CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM FOR SMALL-SCALE AFFORESTATION AND REFORESTATION PROJECT ACTIVITIES (CDM-SSC-AR-PDD)
(Version 02)

CONTENTS

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

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

>> **Title**: Small Scale Cooperative Afforestation CDM Pilot Project Activity on Private Lands Affected by Shifting Sand Dunes in Sirsa, Haryana.
Version : 03
Date: 13/12/2008

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

>> The lands to be planted in the proposed small-scale A/R CDM project activity are located in the western belt of Haryana which has its border with the state of Rajasthan at the north-eastern fringe of the Indian Thar Desert. The project area is affected by *aeolian* (wind blown) sand, and is the degraded part of croplands spread across these eight villages, comprising of 369.87 ha belonging to 227 farmers; which is generally left fallow. Large areas of land are without any vegetation due to frequent dust storms of various intensities. These dust storms toss up large amount of sand, dust and suspended particles into the air and pollute the ambient atmosphere. The report has found that the quality of drinking water and the water table in this region has deteriorated over the years. Many villages also reportedly have lost crop lands due to shifting sands[1]. Impacted by limited precipitation (100-200mm annually) and shifting sand dune, the cropping intensity on these degraded croplands is barely one crop every three years as against the normally two crops annually on the surrounding good croplands (as per the PRA findings). The cultivation and shifting sand dunes prevent the potential natural regeneration of forest in this area.

The purpose of the small-scale A/R CDM project activity proposed by Haryana C.D.M Variksh Kisan Samiti (Haryana CDM Tree Farmers Society), Ellenabad, Sirsa (Hereafter known as *the Society*); are as follows.

- To earn carbon credits from growing of trees to be planted, under the CDM provisions of Kyoto Protocol;
- To help in mitigation of global warming by planting trees for sequestration of atmospheric carbon dioxide;
- To improve the local environmental condition of soil through increasing the water holding capacity of the lands, increasing the humus in soil and also stabilizing the sand dunes, by converting the marginal and degraded croplands into forested lands;
- To increase income, provide employment opportunities, and as a result to alleviate poverty of local communities.

To realize the objectives mentioned above, 369.87 ha of mixed forests will be established, using seven tree species, i.e., *Ailanthus excelsa, Acacia tortilis, Eucalyptus* hybrid, *Acacia nilotica, Dalbergia sissoo, Zizyphus mauritiana, Prosopis cineraria.*

The proposed small-scale A/R CDM project activity is a pilot project activity of its kind in the state of Haryana. Both the Project Developer (Haryana Forest Department) and the local farmers (Project Participants) expect that the success of the proposed small-scale A/R CDM project activity will promote A/R CDM activities in lands of low agricultural productivity in the state of Haryana and beyond in the

[1] Institute of Sustainable Development. Environment Impact Study in Haryana Community Forestry Project Villages, December 2007

country. They are also of the view that it will contribute to poverty alleviation, biodiversity conservation and prevention of soil erosion, thus contributing to sustainable development.

A.3. Project participants:

>>

Table A-1 Project participants

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Indicate if the Party involved wishes to be considered as a project participant (Yes/No)
India	Haryana CDM Variksh Kisan Samiti, Ellenabad, Sirsa	No
(*) At the time of making the CDM-SSC-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. Description of location and boundary of the small-scale A/R CDM project activity:

>> The location and boundary of the proposed small scale A/R CDM project activity is described in the following subsections.

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

A.4.1.1. Host Party(ies):

>> India

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

>> Haryana

A.4.1.3. City/Town/Community etc:

>> The project area covers eight villages falling under three administrative blocks of Sirsa district, Haryana (Table A-2).

Table A-2 Detailed location and areas to be planted

State	District	Block	Village	Area to be planted (Ha)	Coordinates	
					Latitude (N, degree)	Longitude (E, degree)
Haryana	Sirsa	Ellenabad	Neemla	45.89	29.252	74.351
			Dhani Sheranwali	73.27	29.241	74.363
			Bhuratwala	34.43	29.235	74.455
			Umedpura	42.65	29.244	74.495
			Poharkan	68.94	29.234	74.443
			Mallekan	26.85	29.245	74.565
Haryana	Sirsa	Sirsa	Madhosinghana	34.39	29.222	74.565
Haryana	Sirsa	Nathusari Chopta	Gudia Khera	43.46	29.223	74.573
Total				369.87		

A.4.2. Detail of geographical location and project boundary, including information allowing the unique identification(s) of the proposed small-scale A/R CDM project activity:

>> The proposed small-scale A/R CDM project activity is located in Sirsa district of Haryana state, which is 255 Km from New Delhi. The Sirsa district lies between 29˚ 14" and 30˚ 0" north latitude and 74˚ 29" and 75˚ 18" east longitude, forming the western corner of Haryana, bordering the desert of Rajasthan in India (Fig 1). The lands to be planted in the proposed small-scale A/R CDM project activity are comprised of 239 parcels of lands (Table A.3). The geographical axis, measured using GPS, at each corner of the boundary of the lands to be planted is shown in the maps from Fig 2 to Fig 9 below. The hard copy of the maps will be available to the DOE for verification. Please also see GPS project boundary spreadsheet, attached with the PDD, showing geographical identification of each parcel of land.

Table A.3 Details of lands to be planted in each village

Village	Area to be planted (ha)	Number of Farmers	Number of land parcels
Neemla	45.89	43	54
Dhani Sheranwali	73.27	30	31
Bhuratwala	34.43	19	19
Umedpura	42.65	17	39
Poharkan	68.94	38	23
Mallekan	26.85	17	22
Madho Singhana	34.39	20	33
Gudia Khera	43.46	43	49
Total	**369.87**	**227**	**270**

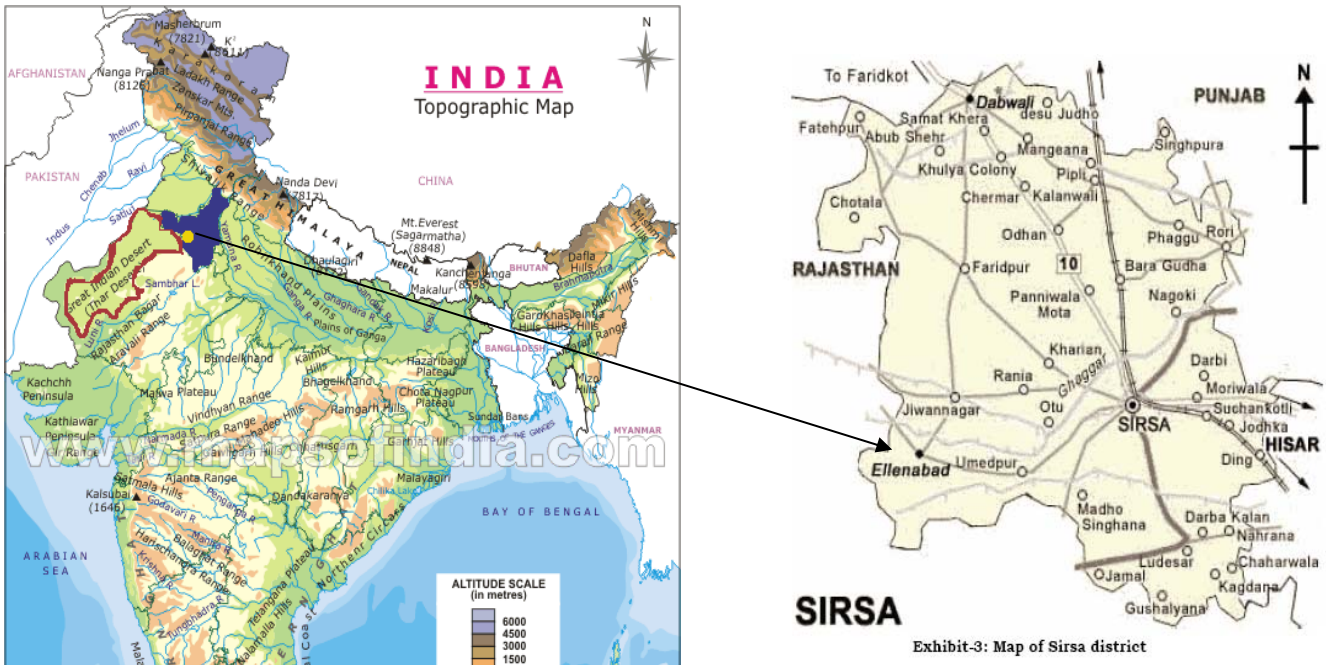


Fig A.1 a) Map of India showing the Great Indian Thar Desert (demarcated in brown) and Haryana (in blue). Project area is shown as yellow dot.

b) Map of Sirsa district of Haryana showing Ellenabad

Fig A.2: The project boundaries of all the area included in the proposed project activity

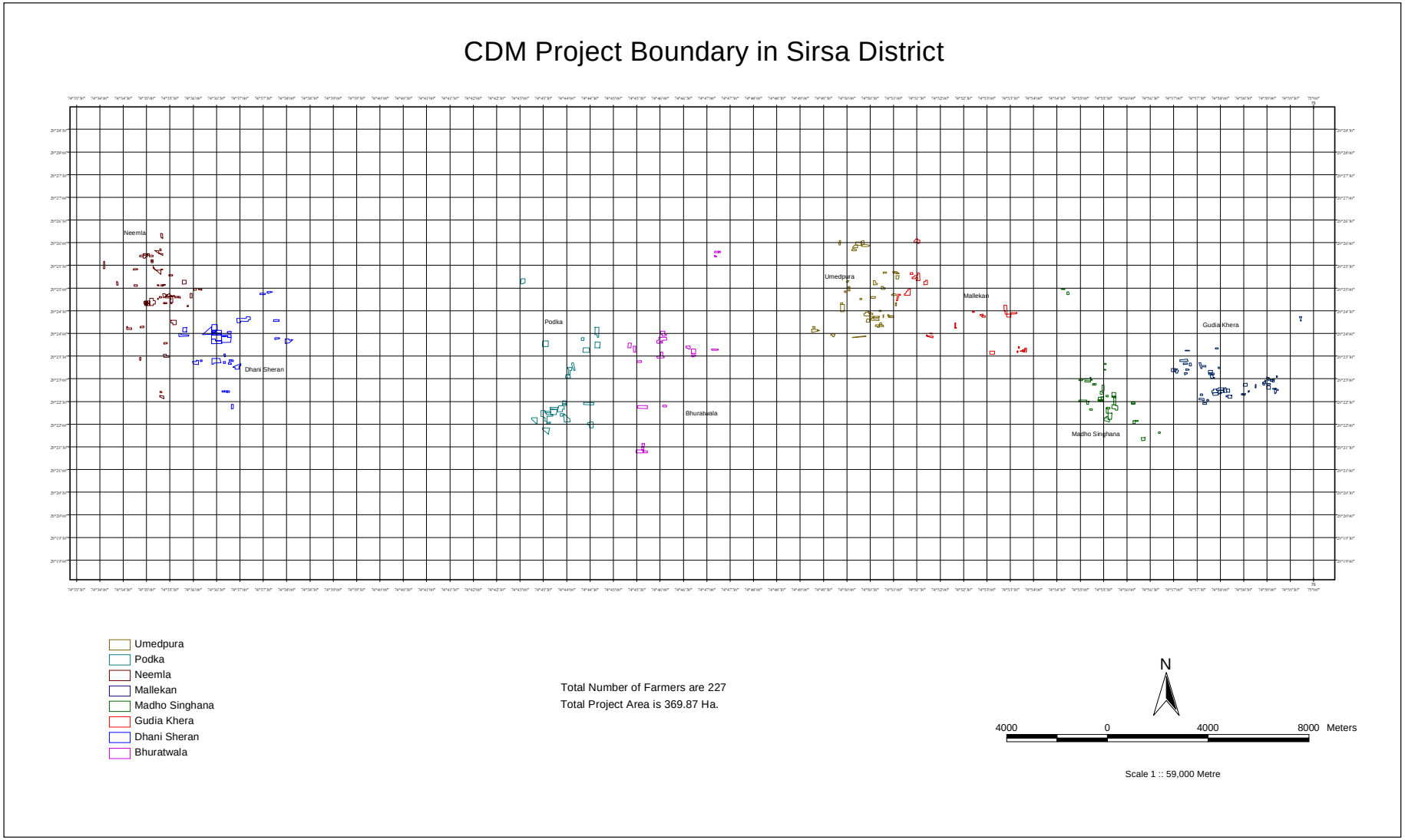


Fig A.3: Project boundary of lands at village Poharkan in Sirsa District

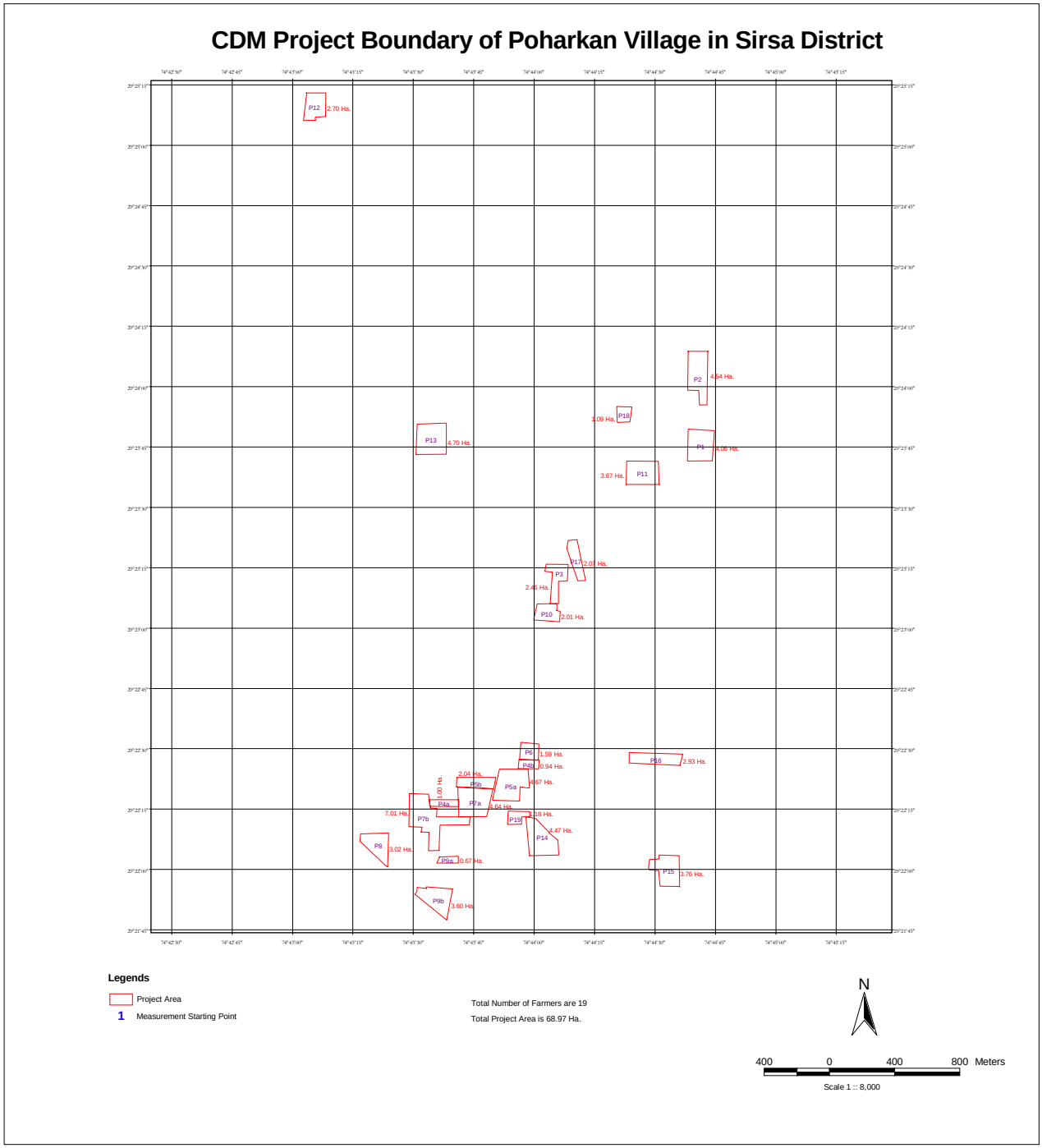


Fig A.4: Project boundary of lands at village Dhani Sheranwali in Sirsa District

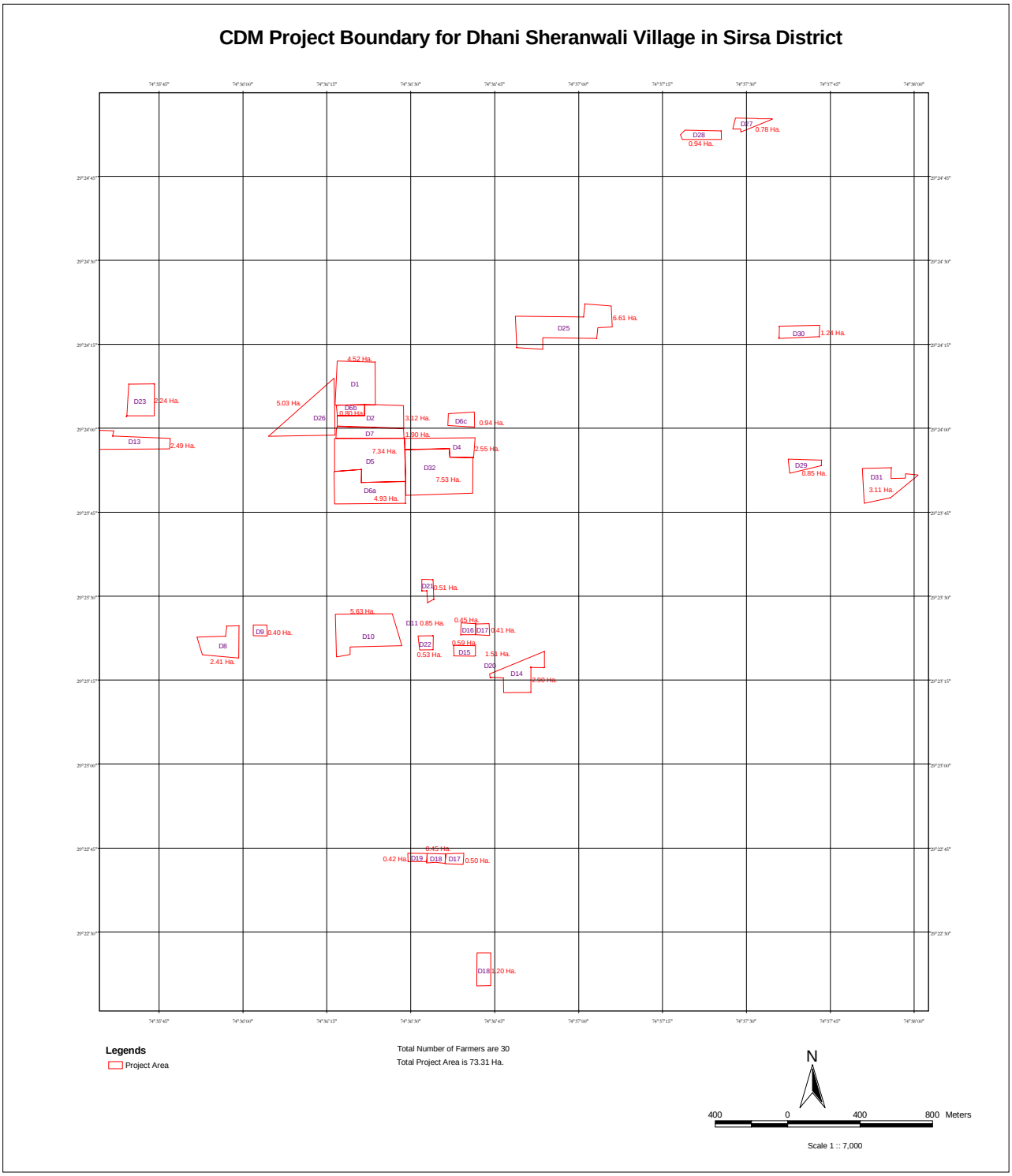


Fig A.5: Project boundary of lands at village Gudia Khera in Sirsa District

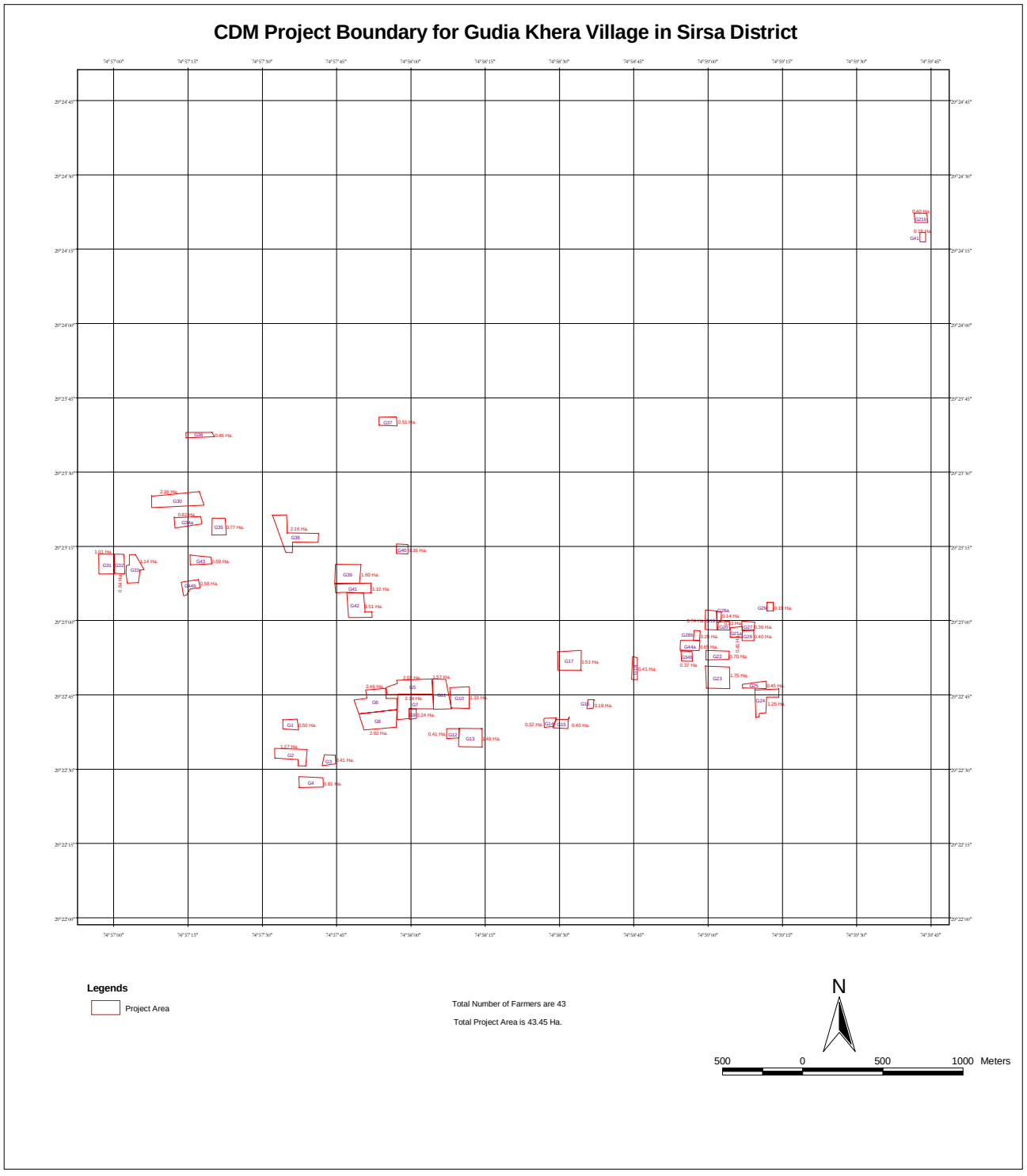


Fig A.6: Project boundary of lands at village Madho Singhana in Sirsa District

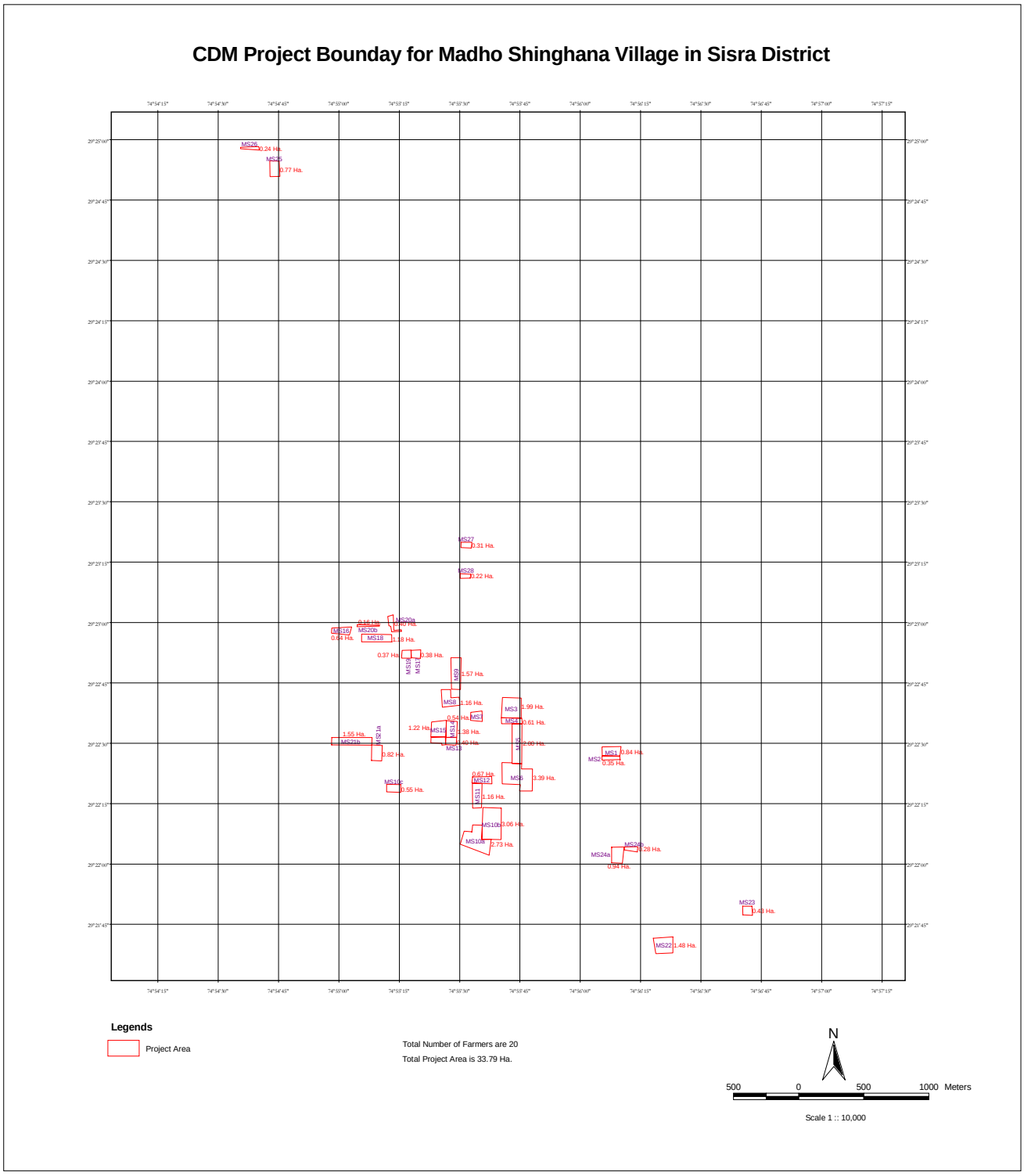


Fig A.7: Project boundary of lands at village Mallekan in Sirsa District

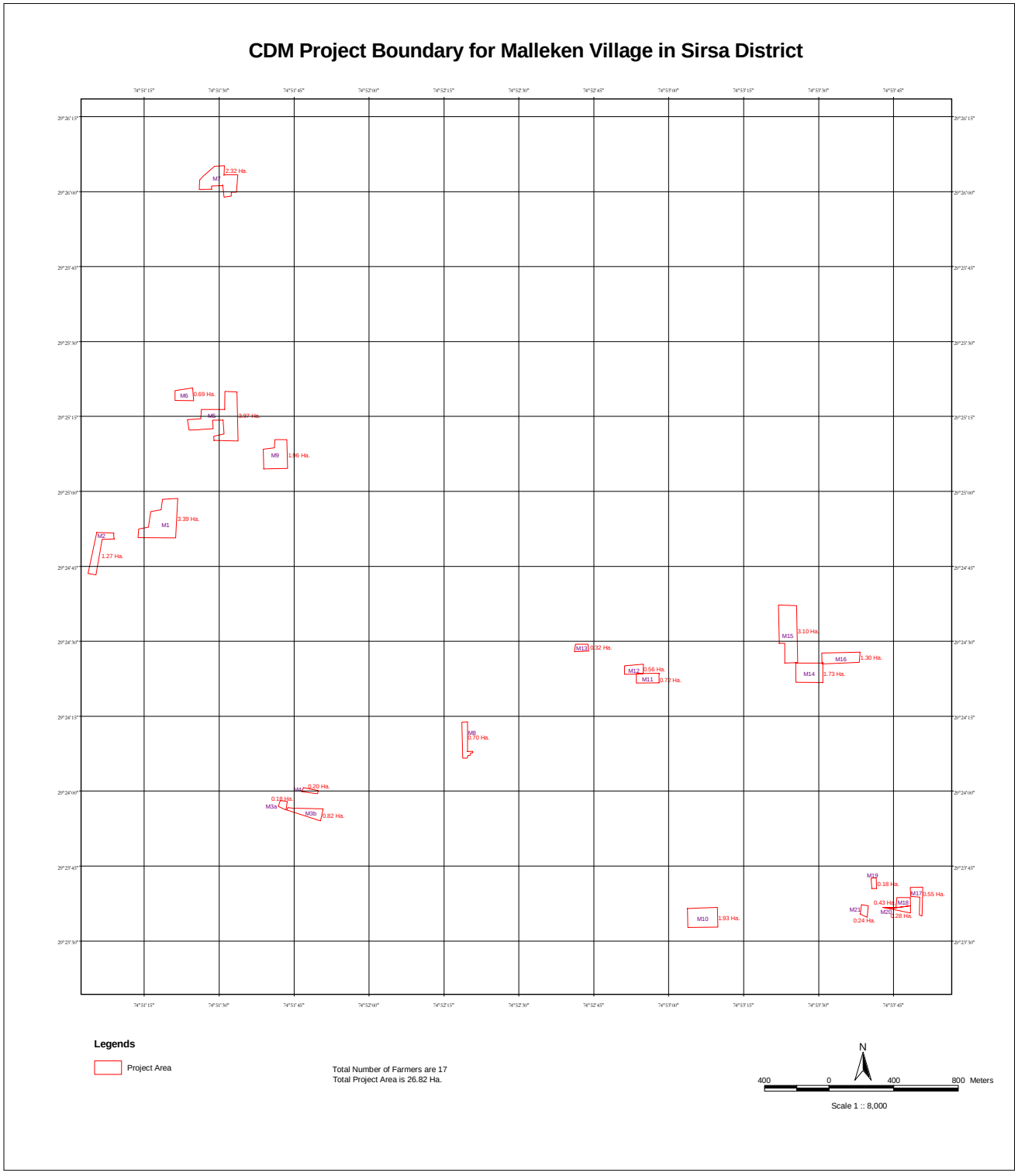


Fig A.8: Project boundary of lands at village Neemla in Sirsa District

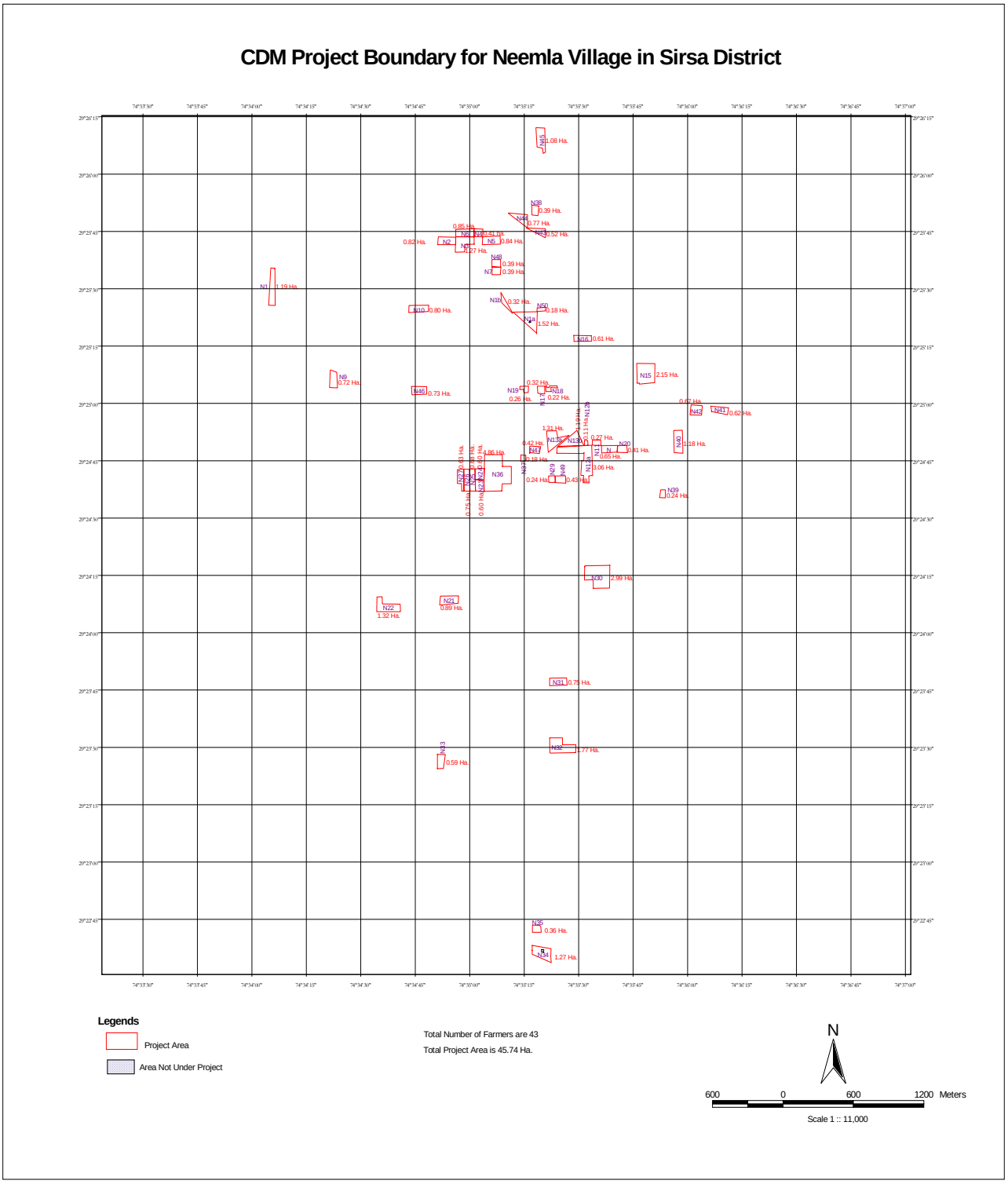


Fig A.9: Project boundary of lands at village Umedpura in Sirsa District

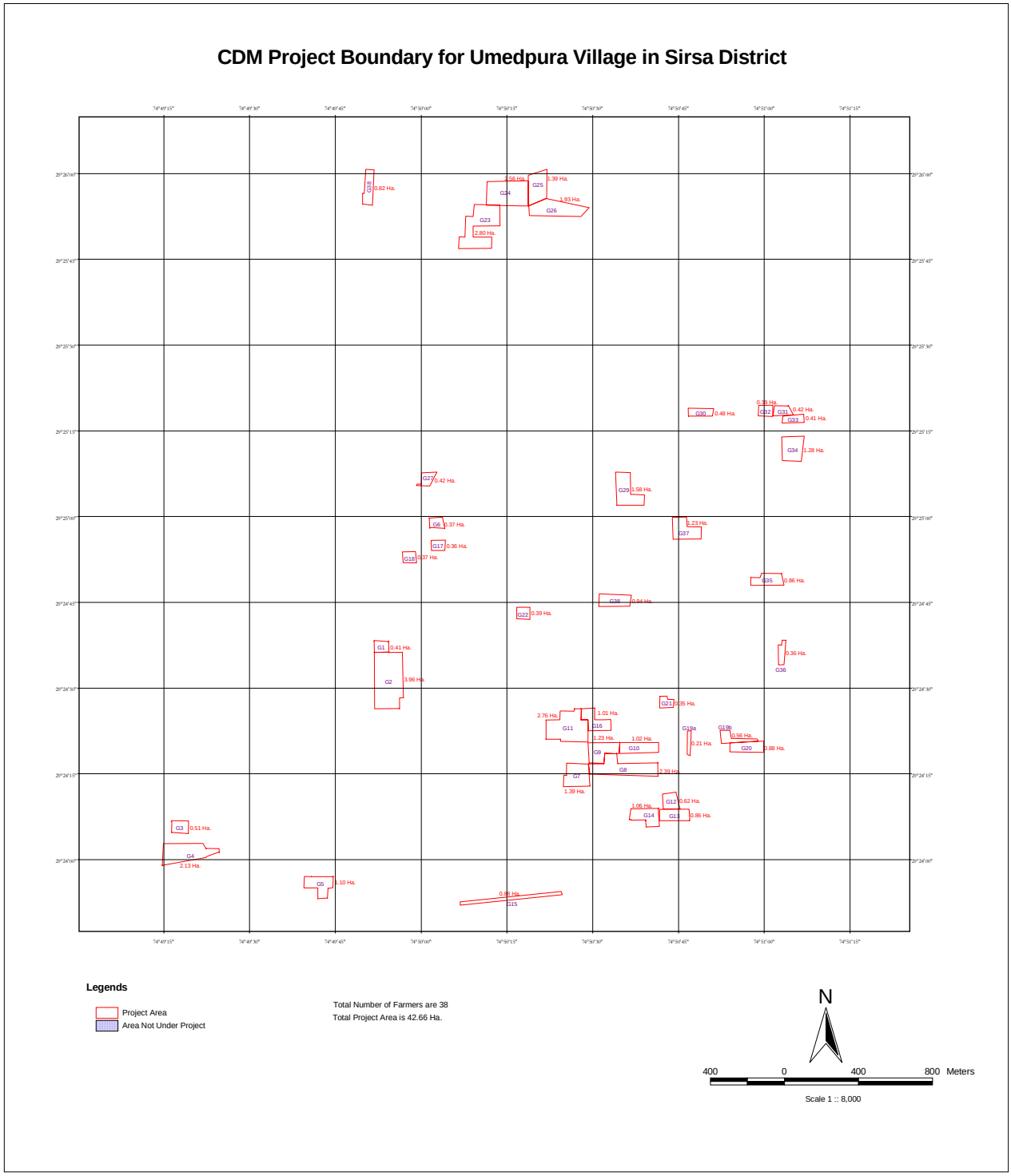
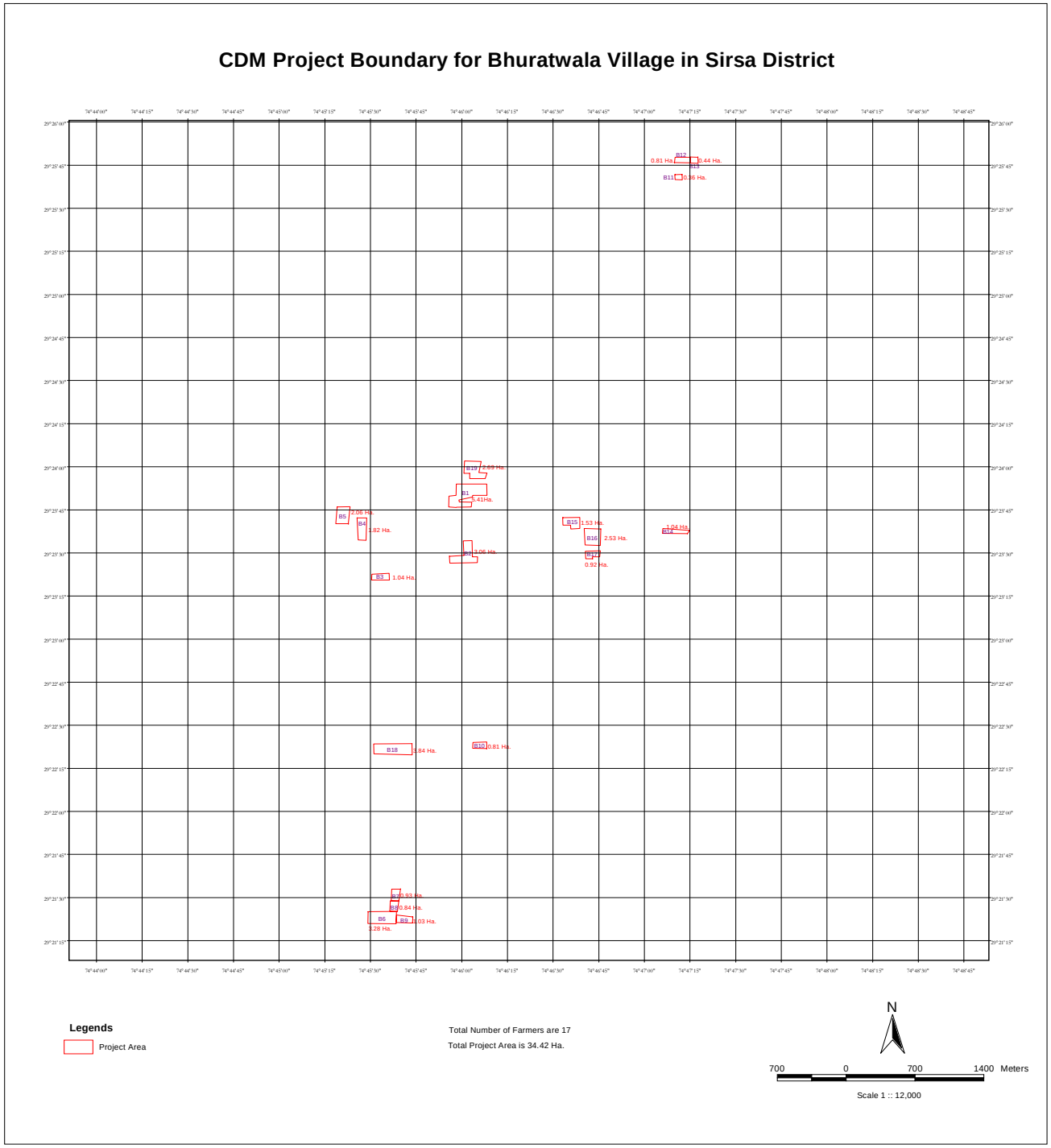


Fig A.10: Project boundary of lands at village Bhuratwala in Sirsa District



A.5. Technical description of the small-scale A/R CDM project activity:

>> Technical issues of the proposed small-scale A/R CDM project activity are described in detail in subsections below.

A.5.1. Type(s) of small-scale A/R CDM project activity:

>> The project lands are marginal croplands that are cultivated once every three years in average, and are left fallow during other period of time. Based on the Decision 6/CMP.1, titled "Simplified modalities and procedures for small-scale afforestation reforestation project activities under the clean development mechanism in the first commitment period of the Kyoto Protocol and measures to facilitate their implementation", the proposed small-scale A/R CDM project activity belongs to the type "cropland to forested land".

A.5.2. A concise description of present environmental conditions of the area, which include information on climate, soils, main watershed, ecosystems, and the possible presence of rare or endangered species and their habitats:

>> The project area, located in the north eastern fringe of the Great Indian Thar Desert, having been affected by mildly shifting sand dunes, is, for most part, a degraded cropland. The region is affected by mild to severe sand storms blowing up volumes of dust and sand into the atmosphere and polluting the surrounding areas. The climate is arid, characterized by dryness and extremes of temperature. The mean daily maximum temperature during May and June, which is the hottest period, varies from 42º C to 47º C and winter temperature ranges between 2º C to 20º C. Precipitation is very low with average annual rainfall ranging between 150-200 mm. All these factors contribute to occurrence of droughts in the area in summer and in the months of October and November. Frost is also common, usually occurring during the months of January and February. The area is also vulnerable to high velocity wind storms during the months of May and June. All this has resulted in sparse and thin natural vegetation and no natural regeneration of trees in this area[1]. Flood occurrences are not common in the area. So the drainage of water is badly developed and maintained and when it rains water logging has been reported in some villages, leading to salinity in soil and poor quality of potable water.

Desert or sandy soil is dominant in the area which is windblown and light in colour. There is no perennial river in the area and Ghaggar is the only river flowing from north to west through the central part of the Sirsa district. During the rainy season its water is diverted into the southern canal flowing through these villages. Apart from this natural source of water supply which is available only during the rains there is a network of canals spread over these villages originating from the Bhakra Canal. These canals are not passing through the project area.

The old natural forests in these areas vanished in the nineteen fifties due to the sudden increase in population on account of the influx of refugees in the aftermath of partition. It has emerged during the PRA that the migrants from Pakistan, who had temporarily settled in these villages, had cleared the vegetation for meeting their fuel needs as also for selling for earning livelihood. Subsequently agriculture has been practised on most of these lands and presently, the proposed project lands have the status of degraded and degrading croplands, affected by shifting sand dunes, with a few scattered trees. The natural trees species available in the area are Jand *(Prosopis cineraria*), Beri *(Zizyphus mauritiana)*, Jaal *(Salvadora oleoides)*, Reru *(Acacia lucophloea)*, Kair *(Capparis decidua)*, Kikar *(Acacia nilotica)*, Pipal *(Ficus religiosa)* etc (please also see Section C.1.b). None of these naturally occurring trees are rare or endangered according to the Botanical Survey of India[2].

[2] http://envfor.nic.in/bsi/research.html

The wild animals which may be found occasionally in the project area include Black Buck (*Antelope cervicapra)*, Chinkara (*Gazella gazella)*, Desert cat (*Felis libyea*), Desert fox (*vulpus bucapus*), Monitor lizard (*Varanus grizeus*), Pea fowl (*Pavo cristatus*), Jackal (*Carris aureus*), Mongoose (*Herpester* sp.) and Blue Bull (*Boselaphus tragocamelus)*. The major habitats of these wild animals are the sandy arid and semi-arid regions of Rajasthan, Madhya Pradesh and Gujarat[3] and these animals occasionally wander into the fringe desert areas of Haryana, where the project area is also situated. The project area of 369.87 ha is an almost insignificant portion of the total habitat of these wild animals. Since the project area is scattered over eight villages there is no habitat fragmentation or loss due to the project. There is no nature reserve in the vicinity of the project area. These lands currently have very low biodiversity.

Sand dunes in the project area

Productive irrigated agricultural lands and canal passing through a village.

A.5.3. Species and varieties selected:

>> Tree species to be used for planting have been determined by interviewing the farmers and taking into consideration of carbon sequestration rates, biodiversity enhancement, soil and climate conditions, and the value of associated forest products. The chosen species are:

[3] http://stp.unipune.ernet.in/zsi/display.html

- *Ailanthus excelsa* (Ullu Neem);
- *Acacia tortilis* (Israeli Kikar);
- *Eucalyptus* hybrid (Safeda);
- *Acacia nilotica* (Desi kikar);
- *Dalbergia sissoo* (Shisham);
- *Zizyphus mauritiana* (Desi ber);
- *Prosopis cineraria* (Jand)

Of the above tree species *Eucalyptus* hybrid (Safeda) is an exotic species and the rest are native to the India though not all occur naturally on the project lands. The exotic species has been selected because of high demand from the farmers. *Eucalyptus* hybrid has been planted in this area for more than fifty years and there are no reports of this species having become invasive.

A.5.4. Technology to be employed by the proposed small-scale A/R CDM project activity:

>> The technology to be employed under this pilot project is afforestation through direct planting of chosen species. Environment friendly technologies like use of vermi-compost, mulching and spot irrigation will be used. National and international forestry experts will also be consulted for this purpose but there will be no transfer of technology from an Annex 1 country to the Host country.

To conserve the soil carbon stock and minimize the GHG emissions from the soil, zero tillage will be practiced. Existing vegetation will not be removed and small pits of size 45 cm x 45 cm x 45 cm will be dug. In the first two years castor crop etc will be grown by dibbling seeds without tilling of land thus ensuring that the land over which soil disturbance is caused due to both tree planting and castor growing will be less than 3% of the total project area. The planting material will be provided by the Haryana Forest Department from their nurseries established in the project villages.

The saplings will be raised in plastic containers, containing an appropriate mixture of soil & farm yard manure/vermi-compost and humus to ensure healthy and robust initial growth. The species are divided into two categories, viz. short rotation species and medium rotation species in the ratio of 4:6. This proportion will ensure regular flow of financial benefit to the farmers.

Ailanthus excelsa seedlings raised in nursery

A spacing of 4 m x 2.5 m will be maintained in the plantation (1,000 trees per hectare) and re-planting will be taken up to fill up casualties. Planting will be done in blocks to maximize economic benefits. The harvesting of trees shall be done at the intervals of 10 and 20 years.

The design of plantation differs from one parcel of land to other. It was selected by the individual farmers according to their choice of species at the time of committing the lands for the proposed small-scale A/R CDM project activity. Please refer Table A.4 and figures from Fig.B.1 to Fig.B.8 for the details of parcel of lands and choice of species by farmers.

In the project area, short rotation (10 years) species (40%) and medium rotation (20 years) species (60%) will be planted. The species have been selected by the project participants under the guidance of the Haryana Forest Department taking into account their carbon sequestration potential, biodiversity enhancement, soil and climate conditions and the value of associated forest products whereas the rotation fixing has been largely a professional job by the forest department. The tree species selected including two categories, i.e. short rotation (10 years) and medium rotation (20 years):

Table A .4 Tree species to be planted, number of trees and rotation

Species	Number of trees in total area	Area (Ha)	Rotation
Ailanthus excelsa (Ullu Neem)	26,300	57.86	Short rotation (10 yrs)
Acacia tortilis, (Israeli Kikar)	57,860	61.65	
Eucalyptus hybrid(Safeda)	61,650	26.30	
Acacia nilotica (Desi kikar)	53,650	60.75	Medium rotation (20 yrs)
Dalbergia sissoo (Sisham)	60,750	53.65	
Zizyphus mauritiana (Desi ber)	74,200	35.46	
Prosopis cineraria (Jand)	35,460	74.20	
Total	369,870	369.87	

3-yr-old of *Ailanthus excelsa* plantation (short rotation) in Sirsa district

5-yr-old *Dalbergia sissoo* plantation (medium rotation) in Sirsa district

A.5.5. Transfer of technology/know-how, if applicable:

>> No technology will be transferred to the host country (India). The project is unilateral and no upfront CDM benefit has been sought for the farmers

A.5.6. Proposed measures to be implemented to minimize potential leakage as applicable:

>> It has been ensured that the farmers contribute only small portions of their lands that are degraded and degrading and are unproductive and they do not rely on these lands for their livelihood; so that the leakages due to the displacement of activities are unlikely to occur.

Though the simplified baseline and monitoring methodologies applied in the proposed small-scale A/R CDM project activity does not require emissions from transportation to be accounted under leakage, to minimize potential leakages bullock carts would be used to transport materials to and from the project area as much as possible.

A.6. A description of legal title to the land, current land tenure and land use and rights to tCERs / lCERs issued:

>> The proposed project lands are owned by farmers. Current land use is cropland but owing to the degraded feature of the lands there is, on an average, only one crop every three years following good monsoon rains. All the timber, non-wood products and carbon credits produced by the proposed small-scale A/R CDM project activity will be owned by the farmers who have the legal title to the lands.

In India there is no specific existing regulation on the rights to carbon credits. All benefits accruing from the project including the CERs belong to the owner of the land.

A.7. Assessment of the eligibility of land:

>> The Indian Government defines forests as lands having trees with:

- A minimum area of 0.05 hectares;
- A minimum tree crown cover of 15%; and
- Trees of, or with potential to reach, the height of minimum of 2 meters.

The land eligibility is demonstrated using "Procedures to define the eligibility of lands for afforestation and reforestation project activities" (EB 35 report Annex 18)

(a) The land at the moment the project starts is not a forest, which has been demonstrated by field survey and the Participatory Rural Appraisal (PRA) which has showed that the lands to be planted in the proposed small-scale A/R CDM project activity are currently degraded and degrading croplands affected by sand dunes and has very low productivity. Although some parcels of the project lands have existing mature trees, these trees are too sparse for any parcel to meet the definition of a forest. There are a total of 492 trees in the project area (369.87 ha) and the crown cover constituted by these trees is about 0.75%.

(b) The activity is an eligible CDM afforestation project activity, which has been demonstrated through interviews with the local farmers/communities on land use/cover history and important events that have impacted the land use/cover changes which have shown that the lands to be planted in the proposed small-scale A/R CDM project activity have been non-forest lands since nineteen fifties and hence satisfies the criteria of being non- forested since last 50 years. See Section E.1 and Section F.2 for details

A.8. Approach for addressing non-permanence:

>>

Please select between:

√ **Issuance of tCERs**

□ Issuance of lCERs

A.9. Duration of the proposed small-scale A/R CDM project activity / Crediting period:

>> Crediting period for this project will be 20 years (with a choice of renewal twice for 20 years each), with verification occurring at intervals of every five years, followed by issue of temporary Certified Emission Reduction (tCERs)

A.9.1. Starting date of the proposed small-scale A/R CDM project activity and of the (first) crediting period, including a justification:

>> The proposed small-scale A/R CDM project activity and its crediting period would start from 01/07/2008, for which Haryana Forest Department would start establishing nurseries from December- January, 2007-08. The actual plantation work will start from July 2008, because during this time, monsoon rains will increase the soil moisture content and would ensure survival of the saplings

A.9.2. Expected operational lifetime of the proposed small-scale A/R CDM project activity:

>>60 years

A.9.3. Choice of crediting period and related information:

>>

Please select one of the following:

1.	**Renewable crediting period**	√
2.	Fixed Crediting period	□

A.9.3.1. Duration of the first crediting period (in years and months), if a renewable crediting period is selected:

>>20 years 00 months

A.9.3.2. Duration of the fixed crediting period (in years and months), if selected:

>> N/A

A.10. Estimated amount of net anthropogenic GHG removals by sinks over the chosen crediting period:

>> The net anthropogenic GHG removals by the sinks as a result of the proposed small-scale A/R CDM project activity are anticipated to be 231,920 tonnes of CO_2 equivalent during the crediting period (from 2008 to 2027). The details are given below in Table A-5

Table A-5: Ex ante estimation of net anthropogenic GHG removals by sinks

Years	Annual estimation of net anthropogenic GHG removals by sinks in tones of CO_2e
2008	1,763
2009	1,784
2010	1,784
2011	1,784

2012	1,784
2013	9,411
2014	9,411
2015	9,411
2016	9,411
2017	9,411
2018	-16,153
2019	10,852
2020	10,852
2021	10,852
2022	10,852
2023	29,742
2024	29,742
2025	29,742
2026	29,742
2027	29,742
Total estimated net anthropogenic GHG removals by sinks (tonnes of CO_2e)	231,920
Total number of crediting years	**20**
Annual average over the crediting period of estimated net anthropogenic GHG removals by sinks (tones of CO_2e)	11,596
Note: Minus sign indicates net emissions.	

A.11. Public funding of the proposed small-scale A/R CDM project activity:

>> There will be no public funding in the proposed small-scale A/R CDM project activity that will result in the diversion of Official Development Assistance and financial obligations of any Parties under UNFCCC.

A.12. Confirmation that the small-scale A/R CDM project activity is not a debundled component of a larger project activity:

>> There is no registered small-scale A/R CDM project activity and no application to register another small-scale CDM project activity that conform to the criteria for determining the occurrence of debundling, namely

- with the same project participants registered within the previous two years
- whose project boundary is within 1 km of the project boundary of the proposed small-scale A/R CDM activity at the closest point.

Therefore the proposed small-scale A/R CDM project activity is not a debundled component of a larger project activity.

SECTION B. Application of a baseline and monitoring methodology :

B.1. Title and reference of the approved baseline and monitoring methodology applied to the proposed small-scale A/R CDM project activity:

>> Simplified baseline and monitoring methodologies for small-scale afforestation and reforestation project activities under the clean development mechanism implemented on grasslands or croplands AR-AMS0001 **(AR-AMS0001 / Version 04.1)**

B. 2. Justification of the applicability of the baseline and monitoring methodology to the proposed small-scale A/R CDM project activity:

>> The applicability conditions laid down in the Simplified baseline and monitoring methodologies for small-scale afforestation and reforestation project activities under the Clean Development Mechanism implemented on grasslands or croplands **(AR-AMS0001 / Version 04.1) are**

a) Project activities are implemented on grasslands or croplands;
b) Project activities are implemented on lands where the area of the cropland within the project boundary displaced due to the project activity is less than 50 per cent of the total project area;
c) Project activities are implemented on lands where the number of displaced grazing animals is less than 50 per cent of the average grazing capacity of the project area;
d) Project activities are implemented on lands where ≤ 10% of the total surface project area is disturbed as result of soil preparation for planting.

These applicability conditions are fulfilled as given below.

a) The project area is located in the western belt of Haryana at the north-eastern fringe of the Great Indian Thar Desert. The area is severely affected by *shifting windblown sands*. The project area comprises of 369.87 hectares of highly degraded and degrading croplands beyond the reach of irrigation, which is generally left fallow, belonging to 227 farmers spread across eight villages. The cropping intensity on these degraded croplands is barely one crop in three years as against the norm of two crops per year on the surrounding good croplands (Ref: PRA report).
b) The farmers have contributed only a small portion of their lands which is degraded and degrading and they do not rely on these lands for their livelihood since these lands are unproductive and an agriculture crop is grown on these lands only once at an average interval of three years, and that too only in one cropping season after the monsoon rains, whereas two crops per year is the norm in the other irrigated agricultural lands in these eight and surrounding villages. The farmers have other productive lands on which they depend for their livelihood. Details are provided in the table B-1 below.

Table B-1 Details of land holding of the farmers in each village

Village	No of farmers	Total land holding (Ha) of the project farmers	Land provided in the project (Ha)
Neemla	43	205.0	45.89
Dhani Sherawali	30	118.4	73.27
Poharkan	19	207.0	68.94
Bhuratwala	17	139.3	34.43
Umedpura	38	166.0	42.65
Mallekan	17	72.4	26.85
Madho Singhana	20	156.6	34.39
Gudia Khera	43	201.0	43.46
Total	227	1,265.7	369.87

c) Most cattle in the project villages are stall fed most of the time with fodder grown on the irrigated agricultural lands outside the project lands. The only period they are allowed to graze is immediately after the crop harvest for a few days in the cropped lands belonging to the cattle owners. During the month of April to May, the project villages are also visited by migratory cattle and herds of sheep and goat from neighbouring state of Rajasthan. These migratory animals feed on grasses on government lands, roadsides and also on the agricultural wastes left on the irrigated agricultural fields when allowed by the owner of the agricultural lands. The project lands do not support any grazing due to its degraded nature. **Thus there is no cattle displacement due to the project activity and hence the use of this simplified methodology is justified.**

d) A total of 1000 plants per ha will be planted in pits of the size 45 cm x 45 cm x 45 cm. In addition in the first two years up to 3,000 castor plants will be sown in between the planting rows by dibbling seeds with not more than 10 sq cm of soil being disturbed by each dibble. There will be no ploughing of land before the establishment of plantation. Thus the planting activities will lead to **soil disturbance over less that 3 % of the surface area and hence the use of this Simplified Methodology is justified.**

e) There is no single accepted definition of low income communities by the Government of India, for the purpose of CDM projects. Therefore the international norms have been followed according to which people below a daily income of US$ 1 (around 40 Rs) fall under the poverty line. Most members (92%) of *the Society* fall in this **low income family** category with an average annual income of just 6,610 Rs as has emerged in the PRA report (refer Sec E.1). Also the generally poor living conditions in most households that have contributed their lands to *the Society* for this project with no toilet and running water facilities justifies their inclusion in the low income categories. In view of the above explanation the use of **a Simplified Methodology is justifiable**.

B.3. Specification of the greenhouse gases (GHG) whose emissions will be part of the proposed small-scale A/R CDM project activity:

>> The greenhouse gases that will be a part of project emissions are N_2O. These emissions are estimated to be negligible based on preliminarily estimation. The spreadsheet for calculation of emissions shall be made available to the DOE during verification.

B.4. Carbon pools selected:

Based on the simplified baseline and monitoring methodology applied by the proposed small-scale A/R CDM project activity, the aboveground and belowground biomass (living biomass) are the only carbon pools to be considered (table B-2).

Table B-2 Chosen carbon pools

Carbon pools	Selected (answer with yes or no)
Above ground	Yes
Below ground	Yes
Dead wood	No
Litter	No
Soil organic carbon	No

B.5. Description of strata applied for ex ante estimations:

>> No stratification has been done for the ex-ante baseline estimation since the climate, landform, soil conditions influencing carbon stocks, in accordance with Section 4.3.3.2 of the IPCC GPG for LULUCF, are largely similar over the entire project area. Also the method adopted for baseline estimation is total count rather than sampling.

For the ex-ante estimation of the carbon stocks in the project area the climate, landform, soil conditions, and afforestation activity, including planting density and age, being same throughout the project area, the project lands have been stratified into seven project strata based on species alone. Each species represents one stratum. See Fig. B.1 to Fig. B.8 below.

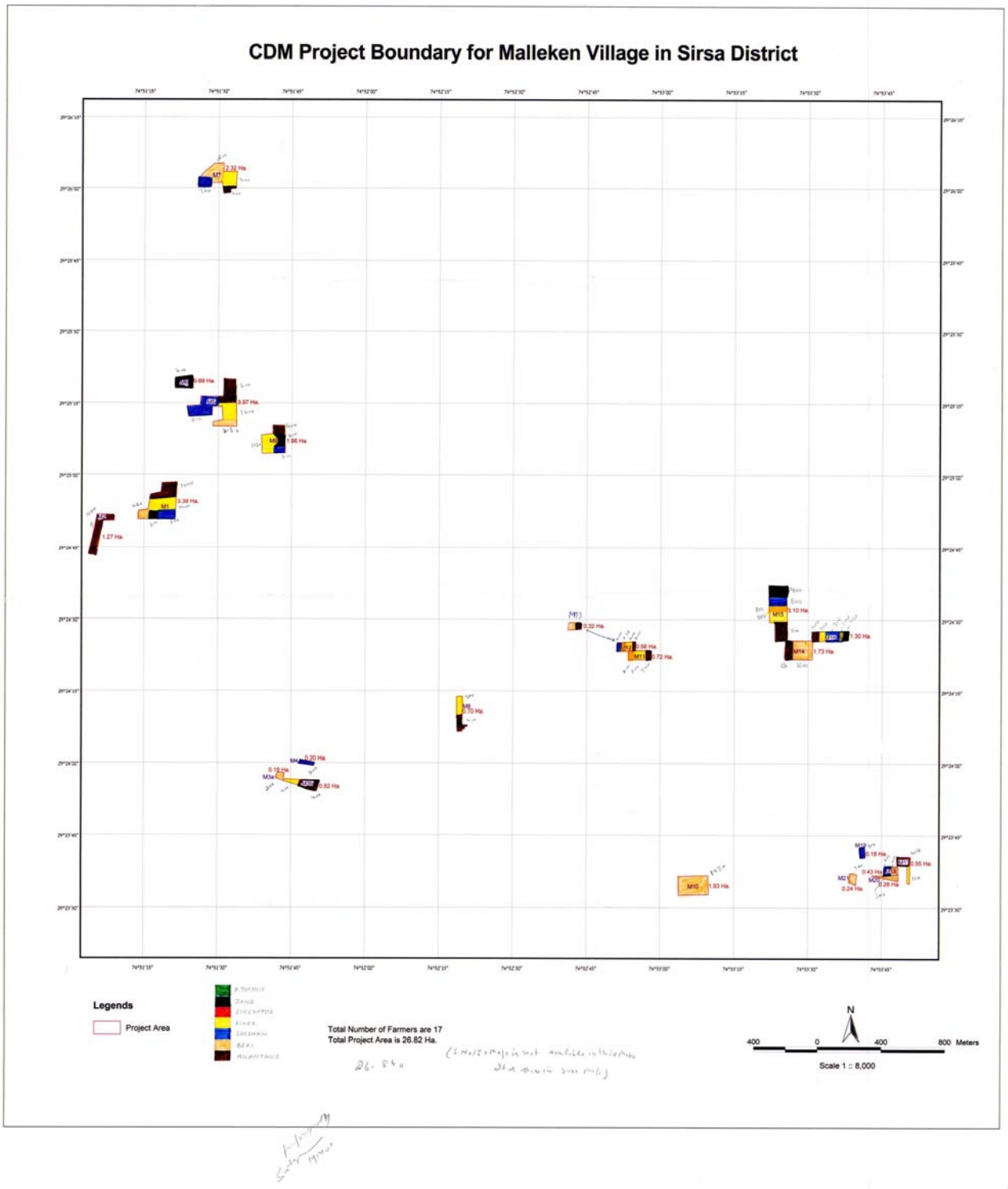


Fig.B.1 Project Stratification Map in Malleken Village

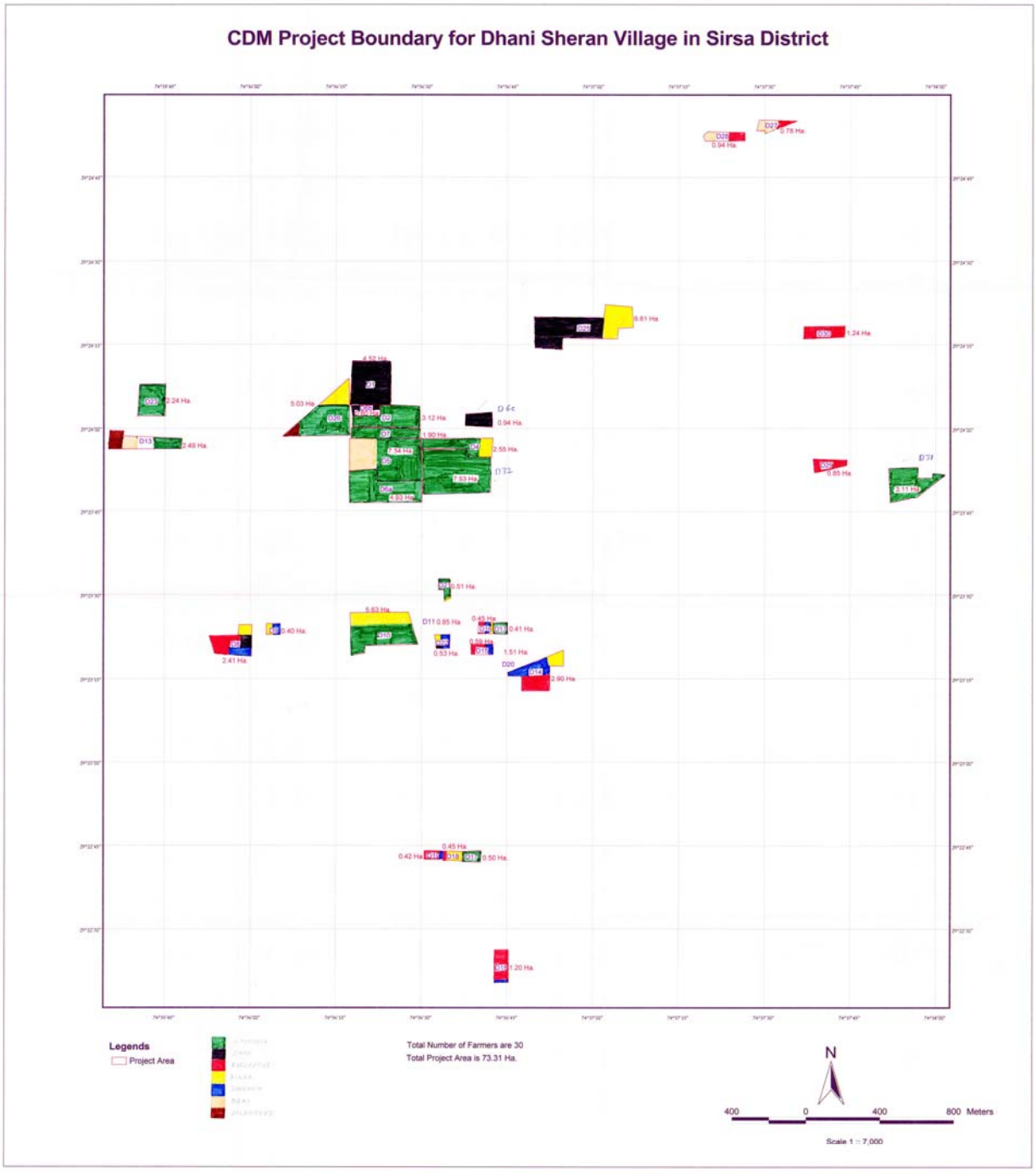


Fig.B.2 Project Stratification Map in Dhani Sheran Village

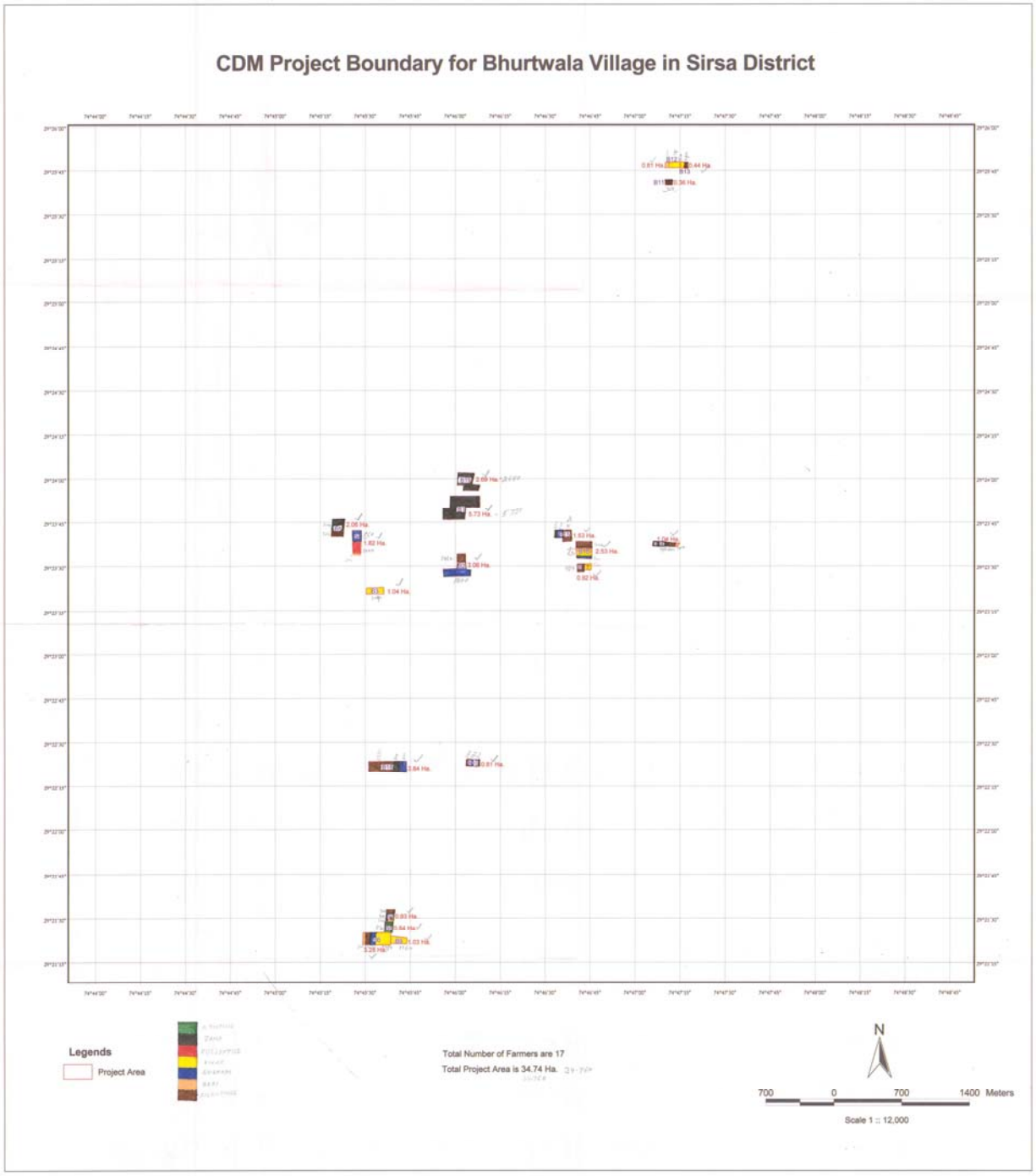


Fig.B.3 Project Stratification Map in Bhurtwala Village

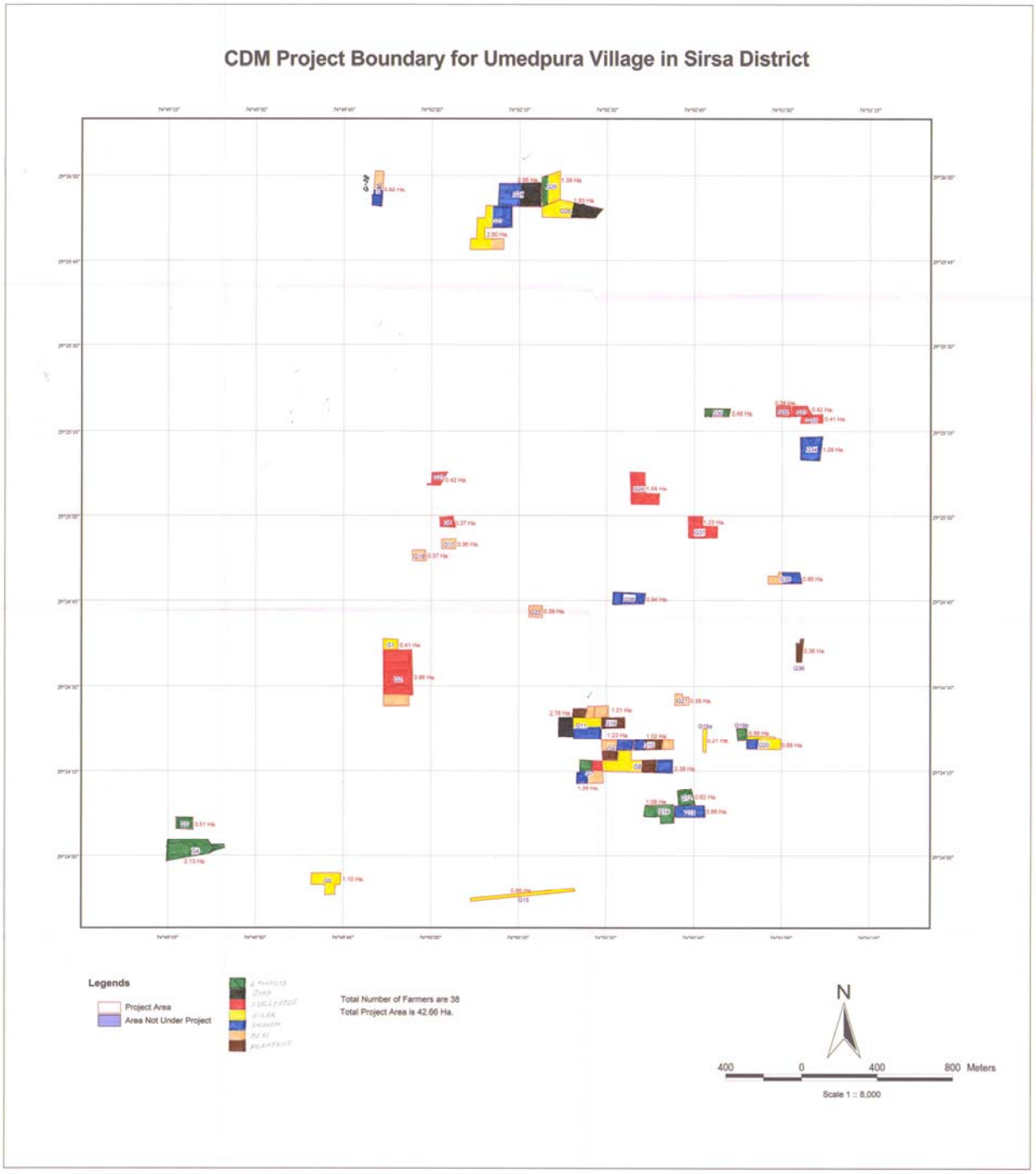
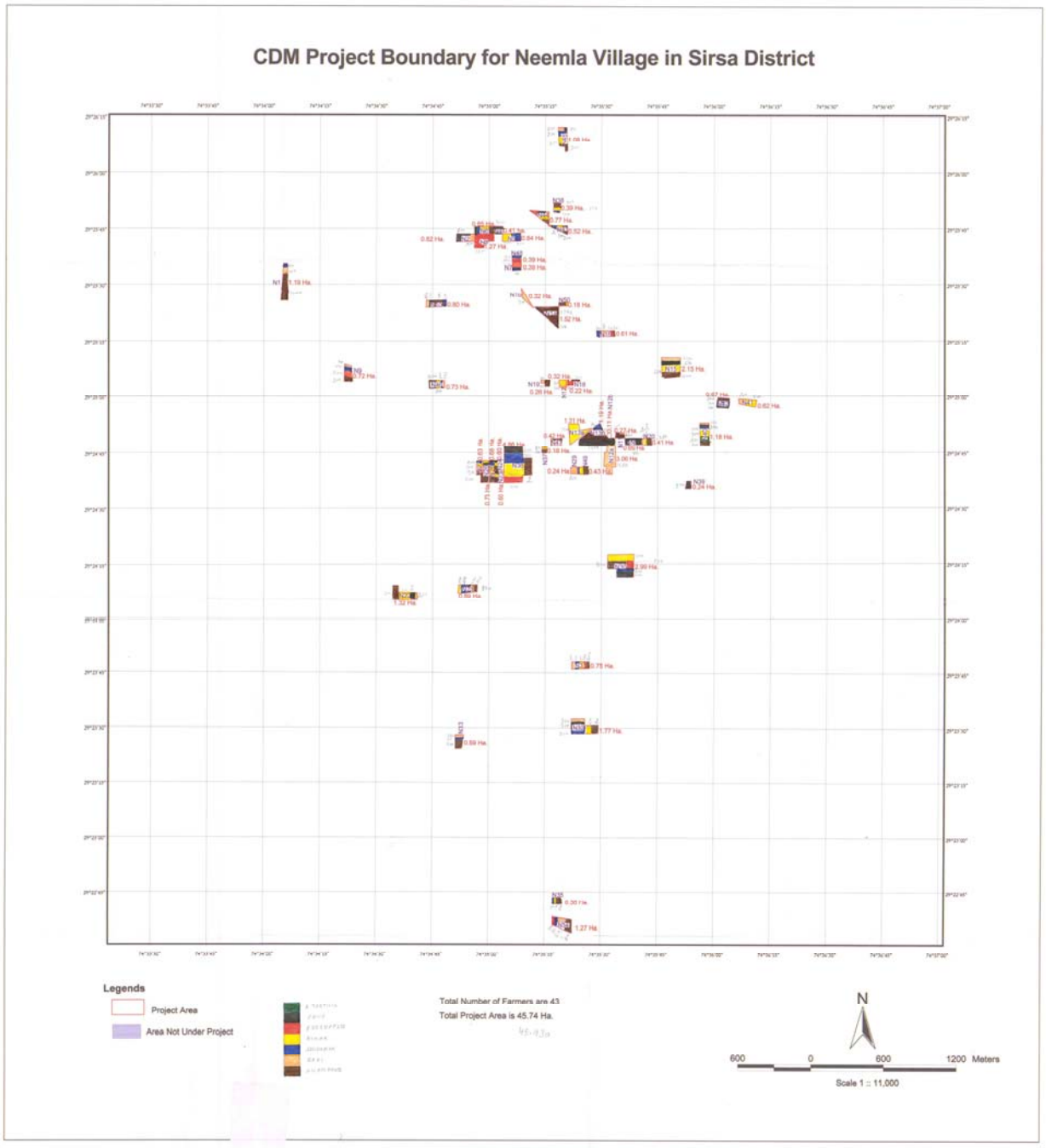


Fig.B.4 Project Stratification Map in Umedpura Village


CDM Project Boundary for Neemla Village in Sirsa District
Legends
Project Area
Area Not Under Project
Total Number of Farmers are 43
Total Project Area is 45.74 Ha.
N
600
0
600
1200 Meters
Scale 1 :: 11,000

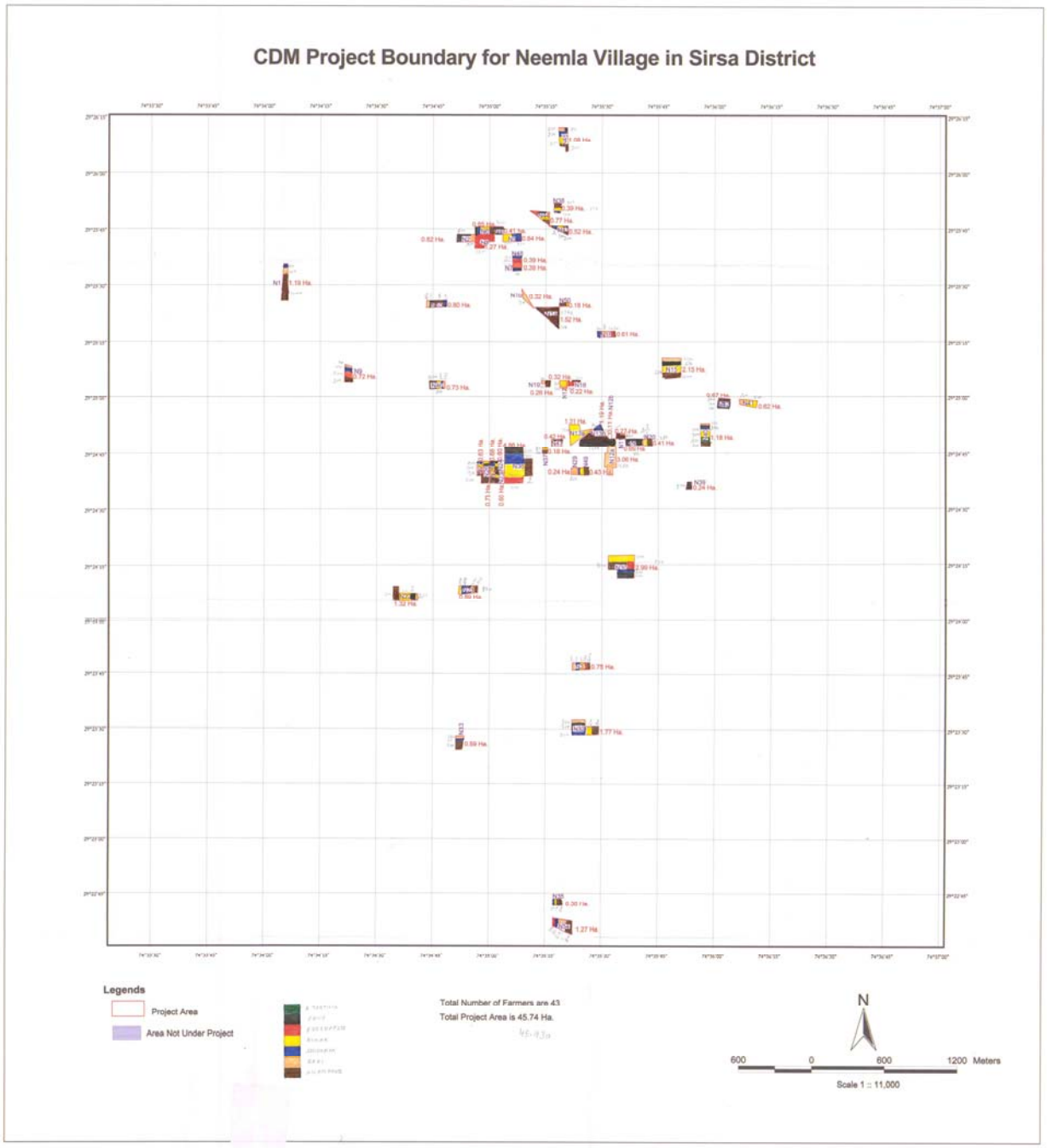


Fig.B.5 Project Stratification Map in Neemla Village

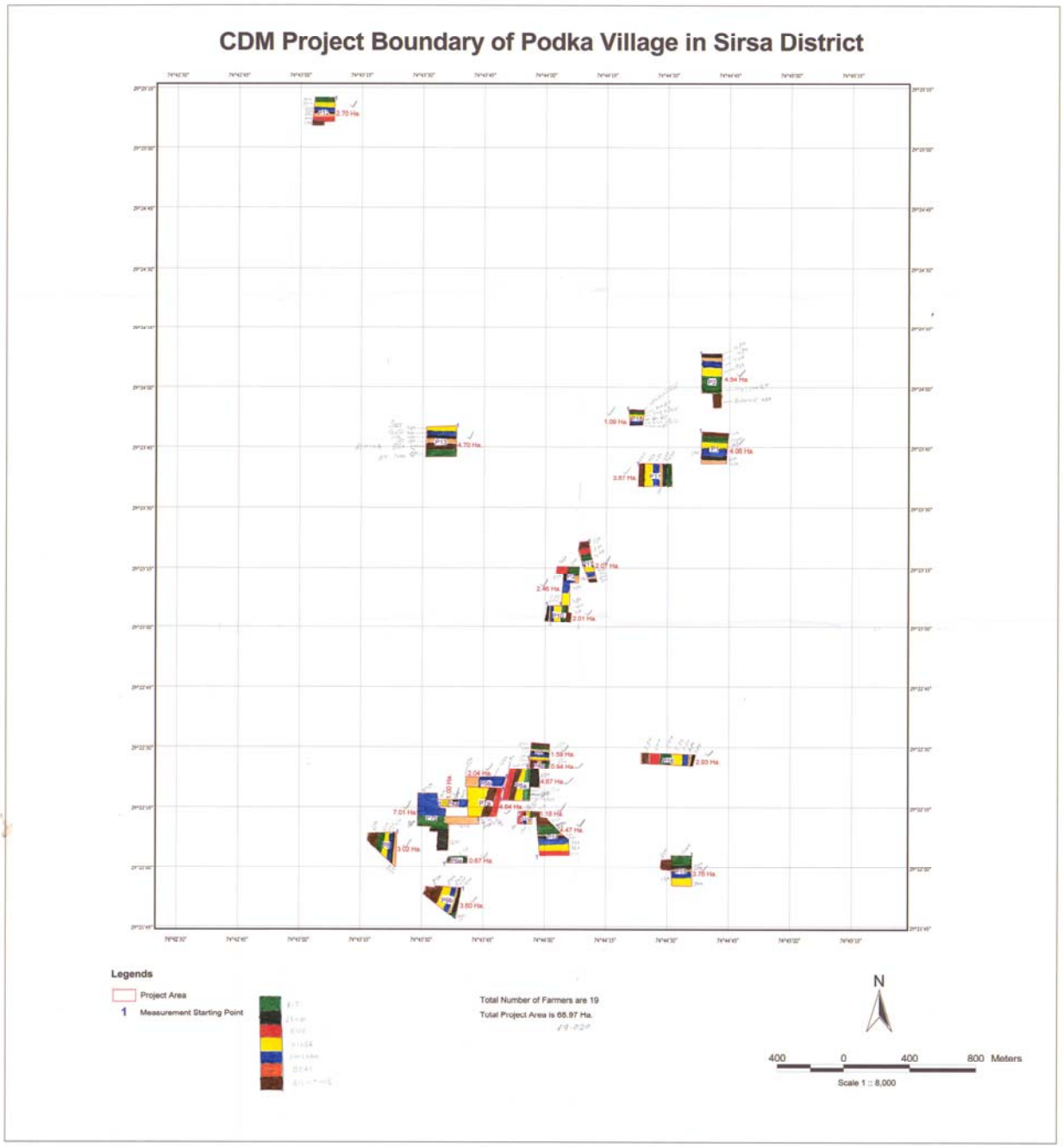


Fig.B.6 Project Stratification Map in Podka Village

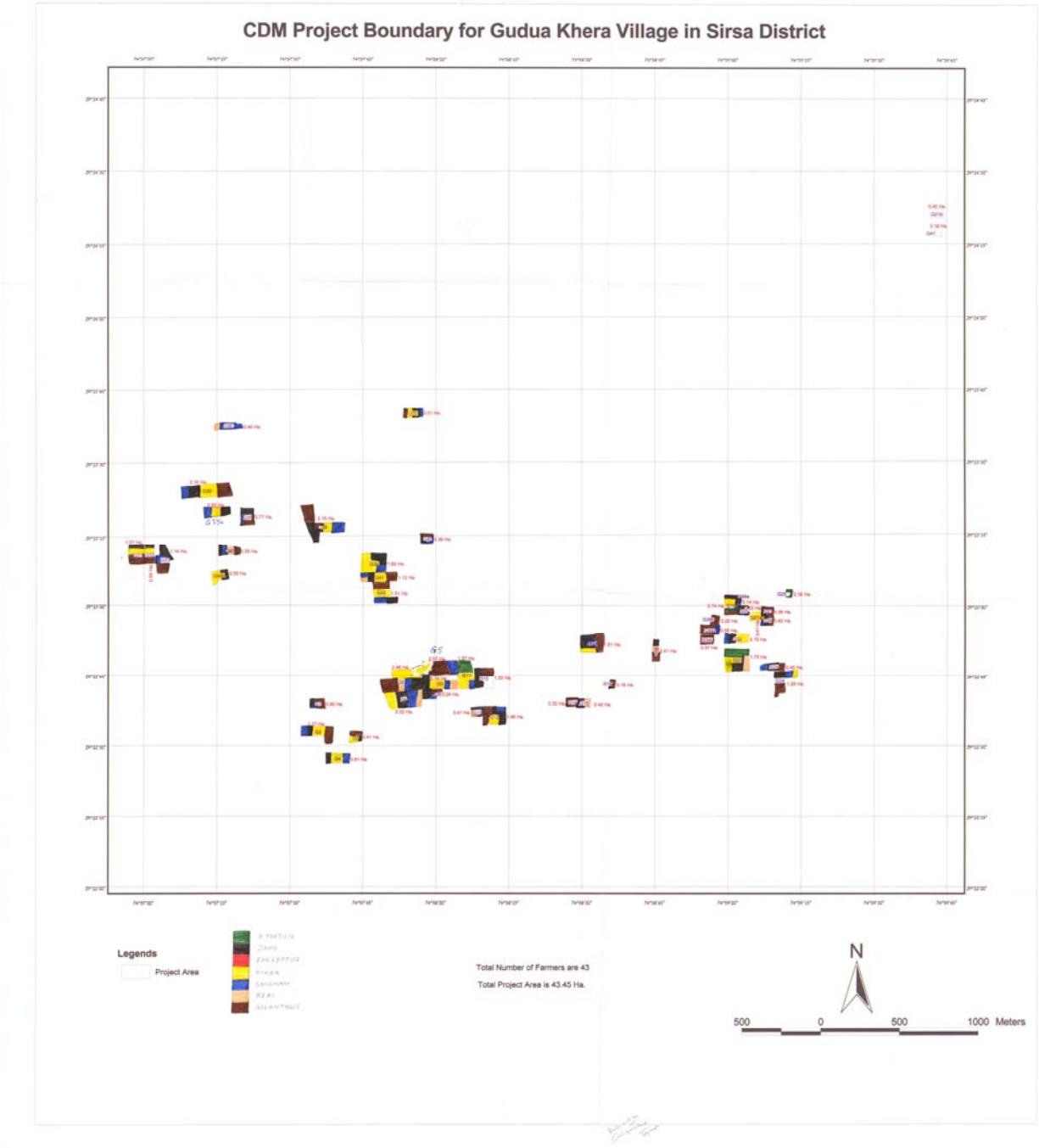


Fig.B.7 Project Stratification Map in Gudua Khera Village

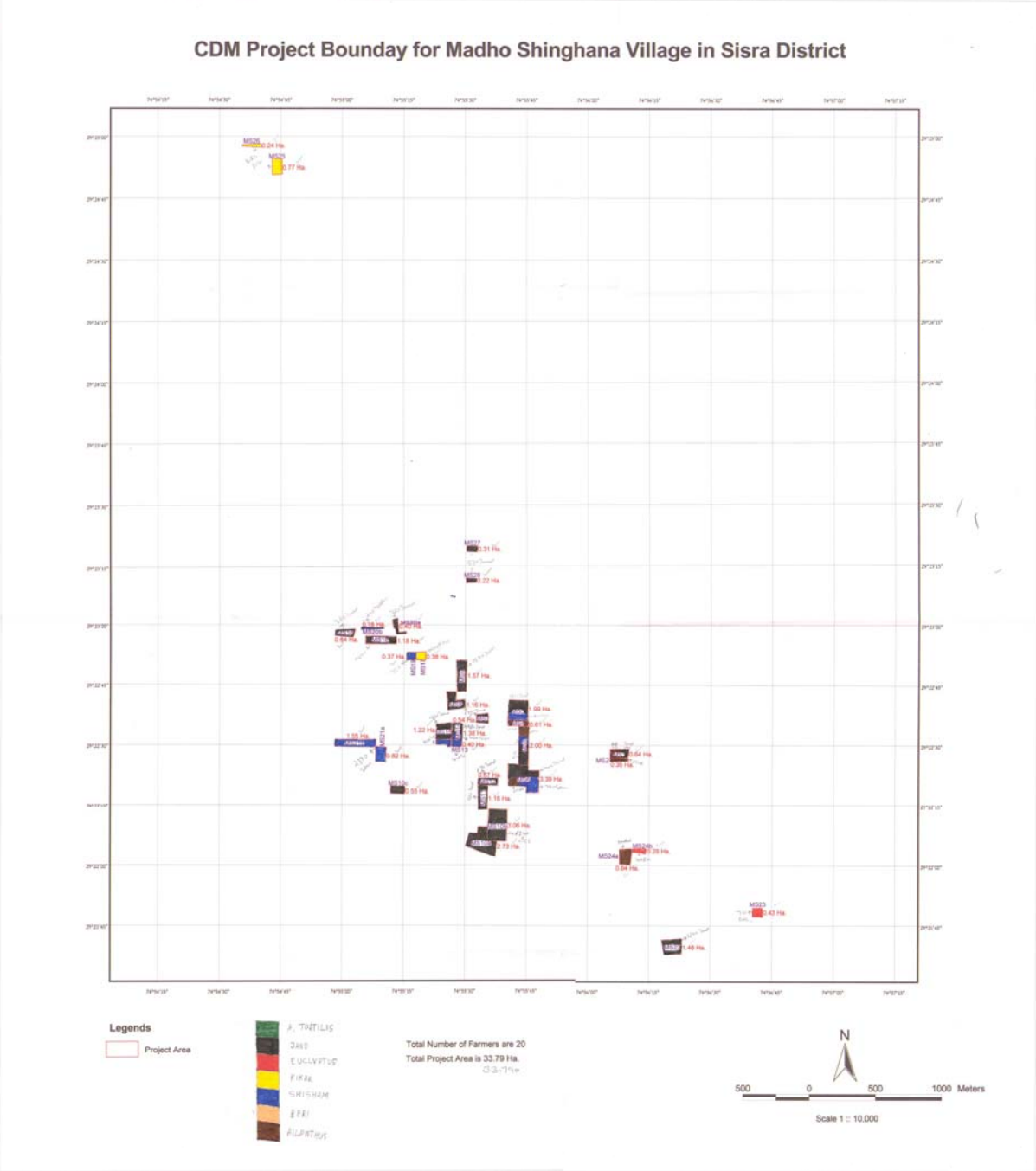


Fig.B.8 Project Stratification Map in Madho Shinghana Village

B.6. Application of baseline methodology to the proposed small-scale A/R CDM project activity:

>> The baseline approach "Existing or historical, as applicable, changes in carbon stock in the carbon pools within the project boundary", is the most appropriate approach for determination of the baseline scenario since due to the degraded and degrading nature of the project lands caused by the shifting sand dunes, the poor condition of landowners and the very high cost of raising and maintaining trees on such lands, the lands to be afforested, without the proposed small-scale A/R CDM project activity, would continue to remain in their present status. The efforts of the Haryana State Forest Department to encourage the farmers to promote tree planting under their social forestry, farm forestry and community forestry programs over the past 20 years, generally considered successful in achieving their objectives in the neighbouring lands, have not been successful in raising trees on the project lands on account of the exceptionally degraded nature of these lands. The baseline approach "The most likely land use would be continued current land use" also carries the same meanings in this context.

The baseline approach "Changes in carbon stocks in the carbon pools within the project boundary from a land use that represents an economically attractive course of action" is not appropriate because there is no economically more attractive alternative to the current status of these lands unless CDM finance is available.

The carbon stock in the living biomass pools of woody perennials and grasslands is expected to decrease in the absence of the proposed small-scale A/R CDM project activity, and is conservatively assumed to be constant (please see section C 1.a). However due to the continuous growth of the pre-project trees in the baseline scenario, the baseline net GHG removals by sinks is calculated as the increase in carbon stock in living biomass of the pre-project living trees even though most of these living trees are mature (please see section C 1.b). In the above case, the baseline carbon stocks in the carbons pools equal to existing carbon stocks at the start of the proposed small-scale A/R CDM project activity.

B.7. Description of how the actual net GHG removals by sinks are increased above those that would have occurred in the absence of the registered small-scale A/R CDM project activity:

>> The condition of **additionality** has been fulfilled as no tree planting activity with comparable sequestration capacity would have been taken up on the project lands in the absence of the project due to the non-viability of such an activity on account of the degraded and degrading nature of these lands. The Community Forestry Project of the Haryana Forest Department has been very active in this area targeting private lands in the past seven years but the lands in question were not taken up for tree plantation under the project for the same reason. Also, since the lands in question are privately owned degraded croplands, the afforestation of these lands is not a legal requirement. Thus the project lands would not have been taken up for tree planting in the baseline scenario. This has been established by barrier analysis presented below.

- Investment Barriers
  - ✓ Lack of access to credit: No credit mechanisms are in place for farmers to make long term investment in plantation forestry on degraded and degrading lands by taking commercial loans from banks. Agriculture is the main income source in the project area and with low productivity the condition of most farmers borders on poverty. As a result they are not able to afford the high plantation costs particularly with the long gestation periods that forestry entails. The proposed small-scale A/R CDM project activity reduces the gestation period for economic returns through carbon credits and makes the project a more attractive economic proposition.
  - ✓ The Haryana Forest Department has taken up the proposed small-scale A/R CDM project activity as a pilot project with a view to promote tree planting for climate change mitigation on the most unproductive lands and is bearing all project investigation and preparation costs as well as nursery costs in the first phase and will also endeavour to help the project proponent raise money for raising plantation. This is being done only because it is a CDM project.

- Technological barriers
  - ✓ The local farmers do not have an easy access to either the planting material or planting technologies as forestry is not their usual occupation. They get these facilities only through the Haryana Forest Department under their social and community forestry project. But owing to lack of resources with the forest department these projects have so far been confined to only better and more productive lands in view of the very high costs of raising plantations over lands as unproductive as the proposed project lands. The Haryana Forest Department has been able to spare resources for raising trees on these lands only because of their commitment to promotion of CDM afforestation on such lands.
- Barriers due to social conditions
  - ✓ There is no organization of local communities that is focused on tree planting and individual farmers are unable to successfully invite investments in tree planting on such lands and exploit commercial synergies with their other products and create new links to market on their own. This also prevents them from overcoming technological barriers mentioned above. Now the interest in CDM and the benefits that are likely to flow from a CDM project has led to the creation of the Haryana CDM Variksh Kisan Samiti, Ellenabad, Sirsa, specifically for this purpose under the patronage of the Haryana Forest Department. Thus an important barrier to the tree planting on the project lands has been removed because of CDM.
- The natural regeneration would not be possible and would not result in the conversion of the project lands to a forest in the absence of the proposed small-scale A/R CDM project activity due to:
  - ✓ Intermittent agricultural cultivation over these lands for a long time has resulted in complete loss of root stock of trees thus preventing the possibility of restocking through regeneration from root suckers;
  - ✓ There are no forests in vicinity thus preventing the possibilities of large scale seed availability for germination. Where seeds do disperse into edge of the land parcels or from pre-project existing trees, the intermittent cultivation prevents the survival of any seedlings.

Carbon dioxide will be sequestered from the atmosphere through the growth of planted trees and stored in the aboveground biomass and belowground biomass of living trees. In the project scenario, 1000 trees per hectare will be planted, resulting in much higher carbon stock change in living biomass than in the baseline scenario. It can also be demonstrated that the increase in GHG emission is negligible. Therefore the actual net GHG removals by sinks will be increased above those that would have occurred in the absence of the registered small-scale A/R CDM project activity.

Refer section C for detailed methods and *ex ante* estimation of baseline net removals by sinks and actual net GHG removals by sink.

B.8. Application of monitoring methodology and monitoring plan to the small-scale A/R CDM project activity:

>>

a. Ex post estimation of the baseline net greenhouse gas removals by sinks

In accordance with the decision 6/CMP.1, appendix B, paragraph 6, no monitoring of the baseline is required for small-scale A/R CDM project activity. The baseline net GHG removals by sinks will be assumed to be those estimated in section C.1 below.

b. Ex post estimation of the actual net greenhouse gas removals by sinks

The project participants will determine any changes in carbon stocks via measuring and monitoring the project area that has been planted. The monitoring will focus on (i) the project boundaries and (ii) the selected stratified sample plots. The stratification shall be based on the species planted, other things being almost uniform throughout the project lands (reference paragraph B.5 above) and carbon sampling will take place within stratified project area. All sampling will be in accordance with the methods described in 4.3.3.4 of the IPCC GPG for LULUCF. This monitoring plan will be used throughout the project area and the crediting period. If at a later stage it is found that the carbon stocks in some areas differ significantly from those in the same strata elsewhere, these areas will be assessed as a separate stratum.

The project boundary will be monitored by monitoring of parcels using GPS. Any changes in project boundary will be accounted for in all calculations of actual net GHG removals by sinks. The monitoring methodology uses permanent sample plots to monitor carbon stock changes in above- and below-ground biomass pools. To reach the targeted precision level of about ±10% of the mean at the 95% confidence level in a cost-effective manner, the number of plots needed in each stratum (table B-3) has been determined following equation (5) and (6) in the draft methodological tool "Calculation of the number of sample plots for measurements within A/R CDM project activities" approved by EB[4]:

$$n = \frac{\left(\sum_{i=1}^{L} N_i * st_i\right)^2}{\left(\frac{N \cdot E}{z_{\alpha/2}}\right)^2 + \left(\sum_{i=1}^{L} N_i * (st_i)^2\right)} \quad \text{(B.1)}$$

$$n_i = \frac{\sum_{i=1}^{L} N_i \cdot st_i}{\left(\frac{N \cdot E}{z_{\alpha/2}}\right)^2 + \sum_{i=1}^{L} N_i \cdot (st_i)^2} \cdot N_i \cdot st_i \quad \text{(B.2)}$$

$$N = \frac{A}{AP} \qquad N_i = \frac{A_i}{AP} \quad \text{(B.3)}$$

$$E = Q \cdot p \quad \text{(B.4)}$$

[4] http://cdm.unfccc.int/EB/Meetings/031/eb31_repan15.pdf

where:

n	sample size (total number of sample plots required) in the project area
n_i	sample size for stratum I
E	allowable error of the estimated quantity Q
i	project strata
L	total number of strata; dimensionless
α	$\alpha = 1-\alpha$ is probability that the estimate of the mean is within the error bound E
$z_{\alpha/2}$	$z_{\alpha/2}$ = value of the statistic z (embedded in Excel as: inverse of standard normal probability cumulative distribution), for e.g. $1-\alpha = 0.05$ (implying a 95% confidence level) $z_{\alpha/2}=1.9599$
N_i	maximum possible number of sample plots in stratum I
N	maximum possible number of sample plots in the project area
st_i	standard deviation for each stratum i; dimensionless, 30%
A	total size of all strata, e.g. the total project area; ha
A_i	size of each stratum i; ha
AP	sample plot size (constant for all strata); 0.04 ha
Q	approximate average value of the estimated quantity (aboveground wood volume per hectare); m^3 ha^{-1}
p	desired level of precision (10%); dimensionless

Table B-3 Number of plots to be sampled for different strata

Strata	Defining feature of the strata (species)	Area (ha)	No. of sampling plots
S1	*Eucalyptus hybrid*	26.30	4
S2	*Ailanthus excelsa*	57.86	6
S3	*Acacia tortilis*	61.65	7
S4	*Dalbergia sissoo*	53.65	5
S5	*Acacia nilotica*	60.75	5
S6	*Prosopis cineraria*	74.20	3
S7	*Zizyphus mauritiana*	35.46	3
Total		369.87	32

GPS located plots ensure the measuring and monitoring consistently over time. To avoid subjective choice of plot locations (plot centres, plot reference points, movement of plot centres to more "convenient" positions), the permanent sampling plots shall 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 series number of each plots shall be recorded and archived. The size of plots will be 400 m^2. Also, it is to be ensured that the sampling plots are distributed as evenly as possible.

The carbon stocks, expressed in CO_2-e, will be estimated through stratified random sampling procedures and using the following equations:

$$P_{(t)} = \sum_{i=1}^{I} (P_{A(t)\,i} + P_{B(t)\,i}) * A_i * (44/12)$$

where

P(t)	carbon stocks within the project boundary at time *t* achieved by the proposed small-scale A/R CDM project activity (t CO_2-e)
PA(t) i	carbon stocks in above-ground biomass at time *t* of stratum *i* achieved by the proposed small-scale A/R CDM project activity during the monitoring interval (t C/ha)
PB(t) i	carbon stocks in below-ground biomass at time *t* of stratum *i* achieved by the proposed small-scale A/R CDM project activity during the monitoring interval (t C/ha)
Ai	area of stratum *I* (ha)
i	stratum *i* (*I* = total number of strata)

Above-ground biomass
For above-ground biomass *PA(t) i* is calculated per stratum *i* as follows:

$$PA(t)\ i = E(t)\ i * 0.5$$

where:

PA(t) i	carbon stocks in above-ground biomass at time *t* achieved by the the proposed small-scale A/R CDM project activity during the monitoring interval (t C/ha)
E(t) i	estimate of above-ground biomass at time *t* achieved by the the proposed small-scale A/R CDM project activity (t d.m./ha)
0.5	Carbon fraction of dry matter (t C/t d.m.)

The calculations shall be performed for each stratum.

Estimate of above-ground biomass at time *t* achieved by the the proposed small-scale A/R CDM project activity *E(t)* shall be estimated through the following steps:
(a) **Step 1:** Establish permanent sample plots and document their location in the first monitoring report;
(b) **Step 2:** Measure the diameter at breast height (*DBH*) and tree height in the sample plots;
(c) **Step 3:** Estimate the above-ground stand volume using the following local allometric equations

Acacia sp.

$V = -0.00142 + 2.61911D - 0.54703D^{0.5}$
($n = 151$, $R^2 = 0.95768$) applicable for eastern Rajasthan
(Ref: Volume Equations for Forests of India, Nepal and Bhutan, FSI, 1996, page 13)

Eucalyptus hybrid

$V = 0.02894 - 0.89284\ D + 8.72416\ D^2$
($n = 198$, $R^2 = 0.9892$) applicable for drier parts of Karnataka
(Ref: Volume Equations for Forests of India, Nepal and Bhutan, FSI, 1996, page 93)

Dalbergia sissoo

V = - 0.3238 + 3.0077 D
(n = 1146, R^2 = 0.9358) applicable for Haryana
(Ref: Volume Equations for Forests of India, Nepal and Bhutan, FSI, 1996, page 221)

Zizyphus spp
$V = - 0.002557 + 0.260114\ D^2H$
(n = 142, R^2 = 0.93), General Volume Table applicable to Zyzhyphus xylopara for drier parts of AP
(Ref: Volume Equations for Forests of India, Nepal and Bhutan, FSI, 1996, page 195)

Ailanthus excelsa

$V = - 0.09362 + 9.93014\ D^2$
(n = 23, R^2 = 0.96323) applicable to Ailanthus grandis In Arunachal Pradesh
(Ref: Volume Equations for Forests of India, Nepal and Bhutan, FSI, 1996, page 22)

Prosopis cineraria

$V = 0.00471 + 1.79326\ D^2$
(n = 1060, R^2 = 0.9041), Local volume table applicable for miscellaneous species in eastern parts of Rajasthan bordering Haryana
(Ref: Volume Equations for Forests of India, Nepal and Bhutan, FSI, 1996, page 201)

New volume tables are being developed by the research wing of the Haryana Forest Department and also by the Forest Research Institute, Dehradun, which are expected to be published well before the date of first monitoring. In case new allometric equations are available at the time of first monitoring the same shall be used instead of the above approximations.

(d) Step 4: Use biomass expansion factors as follows:

$$E_{(t)\,i} = SV_{(t)\,i} * BEF * WD$$

where:

E (t) i	estimate of above-ground biomass of stratum i at time t achieved by the the proposed small-scale A/R CDM project activity (t d.m./ha)
SV(t) i	stem volume (m3/ha)
WD	basic wood density (t d.m./m3)
BEF	biomass expansion factor (over bark) from stem to total aboveground biomass (dimensionless)

Table B-4 Parameters to be used for different species:

Species	Wood density	BEF	Root to shoot ratio
Eucalyptus hybrid	0.64	3.4	0.27
Ailanthus excelsa	0.64	3.4	0.27
Acacia tortilis	0.76	3.4	0.27
Dalbergia sissoo	0.64	3.4	0.27
Acacia nilotica	0.76	3.4	0.27
Prosopis cineraria	0.64	3.4	0.27
Zizyphus mauritiana	0.76	3.4	0.27
Reference	IPCC GPG for LULUCF Table- 3A.1.9-2	IPCC GPG for LULUCF Table- 3A.1.10	IPCC GPG for LULUCF Table- 3A.1.8

Below-ground biomass

Carbon stocks in below-ground biomass at time *t* achieved by the proposed small-scale A/R CDM project activity during the monitoring interval *PB(t)* shall be estimated for each stratum *i* as follows:

$$PB(t)\ i = E(t)\ i * R * 0.5$$

Where:

PB(t) i	carbon stocks in below-ground biomass at time *t* achieved by the the proposed small-scale A/R CDM project activity during the monitoring interval (t C/ha)
E (t) i	estimate of above-ground biomass of stratum i at time t achieved by the the proposed small-scale A/R CDM project activity (t dm./ha)
R	root to shoot ratio (dimensionless)
0.5	carbon fraction of dry matter (t C/t d.m.)

B.8.1. Data to be monitored: Monitoring of the actual net GHG removals by sinks and leakage.

>>

B.8.1.1. Actual net GHG removals by sinks data:

>>

B.8.1.1.1. Data to be collected or used in order to monitor the verifiable changes in carbon stock in the carbon pools within the project boundary resulting from the proposed small-scale A/R CDM project activity, and how this data will be archived:

>>

Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic / paper)	Comment
Location of the areas where the project activity has been implemented	*Field survey using GPS*	*Latitude and longitude*	*Measured*	*4*	*100 %*	*Electronic, paper, photos*	*GPS will be used for field survey*
Ai - Size of the areas where the project activity has been implemented for each type of strata	*Field survey using GPS*	*Ha*	*Measured*	*4*	*100 percent*	*Electronic, paper, photos*	*GPS will be used for field survey*
The land use rights	*Land records with the revenue department*	*Ha*	*Estimated*	*4*	*100 percent*	*Paper*	*The land registration certificates from the revenue department may be verified*
Location of the permanent sample plots	*Project maps and project design*	*Latitude and longitude*	*Defined*	*4*	*100 percent*	*Electronic, Paper*	*Plot location is registered with a GPS and marked on the map*
Diameter of tree at breast height (1.3m)	*Perma-nent sample plots*	*Cm*	*Measured*	*4*	*Each tree in the sample plot*	*Electronic, paper*	*Measure diameter at breast height (DBH) for each tree that falls within the sample plot and applies to size limits*
Height of tree	*Perma-nent sample plot*	*M*	*Measured*	*4*	*Each tree in the sample plot*	*Electronic, paper*	*Measure height (H) for each tree that falls within the sample plot and applies to size limits*

Basic wood density	*IPCC default value*	*Tonnes of dry matter per m^3*	*Estimated*	*Once*	*Each tree in the sample plot*	*Electronic, paper*	
Biomass expansion factor (BEF)	*IPCC default value*	*Dimension Less*	*Estimated*	*Once*	*Each tree in the sample plot*	*Electronic, paper*	
Root-shoot ratio	*IPCC default value*	*Dimension Less*	*Estimated*	*Once*	*Each tree in the sample plot*	*Electronic, paper*	
Total CO_2	*Project activi-ties*	*Mg*	*Calculated*	*4*	*All project data*	*Electronic*	*Based on data collected from all plots and carbon pools*

B.8.1.2. Data for monitoring of leakage (if applicable)

>> Although the leakage is unlikely to occur, leakages will still be monitored through participatory method through the assessment of displacement of people, agriculture production, fuelwood, timber and grazing

B.8.1.2.1. If applicable, please describe the data and information that will be collected in order to monitor leakage of the proposed small-scale A/R CDM project activity

>>

Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic / paper)	Comment
Percentage of families displaced due to project implementation	PRA	Number of families or households	Estimated	4	100 Percent	Electronic, paper	
Percentage of total grain production displaced due to project activity	PRA	Quantity	Estimated	4	100 percent	Electronic, paper	
Percentage of total fuelwood procurement displaced due to project activity	PRA	Quantity	Estimated	4	100 percent	Electronic, paper	
Percentage of total timber procurement displaced due to project activity	PRA	Quantity	Estimated	4	100 percent	Electronic, paper	
The time-average number of grazing animals per hectare within the project boundary that is displaced due to the project activity divided by the average grazing capacity of land for the area, expressed as percentage	PRA	Grazing animal days/ha/ year	Estimated	4	100 Percent	electronic	

B.8.2. Describe briefly the proposed quality control (QC) and quality assurance (QA) procedures that will be applied to monitor actual GHG removals by sinks:

>> A rigid quality control and quality assurance (QA/QC) method involving Standard Operating Procedures to ensure the (i) reliability of collection of field measurements, (ii) verification of the methods used to collect field data, (iii) verification of data entry and analysis techniques, (iv) verification of data maintenance and archiving and (v) upgrading of electronic data with technological changes shall be followed as discussed below.

QA/QC for field measurements

Collecting reliable field measurements is an important step in the quality assurance plan. Those responsible for the carbon measurement work will be fully trained in all aspects of the field data collection and data analyses, and standard operating procedures, described below, will be followed rigidly to ensure accurate measurement and re-measurement. The SOPs include auditing procedures. The first type of audit, a 'hot check', consisting of the project leader observing field crew members during data collection to ensure field

measurements SOPs shall be followed to correct any technique errors. The second type of audit, a 'blind check', to quantify measurement errors, shall consist of a complete re-measurement of 10% of plots by verifying teams highly experienced in forest measurement and attentive to detail. After measurement a comparison will be made with the original data and discrepancies re-verified. Any errors found 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.

For all the verified plots:

QA/QC for data entry

To produce reliable carbon estimates the proper entry of data into the data analyses spreadsheets is required. Steps will be taken to ensure that errors are minimized. Results will be reviewed and double-checked for typing errors. If there are any problems with the monitoring plot data that cannot be resolved, the plot should not be used in the analysis.

QA/QC for data archiving

Due to the long-term length of the project activities, data storage and maintenance is very important. SOPs for data archiving includes storage of original copies of all data, including field measurements, laboratory measurements, and GIS products, and copies of measuring and monitoring reports, in a secure offsite location and provision of copies of all data to all project participants. Copies of all data will also be stored on paper in a separate remote location. Procedures also include updating storage onto new data storage technologies, both hardware and software.

B.8.3. Please describe briefly the operational and management structure(s) that the project operator will implement in order to monitor actual GHG removals by sinks by the proposed small-scale A/R CDM project activity:

>> The proposed small-scale A/R project activity will be implemented by *The Society*, under the guidance of the Haryana Forest Department. The Haryana Forest Department shall provide all needed technical help including training to the persons selected by *the Society* and facilitate consultation with other experts wherever such consultations become necessary.

The Haryana Forest Department shall also coordinate the measuring and monitoring of the actual GHG removals by sinks and any leakage generated by the proposed small-scale A/R CDM project activities. Any activity data and monitoring and measuring data will be reported to and archived in the Forest Department headquarter office at Panchkula which shall act as the State Carbon Sequestration Office.

The Conservator of Forests at Hisar, under the guidance and coordination of the Principal Chief Conservator of Forests of Haryana Forest Department acting as the State Carbon Sequestration Office, will provide instruction for afforestation and forest management, and conduct the specific supervision of the implementation of the proposed small-scale A/R CDM project activity, and collect specific activity data.

The Principal Chief Conservator of Forests of the Haryana Forest Department acting as the State Carbon Sequestration Office, shall arrange for technical consultation and training in the measuring and monitoring of the actual GHG removal by sinks and leakage generated by the proposed small-scale A/R CDM project activity, and shall be responsible for helping *the Society* draft the monitoring report.

An expert team shall be established by the Principal Chief Conservator of Forests of the Haryana Forest Department acting as the State Carbon Sequestration Office, for addressing any technical issues arising out of checking and verification of measured and monitored data.

B.9. Date of completion of the baseline study and the name of person(s)/entity(ies) determining the baseline and the monitoring methodology:

>> Date of completion of the baseline study: 10/01/2008

- Xiaoquan Zhang (xiaoquan@caf.ac.cn), Institute of Forestry Ecology, Environment and Protection, the Chinese Academy of Forestry
- Institute of Global Warming & Ecological Studies, Noida, India
  - Promode Kant (promode.kant@gmail.com)
  - Keshav C Das (kcdas@amity.edu)
  - Debojyoti Chakraborty (dchakraborti@amity.edu)
  - Ashwin A. S. (as.ashwin@gmail.com)
  - Sohini Trehan(sohini_trehan@rediffmail.com)
  - Swati Singh (swati123singh@gmail.com)
  - Kundan Burnwal (k.burnwal@gmail.com)
  - M.A. Khalid (makhalid@amity.edu)
- Haryana Forest Department
  - S.K. Dhar (dharsk_ifs@yahoo.co.in)
  - Jeet Ram (hcfp2003@yahoo.com)
  - Goran Jonsson (hcfp2003@yahoo.com)
  - D.R. Ramesh Singh (drramesh2004@yahoo.com)
  - V.S. Tanwar (vstanwar@rediffmail.com, vst1987@gmail.com)
  - S.S. Sheoran (vst1987@gmail.com)
- Institute of Climate Change & Ecology, New Delhi

With effect from 01.05.2008 the revision of PDD has been undertaken by Promode Kant, Ashwin A.S. and Kundan Burnwal on behalf of the Institute of Climate Change & Ecoloy, New Delhi.

SECTION C. Estimation of ex ante net anthropogenic GHG removals by sinks:

C. 1. Estimated baseline net GHG removals by sinks:

>>

a Pre-project Carbon stock

a.1 Non-tree Vegetation

The woody perennials (shrubs and herbaceous plants) existing at the project area before the start of the proposed small-scale A/R CDM project activity were counted and measured. A total of 2093 woody perennials exist in the project area with an average height of 0.7 m (average no.of woody perennials per hectare = 5.66). Since the area is shifting sand dune affected degraded and degrading land, there is little growth of grasses as evident in the field visits. The total biomass of the woody perennials and grass was calculated by taking 30 kg dm/ha as per the expert judgement. The total biomass of woody perennials and herbaceous plants comes to 11 tonnes of dry matter. The carbon factor is 50% of the dry weight. Hence the carbon stock of the woody perennials is 5.5 tC.

a.2 Pre-project living tree

There are 492 trees pre-existing in the area specified for the proposed small-scale A/R CDM project activity. The diameter at breast height (DBH), tree height, crown diameter and age of all pre-project living trees have been measured. Volume has been estimated from the local volume tables (reference: letter no. 280, Indira Gandhi Canal Project, Forest Department, Government of Rajasthan) provided by the Haryana Forest Department. The stem volume of trees was then converted into carbon stock in aboveground biomass and belowground biomass through wood density (D), biomass expansion factor (BEF), root-shoot ratio (R) and carbon fraction (CF) using equations:

$$C_{AB} = V \cdot D \cdot BEF \cdot CF$$
$$C_{BB} = C_{AB} \cdot R$$

where

C_{AB}	Carbon stock aboveground biomass t C. tree^{-1}
C_{BB}	Carbon stock in belowground biomass t C. tree^{1}
V	Stem volume m^3 tree^{-1}
D	Wood density t d.m.m^{-3}
BEF	Biomass expansion factor from stem biomass to aboveground biomass, dimensionless
CF	Carbon fraction, t C t d.m^{-1} IPCC default =0.5
R	Root-shoot ratio, dimensionless

The D, BEF and R are from table B.4. IPCC default value (0.5) is used for the carbon fraction. The carbon stock in living biomass of the pre-project trees was then estimated and provided in Table C-1.

b Estimation of baseline net GHG removals by sinks

Due to the impact of shifting sand dunes and agricultural cultivation, the lands are degraded and degrading. The carbon stocks both in the living biomass pool of woody perennials and in below-ground biomass of grasslands expect to decrease in the absence of the proposed small-scale A/R CDM project activity. Therefore, based on paragraph 6(a) and (b) of the methodology applied, the baseline carbon stocks in the living biomass

pool of woody perennials and in below-ground biomass of grass are conservatively assumed to be constant and equal to existing carbon stocks measured at the start of the project activity.

Since all pre-project living trees on lands to be planted in the proposed A/R CDM project activity have been measured, the baseline net removals by sinks are estimated on average tree basis rather than per hectare basis. The formulae that have been used for the calculations are:

Baseline Carbon stocks:

$$B_{(t)} = (B_{A(t)} + B_{B(t)}) \cdot N$$

where

$B_{(t)}$	Carbon stocks in the living biomass within the project boundary at time *t* in the absence of the project activity (t C)
$B_{A(t)}$	Carbon stocks in above-ground biomass per tree at time *t* in the absence of the project activity (t C/tree)
$B_{B(t)}$	Carbon stocks in below-ground biomass per tree at time *t* in the absence of the project activity (t C/tree)
N	Number of pre-project living trees

Carbon stocks in aboveground Biomass

$$B_{A(t)} = M_{(t)} * 0.5$$

where

$B_{A(t)}$	Carbon stocks in above-ground biomass per tree at time *t* in the absence of the project activity (t C/tree)
$M_{(t)}$	Aboveground biomass per tree at time *t* that would have occurred in the absence of the project activity (t d.m/tree.)
0.5	Carbon fraction of dry matter (t C/t d.m.)

Carbon stocks in below ground biomass

$$B_{B(t)} = M_{(t)} *R* 0.5$$

where

$B_{B(t)}$	Carbon stocks in belowground biomass per tree at time *t* in the absence of the project activity (t C/tree)
$M_{(t)}$	Above-ground biomass per tree at time *t* that would have occurred in the absence of the project activity (t d.m./tree)
R	Root-shoot ratio
0.5	Carbon fraction of dry matter (t C/t d.m.)

Aboveground Biomass

$$M_{(t)} = V_{(t)} *BEF_{(t)}*D_{(t)}$$

where

$M_{(t)}$ Above-ground biomass per tree at time *t* that would have occurred in the absence of the project activity (t d.m. /tree)
$V_{(t)}$ Stem volume m^3 $tree^{-1}$
$D_{(t)}$ wood density t $d.m.m^{-3}$
$BEF_{(t)}$ Biomass expansion factor from stem biomass to aboveground biomass dimensionless

369.87 ha of degraded sand dune affected land proposed for the small-scale A/R CDM project activity, *Prosopis cineraria* is found in the largest number, which amounts to 435 trees out of the total 492 trees in the baseline. Above ground biomass at time t, M(t), has been estimated using average biomass stock and growth rates specific to the region provided by the Haryana Forest Department. Since the age of the trees could not be estimated, an average MAI of 0.01752 m^3 per tree per year (this gives 8.5 m^3 per year for 492 trees) has been used to project the growth (ref: letter no. 280, Indira Gandhi Canal Project, Forest Department, Government of Rajasthan). The MAI has been used to obtain the volume for each year. From the volume the carbon stocks have been estimated using the formulae from the applied methodology.

The calculated carbon stocks have been given below in table C-1.

Table C-1 Estimation of baseline net GHG removals by sinks (t CO_2 yr^{-1})

Year[a)]	Trees[b)]		Woody Perennials and Grasses[e)] (tC)	Total Carbon stock (tC)	Change in carbon stock (tC yr^{-1})	Baseline net GHG removal by sinks (tCO_2 e yr^{-1})
	AGB[c)] (tC)	BGB[d)] (tC)				
A	B	C	D	E = B+C+D	F = E_i-E_{i-1}	G = F X 44/12
2007	200.17	54.05	5.5	259.8	0	0
2008	209.42	56.54	5.5	271.5	12	43
2009	218.66	59.04	5.5	283.2	12	43
2010	227.91	61.53	5.5	295.0	12	43
2011	237.15	64.03	5.5	306.7	12	43
2012	246.40	66.53	5.5	318.5	12	43
2013	255.64	69.02	5.5	330.2	12	43
2014	264.88	71.52	5.5	341.9	12	43
2015	274.13	74.02	5.5	353.7	12	43
2016	283.37	76.51	5.5	365.4	12	43
2017	292.62	79.01	5.5	377.2	12	43
2018	301.86	81.50	5.5	388.9	12	43
2019	311.11	84.00	5.5	400.7	12	43
2020	320.35	86.50	5.5	412.4	12	43
2021	329.60	88.99	5.5	424.1	12	43
2022	338.84	91.49	5.5	435.9	12	43
2023	348.09	93.98	5.5	447.6	12	43
2024	357.33	96.48	5.5	459.4	12	43
2025	366.58	98.98	5.5	471.1	12	43
2026	375.82	101.47	5.5	482.8	12	43
2027	385.07	103.97	5.5	494.6	12	43

Note:
a)- The starting year of the project is 2008. Year 2007 has been shown in the tables so as to illustrate the change in the carbon stock.

b)- Pre-project trees that existed before the starting of the project.
c)- AGB is Above Ground Biomass of the pre-project trees
d)- BGB is Below Ground Biomass of the pre-project trees
e)- Woody perennials and grasses constitute all the vegetation and shrubs excluding the trees that exist in the area before the start of the project. Since the woody perennials are expected to decrease in the absence of the project, the carbon stocks in them are assumed to be constant and equal to the carbon stocks at the beginning of the project.

C. 2. Estimate of the actual net GHG removals by sinks:

>> There are 492 pre-project trees are allowed to remain on the project site. For the conservative purpose, in the project scenario the carbon stocks of the pre-project trees are assumed to be constant and the woody perennials and grass are assumed to be died out.

The formulae that have been given in the section III of the simplified baseline and monitoring methodologies for small-scale afforestation and reforestation project activities under the clean development mechanism implemented on grassland or cropland (AR-AMS0001; version 04.1) has been used for calculating the actual net green house gas removals by sinks (ex-ante)

The carbon stocks for the project scenario at the starting date of the project activity4 (t=0) is the same as the baseline stocks of carbon at the starting date of the project (t=0).
For all other years, the carbon stocks of planted trees within the project boundary ($N(t)$) at time t has been be calculated as follows:

$$N_{(t)} = \sum_{i=1}^{I} (N_{A(t)\,i} + N_{B(t)\,i}) * A_i$$

where:

$N_{(t)}$	total carbon stocks in biomass at time t under the project scenario (t C)
$N_{A(t)}$	carbon stocks in above-ground biomass at time t of stratum i under the project scenario (t C/ha)
$N_{B(t)}$	carbon stocks in below-ground biomass at time t of stratum i under the project scenario (t C/ha)
Ai	project activity area of stratum i (ha)

Above-ground Biomass
Above-ground biomass $NA(t)\ i$ is calculated per stratum i as follows:

$$N_{A(t)\,i} = T_{(t)i} * 0.5$$

where:

$N_{A(t)}$	Carbon stocks in above-ground biomass at time t under the project scenario (tc/ha)
$T_{(t)I}$	Above-ground biomass at time t under the project scenario (t d.m./ha)
0.5	Carbon fraction of dry matter (t c/t d.m.)

Volume and yield tables were used for the calculations. Hence according to the methodology, then,

$T_{(t)i} = SV_{(t)i} * BEF * WD$
where:

$T_{(t)}$	Above-ground biomass at time t under the project scenario (t d.m./ha)
$SV_{(t)I}$	Stem volume at time t for the project scenario (m^3 /ha)
BEF	Biomass expansion factor (over bark) from stem to total above-ground biomass

(dimensionless)
WD Basic wood density (t d.m./m^3)

Below-ground biomass
For below-ground biomass, *NB(t)* is calculated per stratum *i* as follows:

$$N_{B(t)\,i} = T_{(t)} * R * 0.5$$

where:

$N_{B(t)\,i}$ Carbon stocks in below-ground biomass at time t under the project scenario (t c/ha)
T(t) Above-ground biomass at time t under the project scenario (t d.m./ha)
R Root to shoot ratio (t d.m./ t d.m.)
0.5 Carbon fraction of dry matter (t c/t d.m.)

The plantation has been planned in block mixtures, each block having a particular species. The GHG removal by each of the seven species has been calculated. The volume has been calculated from the local volume tables[5] provided by the Haryana Forest Department. In all the cases, to make conservative estimation, only the rate of growth of trees of area having a similiar physiographic and edaphic factors similar to the project site has been taken. The MAI of the tree species are 0.0333 m^3 for *Eucalyptus* hybrid, 0.00156 m^3 for *Ailanthus excelsa*, 0.0022 m^3 for *Acacia tortilis*, 0.0144 m^3 for *Dalbergia sissoo*, 0.01752 m^3 for *Prosopis cineraria*, 0.0224 m^3 for *acacia nilotica* and *zizyphus mauritiana* respectively.

The BEF of 3.4 has been taken from the table 3A.1.10 of the IPCC good practice guidance for LULUCF. The BEF has been chosen from the default values in the absence of any national data in this regard. The default value is that of a tropical broadleaf forest having a range of BEF from 2.0 to 9.0.The wood density has been obtained from the table of IPCC good practice guidance for LULUCF (refer to table B-4). The root to shoot ratio of 0.27 (GPG LULUCF table no. 3A.1.8) has been used to calculate the BGB because no national data are available.

The plantation of trees shall be divided into short rotation (of 10 tears) and medium rotation (of 20 years) and fruit trees. The biomass has been calculated from the volumes obtained from the tables and the using the value of the wood density. Re-planting shall be taken up in the first three years. Still mortality of 20% has been taken to make the estimations conservative.

Project emissions:

In 2008, plantation shall be undertaken in the 369.87 ha selected for the project with one thousand trees in every hectare. The saplings shall be transported in bullock-carts to the respective planting area from the nurseries that have been made at the villages itself. Trees shall be planted in 45cm X 45cm x 45cm pits in which one kilogram organic manure shall be spread, amounting to an application of 1 ton of fertilizer in every hectare. This manure shall be collected from locally available sources and transported using bullock-carts causing zero emission in the transportation of the manure. Manure shall be applied only in the year of plantation. The GHG emissions from the fertilizers are 0.92% of the annual GHG sequestered by the project (Net nitrogen content of organic manure is 5% for dried matter (IPCC Emission Factor Data Base). N_2O emissions are 1% of the total nitrogen content.(EB report 33 , AR methodology tool)). Since the emissions are below 10% of the net GHG sequestered, they have been taken as zero.

[5] Reference: letter no. 280, Indira Gandhi Canal Project, Forest Department, Government of Rajasthan

The ex-ante actual Greenhouse Gas removal by sinks is calculated as follows-

$$\Delta C_{ACTUAL} = \Delta C_{PROJ,t} - GHG_{PROJ,t}$$

where

ΔC_{ACTUAL} Ex-ante actual greenhouse gas removal by sinks (t co_2 e yr^{-1})
$\Delta C_{PROJ,t}$ Project GHG removals by sinks (t co_2 yr^{-1})
$GHG_{PROJ,t}$ Project emissions (t co_2 yr^{-1})

Table C-2 Carbon stock in AGB (tC) (Please see table B.3 for the species of each stratum)

Years	Pre-project vegetation (tC)	Project strata							Total Carbon Stock in AGB (tC)
		S1 (tC)	S2 (tC)	S3 (tC)	S4 (tC)	S5 (tC)	S6 (tC)	S7 (tC)	
2007	205.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	205.7
2008	200.2	21.6	29.0	69.0	44.0	49.5	136.1	43.1	592.5
2009	200.2	43.1	58.1	138.0	87.9	99.0	272.1	86.3	984.7
2010	200.2	64.7	87.1	207.0	131.9	148.5	408.2	129.4	1,377.0
2011	200.2	86.2	116.2	276.0	175.8	198.0	544.2	172.6	1,769.2
2012	200.2	107.8	145.2	345.0	219.8	247.5	680.3	215.7	2,161.5
2013	200.2	983.4	208.7	446.2	462.1	574.9	928.1	388.3	4,191.9
2014	200.2	1,859.0	272.1	547.4	704.4	902.2	1,175.8	560.9	6,222.0
2015	200.2	2,734.6	335.5	648.7	946.7	1,229.6	1,423.6	733.4	8,252.3
2016	200.2	3,610.2	399.0	749.9	1,189.0	1,556.9	1,671.4	906.0	10,282.6
2017	200.2	4,485.7	462.4	851.1	1,431.3	1,884.2	1,919.2	1,078.6	12,312.7
2018	200.2	21.6	29.0	69.0	1,729.1	2,787.2	2,593.4	1,423.7	8,853.2
2019	200.2	43.1	58.1	138.0	2,027.0	3,690.1	3,267.6	1,768.9	11,193.0
2020	200.2	64.7	87.1	207.0	2,324.8	4,593.1	3,941.7	2,114.0	13,532.6
2021	200.2	86.2	116.2	276.0	2,622.6	5,496.0	4,615.9	2,459.2	15,872.3
2022	200.2	107.8	145.2	345.0	2,920.4	6,399.0	5,290.1	2,804.3	18,212.0
2023	200.2	983.4	208.7	446.2	3,913.8	8,422.9	6,895.4	3,537.8	24,608.4
2024	200.2	1,859.0	272.1	547.4	4,907.2	10,446.8	8,500.7	4,271.2	31,004.6
2025	200.2	2,734.6	335.5	648.7	5,900.6	12,470.7	10,105.9	5,004.7	37,400.9
2026	200.2	3,610.2	399.0	749.9	6,894.0	14,494.5	11,711.2	5,738.1	43,797.1
2027	200.2	4,485.7	462.4	851.1	7,887.5	16,518.4	13,316.5	6,471.6	50,193.4

Note - Pre-project vegetation includes the Above Ground Biomass of trees and woody perennials (shrubs). The Carbon stocks of woody perennials are included in the AGB alone. The woody perennials are expected to be removed during the site preparation but the carbon stocks of pre-project vegetation are otherwise taken to be constant for a conservative estimation.

Table C-3 Total BGB Carbon stock (tC dm) (Please see table B.3 for the species of each stratum)

Years	Pre-project vegetation (tC)	Project strata							Total Carbon Stock in BGB (tC)
		S1 (tC)	S2 (tC)	S3 (tC)	S4 (tC)	S5 (tC)	S6 (tC)	S7 (tC)	
2007	54.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.1
2008	54.1	5.8	7.8	18.6	11.9	13.4	36.7	11.6	159.9
2009	54.1	11.6	15.7	37.3	23.7	26.7	73.5	23.3	265.9
2010	54.1	17.5	23.5	55.9	35.6	40.1	110.2	34.9	371.8
2011	54.1	23.3	31.4	74.5	47.5	53.5	146.9	46.6	477.8
2012	54.1	29.1	39.2	93.1	59.3	66.8	183.7	58.2	583.5
2013	54.1	265.5	56.3	120.5	124.8	155.2	250.6	104.8	1,131.8
2014	54.1	501.9	73.5	147.8	190.2	243.6	317.5	151.4	1,680.0
2015	54.1	738.3	90.6	175.1	255.6	332.0	384.4	198.0	2,228.1
2016	54.1	974.7	107.7	202.5	321.0	420.4	451.3	244.6	2,776.3
2017	54.1	1211.2	124.8	229.8	386.5	508.7	518.2	291.2	3,324.5
2018	54.1	5.8	7.8	18.6	466.9	752.5	700.2	384.4	2,390.3
2019	54.1	11.6	15.7	37.3	547.3	996.3	882.2	477.6	3,022.1
2020	54.1	17.5	23.5	55.9	627.7	1,240.1	1,064.3	570.8	3,653.9
2021	54.1	23.3	31.4	74.5	708.1	1,483.9	1,246.3	664.0	4,285.6
2022	54.1	29.1	39.2	93.1	788.5	1,727.7	1,428.3	757.2	4,917.2
2023	54.1	265.5	56.3	120.5	1,056.7	2,274.2	1,861.8	955.2	6,644.3
2024	54.1	501.9	73.5	147.8	1,324.9	2,820.6	2,295.2	1,153.2	8,371.2
2025	54.1	738.3	90.6	175.1	1,593.2	3,367.1	2,728.6	1,351.3	10,098.3
2026	54.1	974.7	107.7	202.5	1,861.4	3,913.5	3,162.0	1,549.3	11,825.2
2027	54.1	1211.2	124.8	229.8	2,129.6	4,460.0	3,595.5	1,747.3	13,552.3

Note - Pre-project vegetation consists of the below ground carbon stocks of the 492 pre-project trees alone and not woody perennials as their carbon stocks has been assumed to be above ground only. The stocks are assumed to be constant for conservative estimations.

Table C-4 Actual net GHG removals by sinks

Years	AGB[a)] (tC)	BGB[b)] (tC)	Total Carbon stocks (tC)	Change in carbon stocks (tC yr^{-1})	Actual net GHG removal by sinks (tCO_2 e yr^{-1})
A	B	C	D = B+C	E = D_2-D_1	F = E X 44/12
2007	205.7	54.1	259.8	0.0	
2008	592.5	159.9	752.4	492.6	1,806
2009	984.7	265.9	1,250.5	498.2	1,827
2010	1,377.0	371.8	1,748.7	498.2	1,827
2011	1,769.2	477.8	2,246.9	498.2	1,827
2012	2,161.5	583.5	2,745.0	498.2	1,827
2013	4,191.9	1,131.8	5,323.5	2578.4	9,454
2014	6,222.0	1,680.0	7,901.9	2578.4	9,454
2015	8,252.3	2,228.1	10,480.4	2578.4	9,454
2016	10,282.6	2,776.3	13,058.8	2578.4	9,454
2017	12,312.7	3,324.5	15,637.2	2578.4	9,454
2018	8,853.2	2,390.3	11,243.6	-4393.7	-16,110
2019	11,193.0	3,022.1	14,215.0	2971.4	10,895
2020	13,532.6	3,653.9	17,186.4	2971.4	10,895
2021	15,872.3	4,285.6	20,157.8	2971.4	10,895
2022	18,212.0	4,917.2	23,129.2	2971.4	10,895
2023	24,608.4	6,644.3	31,252.5	8123.3	29,785
2024	31,004.6	8,371.2	39,375.8	8123.3	29,785
2025	37,400.9	10,098.3	47,499.0	8123.3	29,785
2026	43,797.1	11,825.2	55,622.3	8123.3	29,785
2027	50,193.4	13,552.3	63,745.6	8123.3	29,785

Note-
a)– AGB total as demonstrated in table C-2
b)– BGB total as demonstrated in table C-3

C. 3. Estimated leakage:

>> The project area is degraded/degrading cropland which is generally left fallow and profitable agriculture is carried out on an average interval of three years and only one crop is taken instead of two which is the general trend in the nearby irrigated agricultural fields. Thus the agriculture activity shifting to near by area is insignificant and far below 10%.

The cattle in the area are stall fed, the cattle feed comprises of agriculture waste as well as fodder crops grown in the adjoining fertile agriculture fields, which are canal-irrigated. The region is visited by migratory cattle herd from Rajasthan in the months of March–May. These herds feed on agricultural wastes and grasses growing on road side and are not allowed to graze on the privately owned lands of the proposed project. Therefore the number of displaced grazing animals due to the project activity is less than 10 % of the average grazing capacity of the project area.

Therefore according to the Para 30 of Small scale AR methodology (AR-AMS0001/Version 04.1 there is no displacement of activities outside the project. So the estimated leakage is zero.

C. 4. The sum of C. 2. minus C.1. minus C.3. representing the net anthropogenic GHG removals by sinks of the proposed small-scale A/R CDM project activity:

>> The net anthropogenic GHG removals by sinks of the proposed small-scale A/R CDM project activity has been estimated using the formula 21, paragraph 33 of the AR-AMS0001/version 4.1 as given below.

$ER_{AR\ CDM\ t} = C_{PROJ\ t} - C_{BSL\ t} - GHG_{PROJ\ t} - L_t$

where

$ER_{AR\ CDM\ t}$	Net anthropogenic GHG removals by sinks (tonnes of CO_2 e/yr^{-1})
$C_{PROJ\ t}$	Project net GHG removals by sinks (tonnes of CO_2 e/yr^{-1})
$C_{BSL\ t}$	Baseline net GHG removals by sinks (tonnes of CO_2 e/yr^{-1})
$GHG_{PROJ\ t}$	Project emissions (tonnes of CO_2 e/yr^{-1})
L_t	Leakage (tonnes of CO_2 e/yr^{-1})

The project emissions have been deducted from the project GHG removals by sinks as shown in table C-6. The net anthropogenic GHG removals by sinks of the proposed small-scale A/R CDM project activity have been estimated to be 231,920 t CO_2 e.

C. 5. Table providing values obtained when applying equations from the approved methodology:

The result of the application of equations from approved methodology above shall be indicated using the following tabular format:

Table C-5 net anthropogenic GHG removals by the project

Years	Estimation of baseline net GHG removals by sinks[a)] ($t CO_2 e$)	Estimation of actual net GHG removals by sinks[b)] ($t CO_2 e$)	Estimation of leakage[c)] ($t CO_2 e$)	Estimation of net anthropogenic GHG removals by sinks ($t CO_2 e$)
2008	43	1,806	0	1,763
2009	43	1,827	0	1,784
2010	43	1,827	0	1,784
2011	43	1,827	0	1,784
2012	43	1,827	0	1,784
2013	43	9,454	0	9,411
2014	43	9,454	0	9,411
2015	43	9,454	0	9,411
2016	43	9,454	0	9,411
2017	43	9,454	0	9,411
2018	43	-16,110	0	-16,153
2019	43	10,895	0	10,852
2020	43	10,895		10,852
2021	43	10,895	0	10,852
2022	43	10,895	0	10,852
2023	43	29,785	0	29,742
2024	43	29,785	0	29,742
2025	43	29,785	0	29,742
2026	43	29,785	0	29,742
2027	43	29,785	0	29,742
Total				231,920

Note-
a)-Refer table C-1
b)-Refer table C-4
c)-Refer section C 3.

SECTION D. Environmental impacts of the proposed small-scale A/R CDM project activity:

D.1. Provide analysis of the environmental impacts, including transboundary impacts (if any):

>> The proposed small-scale A/R CDM project activity is expected to have the following environmental impacts through its afforestation activities:

Sand dune fixation and controlling wind erosion

The major soil type in the project area is desert soil with a high sand content and the area is affected by shifting sand dunes and frequent wind erosion/dust storm. Due to lack of vegetation cover, mild to heavy winds often occurring in this region blow up clouds of dust and sediments into the atmosphere and denudes the adjacent area of vegetation. As a result, these lands have severely degraded and are degrading. Therefore establishment of plantations in 369.87 ha of the project area under the proposed small-scale A/R CDM project activity will help stabilize the sand dunes in the project area and arrest soil erosion. Environment impact study in Haryana Community Forestry Project (HCFP) villages indicated that with the establishment of plantation by HCFP, moving sand dunes have been fixed and dust storm has been mitigated in 25-70% of the HCFP villages[1].

Sand dune fixed by 2-yr-old plantation

Improving land fertility

Productivity on these lands is very low and highly depends on rainy event due to inaccessible irrigation system and low soil fertility. The proposed afforestation activitiy will enhance the soil moisture and humus content by improving nutrient cycling and soil water regime. Soil sampling and analyses in 11 HCFP villages indicated that soil organic carbon (0-30 cm) under the 5-6 year old plantation established by the project ranges from 0.43% to 1.29% compared to 0.31-1.21% in the open lands adjacent to the plantation[1].

Sheltring the surrounding productive cropland

Productive croplands adjacent to the project lands have been threatening by shifting sand dune and become less productive. The loss of cropland due to shifting sand dune has occurred in many villages[1]. Restoration of these degraded areas will lead to positive impacts in the areas outside the project boundary, especially the fertile agricultural areas as the afforestation activities in the project activity area will contribute to stabilize shifting sand dune and alleviate wind erosion and and thus provide shelter for the neighbouring fertile fields. Environment impact study in HCFP villages indicated that with the establishment of plantations and planting of moving sand dun Environment impact study in Haryana Community Forestry Project villages indicated that the loss of cropland due to shifting sand dunes has been brought under control in some of the HCFP villages[1].

Productive cropland threatened by neighbouring shifting sand dune

Risk analysis and countermeasures:

- **Site preparation:** Site preparation has the potential to disturb the vegetation and soil in the planting sites. The main technical measures to be employed to mitigate the impacts designed in the project are to plant the trees with low density (1000 trees per hectare), limited pit size (45 cm x 45 cm x 45 cm) and retaining all the existing vegetation. Even the castor crop that is proposed to be taken in the first two years shall be raised only by dibbling seeds and not more than 10 sq cm of soil at each dibble point will be disturbed. As a result, the surface area disturbed by site preparation is estimated to account for less than 3% of the total land surface. Therefore the site and soil preparation will have minor negative impacts on original soil and vegetation.
- **Fertilization:** In the proposed small-scale A/R CDM project activity, only organic manure will be applied within the small planting pits rather than through dispersal over the entire land, thus leading to maximum

impact on the plant while causing least disturbance outside.

- **Pesticide:** Under the proposed small-scale A/R CDM activity, no pesticides are proposed to be used as a preventive measure. Only hygienic measures to control pests and diseases will be adopted. Only in case of a severe outbreak of pest attack would the use of pesticides be considered and then suitable safeguards against the environmental effects of the pesticides would be undertaken to ensure that the residues do not escape into the water sources for the people and the cattle.
- **Fire risk:** Fires in the plantations escaping into the neighbourhood is a potential risk of the proposed small-scale A/R CDM project activity. However the Haryana Forest Department shall reduce this risk through awareness and training to local farmers/communities in collaboration with *the Society*.
- **Invasives:** Native tree species are being planted in the project area apart from Eucalyptus hybrid which has been raised in the district by the Haryana Forest Department under various forestry projects as well as by the farmers in their private lands for the past many decades and there is no evidence of this species becoming invasive.

Given the countermeasures to be implemented, all the above mentioned risks are not considered to be significant by the project participants.

D.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:

>>

Environmental Impact Assessment (EIA) is **not** required for the proposed small-scale A/R CDM project activity, since this project does not have any significant negative impacts on the environment.

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

>> Not applicable

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

E.1. Provide analysis of the socio-economic impacts, including transboundary impacts (if any):

>>

The project participants belong to communities whose main income source is farming and animal husbandry. These farmers have small land holdings, a considerable part of which is degraded and degrading croplands and not suitable for profitable agriculture as investment costs are too high for them to carry out any kind of farming or planting activities. Only 35% of the land owned by the farmers are productive and give them an annual income of 4000 rupees per acre while their earnings from animal husbandry ranges around one to five thousand rupees a year .Data[6] with the land details and cattle holding of the farmers participating in the proposed small-scale A/R CDM project activity was collected to estimate their average annual income individually as well as for all the villages and their households (as shown in the table E-1). The data shows that 92% of the households are below the international poverty norm of US$ 1.00 (around Rs. 40) per day and have an average daily income amounting to 18 Rupees.

Field visits and interviews with the project participants have shown that the households of majority of the farmers lack basic amenities such as running water and bathroom facilities. Most of the farmers reside in small mud houses which are not concrete structures and the cattle are also housed in the same dwelling. Fuelwood is the sole medium of cooking in all the households which puts a lot of burden on the women folk as they have to walk long distances for fuelwood collection. They don't own vehicles for transport and they either walk long distances or use animal transport. It was learnt through repeated interactions with the project participants and their family members that they don't have any savings or assets apart from the land and a few cattle that they possess .The average annual income of these households varies from 20 to 40 thousands which is still below the international poverty line ceiling around 86,400 Rs. A small percentage of farmers (8 %) who have larger land holdings have been also included in the project in order to make the activity more viable and enable smooth and efficient functioning of the proposed small-scale A/R CDM project activity.

[6] Data sheets containing land and cattle holding details along with the individual annual income of the project participants will be made available to the DOE .

Table E-1 Mean annual income of the participants[7]

Project Village	Total number of household participants	Average annual income per capita (Rs)
Neemla	43	5,594
Dhani Sheranwali	30	7,074
Poharkan	19	11,552
Mallekan	17	5,081
Madho Singhana	20	8,768
Gudia Khera	43	5,265
Bhuratwala	17	8,564
Umedpura	38	5,119
Total	**227**	**6,610**

Ninety two percent of the project participants have an annual income that places them far below the international poverty ceiling and their households lack basic running water and toilet facilities. Their present socio-economic conditions clearly place them as low income communities. Therefore in order to maximize he socio-economic benefits, from the proposed small-scale A/R CDM project activity, a series of Participatory Rural Appraisal (PRA) methods were adopted in interviewing and consulting with farmers in the project area to understand the expectations and preferences, wishes and concerns of the local farmers, so that the proposed small-scale A/R CDM project activity would better respond to their desires for livelihood development (see section F). It is expected that 227 farmers from 8 villages of 3 developmental Blocks will benefit from the proposed small-scale A/R CDM project activity. The main socio-economic benefits of the project include:

1. Income generation: The project will open up certain new economic opportunities and enhance the income of the farmers through timber and fruit production besides earnings from the sale of carbon credits. About 227 local farmers of 8 villages will benefit from the project. Timber produced is expected to fetch a lucrative price in the local markets. Besides, Ber (*Zizyphus mauritiana*) is the most preferred fruit species in the project area. The farmers can grow this fruit tree and realize a good market price at the farm gate as well as in the local markets. Since it is the first CDM forestry project in the country it is expected to provide excellent opportunities for training and exposure to this fast developing field and at least some educated young men and women in these villages hope to be able to access entirely new employment avenues in the field of CDM.

2. Sustainable fuel wood supply: The local communities depend on fuel wood for their living to a certain extent and the proposed small-scale A/R CDM activity will provide more sustainable fuelwood resources to the local farmers and thus make the living conditions of at least some womenfolk have to walk long distances for the purpose of fuelwood collection easier.

[7] Income pattern: 35% and 65% of land is productive and unproductive respectively
Income form productive area = Rs. 4000/acre/annum
Income form unproductive area = Rs. 1500/acre/annum
Income from buffalo = Rs. 2000/annum/buffalo
Income from cow = Rs.1000/annum /cow
Number of members per household = 6.1

3. **Strengthening social cohesion**: Individual farmer households/communities are unable to successfully manage the investment, production and market chain of the timber and non-wood forest products, which normally takes a much longer period than food production. In addition, the lacks of organisational instruments also prevent them from overcoming technological barriers. Overall the proposed small-scale A/R CDM project activity will entail close interaction between individuals, communities, farm forestry and local government, with intensified communication among them, thus supporting the network for social and productive services.

4. **Social Well Being**: The proposed small-scale A/R CDM project activity will generate additional employment through site preparation, plantation and other intercultural operations. Besides, the project will enhance the community bondage and elevate the status of women by ensuring their participation in the proposed small-scale A/R CDM project activity. Since this is a first CDM forestry project in India, and only second in the world, it is expected to bring recognition to the community working for the project and thus contribute significantly to the sense of well being.

5. **Better agricultural production**: It is expected that the afforestation activities of the project will lead to fixation of shifting sand dunes. The proposed small-scale A/R CDM project activity will also increase the water holding capacity of the soil and add humus to the soil which would in turn make agriculture more viable in the neighbourhood.

6. **Technical training and demonstration:** Interview with local communities indicated that local farmers/communities are usually short of access to quality seed sources and lack skills for producing high quality seedlings for successful tree planting, as well as for preventing planted trees from impact of fire, pest and diseases. This is one of the important barriers of local communities in planting trees on their lands. In the proposed small-scale A/R CDM project activity, the local forestry agencies as well as large farms will organise the training for local communities to assist them in understanding and evaluating the issues of hosting the proposed A/R CDM project activity, both on-site and off-site such as seed and seedling selection, nursery management, site preparation and planting models.

The proposed small-scale A/R CDM project activity is therefore expected to uplift the socio-economic status of the project participants and the communities at large by meeting the various objectives mentioned above.

Potential socio-economic risks and counter measures:

(1) Cultural Resources

There are no cultural relics and/or cultural reserve that have been identified in the project area, and consequently, no damage to non-replicable cultural property will occur under the proposed small-scale A/R CDM project activity. Meanwhile, the project does not involve any site used for local social gatherings or other spiritual activities, thus the proposed small-scale A/R CDM project activity will not impact the normal local gatherings and religious activities.

(2) Economic risk

The potential economic risks will be poor management of the plantations established under the project such as lack of pest and fire control measures, which could contribute to project failure and farmers' loss. The proposed small-scale A/R CDM project activity has been designed to mitigate this risk by providing technical assistance and training to farmers and communities, by farm forestry and the extension network of the forestry

sector. The local government forestry office, which is experienced in reforestation and forest management, will provide the technical assistance to the farmers/communities.

(3) **The possibility that carbon credits from forestry projects may have very low value:**

This is almost the lowest risk factor, as there is increasing realisation of the threat of global warming and the countries which were reluctant to join Kyoto till recently are coming onboard and it is expected that the demand for carbon credits will keep on increasing thereby helping raise their prices in future.

None of these risks are considered significant.

E.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 support documentation:

>>
There is no negative impact that is considered significant by the project participants or the host party.

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

>> N/A

SECTION F. Stakeholders' comments:

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

>> To collect the relevant information for the 'Small Scale Cooperative Afforestation CDM Pilot Project Activity on Private Lands Affected by Shifting Sand Dunes in Sirsa, Haryana**,** a series of PRA exercise was conducted. The main objectives of this PRA exercise were:

- To know the aspirations of the participants/villagers on small scale AR-CDM project activities & identify project participants
- To evaluate the eligibility of the lands under the project area
- To analyze the potentiality of additionality and leakage in the project area
- To identify the discrete parcels to be included under the project area
- To explore the crop productivity, grazing pattern, climate & other relevant points
- To know the income sources of the project participants and study the socio-economic conditions of the households and the communities in the eight villages.
- To collect field data on individual land details and cattle holdings of the project participants

Tools Used:
A series of open meetings were conducted by using the following tools:

- Semi-structured interviewing
- Focus group discussions
- Village and resource Mapping
- Seasonal /crop cycle mapping
- Timeline analysis
- Transect walk

A PRA exercise in progress in one of the project village

Detailed PRA exercises were conducted for 8 participating villages, viz. Neemla, Dhani Sheranwali, Bhuratwala, Poharkan, Umedpura, Mallekan, Madho Singhana and Gudia Khera. The villagers were informed well in advance about the visit of the PRA team by the Haryana Forest Department. The PRA team met the farmers in their respective villages at a common place. At each village, activities like preparation of village & resource map, timeline analysis, crop cycle / seasonal maps were performed. The villagers were clearly informed about *the Society* byelaws and the criteria and eligibility for the CDM project. They were particularly asked questions under following broad categories, which were captured in video and camera as evidence/proof for records to be sent along with PDD during project submission.

Land eligibility: Villagers were asked about their proposed land status, whether it was a forest area, and if so since when? For ascertaining land eligibility criteria of the CDM project activities**.**

Grazing for leakage criteria: Villagers were specifically asked about grazing of their cattle in the proposed land and also any grazing by migratory cattle from adjoining areas.

Agriculture: Villagers were asked about the agriculture of crop in their proposed land, which are degraded sand dune areas.

Time line and history tracing: Villagers were asked to elaborate about their areas and record any developmental activities in their areas since 1940.

Income: land and cattle holding data collected by the field staff was cross-checked with the individual participants and the participants were interviewed about the productivity and yield of their lands.

Alternative to land: Villagers were asked to tell whether they have any other alternative available for the project lands, had this project not suggested.

Species choice: Villagers were categorically asked to tell about the choice of tree species selected for planting with their full consent and choice.

Seasonality of crops: Villagers were requested to prepare a crop cycle map showing seasonality of various crops in their area.

A total of 227 farmers from all the 8 selected villages, finally volunteered to give their degraded land, which totally constitutes 369.87 (as per GPS calculations) for the project activity.

F. 2. Summary of the comments received:

>> **Farmers' understanding on CDM & its benefits**

Initially, a thorough discussion was made with the farmers on Clean Development Mechanism (CDM). It was stated that Afforestation / reforestation CDM project activities could be carried out if a certain amount of the land is degraded in nature or not suitable for growing profitable agricultural crops. The team stated that there could be several benefits, as given below from the proposed small-scale A/R CDM project activity -

- Growing timber or fruit crops in the degraded lands, which were otherwise, kept fallow and not utilized for agricultural practices;
- Providing timbers after 10-20 years interval;
- Providing annual fruits after 5 years onwards;
- Earning Carbon Credit (CER); besides, conservation of land and environment, and development of local area.

During the PRA exercise the farmers of the villages were made aware of the eligibility conditions of lands under the small scale AR CDM methodology. The various clause of land eligibility were discussed with the farmers. The farmers were informed that the lands to be afforested under the proposed small-scale A/R CDM project activity should preferably be degraded or marginal agricultural lands. Most of the questions regarding the suitability of lands were cornered around as to why such lands are to be selected for the project.

The farmers were informed that for getting all the aforesaid benefits, they might contribute their degraded lands at least for 20 years (minimum) or for 30 years (maximum). At the end of the interaction, farmers (80% of the total respondents) expressed their willingness to contribute their lands for 20 years, as they found a '30 years time period' too long.

Acceptance of CDM activities, byelaws

During the interactions, made with the villagers, it was found that farmers were willing to take up this project. The active participation of the farmers in the discussion and their keen interest in knowing detailed specifics of the project are proof for this. All the farmers who participated in the activity volunteered to contribute lands for the project and were quite happy in being allowed to manage the plantation by them. However, the farmers insisted that each village should be represented in the plantation management committee. This was noted and it was decided that representation from each village shall be ensured.

The draft byelaws were discussed with the farmers in the brain storming exercise and it was felt that farmers are willing to take part in afforestation activity on their private lands. The PRA team elaborately explained to the villagers that a society would be established for this afforestation activity which would be having two types of memberships, namely, general membership and executive membership. The membership of *the Society* will be granted to any adult person of Ellenabad block and its neighbourhood who is willing to take part in the project by making eligible land under his/her lawful ownership available for meeting the objectives of *the Society*. All such members shall constitute the General Body of *the Society*.

The Society will accept only those lands that the owners are willing to commit to it for the proposed small-scale A/R CDM project activity for a minimum period of 20 years and are of at least 0.05 ha in size and are not considered suitable by the owners for raising agricultural crops regularly either on account of their low productivity or difficulty in management. During the PRA, the landowners agreed that they shall be responsible for the protection and management of the plantations raised on their lands subject to the overall supervision and satisfaction of *the Society*. These lands should not be withdrawn during the project period of 20 years.

The villagers were informed that the General Body of *the Society* shall approve the program of the activities of *the Society* for the ensuing year and decide on the manner of sharing of benefits, including income from carbon credits. Besides, the farmers agreed that there will be an Executive Body consisting of minimum nine (9) members with one each being elected from the eight participating villages and one member from forest department as secretary cum treasurer. At least one third of the members of the Executive Body shall be women. In the event of inadequate representation of women in the Executive Body, the Patron (Haryana Forest Department) shall nominate such number of women from among the Members of *the Society*, or their families, as are necessary to fulfil this mandatory requirement.

The Executive Body shall be responsible for the day-to-day management of *the Society* under the overall control and guidance of the General Body. The Executive Body shall elect its President and Vice President from among its elected and nominated members. The Patron of *the Society* shall appoint a serving forest officer not below the rank of Forest Range Officer as the Secretary-cum-Treasurer to the Executive Body. *The Society* would have full right and control to decide on the proposed small-scale A/R CDM project activity and benefit sharing.

The farmers also agreed that once the land would be contributed for the proposed small-scale A/R CDM project activity, all the lands that has been considered for the project activity for 20 years would be managed by the land owner themselves under the overall supervision of *the Society*, which would decide further activities on this project area. General members would continue to be the legal owner of their contributed land and possess the power to transfer or sell the land to a person who will be willing to accept all the byelaws of *the Society* and thereby become member of *the Society*.

Resource Inventory:
For assessing the economic & social resources of the villages, PRA tools like ‘Village mapping and time line analysis were used. Farmers identified the following resources during the inventory analysis:

Land & water
Village mapping exhibited that all the eight villages are located along the southern most part of the Sirsa district. The fertile lands of these villages are under agricultural practices, which are irrigated by canal-fed irrigation system.

There is no perennial river in the area and Ghaggar is the only river flowing from north to west through the central part of the Sirsa district. During the rainy season its water is diverted into the southern canal flowing through these villages. Apart from this, other source of water is available only during the rains. There is a network of irrigation canals spread over these villages, originating from the Bhakra Canal but are not present in project area.

Time line analysis reveals that the areas of the proposed small-scale A/R CDM project activity were deforested in 1947-1950, i.e. post partition (between India-Pakistan) period partially due to population growth and high dependency of local people on forest products for their livelihood and construction material for their houses, which lead to deforestation. The villagers identified the lands under the project as unproductive for agricultural crops as they are sandy and heavily affected by sand dunes. The area is affected by *aeolian* (wind blown) sand. The villagers confirmed in PRA that the current land use of the project area is of degraded croplands. There are only a few shrubs or grasses in the area, which was cross checked during the PRA.

During the ***transect walk,*** farmers revealed (and the team also found) that the area has sand dunes (locally called tibbas) which cover the whole tract passing through the project area. These sand-dunes (tibbas) as found around Ellenabad which are as high as 9 meters (approx) and are broad based transverse ridges, a few of them even 3 Kilometres long.

Vegetation Cover
During the ***transect walk***, it was found that the natural tree species available in the area are Jand *(Prosopis cineraria*), Beri *(Zizyphus mauritiana)*, Jaal *(Salvadora oleoides)*, Reru *(Acacia lucophloea)*, Kair *(Capparis decidua)*, Kikar *(Acacia nilotica)*, Pipal *(Ficus religiosa)* etc. It was reported that trees like *Acacia nilotica, Ailanthus excelsa, Acacia tortilis, Albizzia lebbek* and *Azadirachta indica* are vulnerable to frost. The old natural forests in these areas have vanished due to the increasing population over the years. Only few trees and shrubs exist in this region and the tree crown cover is not more than 5% (ocular estimate).

Agriculture
It was evident from the discussions with the farmers during PRA that there are large tracts of lands on which a very limited agriculture practices are possible. Droughts prevail during October and November and in summer months. As this region receives erratic and scanty rainfall (25-50 cm) the farmers get some yield from these lands on an average of once in 3 to 4 years (the farmers discussed with the PRA team that in their area good rainfall is a rarity as scanty rainfall occurs only once in 3 to 4 years interval). There are a few irrigation canals near the selected villages, but these canal systems are not available in the project area. As rainfall in these lands is scanty, even the rain fed crop productivity is very low. The lands which have access to canal-fed irrigation, supports normal agriculture. About 30-40% of the lands owned by the farmers are productive. The main cropping pattern is two crop systems. Paddy, cotton and bajra crops are grown in Kharif season (Kharif means autumn harvest in India, which is also known as summer or monsoon crops), whereas wheat, gram, barley and rapeseed & mustard are grown in Rabi season (Rabi means spring harvest in India, which is also known as winter crop). Cotton, oilseeds and citrus (kinnow) are the main cash crops of this area practised in canal-fed irrigated areas. These areas give the farmers an annual income of Rs. 4000 per acre, while the income from the degraded areas range anywhere around Rs. 1000-1500 per acre annually.

The farmers were also asked whether they presently have or are considering any options related to any other use of these lands. It was learnt from the farmers that they do not have any other alternative use of these lands and feel that by afforesting these degraded lands under the proposed small-scale A/R CDM project activity, they would obtain means of additional income from the wood and non-wood products and will also earn money from sale of Carbon Credits (through sale of t-CERs). The farmers expect that the timber produced through the proposed small-scale A/R CDM project activity would also fetch a good market price.

Livestock & grazing
During the PRA exercise, information regarding livestock and grazing pattern in the project area was assessed. The farmers were asked about the number of livestock they have and how these animals are fed. It was learnt that the farmers willing to participate in the proposed small-scale A/R CDM project activity have cattle which are usually stall fed from agricultural waste obtained from canal-fed irrigated lands. The goats and sheep are grazed in the lands near railway tracts or on canal-fed agricultural fields after the harvest. It was univocally said that no grazing occurs on the project lands. Migratory cattle also visit these villages, but they graze along the roads and canals. They are not allowed to graze in the degraded crop lands. As animal husbandry is also one of the income sources of the farmers, most of them own one or two buffaloes and cows, while a very small percentage own sheep and goats .It was learnt through interviews that the income from Buffalo is around Rs. 2000/annum/buffalo while it is Rs. 1000/annum/cow.

Standard of Living
Transect walks, house visits and direct interviews with family members of the project participants as well as group interviews with the womenfolk of all the eight villages was carried out to study the living conditions of the communities. Apart from a very small percentage of people in the village it was learnt that all the households lack basic running water and toilet facilities. The lack of various basic amenities was a clear indicative that the farmers participating in the proposed small-scale A/R CDM project activity belonged to low income communities.

Summary of comments received:

Summarized comments of local stakeholders from 8 participating villages viz. Neemla, Poharkan, Bhuratwala, Dhani Sheranwali, Mallekan, Madhosinghana, Umedpura, Gudia Khera are given below as:

The selected areas for the proposed small-scale A/R CDM project activity are severely affected by shifting sand dunes. The land is degraded in nature. The fertility of the lands is poor and not suitable for profitable agricultural ventures. In few areas, rain fed agriculture is possible once on an average interval of three to four years. Though, a few canal-fed irrigation systems are present in the district of Sirsa, these canals do not pass through the vicinity of the project area.

The climate of the project area is characterized by dryness, and can be classified as ‘semi-arid climate’. The daily maximum temperature during May–June ranges from 42 degrees C to 47 degrees C. In winter, the area experiences extreme cold and frost.

During the semi-structured interviews, farmers understood the basic concept of Clean Development Mechanism (CDM) and its potential benefits. The villagers agreed that the proposed small-scale A/R CDM project activity could enable them to grow timber trees or fruit trees in degraded lands, which would have otherwise, kept fallow as no other alternative for these lands, exist.

Farmers have also understood the conditions of land eligibility for AR CDM Projects and agreed upon that they would contribute only those lands which are degraded in nature (and not suitable for profitable

agricultural practices) and were not under forest since last 50 years. They (farmers) also agreed to contribute their degraded lands for a total period of 20 years.

The farmers are willing to take part in this project. The active participation of the farmers in the discussion and their keen interest in knowing details and the specifications of the project are proof for this (evidences recorded on video).

Farmers who participated in the PRA activity volunteered to give land for the project period of 20 years and were quite happy in being allowed to manage the plantation by them through *the Society*. However the farmers insisted that each village should be represented in the plantation management committee.

Draft byelaws were elaborately discussed with the farmers (Evidence recorded on video). In the brain storming exercises along with the farmers, it was felt that farmers are willing to take part in afforestation activity on their private lands. The PRA team explained in detail the draft byelaws to the farmers for the proposed afforestation activity and also described them various types of memberships, namely, general membership and executive membership.

The Society will have a committee of elected members from the general body with representatives from each participating village. The President and the Vice-president would be elected from the executive body; the Secretary of *the Society* would be a serving Forest Range Officer (Ellenabad), who would supervise the proceedings of *the Society*. *The Society* would have full right and control to decide on the proposed small-scale A/R CDM project activity and benefit sharing.

The general members of *the Society* would be the farmers who would take part in the proposed small-scale A/R CDM project activity by contributing their degraded fallow marginal agricultural land for afforestation. In order to broaden the participation by inclusion of women (who do not normally own lands in this district) it has been decided that at least one third of the executive members should be women.

In the meeting it was also agreed that once the land has been contributed for the proposed small-scale A/R CDM project activity, all the lands that has been considered for the project activity for 20 years would be managed by the land owner under the overall supervision of *the Society*, which would decide further activities on this project area. The farmers agreed to the mechanism of sharing of benefits accruing from the proposed small-scale A/R CDM project activity.

The displacement of activities due to the proposed small-scale A/R CDM project activity is insignificant. Grazing of livestock is not done in the project lands. Livestock's are mostly stall fed in the village. Farmers stated that no open grazing is generally practised in the area and the cattle are mostly stall fed, whatever migratory cattle arrive in the area from adjoining Rajasthan state, they graze in canal-fed fields, which is away from project area.

The PRA exercise brought out list of tree species, preferred by the farmers for plantation in the project lands. It was agreed upon, that a mixed plantation will be carried out comprising trees with short, middle and long term rotation. In order to ensure quick returns, a certain proportion of fruit plants were also selected by the farmers. As per preference following trees were listed by the farmers: *Prosopis cineraria, Dalbergia sissoo, Ailanthus excelsa, Acacia nilotica, Acacia tortilis, Azadirachta indica*, *Tecomella undulata, Melia azadirachta* and *Eucalyptus* hybrid.

It is evident from the PRA that farmers were expressing this preference based on the profitability of timber species. But, the forest department informed that species like Dalbergia and Eucalyptus can be successful only in irrigated lands. Availing guidance from the forest department, the farmers took an educated decision about

the tree species to be planted in the project lands. They zeroed on these species i.e. *Ailanthus excelsa*, *Acacia tortilis, Eucalyptus* hybrid, *Acacia nilotica, Dalbergia sissoo, Prosopis cineraria and Zizyphus mauritiana.* The fruit tree preferred by the farmers was Beri.

The stake holders expect that the proposed small-scale A/R CDM project activity would earn them additional means of income through employment generation and credits earned through sequestration of carbon in their trees.

Land Eligibility of the project area
It was evident from various exercises of PRA that the farmers own lands which are degraded due to shifting sand dunes. On these lands, rain fed agriculture is the normal practice. These lands were never been attempted for plantation either by the forest department or by the farmers since last 50 years. It is mainly because of the barrier like harsh ecological conditions of the area. The productivity of the rain fed agriculture is also not profitable considering the amount of resource inputs and returns received.

In the seasonality analysis, the farmers commented that these lands are not utilized for grazing of livestock, so there is no question of any live stock being displaced. Moreover, the lands have less than 5% crown cover (Approximately per 100 square meter 3-4 shrubs observed through ocular estimate). The height of these shrubs is 0.5-1.00 meter. In the historical analysis, farmers stated that the private lands, contributed to the proposed small-scale A/R CDM project activity, have been kept fallow, since 1970, and only a few agricultural operations were practiced depending on the scanty rainfall, which also takes place once in 3 to 4 years interval. Therefore, this area was not a forest from almost last 40-50 years. So, these lands satisfy the land eligibility conditions laid down in the methodology for small scale AR CDM Project activity.

Suitability of tree species to be grown
The PRA exercise brought out following list of tree species, preferred by the farmers for plantation in the project lands. It was agreed upon, that a mixed plantation will be carried out comprising trees with short and medium term rotation. In order to ensure quick returns, a certain proportion of fruit plants were also selected by the farmers. As per the preference of farmers, following tree species were listed:

- *Ailanthus excelsa*
- *Acacia tortilis*
- *Eucalyptus* hybrid*;*
- *Acacia nilotica;*
- *Dalbergia sissoo;*
- *Prosopis cineraria;*
- *Zizyphus mauritiana.*

It is evident from the PRA that farmers were expressing this preference based on the profitability of timber species like *Dalbergia sissoo* and also because of their expectation to get quick return from fruit species like Beri. But with the guidance from the Haryana Forest Department, the farmers took an educated decision about the tree species to be planted in the project lands. They zeroed on these 7 species i.e. *Ailanthus excelsa*, *Acacia tortilis, Eucalyptus* hybrid, *Acacia nilotica, Dalbergia sissoo, Prosopis cineraria and Zizyphus mauritiana.* The fruit tree preferred by the farmers was Beri.

Additionality & Leakage
One of the main objectives of the PRA exercise conducted was to analyze the potentiality of additionality and leakage in the project area.

This analysis is important to ensure that the proposed small-scale A/R CDM project activity would lead to positive and additional benefits for the participants and the local communities. Therefore, a few important issues concerning the proposed project's additionality and leakage were discussed during the PRA exercise. The discussions helped the PRA team to understand the present circumstances of the participants and more importantly their requirements, needs and concerns for livelihood development.

The emergent issues of the discussions and comments from the stakeholders have been summarized below.

The land under the project area is degraded by shifting sand dunes since long. The area receives erratic and scanty rainfall (150-200 mm) which leads to water scarcity. The network of canals (Bhakra Nangal canal system and Ghaggar river) in the region do not pass through the project area.

During summer season temperatures in the project area rises up to 50°C causing desiccation of the plants. Frost is an annual threat to the vegetation in the area and the region suffered considerable damage in January 2005. Due to high summer temperatures and low rainfall the area is susceptible to droughts. No plantation activity was attempted by the forest department in the project lands due to these harsh ecological conditions.

The above information gathered from the villagers helped to prove that the proposed small-scale A/R CDM project activity will be additional in the area.

The project area is degraded cropland and grassland which is generally left fallow and profitable agriculture is carried out on an average interval of three to four years and only one crop is taken instead of two which is the general trend in the nearby agricultural fields. Thus the agriculture activity shifting to near by area is insignificant and far below 50%.

The cattle in the area are stall fed, the cattle feed comprises of agriculture waste as well as fodder crops grown in the adjoining fertile agriculture fields, which are canal-irrigated. The region is visited by migratory cattle herd from Rajasthan in the months of March–May. These herd feed on agricultural wastes and grasses growing on road side. Therefore the number of displaced grazing animals due to the proposed small-scale A/R CDM project activity is unlikely to occur.

The above information collected through the PRA exercise indicates that the leakages arising due the proposed small-scale A/R CDM project activity would be far below 10%.

Land condition (Land eligibility)

- In general almost all the stakeholders from all the villages informed that there were moderate to dense forest during 1940s, which rapidly got degraded and finally lost between years 1945 to 1950;

- The rapid loss of forests during this period is attributed due to migration of people during partition of India and Pakistan, as area is close to borders of adjoining country i.e. Pakistan and also to growth in population of local people with time;

- The forests were cleared manually basically by migrants and the local people for practicing agriculture and for the wood required to construct their houses.

Grazing

- All the stakeholders agreed that almost no grazing is practiced in the parcels of land provided for the project;

- This is further confirmed by stakeholders that they stall feed their cattle by providing them fodder from canal irrigated lands nearby to their villages;

- Regarding migratory cattle from adjoining state of Rajasthan, they stated that these cattle don't graze in the project area and whatever grazing occurs is on roadside near canal land, away from the project area.

Income

- Stakeholders consultation as well as field visits and data have clearly shown that the participants belong to low income groups with an average income ranging from 20,000 Rupees to 40,000 Rupees per year;

- The farmers, who have provided their degraded land but also possess tube well-irrigated land manage to earn livelihoods from them, which ranges from Rs. 1000 to Rs 1500/acre.

Species choice

- Species choice by the stakeholders was voluntary and based on their interest for anticipated return following a ratio of 4:6 for short and medium rotation crops;
- Stakeholders were keen on planting species like Jand and Kikar.

Agriculture potential of project lands

- All the stakeholders were unanimous in expressing that the degraded land provided for the proposed small-scale A/R CDM project activity yields a poor crop that also only after rains which occurs once in 3 to 4 years;
- The stakeholders also agreed that there is no potential use of this degraded land as it is a matter of loss whenever they have invested money to get crops from these.

Any Alternatives

- Stakeholders from all the participating villages categorically said that they don't have any other alternative for the degraded land provided for the proposed small-scale A/R CDM project activity other than waiting for rains and risking investment to get crops from it after 3 to 4 years

<u>Quotable comments of the stakeholders</u>

- "The area is having these degraded lands since we were born and they are still the same" a 70 year old stakeholder;

- "Once good forest, these areas were cleared by migrants in 1950s";

- "The area was having sparse forest, which also got totally cleared by growing local population for need of wood and fuel for their houses";

- "We could hardly get any crop from the degraded land as we have to wait for rains, which occurs only once in 4-5 years";

- "Certainly we have no other option but to wait for rain to get meagre crop from degraded lands";

- "We have most of the time incurred losses by investing in degraded lands for crop, as return has been very poor";

- "The question of cattle grazing in project area does not arise at all, as there exists not a blade of grass to eat for the animals";
- "Though we earn around Rs. 30,000 annually from farming and sometimes even more depending upon market prices after meeting our daily needs nothing is left over as saving".

Comments from local NGOs:

Comments from five local non-government organizations, i.e., Wildlife Society of India, Wildlife Institute of India, Life Line Awareness & Serving Welfare Society, Sirsa, Maksad Welfare Society, Sirsa, and Shikhar Chetna Sangathan, have been collected. All NGOs convinced and satisfied with all socio-economic, environmental and technological aspects of the projects. The specific comments are summarized below.

The proposed A/R CDM project, being a pilot project in the country, will give impetus to many such project activities in the future. The project will develop the skills of the farming community in deriving multiple benefits from tree growing and crop cultivation. It will also provide an opportunity to the Haryana Forest Department to educate farmers about the need for mitigation of climate change leading to the adoption of the principles of GHG emissions reductions at all levels of society.

As the first A/R CDM project activity in the region, it is expected to provide excellent opportunities for training and exposure to this fast developing field and at least some educated young men and women in these villages hope to be able to access entirely new employment avenues in the field of CDM.

It will also open up new economic opportunities and enhance the income of the farmers through timber and fruit production as well as earning from the sale of carbon credits.

This project is expected to enhance community bondage and elevate the status of women by ensuring their participation in the proposed A/R CDM project activity.

The project will not harm the existing flora and faunal species as the project area is small and scattered, and the project area only form the fringe area of the natural habitat of the concerned wildlife thus there would be no habitat destruction or fragmentation. On the other hand, plantation established by the proposed A/R CDM project activity will provide a refuge to some desert wildlife, and the economic benefits of the plantation to the locals will be helpful in establishing a harmonious relationship between them and the conservationists.

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

>> Due account was taken in incorporating the comments received from the PRA survey in preparation of detailed PRA report, PCN and PDD documents. Following aspects were especially taken into account:

- The stakeholders were informed about the byelaws and other aspects of the project in public meeting and all their queries answered to
- The participation of local farmers was made on a voluntary basis after they fully understood various aspects of the CDM project like the anticipated benefits, sharing of usufructs etc.;
- Stakeholders who are local farmers and who have contributed their degraded lands voluntarily and unanimously agreed to manage the land themselves under the guidance of *the Society*;
- Preferences of farmers were taken into account in the selection of tree species, which are of economic and ecological importance for the local people;

Farmers have agreed to use chemical pesticides very sparingly.

Annex 1

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

Organization:	Haryana CDM Variksh Kisan Samiti, Ellenabad, Sirsa
Street/P.O.Box:	
Building:	Forest Complex Sirsa
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Country:	India
Telephone:	
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E-Mail:	hsamb1998@hry.nic.in
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Represented by:	Sh. Ravi Khod
Title:	President
Salutation:	Mr.
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No ODA will be utilized for the purpose of this proposed small-scale A/R CDM project activity.

Annex 3

DECLARATION ON LOW-INCOME COMMUNITIES

Please provide a written declaration that the proposed small-scale afforestation or reforestation project activity under the CDM is developed or implemented by low-income communities and individuals as determined by the host Party.

There is no single accepted definition of low income communities by the Government of India, for the purpose of CDM projects. Therefore the international norms have been followed according to which people below a daily income of US$ 1 (around 40 Rs.)[8] fall under the poverty line. Most members (92%) of *the Society* fall in this **low income family** category with an average annual income of just Indian Rupees 6,610 as has emerged in the PRA report (refer Sec E.1).

The main income source of the project participants is farming and these farmers have small land holdings, a considerable part of which is degraded/degrading and not suitable for profitable agriculture as investment costs are too high for them to carry out any kind of farming or planting activities. Therefore plantation activities in these lands are possible only through external aid and intervention. The majority of households lack basic amenities such as running water and bathroom facilities. Most farmers reside in small mud houses which are not concrete structures and the cattle are also housed in the same dwelling. Fuelwood is the medium of cooking. Most households don't own vehicles for transport. Farmers don't have any savings or assets of any nature apart from the land and a few cattle. The annual income of the household varies from twenty to forty thousand Rupees, which is still far below the international poverty line of eighty thousand Rupees.

The above reasons clearly show that the households participating in the proposed small-scale A/R CDM project activity belong to low income communities.

Haryana CDM Variksh Kisan Samiti, Ellenabad, Sirsa

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[8] The world bank definition of the poverty line for the under developed countries like India is US$1 per person per day or US$365 per year. (http://www.wakeupcall.org/administration_in_india/poverty_line.php, http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTPOVERTY/EXTPA/0,,contentMDK:20153855~menuPK:435040~pagePK:148956~piPK:216618~theSitePK:430367,00.html#measuring)