracy of measuring and monitoring in a cost-effective manner.

Step 2*:* Local information of key factors identified in step 1 has been collected, e.g.:

- local site classification maps and/or tables;
- the most updated land use/cover maps and/or satellite images / aerial photography;
- Soil types, parent rocks and soil maps;
- landform information;
- soil erosion intensity;

Data sources such as archives, records, statistics, study reports and publications of national, regional or local governments, institutes and/or agencies, and literature has been collected.

Step 3: Preliminary stratification: The preliminary stratification based on land capability class has been conducted using the GIS platform by overlaying information/maps collected, and hence in this case the hierarchical order is not necessary.

Step 4: A supplementary sampling survey on site specifications for each preliminary stratum, e.g.:

- Existing trees if any: species, age class, number of trees, mean diameter at breast height (DBH) and height by measuring randomly selected plots with an area of 400 m^2 will be conducted with at least 3 plots for each preliminary stratum;
- Non-tree vegetation: crown cover and mean height for herbaceous vegetation and shrubs by measuring randomly selected plots with an area of 4 m^2 (at least 10 plots for each preliminary stratum). For stratum with growing trees, the plots will be sub-plots of plots for measuring trees;
- Conducting variation analysis for key factors investigated above. If the variation is large within each preliminary stratum, more intense field investigation will be conducted and further stratification shall be considered in step 5.

Step 5: A further stratification will be done based on supplementary information collected from step 4 above, by checking whether or not each preliminary stratum is sufficiently homogenous or the difference among preliminary strata is significant. The degree of homogeneity will be assessed based on stratum size, the degree of natural variability and the significance of the variability to the project and baseline scenarios. A stratum within which there is a significant variation in any of vegetation type, soils and human intervention shall be divided into two or more strata. On the other hand, strata with similar features shall be merged into one stratum. Distinct strata should differ significantly from each other in terms of their baseline and/or project carbon calculation.

Step 6*:* Sub-stratification: Sub-strata will be created for each stratum based on tree species to be planted and/or on planting year described in CDM-AR-PDD.
Step 7*:* Stratification map will be created, by using a Geographical Information System (GIS). The GIS will be useful for integrating the data from different sources which can then be used to identify and stratify the project area. In addition, post stratification will be considered after the first monitoring event, because there are possible changes of project boundaries, tree species arrangement and planting year in comparison to the CDM-AR-PDD. The following factors shall be considered in the post-stratification:

- Data from monitoring of forest establishment and project boundary, e.g., actual project boundary, site and soil preparation, tree species and planting year;
- Data from monitoring of forest management, e.g., actual thinning and fertilization;
- Variation in carbon stock changes for each stratum and substratum after the first monitoring event.
- Strata or substrata shall be grouped into one strata or substrata if they have similar carbon stock, carbon stock change and spatial variation.

b) Sampling

Permanent sampling plots will be used for sampling over time to measure and monitor changes in carbon stocks of above- and below ground biomass. Permanent sample plots are generally regarded as statistically efficient in estimating changes in forest carbon stocks because there is typically a high covariance between observations at successive sampling events. Plots will be treated in the same way as other lands within the project boundary, e.g., during site and soil preparation, weeding, fertilization, irrigation, thinning, etc., will not be destroyed over the monitoring interval. The staff involved in management activities will not be informed of the location of monitoring plots.

(i) Determining sample size

The number of plots depends on species variation, accuracy and monitoring interval. In this methodology the total sum of samples (n) will be estimated as per a criterion of Neyman of fixed levels of accuracy and costs, according to Wenger (1984) and given in the approved methodology.

$$n = \left(\frac{t}{E}\right)^2 \left(\sum_{h=1}^{L} W_h S_h \sqrt{C_h}\right)\left(\sum_{h=1}^{L} W_h S_h / \sqrt{C_h}\right)$$

$$n_h = n.\frac{W_h.S_h / \sqrt{C_h}}{\sum_{h=1}^{L} W_h S_h / \sqrt{C_h}}$$

Where:

L total number of strata

t	t value for a confidence level (95%)
E	allowable error (±10% of the mean)
s_h	standard deviation of stratum h
n_h.	number of samples per stratum that is allocated proportional to $W_h.S_h / \sqrt{C_h}$
W_h	N_h/N
N	number of total sample units (all stratum), $N = \sum N_h$
N_h	number of sample units for stratum h, calculated by dividing the area of stratum h by area of each plot
C_h	cost to select a plot of the stratum h

The allowable error on per-plot basis (±10%) of the expected mean biomass carbon stock per plot in living trees at the end of a rotation, which will be estimated as part of the ex-ante estimation of the actual net GHG removals by sinks described in the baseline methodology. It is possible to reasonably modify the sample size after the first monitoring event based on the actual variation of the carbon stock changes determined from taking the n samples.

(ii) Randomly locating sampling plots

To avoid subjective choice of plot locations (plot centres, plot reference points, movement of plot centres to more "convenient" positions), the permanent sample plots will be located systematically with a random start, which is considered good practice in GPG-LULUCF. This will be accomplished with the help of a GPS in the field. The geographical position (GPS coordinate), administrative location, stratum and sub-stratum series number of each plots will be recorded and archived. The size of plots will depend on the density of trees. Also, it will be ensured that the sampling plots are distributed as evenly spread as possible.

E.3. Monitoring of the baseline net GHG removals by sinks :

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N/A

E.3.1. Monitoring of the baseline net GHG removals by sinks (before start of the project), if required:

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ID number[25]	Data variable	Measured (m), calculated (c) estimated (e) or default (d)[26]	Data unit	Value applied	sample plots at which the data was monitored
3.1.1	the sum of the changes in carbon stocks in the living biomass of trees for year t, tonnes CO_2yr^{-1}	(m)	$\Delta C_{BSL,t}$		*See section C.7*
3.1.2	strata, taluk level	-	*i*	14	
3.1.3	tree species	-	*j*	6	
3.1.4	1 to length of crediting period - years	-	*t*	20	
3.1.5	average annual carbon stock changes in living biomass of trees for stratum i species j in the absence of the project activity, in tonnes CO_2yr^{-1} for year t.	-	$\Delta C_{ij,baseline,t}$	276.4	
3.1.6	Volume	-	V	$(0.079+0.4149D^2H)$	
3.1.7	Wood density	(d)	D	*0.7*	
3.18	Below ground biomass	-	BGB	Y = exp[-1.0587+0.8836*ln(ABD)]	
3.1.9	Above Ground Biomass	-	AGB	$(0.079+0.4149D^2H)$.	

[25] Please provide ID number for cross-referencing in the PDD.

[26] Please provide full reference to data source.

E.3.2. Monitoring of the *ex post* baseline net GHG removals by sinks (after start of the project), if required:

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ID number[27]	Data variable	Data unit	Measured (m), calculated (c) estimated (e) or default (d)[28]	Recording frequency	Number of sample plots at which the data will be monitored	Comment
N/A						

E.4. Monitoring of the actual net GHG removals by sinks:

E.4.1. Data to be collected in order to monitor the verifiable changes in carbon stock in the carbon pools within the project boundary resulting from the proposed A/R CDM project activity:

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ID number[29]	Data variable	Source of data	Data unit	Measured (m), calculated (c) estimated (e) or default (d)[30]	Recording frequency	Number of sample plots at which the data will be monitored	How will the data be archived? (electronic/ paper)	Comment
4.1.1.01	Stratum ID	Stratification map	Alpha numeric		Before the start of the project	100%	Electronic and paper	Based on land capability class as each stratum has a particular combination of soil type and landform
4.1.1.02	Sub- stratum	Stratification	Alpha numeric		Before the	100%	Electronic	Each sub-stratum will be a

[27] Please provide ID number for cross-referencing in the PDD.

[28] Please provide full reference to data source.

[29] Please provide ID number for cross-referencing in the PDD.

[30] Please provide full reference to data source.

	ID	map			start of the project		and paper	particular year to be planted under each stratum
4.1.1.03	Confidence level		%		Before the start of the project	100%	Electronic and paper	For the purpose of QA/QC and measuring and monitoring precision control
4.1.1.04	Precision level		%		Before the start of the project	100%	Electronic and paper	For the purpose of QA/QC and measuring and monitoring precision control
4.1.1.05	Sample plot ID	Project and plot map	Alpha numeric		Before the start of the project	100%	Electronic and paper	Numeric series ID will be assigned to each permanent sample plot
4.1.1.06	Plot location	Project and plot map and GPS locating		m	5 years	100%	Electronic and paper	Using GPS to locate before start of the project and at time of each field measurement
4.1.1.07	Tree species	Project design map			5 years	100%	Electronic and paper	As in PDD
4.1.1.08	Age of plantation	Plot measurement	Year	m	5 years	100 % sampling plot	Electronic and paper	Counted since the planted year
4.1.1.09	Number of trees	All project area and also Plot measurement	Number	m	Yearly & 5 years	100 %	Electronic and paper	- All trees based on PRA by cluster leader with the farmers - Counted in plot measurement at 5 years interval
4.1.1.10	Diameter at breast height (DBH)	Plot measurement	cm	m	5 years	100 % trees in plot	Electronic and paper	Measuring at each monitoring time per sampling method
4.1.1.11	Mean DBH	Calculated via 4.1.1.10	cm	c	5 years	100 % sampling plot	Electronic and paper	Calculated via 4.1.1.09 and 4.1.1.10
4.1.1.12	Tree height	Plot measurement	m	m	5 years	100 % trees in plot	Electronic and paper	Measuring at each monitoring time per sampling method
4.1.1.13	Mean tree height	Calculated via 4.1.1.12	m	c	5 years	100 % sampling	Electronic and paper	Calculated via 4.1.1.09 and 4.1.1.12

						plot		
4.1.1.14	Allometric equations	Calculated using equation (11)- (12)	M^3 hectare^{-1}	c/m	5 years	100 % sampling plot	Electronic and paper	Calculated using equations (11)-(12) via 4.1.1.11 and 4.1.1.12
4.1.1.15	Wood density	National inventory for LULUCF	t d.m.m^{-3}	e	5 years	100 % sampling plot	Electronic and paper	Species specific
4.1.1.16	Biomass expansion factor (BEF)	National inventory for LULUCF	dimensionless	e	5 years	100 % sampling plot	Electronic and paper	Species specific
4.1.1.17	Carbon fraction	IPCC	t C. (t.d.m)$^{-1}$	e	5 years	100 % sampling plot	Electronic and paper	IPCC default value
4.1.1.18	Root- shoot ratio	GPG, LULUCF, 2003	dimensionless	e	5 years	100 % sampling plot	Electronic and paper	Based on IPCC equation for tropical forests
4.1.1.19	Carbon stock in above ground biomass of plots	Calculated from equation	t C hectare^{-1}	c	5 years	100 % sampling plot	Electronic and paper	Calculated using equation (14) via 4.1.1.14 and 4.1.1.17
4.1.1.20	Carbon stock in below ground biomass of plots	Calculated from equation	t C hectare^{-1}	c	5 years	100 % sampling plot	Electronic and paper	Calculated using equation (15) via 4.1.1.18 and 4.1.1.19
4.1.1.21	Mean carbon stock in above ground biomass per unit area per stratum per	Calculated from plot data	t C hectare^{-1}	c	5 years	100 % strata and sub-strata	Electronic and paper	Calculated from 4.1.1.09 and 4.1.1.19

	species							
4.1.1.22	Mean carbon stock in below ground biomass per unit area per stratum per species	Calculated from plot data	t C hectare^{-1}	c	5 years	100 % strata and sub-strata	Electronic and paper	Calculated from 4.1.1.09 and 4.1.1.20
4.1.1.23	Area of stratum and sum-stratum	Stratification map and data	hectare	m	5 years	100 % strata and sub-strata	Electronic and paper	Actual area of each stratum and sub-stratum
4.1.1.24	Carbon stock in above ground biomass of stratum per species	Calculated using equation (8)	t C	c	5 years	100 % sampling plot	Electronic and paper	Calculated using equation (8) via 4.1.1.21and 4.1.1.23
4.1.1.25	Carbon stock in below ground biomass of stratum per species	Calculated using equation (9)	t C	c	5 years	100 % sampling plot	Electronic and paper	Calculated using equation (9) via 4.1.1.22and 4.1.1.23
4.1.1.26	Carbon stock in above ground biomass of stratum per species	Calculated using equation (6)	t C yr^{-1}	c	5 years	100 % strata and sub-strata	Electronic and paper	Calculated using equation (6) via 4.1.1.24
4.1.1.27	Carbon stock in above below biomass of stratum per	Calculated using equation (7)	t C yr^{-1}	c	5 years	100 % strata and sub-strata	Electronic and paper	Calculated using equation (7) via 4.1.1.25

	species							
4.1.1.30	Total carbon stock change	Calculated using equation (5)	t CO_2-e yr^{-1}	c	5 years	100 % project area	Electronic and paper	Summing up carbon stock change 4.1.1.26 and 4.1.1.27 for all strata , sub-strata and tree species

E.4.2. Data to be collected in order to monitor the GHG emissions by the sources, measured in units of CO_2 equivalent, that are increased as a result of the implementation of the proposed A/R CDM project activity within the project boundary:

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An estimate of the GHG emissions by sources was calculated from i. decrease in living biomass of existing non-tree vegetation and ii. Nitrous oxide emissions from nitrogen fertilization practices using organic manure. A sample survey as done to estimate the area under shrubs in each of the 5 taluks. The shrubs were harvested in 14 hectare in 20 plots. The biomass of shrubs were estimated based on the methodology given in section C.

During the year of planting, farmyard manure will be applied to each of the pit at a proportion of 5 kg of organic manure (dung+vegetable waste+crop residue) :15 kg of red loam: 15 kg of sand. The N content of organic manure is 0.5%[31]. The CO_2e of N_2O induced by N input was calculated according to the procedure given in the approved methodology and discussed in section C.

ID number[32]	Data variable	Data source	Data unit	Measured (m), calculated (c) estimated (e) or default (d)[33]	Recording frequency	Number of data points	Archiving	Comment
4.2.01	Amount of organic fertilizer N applied per unit area	Monitoring activity	Kg N $hectare^{-1}$ yr^{-1}	m	annually	100%	Electronic and paper	
4.2.02	Area of	Monitoring	hectare yr^{-1}	m	annually	100%	Electronic	

[31] Mukherjee, H.N., Daji, J.A. and Raychaudhari, S.P. Manure and Fertilizer. Chapter 3 of Hand book of Agriculture. Indian Council Of Agricultural Research, New Delhi, 1961.

[32] Please provide ID number for cross-referencing in the PDD.

[33] Please provide full reference to data source.

	land with N applied	activity					and paper	
4.2.03	Amount of organic fertilizer N applied	Calculated using equation (17)	t N yr^{-1}	c	annually	100%	Electronic and paper	Calculated using equation (17) via 4.1.2.01 and 4.1.2.02
4.2.04	Fraction that volatilizes as NH_3 and NOx for organic fertilizers	GPG 2000, IPCC Guideline	Dimensionless	e	Before start of monitoring	100%	Electronic and paper	IPCC default value (0.2) is used
4.2.05	Emission factor for emission from N input	GPG 2000, IPCC Guideline	N_2O-N (tones N input)$^{-1}$	e	Before start of monitoring	100%	Electronic and paper	IPCC default value (1.25%) is used
4.2.06	Direct N_2O emission of N input	Calculated using equation (18)	t CO_2-e yr^{-1}	c	annually	100 %	Electronic and paper	Calculated using equation (18) via 4.1.2.04and 4.1.2.08

E.5. Leakage:

>>

Leakage represents the increase in GHG emissions by sources which occurs outside the boundary of an A/R CDM project activity which is measurably attributable to the A/R CDM project activity.

Primary leakage is when the baseline activity is shifted to other areas due to project implementation. Primary leakage is not possible as currently the communities are not getting any benefit from the degraded lands. Thus primary leakage will not be monitored, and there is no need to take any measures to minimize leakage. The other type of primary leakage cited in the literature is demand of land for subsistence crops, commercial crops, which would deforest other lands. This is also not applicable as there are no forests which can be deforested.

Secondary leakage is caused by market effects. These will not occur from this dry zone.

In fact what is termed "negative leakage" will occur. This is because some of the proposed A/R CDM project area is presently under soil and water conservation, under the dryland development programme by ADATS. Most of the land used for reforestation is degraded and uncultivable private farm land unfit for productive cultivation. The economical unattractive land currently does not support agriculture, grazing, and is not a major source for fuelwood. PRA exercises at village level show that nearby forests and common lands are the main sources of fuelwood. As a result of the project there will be a huge increase in on-farm fuelwood. Participating farmers and probably others too will be able to collect fuel form within the project boundary without compromising the growth of the trees established under the proposed A/R CDM project activity. The collection will be restricted to dead wood and branches. Thus, as the result of the proposed A/R CDM project activity, local farmers will in fact have fallen twigs and branches as fuelwood and will not have to collect fuelwood on lands outside the project boundary.

However, in the context of A/R activities, fossil fuel combustion from vehicles use to the transportation of seedling, and NTFP products, to and/or from project sites, as a result of the proposed A/R CDM project activity, emits greenhouse gases. This will be monitored and estimated using IPCC approach.

E.5.1. If applicable, please describe the data and information that will be collected in order to monitor leakage of the proposed A/R CDM project activity:

>>

ID number[34]	Data variable	Data source	Data unit	Measured (m), calculated (c) estimated (e) or default (d)[35]	Recording frequency	Number of data points	Archiving	Comment
5.1.01	Number of each Vehicle type used	Monitoring of project activity	Number		annually	100%	Electronic and paper	Monitoring number of each Vehicle type used

[34] Please provide ID number for cross-referencing in the PDD.

[35] Please provide full reference to data source.

5.1.02	Emission factor for road transportation	GPG 2000, IPCC Guideline, national inventory	kg CO_2-e L^{-1}	e	annually	100 %	Electronic and paper	National or local value as the priority
5.1.03	Kilometers travelled by Vehicle	Monitoring of project activity	Km	m	annually	100%	Electronic and paper	Monitoring Kilometers of each Vehicle type and fuel type used
5.1.04	Fuel consumption per km	Local data, National data, IPCC	Litre km^{-1}	e	5 years	100 %	Electronic and paper	Estimated for each Vehicle type and fuel type used
5.1.05	Fuel consumption for road transportation	Calculated	Litre	c	annually	100 %	Electronic and paper	Calculated
5.1.06	Leakage due to vehicle use for transportation	Calculated	t CO_2-e yr^{-1}	c	annually	100 %	Electronic and paper	Calculated

E.5.2. Please specify the procedures for the periodic review of implementation of activities and measures to minimize leakage:

>>

The leakage associated with the proposed A/R CDM project activity is due to the use of vehicles for the transportation of staff and products outside project area. This may be minimal as most products will be consumed on site. Primary and secondary leakage will not be monitored and there is no need to take measures to minimize leakage, for reasons described above.

E.6. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:

Data ***(Indicate ID number)***	Uncertainty level of data (High/Medium/Low)	**Explain QA/QC procedures planned for these data, or why such procedures are not necessary.**
4.1.1.06 Plot location	Low	Random plot verification using GPS to ensure the consistent measuring and monitoring of carbon stock change over time

4.1.1.07 tree species	Low	Random verification over the project area to ensure each tree species is correctly measured
4.1.1.08 age of plantation	Low	Random verification over the project area to ensure the area in terms of plantation age is correctly measured
4.1.1.09 number of trees	Low	Random plot verification
4.1.1.10 diameter at breast height (DBH)	Low	Random plot verification
4.1.1.12 tree height	Low	Random plot verification
4.1.1.14 Merchantable volume	Low	All allometric equations used to calculate this data will be verified
4.1.1.15 wood density	Low	Data that divert significantly from IPCC default value will be verified
4.1.1.16 Biomass expansion factor (BEF)	Low	Data that divert significantly from IPCC default value will be verified
4.1.1.17 Carbon fraction	Low	Data that divert significantly from IPCC default value will be verified
4.1.1.18 Root-shoot ratio	Low	Data that divert significantly from IPCC default value will be verified
4.2.06 Direct N_2O emission of N input	Low	Data that divert significantly from IPCC default value will be verified
5.1.10 Number of each vehicle type used	Low	Project record shall be available and verified
5.1.02 Emission factors for road transportation	Low	Data that divert significantly from IPCC default value will be verified

5.1.03 Kilometers travelled by vehicles	Low	Project record will be available and verified

E.7. Please describe the operational and management structure(s) that the project operator will implement in order to monitor actual GHG removals by sinks and any leakage generated by the proposed A/R CDM project activity:

>>

A. The Project Director of ADATS will be responsible for coordinating the Programme;

B. The project implementation is based on the Coolie Sangha Units (CSU) in each village. These CSUs are non-governmental organizations consisting of members of the public owning small parcels of marginal degraded lands who have joined the CSUs and are implementing reforestation on their degraded lands. The main role of the CSUs is to manage the reforestation activity in their villages and clusters in close cooperation with ADATS. The CSUs have in the past implemented the Dry Land Development Programme (DLDP) and have management systems in place for coordinating the Bagepalli CDM Reforestation Programme work. The CSUs are organized formally at village levels, with CSU management through the federal Coolie Sangha structure in each talk. The CSUs are part of the federal structure of the Bagepalli Coolie Sangha which is officially registered, and is overseen by elected members.

C. The CSUs will be responsible for:

- planting, tending of the trees
- annual reporting of tree counts
- doing the first survival monitoring
- dissemination of information on project implementation and best practices to all CSUs
- coordination with all involved parties on project financing and supervision.
- managing day to day activities of the project implementation, coordination of the project monitoring plan, including verification and reporting.
- implementation of the Emission Monitoring Plan (EMP) and annual monitoring of the project progress and measure the impact of project activities against the baseline survey undertaken during project preparation.
- systematic analysis of the project activities and the results of the monitoring activities, which will be fed back into the implementation process.
- sustainability of the project reforestation activities through strengthening of the forestry management practices;
- project co-ordination and knowledge management of project activities.
- inventory and mapping of every sector with the use of GPS and GIS;
- supervision of project stipulations, plantation technique and technologies.
- establishment of polygons and methodologies concerning the necessary measurements within the project area.
- carrying out of project monitoring at initial phase, and after that in year V, X and XV;
- verification of inventories of plantations;

- preparation of annual reports;
- formulation of recommendations for re-addressing and improvements of works (reparation, maintenance, assurance of integrity etc.);
- preparation of recommendations concerning the management of new created forests;
- preparing and carrying out workshops and training within the project.

Any activity data and monitoring and measuring data will be reported to and archived in the ADATS offices in both electronic and paper copy.

E. District forestry offices will provide technical instruction and support on reforestation and forest management.
F. An expert team will be established if any technical issues will arise, conducting checking and verification of measured and monitored data.
G. Leakage will not be monitored. Activities to reduce leakage will be described qualitatively. This includes development of alternative sources of income such as animal husbandry, technical assistance to increase productivity of existing agricultural soils to reduce the need to clear new areas, and improvement in the quality of health and educational opportunities, and biogas to reduce dependence on fuel wood.

E.8. Name of person(s)/entity(ies) applying the monitoring plan:

>>
Ram Esteves, Project Director, Agricultural Development and Training Society Bagepalli 561207, Chickballapur District, Karnataka, India.
The entity is the project participant listed in Annex 1.

SECTION F. Environmental impacts of the proposed A/R CDM project activity:

F.1. Documentation on the analysis of the environmental impacts, including impacts on biodiversity and natural ecosystems, and impacts outside the project boundary of the proposed A/R CDM project activity:

>>

- Afforestation and reforestation activities can have negative impacts on biodiversity, if taken up in forest ecosystems with already existing biodiversity value. Conversely, if planting is being promoted on land that is degraded or with no trees, it will have a positive impact on biodiversity.
- Forestry on degraded lands without any trees on them has a positive impact on biodiversity, regeneration of vegetative cover through leading to soil and water conservation and protection of watersheds, and increased supply of biomass, which is essential as sustainable development issues of mitigation projects.
- Among the many environmental services they provide, the most critical places are soil conservation i.e. protection against erosion and maintenance of fertility, shelter against wind and shade.
- Decreases vulnerability to current climate change and climatic variability
- Forestry on these degraded lands will enrich the soil by fixing nitrogen, improve drainage, promote efficient nutrient cycling, opportunity to optimise land productivity and diversity in output to meet domestic needs and improving economy of farmers.
- The project area is devoid of trees in most on the parcels of lands. A few parcels of land have trees on the bunds which are mature and these trees will not be uprooted. The spacing of tamarind trees is 7 x 7 m. A total of 260 +50 trees will be planted in a hectare. Thus the disturbance to soil will be limited.
- The species proposed, Mango, Tamarind, Syzygium sp and Teak are native to the region.
- Since the planting will be done is discrete parcels of land, fire and pests are not a serious threat.

F.2. If any negative impact is considered significant by the project participants or the host Party, a statement that project participants have undertaken an environmental impact assessment, in accordance with the procedures required by the host Party, including conclusions and all references to support documentation:

>>

No significant negative impacts have been envisaged by the project activity. The project has received host country approval by the Indian National CDM Authority, hosted by the Ministry of Environment and Forests.

F.3. Description of planned monitoring and remedial measures to address significant impacts referred to in section F.2. above:

>>

Not required as no significant impacts are projected.

SECTION G. Socio-economic impacts of the proposed A/R CDM project activity:

>>

In a semi-arid, water scarce, poverty stricken region like this, the CDM A/R project activity which pays families to work on their land is extremely necessary, in fact life saving. It is a global environmental service activity which also generates substantial local benefits in terms of employment and income, and natural resource conservation.

- All forestry sector activities are labour-intensive and create rural employment in establishing, protecting and maintaining trees and also provide diverse biomass products. Thus, activities

aimed at carbon sink creation or enhancement and in turn forest conservation and regeneration of degraded forests and non-forests will lead to improvement of the livelihoods.

- Further, the CDM A/R project activity increases the supply of biomass such as fuelwood to families to meet their biomass requirements.
- In the proposed project, which is multi-component including promotion of fruit orchards on a large-scale, biodiversity will be enhanced. Further, these fruit tree species with varied gestation periods and end-use would provide not only economic returns at different time periods but also in a sustained manner, as fruit orchards yield over many decades, albeit with variations in yield.
- The proposed CDM A/R activity will provide employment at the time of initiation of the project when various activities such as land preparation, pitting, nursery raising, transportation of seedlings and actual planting occurs, and is paid for through the CDM A/R project activity.

The proposed CDM activity will generate income and minimise risks in cropping enterprises. It provides long term investment opportunity, diversified land use, commercial tree cropping and best option for the marginal farmers. This can generate diversified on-farm employment, Non Timber Forest Produce (NTFP) and ensure raw-material supply to forest based industries. It is a potential technology for commercial farming, improving degraded and polluted sites, an opportunity for stabilizing fragile ecosystems and also a forestry system for arid and semi-arid zones.

G.1. Documentation on the analysis of the major socio-economic impacts, including impacts outside the project boundary of the proposed A/R CDM project activity:

>>

The attached report from the Pilot Dry Land Horticulture projects provides documentary evidence of the positive socio-economic benefits expected from this project. See also the documentation for CCBA Certification.

G.2. If any negative impact is considered significant by the project participants or the host Party, a statement that project participants have undertaken a socio-economic impact assessment, in accordance with the procedures required by the host Party, including conclusions and all references to supporting documentation:

>>

No negative impact is considered due to the implementation of the proposed A/R CDM project activity.

G.3. Description of planned monitoring and remedial measures to address significant impacts referred to in section G.2 above:

>>

None are required.

SECTION H. Stakeholders' comments:

H.1. Brief description of how comments by local stakeholders have been invited and compiled:

>>

There has been 12 years of discussion, pilot project, participatory decision-making etc in this region. The pilot activities for this project were the first reforestation project activity to receive approval from the Government of India as an AIJ project in 1996. Local stakeholders include the local village councils or Gram Panchayats and the farmers. Secondary data was obtained from Gram Panchayats regarding the land holding of different farmers within the villages chosen in all the 5 taluks of Kolar. Families were interviewed as to

their interest in the scheme. A PRA exercise was also conducted in all the villages by ADATS to explore the interest of families and the extent of land they wanted to dedicate for the CDM A/R project activity. The farmers or the owners of these lands were interviewed using a questionnaire to elucidate their interest in planting, the species choice, the extent of land they were inclined to dedicate and species for bund and block planting, for implementation of the A/R CDM project. Thus, a list of species to be promoted, the proportion of the species to be promoted and the phasing of the activity was worked out based on the stakeholder's comments.

H.2. Summary of the comments received:

>>

A participatory approach was adopted to identify the area for afforestation and species choice through group meetings at cluster level comprising of 5-6 villages. Discussions were also held of the planting arrangement, tending to the seedlings, fertilizer application and maintenance of the plantations.

H.3. Report on how due account was taken of any comments received:

>>

During discussion participants welcomed the idea of reforestation on degraded private lands given that the region is dry, semi-arid and with low tree cover. Families are interested in promoting fruit orchards as it will be a source of additional income and is less subject to the vagaries of weather compared to annual crops.

There are also many local NGO records and government strategy papers which present an overall strategic view of how Chickballapur District agriculture needs to shift to dry land horticulture. The ADATS pilot project elicited enough and more comments over the last 10 years from participating families as to why and how the Bagepalli CDM Afforestation project can be taken forward for the benefit of all.

The concern that most of the farmers expressed was watering of plants during the establishment phase in the initial 3 years. Based on the experience of the AIJ project in this region, the communities requested for watering facilities during the initial years after planting.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROPOSED A/R CDM PROJECT ACTIVITY

Organization:	Agricultural Development and Training Society (ADATS)
Street/P.O.Box:	ADATS Campus
Building:	
City:	Bagepalli
State/Region:	Karnataka
Postfix/ZIP:	561207
Country:	India
Telephone:	+91 (8150) 282375, 282376
FAX:	-
E-Mail:	adats@vsnl.com
URL:	www.adats.com
Represented by:	
Title:	Project Director
Salutation:	Mr
Last Name:	Esteves
Middle Name:	-
First Name:	Ram
Department:	-
Mobile:	+91 (94485) 24696
Direct FAX:	-
Direct tel:	-
Personal E-Mail:	ramesteves@gmail.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No funding will be diverted from the Official Development Assistance.

Annex 3

BASELINE INFORMATION

Data/Parameters	Descriptions	Vintage	Resolution	Sources
Historical land use/cover data	- Determining baseline approach - Demonstrating eligibility of land	- Statistics from Kolar Gazetteer - Village level cadastre maps for all the 471 villages showing the survey number of parcels of land prepared during 1890-1960s - 1989 digitized satellite imagery - 2005 digitized satellite imagery	District level statistics - Depending on village size. - 1:250,000 - 1:50,000	Land Records and Land Settlement Department, Govt. of Karnataka, - Karnataka State Remote Sensing Application Centre
Land use/cover Map	Demonstrating eligibility of land, stratifying land area	- 2005 digitized satellite imagery	- 1:50,000	- Karnataka State Remote Sensing Application Centre
Satellite image area	Demonstrating eligibility of land, stratifying land	1989 and 2005	- 1:250,000 - 1:50,000	PAN+LISS III (final resolution of 5.8 m) merged data from IRS 1C/ ID satellite images of 2000-2001
Landform map area	Stratifying land	2005	1:50000	PAN+LISS III (final resolution of 5.8 m) merged data from IRS 1C/ ID satellite images of 2005
Land capability map	Stratifying land area	2005	2005	- Karnataka State Land Use Board, Bangalore, Karnataka - PAN+LISS III (final resolution of 5.8 m) merged data from IRS 1C/ ID satellite images of 2005
National and sectoral policies	Additionality consideration	Before 1998	National, Karnataka	Planning Commission,

			and at district and taluk level	Govt. of India, Karnataka Forest Department, National Forestry Action Plan
UNFCCC decisions UNFCCC website		1997 up to now	International	UNFCCC website
	Baseline net GHG removals by sinks			
ΔC_{ij}	average annual carbon stock change in living biomass of trees	2006	Stratum, species	Estimated based on field survey
$\Delta G_{Total,ij}$	Annual average increment rate in total biomass per hectare for stratum	2006	Local	Based on field studies conducted by ADATS
CF	Carbon fraction		Global default	GPG-LULUCF
C_{Actual}	Actual net greenhouse gas removals by sinks	Project specific		Calculated
	Carbon stock in aboveground biomass			Calculated
CAB_{ij}	Carbon stock in belowground biomass			Calculated based on IPCC default value given for tropical forests
GHG_E	Increase in GHG emissions by the sources within the project boundary as a result of the implementation of an A/R CDM activity		Project specific	Calculated
	Allometric equation		Species specific	Published data - FSI

				- Paper
$E_{biomassloss}$	Decrease in carbon stock in living biomass of existing non-tree vegetation			Estimated – Destructive harvesting
$CF_{non-tree}$	Carbon fraction of non-tree vegetation			GPG-LULUCF
N_2O_{direct}-$N_{fertilizer}$	Increase in N2O emission as a result of direct nitrogen application within the project boundary			Estimated
F_{on}	Annual amount of organic fertilizer nitrogen adjusted for volatilization as NH3 and NOx			Estimated
EF_1	Emission factor for emissions from N inputs		Global default	IPCC guidelines
$N_{ON-fert}$	Mass of organic fertilizer nitrogen applied			Estimated
$Frac_{GASM}$	Fraction that volatilizes as NH3 and NOx		Global default	IPCC guidelines
Nsn-fert	Amount of organic fertilizer nitrogen applied		Project	Monitored
EF_{ij}	Emission factor for vehicle type I with fuel type j		National	India's First National Inventory to the UNFCCC, 2004
$FuelConsumption_{ij}$	Consumption of fuel type j of vehicle type i		Project	Estimated
E_{ij}	Average litres consumed per km traveled for vehicle type I with fuel type j		Project	Interview with local communities

K_{ij}	Kilometres traveled by each of vehicle type I with fuel type j		project	Monitored
N_{ij}	Number of vehicles		Project	Monitored

Annex 4

MONITORING PLAN

Monitoring of the baseline net GHG removals

The carbon stocks changes in the baseline scenario is set to zero for Siddalaghatta taluk without trees in the baseline. For the other taluks, Bagepalli, Chickballapur, Chintamani and Gudibanda with trees, the projected carbon stock changes in above-ground biomass and below-ground biomass for existing trees for lands with growing trees was set based on calculations based on stock change method. Field studies were conducted in the 5 taluks of project area based on the land capability classification. The estimated mean annual increment (t/ha/yr) was determined which was projected as the carbon stock change in the project scenarion in aboveground biomass and belowground biomass. A renewable crediting period of 3 x 20 years is chosen for the proposed A/R CDM project. The baseline net GHG removals by sinks do not need to be measured and monitored over time.

Monitoring the proposed project activity

1. Monitoring project boundary and project implementation

(a) Monitoring the boundary of the proposed A/R CDM project activity

- The survey numbers of the land holdings of the farmers is the actual boundary within which reforestation activity will occur. These areas and boundaries have been measured and fixed by using the chain method by the revenue department. The project boundary shall be monitored periodically all through the crediting period by the CSU from ADATS. If the project area changes during the crediting period, for instance, because deforestation occurs on the project area, the specific location and area of the deforested land shall be identified. Similarly, if the planting on certain lands within the project boundary fails these lands shall be documented.
- The geographical positions (latitude and longitude of each corner of polygon sites) will be measured using GPS. These measured geographical positions will be input into GIS system and calculate the eligible area of each stratum and sub-stratum.
- The actual boundary for reforestation will be consistent with the description in the CDM-AR-PDD as the planting is on the farmer's lands who are part of the CSU. If the actual boundary falls outside of the designed boundary in CDM-AR-PDD, additional information for lands beyond the designed boundary in CDM-AR-PDD shall be provided; the eligibility of these lands as a part of the A/R CDM project activity will be justified and the projected baseline scenario will be demonstrated to be applicable to these lands. Such changes in boundary shall be communicated to the DOE and subject to validation during the project, e.g. during the first verification event.

(b) Monitoring of forest establishment

To ensure that the planting quality confirm to the practice described in CDM-AR-PDD and is well implemented, the following monitoring activities shall be conducted:

The site and soil preparations implemented on the field before planting for each of the parcel of land will be monitored by the CSU and a database will be created for each of the farmer's land at the ADATS office. Slash and burn of pre-existing vegetation is not practiced. The existing trees on the bunds will not

be disturbed. No tillage will be done to cause significant longer term net emissions from soil carbon. For survival checking, the initial survival rate of planted trees shall be counted three months after the planting by the CSUs and reported to the ADATS office which will be maintained as a database. Replanting shall be conducted aper the planting plan given. The final checking will be undertaken three years after the planting. The checking of the survival rate will be on 100% of lands and of all the trees. This will be done by the CSU and reported to ADATS, which will be documented and stored electronically. Also check will be done through permanent sample plots.

(c) Monitoring of forest management

There is no need to monitor thinning or harvesting. Farm yard manure will be applied during the first year of planting. This will be monitored at the time of planting.

2. Stratification and sampling for ex-post calculations

(a) Stratification

The pre-stratification of the proposed project area as detailed in Section B, which influences the carbon stocks in the above- and below-biomass pools was determined by using satellite imagery land use/cover maps and other factors i.e. micro-climate, soil depth, soil type, soil erosions and slope gradient. The further ex-post stratification will be based on tree species to be planted, year to be planted and human management.

The ex-post stratification will be further examined during the first monitoring and sub-stratification of the project area will be done into relatively homogeneous units to increase the measuring precision without increasing the cost unduly, or reduce the cost without reducing measuring precision because of the lower variance within each homogeneous unit. The sub-strata and strata will be grouped into one stratum or substratum if similar carbon stock and carbon stock change is seen.

(b) Sampling

(i) Determining sample size

Permanent sampling plots will be used for sampling over time to measure and monitor changes in carbon stocks of above- and below ground biomass. According to the AR-AM0001 version 2, the sample size for each stratum and sub-stratum will be determined by using the equation as given in section C.3.1. The sample size will be determined based on the mean standard deviation of carbon stock and carbon stock changes during the monitoring period for each of the sub-stratum.

(ii) Randomly locating sampling plots

To avoid subjective choice of plot locations, the permanent sample plots will be located systematically with a random start, which is considered good practice in GPG-LULUCF. This can be accomplished with the help of a GPS in the field. The geographical position (GPS coordinate), administrative location, stratum and sub-stratum series number of each plots shall be recorded and archived. The size of plots in general will be 50 x 50.(2500 m^2). Also, it will be ensured that the sampling plots are distributed as evenly spread as possible.

(iii) Monitoring frequency

Depending on the registration of the project, the planting will be conducted from 2008 to 2010. The frequency of monitoring will be every 5 years. The monitoring frequency will be accordingly during 2013, 2018, 2023, 2028.

3. Measuring and estimating carbon stock changes over time.

The steps, parameters and formula in section E.4.1 will be followed.

4. Monitoring GHG emissions by sources as the results of the A/R CDM project activity

The steps, parameters and formula in section E.4.2 will be followed.

5. Quality assurance and quality control (QA/QC)

A quality assurance and quality control (QA/QC) procedure will be followed based on the Good Practice Guidance of IPCC of 2004 (section 4.3.4)

Procedures to ensure reliable field measurements

Personnel responsible for the measurement work will be fully trained in all aspects of the field data collection and data analyses. A Standard Operating Procedures (SOPs) for each step of the field measurements will be prepared and adhered to. These SOPs should detail all phases of the field measurements and contain provisions for documentation for verification purposes and so that future field personnel can check past results and repeat the measurements in a consistent fashion. To collect reliable field data the following will be ensured:

- Field-team members are fully cognisant of all procedures and the importance of collecting data as accurately as possible
- Field teams install test plots if needed in the field and measure all pertinent components using the SOPs
- All field measurements are checked by a qualified person in cooperation with the field team and correct any errors in techniques
- A document is filed with the project documents that show that these steps have been followed. The document will list all names of the field team and the project leader will certify that the team is trained
- New staff will be adequately trained.

Procedures to verify field data collection

To verify that plots have been installed and the measurements taken correctly, the following will be adhered to:

- Re-measure independently every 80-100 plots, and to compare the measurements to check for errors. Any errors will be resolved, corrected and recorded. The re-measurement of permanent plots is to verify that measurement procedures were conducted properly.
- At the end of the field work, independently 1-2% of the plots will be checked. Field data collected at this stage will be compared with the original data. Any errors will be corrected and

recorded. Any errors discovered will be expressed as a percentage of all plots that have been rechecked to provide an estimate of the measurement error.

Procedures to verify data entry and analysis

Reliable carbon estimates require proper entry of data into the data analyses spreadsheets. Possible errors in this process will be minimized. The entry of both field data and laboratory data will be reviewed using expert judgement and, where necessary, comparison with independent data to ensure that the data are realistic. Communication between all personnel involved in measuring and analysing data will be used to resolve any apparent anomalies before the final analysis of the monitoring data is completed. If there are any problems with the monitoring plot data that cannot be resolved, the plot will not be used in the analysis.

Data maintenance and storage

Because of the long-term nature of these projects, data archiving (maintenance and storage) will be an important component of the work. Data archiving should take several forms and copies of all data should be provided to each project participant. Copies (electronic and/or paper) of all field data, data analyses, and models; estimates of the changes in carbon stocks and non-CO_2 greenhouse gases and corresponding calculations and models used; any GIS products; and copies of the measuring and monitoring reports will be stored in a dedicated and safe place, preferably offsite.

Given the time frame over which the project will take place and the pace of production of updated versions of software and new hardware for storing data, the electronic copies of the data and report will be updated periodically or converted to a format that could be accessed by any future software application.

6. Uncertainty assessment

The uncertainty in each species in each stratum can be estimated from re-measurement of randomly selected plots and/or from the measurement of replicate plots. Uncertainties will be estimated and expressed as half the 95% confidence interval width divided by the estimated value, i.e.,

$$Us = \frac{1}{2}.\frac{(95\%confidence.level.\text{int}erval.width}{\mu}.100$$

Where
μ = mean value
ó = standard deviation

$$Uc = \frac{\sqrt{(U_{s1}.C_{s1})^2 + (U_{s2}.C_{s12})^2 + ... + (U_{sn}.C_{sn})^2}}{\left|C_{s1} + C_{S2} + ...C_{sn}\right|}$$

Where
U_c = combined percentage uncertainty of sub-stratum, %
C_{si} = mean carbon stock of species i in the sub-stratum

The stratum and total percentage uncertainties are further combined in the same way as above.