GROUPED AGROFORESTRY PROJECT IN VARIOUS STATES OF INDIA

Document prepared by Infinite Solutions

Project Title	GROUPED AGROFORESTRY PROJECT IN VARIOUS STATES OF INDIA
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1 PROJECT DETAILS

1.1 Summary Description of the Project

This project is an agroforestry plantation initiated by Infinite Environmental Solutions LLP (IESLLP) with the help of local farmers/communities. Plantation activities conducted at multiple locations in the states of India from 2019 and is expected to cover 10000 hectares. Farmers retain ownership of the trees, products, and land as well. Farmers received training from project implementer for plantation. Simple tree plantation technique is used with negligible soil disturbance. The proposed ARR VCS project plans to promote sustainable agroforestry for small-scale farmers to provide them with financial benefits and ensure GHG mitigation in the various state of India.

The major agricultural crops that were grown, prior to agroforestry are Wheat, Cotton, Castor, Bajra, Rice, Pulses. Apart from that, other commercial crops such as cotton, groundnut, sugarcane and tobacco were grown. With rising population at a decadal rate of almost 27%, the need for food and other forest products including wood has also been increasing. To address these needs, a social forestry model along with timber and bamboo was introduced by the project developer for planting trees on unutilized lands and other wastelands. Farmers were motivated to plant trees along with the agricultural crops. This gave the impetus to agroforestry practices.

The project quantifies the GHG removals occurring from agroforestry plantations through the use of ARACM0003: “Afforestation and reforestation project activities implemented on lands other than wetlands”, Version 02.0 developed under the Clean Development Mechanism for large-scale plantations. The project aim is to cover 10,000 hectares in the country out of which 1500 hectares of land which is currently under management by the project proponent have been planted. The project is designed to continually increase its project zone, project area, and the number of project instances within the expansion area during the project lifetime.

The project estimates the total GHG emission reduction for 30 years, i.e. from 2019 to 2048, to be 4916593 tCO2e. The long-term average GHG benefit (LA) is determined by averaging the expected total GHG benefit for the length of 30 Years.

1.2 Sectoral Scope and Project Type

The Project is classified under the sector 14 of the VCS: Agriculture, Forestry and other land use (AFOLU) and operates as an Afforestation, Reforestation, and Revegetation (ARR) project type. In addition, the project has been designated as a grouped Project and plans to increase the number of project instances. As described in this design document. The first phase of the project consists of the participation of small and marginal landholders to restore tree cover in

initial project instances. The project is expected to cover 10,000 hectares in the country from 2019.

1.3 Project Eligibility

The project complies with all rules and requirements stated in the following documents. ARR program has not cleared any native forest within the 10 years of the project start date and trees have been planted on the deserted wasteland to increase the forest cover of the area and are in compliance with section 3.2 of the AFOLU specific matters of VCS standard Ver_4.3. The project is eligible for ARR activities and increases carbon sequestration by establishing vegetative cover on a less productive degraded land. The project includes multiple species such as agroforestry and other fast-growing species as well as shrubs.

The project is eligible under the scope of the VCS Program as the project includes AFOLU activities (project category ARR), which are supported by a methodology approved under the VCS Program. The project shall comply with all rules and requirements stated in the following documents:

- Verified Carbon Standard (VCS) Program guide Version 4.2
- VCS Standard, Version 4.3
- VCS Methodology Requirements, v4.2
- AFOLU Non-Permanence Risk Tool, v4.0

• The project does not intervene in native ecosystems, that is, there was no impact on natural forests (as per the VCS Standard, Version 4.3). Evidences have been provided to depict that the project area has not been cleared of native ecosystems within the 10 year period prior to the initiation of the project in the form of Google Earth Images.

According to the list of eligible AFOLU projects described in Appendix 1 of VCS Standard Version 4.3, the present project activity falls under the "Afforestation, Reforestation and Revegetation" (ARR) category. The project aims at increasing the vegetation cover through the plantation. The justification of eligibility of the project under the scope of the VCS Program is given in the table below.

Table 1: Eligibility conditions for Afforestation, Reforestation and Revegetation (ARR) and description under VCS

Eligibility conditions	Justification/Description
a) Eligible ARR activities are those that increase carbon sequestration and/or reduce GHG emissions by establishing, increasing or restoring vegetative cover	The project activity involves the plantation of trees on non-forest land (degraded and low productive land) which will increase the carbon sequestration of the land much higher than in

(forest or non-forest) through the planting, sowing or human-assisted natural regeneration of woody vegetation.	the baseline conditions
b) Eligible ARR projects may include timber harvesting in their management plan.	Not Applicable.
c) The project area shall not be cleared of native ecosystems within 10 years before the project start date.	The project activity has not cleared the native ecosystems. Instead, it will plant agroforestry trees which are suitable for fruit and fodder production and highly adaptive to the native ecosystems of the project area. There was no vegetation in the baseline as the project area is degraded land and not identifies are not suitable for or survival of agroforestry trees without any plantation, management activity [1]. Local stakeholder consultation- Local stakeholder consultation was conducted to identify the baseline scenario and impact of land-use conversion to forestation activity. It is identified that the project activity has no forest or any vegetation in the baseline and is identified as desert land.

1.4 Project Design

The project is grouped activity and aims to afforestation the deserted wastelands, degraded lands and unused areas which are expected to remain degraded or to continue to degrade further in the absence of this project activity. The grouped project activity complies with the requirements of section Grouped projects 3.5 of the VCS standard Ver.4.3.

☐ The project includes a single location or installation only

☐ The project includes multiple locations or project activity instances, but is not being developed as a grouped project

[1] https://www.frontiersin.org/articles/10.3389/fpls.2018.01696/full

☒ The project is a grouped project

In all other cases, indicate whether the project has been designed to include a single location or installation only, multiple locations or project activity instances, but is not being developed as a grouped project, or as a grouped project.

Eligibility Criteria

For grouped projects, additional information relevant to the design of the grouped project (e.g., the eligibility criteria for the inclusion of new project activity instances) are described in the table below:

Eligibility conditions	Justification/Description
a) Eligible ARR activities are those that increase carbon sequestration and/or reduce GHG emissions by establishing, increasing or restoring vegetative cover (forest or non-forest) through the planting, sowing or human-assisted natural regeneration of woody vegetation.	The project activity involves the plantation of trees on non-forest land (degraded and low productive land) which will increase the carbon sequestration of the land much higher than in the baseline conditions
b) Eligible ARR projects may include timber harvesting in their management plan.	Not Applicable.
c) The project area shall not be cleared of native ecosystems within 10 years before the project start date.	The project activity has not cleared the native ecosystems. Instead, it will plant agroforestry trees which are suitable for fruit and fodder production and highly adaptive to the native ecosystems of the project area. There was no vegetation in the baseline as the project area is degraded land and not identifies are not suitable for or survival of agroforestry trees without any plantation, management activity [2]. Local stakeholder consultation- Local stakeholder consultation was conducted to identify the baseline scenario and impact of land-use conversion to forestation activity. It is identified that the project activity has no forest or

[2] https://www.frontiersin.org/articles/10.3389/fpls.2018.01696/full

	any vegetation in the baseline and is identified as desert land.

Eligibility criteria for the new grouped project are discussed below. New project activity instances shall:

Eligibility conditions	Justification/Description
Occur within one of the designated geographic areas specified in the project description.	The new project instances will be within the geographical boundary several states of India.. All the areas are part of the project boundaries and have similarities in geography, meteorology and are identified as deserted land[3].
Comply with at least one complete set of eligibility criteria for the inclusion of new project activity instances. Partial compliance with multiple sets of eligibility criteria is insufficient.	The addition of new project instances will be done based on compliance with at least one complete set of eligibility criteria.
Be included in the monitoring report with sufficient technical, financial, geographic and other relevant information to demonstrate compliance with the applicable set of eligibility criteria and enable sampling by the validation/verification body	The applicable set of eligibility criteria is mentioned in the relevant section and will follow the same approach for new instances as well, please refer to the monitoring section of this PD.
Be validated at the time of verification against the applicable set of eligibility criteria.	The validation and verification will be done at the same time against the applicable set of eligibility criteria. The DOE is a third-party auditor and is eligible to validate and verify the project.
Have evidence of project ownership, in respect of each project activity instance, held by the project proponent from the respective start date of each project activity instance (i.e., the date upon which the project activity instance began reducing or removing GHG	The evidence of project ownership will be held by project developer and will remain same during the inclusion of new project instances.

[3] https://www.worldatlas.com/articles/where-does-the-arabian-desert-lie.html

emissions)	
Have a start date that is the same as or later than the grouped project start date	The project start date will be the same as the grouped project start date. The start date of the project is when the soil preparation for plantation has begun and is in line with section 3.7 of the project standard version. 4.3.
Be eligible for credit from the start date of the instance through to the end of the project crediting period (only). Note that where a new project activity instance starts in a previous verification period, no credit may be claimed for GHG emission reductions or removals generated during a previous verification period	The project instances later added will have to be credited from the start date of the instance through the end of the project crediting period (only).

1.5 Project Proponent

Organization name	Infinite Environmental Solutions LLP (IESLLP)
Contact person	Jimmy Sah
Title	Chief Operating Officer
Address	214-215, Milinda's Manor, Indore Madhya Pradesh, 452001, India
Telephone	+91-7314050174
Email	Jimmy@infisolutions.org

1.6 Other Entities Involved in the Project

Organization name	Infinite Solutions
Role in the project	Carbon project developer
Contact person	Jimmy Sah
Title	Chief Operating Officer

Address	214-215, Milinda's Manor, Indore Madhya Pradesh, 452001, India
Telephone	+91-7314050174
Email	Jimmy@infisolutions.org

1.7 Ownership

The project proponent IESLLP is acting as the owner of the project. The project proponent has full and uncontested legal rights over the project activity as they have entered into agreement with individual farmers/land owners who are the legal owners of the land after due discussion and consent. IESLLP has agreed with the farmers for a 30-year contract period, thus the calculations have been demonstrated for 30 years. The project may be renewed after the expiry of the current contract agreement.

Another entity is Infinite Solutions which acts as the carbon developer for the project.

1.8 Project Start Date

The project start date is the date of plantation for the first activity instance which was carried out on 01-July-2019.

1.9 Project Crediting Period

The project-crediting period will be of 30 years starting from 01/07/2019 to 30/06/2048.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

The estimated annual GHG emission reductions/removals of the project are:

☐<20,000 tCO_2e/year

☐ 20,000 – 100,000 tCO_2e/year

☒ 100,001 – 1,000,000 tCO_2e/year

☐>1,000,000 tCO_2e/year

Project Scale	
Project	✓
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
Year 2019	0
Year 2020	9330
Year 2021	22003
Year 2022	37830
Year 2023	56811
Year 2024	70201
Year 2025	83590
Year 2026	96979
Year 2027	110368
Year 2028	123758
Year 2029	137147
Year 2030	150536
Year 2031	163925
Year 2032	177315
Year 2033	190704
Year 2034	204093
Year 2035	217482
Year 2036	230871
Year 2037	244261
Year 2038	257650
Year 2039	267300
Year 2040	265389

Year 2041	260612
Year 2042	250099
Year 2043	237155
Year 2044	229712
Year 2045	219974
Year 2046	210236
Year 2047	200499
Year 2048	190761
Total estimated ERs	4916593
Total number of crediting years	30
Average annual ERs	163886

1.11 Description of the Project Activity

The main aim of project is to restore the degraded land through reforestation and plantation activity. The project aims to convert the underproductive degraded lands into Agroforestry land with the help of small-scale farmers. The project activity aims to contribute towards forest restoration, climate change mitigation and will provide additional income to farmers through selling of carbon credit. Farmers are the major Participants of this project activity and were trained and their information was upgraded to maintain forest and reduce the soil erosion in the area. The participants were informed about the need of project through the training and demonstrated with future impacts of climate change. Project activity will change the pre-project scenario which was agriculture to plantation activity. Subsistence farmers voluntarily choose to be a part of this activity due to less water availability in areas. Project participants shifted their activity from agriculture to agroforestry plantation. Project is not located in a boundary that is covered by jurisdictional REDD+ program.

Project has established procedures and guidelines to maintain a sustainable forest plantation that included forest management plan, that covers all stages after the land is notified. The below chart shows the plan from silviculture to harvest-

- Management- Information management, GIS, Budgeting.

• Planning- Site layout, Species selection and suitability, Environment assessments, stakeholder identification.

• Silviculture- Nursery, Land management, Marking and pit preparation, planting.

• Forest protection- Fire control, pest control, Disease control, Training management.

Management system

The project activity consists of the plantation that will increase the vegetation cover of the project site. The Afforestation activity will get employment for local people from yearly operational and maintenance of the plants, further the project activity also consists the concept of sustained yield that will include the periodic felling after the completion of rotation period (in case of mahogany the rotation period is 10 years, bamboo is yearly after 4 years of planation). Rotation period is selected based on physical and silvicultural rotation. The plantation activity will provide employment to local people for yearly operational and maintenance of the plants.

Remote sensing is used to have a synoptic view of larger area and to achieve faster as well as more accurate data interpretation. The company uses the multiple online platforms to share the information for better support and reduce the risk of data loss. GPS was used to mark the attributes (Latitude and longitude) for location identification and better accuracy of the plantation location. Apart from these the participant farmers were part of training and management. Budgeting was done and discussed with relevant stakeholders about the future planning and availability of funds for future project management.

Planning- The working plan has been developed to aim at continuity of policy action and controlling the plantation activity at the local level. Working plan covered multiple activities of survey, assessment and revisions on basis of past results and present facts. Planning also include actions those include actions for future in conformity with long term objectives. Planning activity has multiple provisions of control and maintenance of records (Such as: Number of farmers and contracts) and collection of facts. Planning conducted to implement the actives: Formulation, Draft and implementation of working plan. Species were selected based on the climatic suitability, Rotation period and environment assessment.

The planning is divided in four areas, land mapping and planning, management of natural areas, conservation areas and management of commercial areas. For the first one, Micro Forestry assesses the terrain and examines the basic structure of soils and grass vegetation. Special consideration is given to important land planning issues such as land slope, water bodies, identification of any cultural sites, identification of riparian strips and sites for conservation protection, the existence of agricultural farms, condition of old logging roads, and wildlife habitats. Regarding natural areas, environmentally sensitive and conservation areas are identified during the planning phase of operations and designated as conservation zones which are protected to encourage natural regeneration. It is the Company's policy to enable natural

recovery and succession of conservation zones, and as such the primary management activity is to protect these areas, removing alien invasive exotics.

Silviculture- Pomogranate, Mahogany, Mango, Neem, Moringa, Bamboo, Prosopis Cineraria, Morus alba, Neem, Nilgiri and Ziziphus mauritian species was selected for plantation in this project activity. The company aims to grow high quality trees to produce sawn timber, fruits, transmission poles and wood-based panel products. Mahogany is currently the most used species for producing pulpwood for the paper industry, the major timber used for transmission poles across the tropics, it is also used for woodbased products and plywood used in construction industry. Additionally, these species can be suitable for a wide range of climatic conditions and soil types.

The silviculture activities include the following.

Nursery management: The Tree Breeding Centre is the facility where nursery operations take place. The seeds are nursed in trays which contains insert cups.. The seeds are sown in the insert cups by means of hand sowing and a sowing machine. The trays with sownseeds are then taken to the greenhouse with shade netting. After germination of the seeds, the seedlings take some time in the greenhouse depending on the species and the growth rate.

Planting target- Company is targeting to plant tree plantation in the coming years. The area to be covered is approximately 10000 Hectare (25000 Acre).

Land preparation- Land was prepared for plantation before one month of plantation and weeds were removed manually.

Plantation- Planting is done just before the rainy season for better survival. All the plants were brought from nursery to field for direct plantation. Plants were planted with multiple spacing according to species. This activity is expected to be completed by the end of October of each planting year depending on the weather where possible. Soil is then placed around the roots, ensuring that the seedling remains in a vertical position and firmed down using the fingertips.

Weed Control- It is noted that common weeds grow faster than newly planted trees and unless the weeds are controlled effectively. Weeding will be performed manually or mechanically or by hand. No chemical weedicide would be applied on the field.

Forest protection- Forest protection include natural resilience as well as anthropogenic resilience system. Natural resilience is the capacity of the biological system to maintain its structure and patterns of behaviour with respect to external disturbances thus resilience is the ability of a forest ecosystem to withstand such prospective disturbing forces.

Fire control- Trainings are given to farmers and tools are provided to prevent the forest fires. Apart from training and tools, plantation area is planned accordingly to minimize the forest loss and reduce the spread of forest fires. One more step is also taken by maintaining the soil moisture to mitigate forest fires.

Pest and disease control– Organic pesticides and traditional methods are used to control pest in the plantation area. The Company actively employs a range of preventative and control methods to combat pest and disease. It aims to maintain a diversity of planting stock, to ensure that the genetic base of the plantation is wide and varied. The Company aims to avoid exposing trees to extreme temperature or abnormally high or low levels of water or fertilizer, to eliminate wherever possible unhygienic conditions and weeds, and to remove dead or dying plants on a regular basis.

1.12 Project Location

This project is being carried out in Gujarat, Maharashtra, Rajasthan and Madhya Pradesh states of India, an agrarian state. Latitude and longitude of plantation activities has been given in table below for Nagpur plantations: 21.962825 N and 79.042304 E

Table 1: Latitude and Longitude of Agroforestry plantation activity

Figure 1: Map of India

1.13 Conditions Prior to Project Initiation

The land before the implementation of the project activity was degraded agriculture land. Without the implementation of the project the land would continue to degrade.

- **Ecosystem type:** The project area has tropical ecosystem.
- **Current and historical land-use:** Land in the baseline was degraded and will continue to be degraded in the baseline.
- **Has the land been cleared of native ecosystems within 10 years of the project start date?**

  ☐ Yes ☒ No

  Climate –

  Rajasthan, Gujarat, Maharashtra and Madhya Pradesh come under the high temperature Zone and probably that's why the state observes tropical type of climate. Though weather varies from region to region, it's warm in most of the places. Like any other part of India, Rajasthan, Gujarat, Maharashtra and Madhya Pradesh enjoy three seasons, summers, winters, and monsoons. During summers (April-June), the temperature sometimes goes up to 45°C (max) whilst the sun shines brightly over heads.

  Pedology–

- Project site in Gujarat and Rajasthan lie in desert soil while Maharashtra and Madhya Pradesh lies in Black soil type region according to the All India Scheme of Soil Classification.
- Because of the topographical variations, the soil types are diverse in Rajasthan, Gujarat, Maharashtra and Madhya Pradesh. The soils are usually shallow and young in the upper part of the landscape with less developed features and are usually highly eroded.

  Hydrology –

- Surface hydrology of Gujarat also displays high degree of heterogeneity. North Gujarat has very poor drainage density with only four major rivers basins, namely, Sabarmati, Rupen, Banas and Saraswati. The ground water quality in Rajasthan is in general poor (brackish to saline) at deeper levels. All these are seasonal in nature.Nearly 90 lakh farmers in Maharashtra have been impacted by the drought that has devastated the kharif crop, official data shows. In Madhya Pradesh, Major water bearing formations are weathered, jointed & fractured rocks of Proterozoic age where ground water occurs

under water table conditions. Water bearing fractures generally occur within 100 m depth.

Eco–system –

- Rajasthan consists of a large part of desert area ecosystem. Rajasthan, Gujrat covers a large portion of Thar desert ecosystem while Maharashtra and Madhya Pradesh lies in Deccan Plateau and western ghats respectively in central and North western India, has over 159872 Square km area as per FSI 2021 report under forests and is rich in biodiversity. These states have rich Indigenous and tribal community diversity which depends on these forests and biological resources. Their dependence on forest increases the pressure on forests and leads to deforestation.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

India is a member of the UNFCCC (United Nations Framework Convention on Climate Change) and an active member of the ITTO (International Tropical Timber Organization). The Project complies with this regulatory framework, because in the AFOLU scope, Afforestation/ Reforestation is one of several mechanisms by which GHG emissions are expected to be reduced.

The project is compliant with the entire applicable national and regional legal framework of the Government of India. The development of the project is based on guidelines included in environmental regulations and laws in force in the country. In addition, the project responds to the Government's desire to promote forest plantations and the development of agricultural economic activities. To demonstrate that the project activity are in compliance with all the applicable legal and regulatory requirements, the applicable Central and State Government laws and regulations which are implemented prior to 2019 are scrutinized.

The following are the list of such laws which are implemented:

- Biological Diversity Act, 2002 is an act to provide for conservation of biological diversity, sustainable use of its components and fair and equitable sharing of the benefits arising out of the use of biological resources, knowledge and for matters connected therewith or incidental thereto23. This project will help in conservation of biodiversity and their sustainable use as agroforestry plantation will help in increasing tree outside forest, reducing soil erosion and upgrading the quality of soil.

- National Forest Policy (1988) suggested that to maintain ecological balance and to meet the wood-based needs there is a need to have at least one-third area of the country under forests. Only feasible alternative to fulfill such a demand would beadoption of agroforestry practice as this is one system that can provide both wood and food while at the same time conserve and rehabilitate ecosystem.

- The National Agroforestry Policy, 2014 deals with the practice of integrating trees, crops and livestock on the same plot of land and deals with problems agroforestry sector. The policy talks about offering incentive to farmers that have been provided to them as subsidy to maintain the agroforestry plantations done by them under the project.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project has not been registered under any other GHG programs and is not seeking registration under any other GHG programs.

1.15.2 Projects Rejected by Other GHG Programs

The project has not participated in any other programs and has therefore not been rejected by any of them.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

Does the project reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading?

☐ Yes ☒ No

There is no other form of environmental credits included in the project framework or currently ongoing in the project area. The project has not participated in any other program of environmental crediting for GHG emission removals. The project does not intend to generate any other kind of environmental crediting for GHG emission removals.

1.16.2 Other Forms of Environmental Credit

Has the project sought or received another form of GHG-related credit, including renewable energy certificates?

☐ Yes ☒ No

There is no other form of environmental credits included in the project framework or currently ongoing in the project area. The project has not participated in any other program of environmental crediting for GHG emission removals. The project does not intend to generate any other kind of environmental crediting for GHG emission removals.

1.17 Sustainable Development Contributions

1.17.1 Sustainable Development ContributionsActivity Description

SDG	SDG GOALS
	The project helps the communities to sustain on the forest produce that is generated from the plantation. The JFMCs are allowed to consume non-timber based products from these forests.
	The project activity will provide employment to many people including men, women, and young people.
	The project activity will sequester tonnes of Carbon Dioxide (a major greenhouse gas) resulting in positive impacts on the environment.
	Improved management of land as a result of adoption of good practices – thereby increasing the adaptive capacity of the plantation to climate change impacts.

1.17.2 Sustainable Development Contributions Activity Monitoring

Table 2: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	1.4.2	Proportion of total adult population with secure tenure rights to land, with legally recognized documentation and who perceive their rights to land as secure, by sex and by type of tenure	Implemented activities to increase	The project will lead to various communities getting access to the plantation activities for non-timber related valued products.	It is expected that tribal areas in the village communities would be beneficiaries. The actual number shall be available at a later stage.
2)	8.3.1	Proportion of informal employment in non-agriculture employment, by sex	Implemented activities to increase	The project will lead to various communities getting access to the plantation activities for non-timber related valued products.	It is expected that tribal areas in the village communities would be beneficiaries. The actual number shall be available at a later stage.
3)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	By plantation of 10000 ha, this project will prevent the release of 163886 tCO2 into the atmosphere annually.	Prevented the release of 4916593 tCO2 into the atmosphere over its lifetime of 30 years

	15.1.1	Forest area as a proportion of total land area	Implemented activities to increase	The project will promote sustainable use of terrestrial ecosystems, combat desertification, and halt and reverse land degradation and halt biodiversity loss by plantation of 10000 ha.	In total lifetime of the project, it will promote sustainable use of terrestrial ecosystems, combat desertification, and halt and reverse land degradation and halt biodiversity loss by plantation of 10000 ha.
1)	1.4.2	Proportion of total adult population with secure tenure rights to land, with legally recognized documentation and who perceive their rights to land as secure, by sex and by type of tenure	Implemented activities to increase	The project will lead to various communities getting access to the plantation activities for non-timber related valued products.	It is expected that tribal areas in the village communities would be beneficiaries. The actual number shall be available at a later stage.

1.18 Additional Information Relevant to the Project

Leakage Management

There is no displacement of agriculture activities and leakages are considered to be nil. As a result, the overall leakage for the project is nil.

Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

Further Information

Not Applicable

2 SAFEGUARDS

2.1 No Net Harm

The project is designed to have a positive impact on the environment and socio-economic conditions by improving the local ecological conditions through plantation and there is no potential negative impact on the environmental or socio-economic conditions. This project does not use any fertilizers, pesticides, etc. which are considered harmful to the environment and leads biodegradation. This project also improves the economic conditions of the local communities over a period of time and beyond the project's lifetime. In case, if any farmer wishes to withdraw their participation from the program there will be no impact on the project, except the carbon benefits and the same will be notified to VVB during verification time. In addition, during the stakeholder consultation meetings there was no negative feedback received from the farmers. Therefore, this project is deemed to produce positive impacts and there will be no net harm from this project.

2.2 Local Stakeholder Consultation

Multiple stakeholders from different concerned fields were present during the meeting,

- Benefitted farmers
- Local communities and community heads
- Representatives of regional government and non-governmental organization.
- Local NGOs and other FPOs

During the discussions with project proponent and the farmers the feasibility of the project in terms of timber benefits vis-à-vis agricultural revenue were discussed. The crop yield and impact of climate change on the agricultural practices were also discussed. Overall, at the sites a representative from IESLLP (or its partner representative) would start with the introduction about the financial benefits due to Agroforestry plantation. IESLLP (or its partner representative) would also introduce the project idea of the agroforestry activity into farmers. Overall, at the sites a representative from PP, would start with the introduction about the financial benefits due to plantation.

IESLLP (or its partner representative) also discussed about the agreement with each of the land parcel owners and the long term benefits associated due to the partnership. Farmers willing to voluntarily participate to the project were registered in these preliminary meetings. Each interested farmer was then individually visited, in order to assess eligibility and his land, to conduct biophysical evaluation of the area, to determine the planting models and the choice of responsibilities that they would carry out.

As the project was designed and proposed in a participative way, and because it is managed by each Entity in a very cooperative way, each farmer can at any time give advice or recommendations, as a full owner of the project via his Project Entity.

Stakeholder meeting was conducted phase wise from 2019 to 2021 in different districts of Rajasthan, Gujarat, Maharashtra and Madhya Pradesh.

The project proponent explained the process to stakeholder and community members about VCS Program validation and verification and the validation/verification body's site visit. The project proponent requested all the stakeholder cooperation to VVB during the validation process.

Summary of the comments received:

The project is generally well accepted:

A. Farmers are proud to be part of a climate change mitigation program

B. Farmers are thankful for this help as they feel it would provide a better long-term viability as compared to the regular agricultural outputs.

C. The producers also declared they were very interested by the possibility of developing projects of carbon sequestration. The project will help them access this new market and revenue for their efforts to mitigate climate change.

Some doubts or requests were taken into account:

A. Will a real efficient monitoring process be implemented? (they've heard of or known other projects led by other entities that did not include follow up in the long run)

B. Will the farmers receive trainings about agroforestry and forestry practices?

C. How will the farmers fight against the pests?

D. How will the carbon credits be claimed and how much revenue the farmers would receive?

E. By when would the farmers receive the money from carbon credits?

F. What will be the requirements from individual farmers to claim carbon credits?

G. Report on how due account was taken of any comments received

In the project development, all these questions were taken into account: A monitoring plan has been developed and the cooperative is highly conscious that a monitoring in the long run is crucial for the development and permanence of the project. All farmers will be covered under farmers training plan. The plan would take into account the activity right from sourcing of seed, to preparing the land, planting of saplings and then management of the plants, pest control, fire control etc. The farmers were made aware of the climate change implications due to rise of temperature and its harmful impacts. Discussion on the possible mitigation as well as how forest is the best option available to fight global warming was carried out. All the farmers were in unison to make a positive impact on the environment.

Discussion on various carbon credits mechanisms were carried out and various project failures were discussed. The monitoring mechanism as well as carbon stock assessment was discussed and farmers agreed to be part of the sampling measures that would be implemented during the entire period. Sharing of carbon credits was explained and they were happy to be part of such a positive initiative.

Figure 2: Glimps of Community interaction




2.3 Environmental Impact

The A/R VCS project activity does not have any negative environmental impact because the project activity is directed towards improving the local environment. The main environmental impact of the project is very clearly positive: by creating source of timber, the project significantly reduces the pressure on the surrounding natural forests.

Rajasthan, Gujarat, MP and Maharashtra has less forest area of 4.87%, 9.62%, 25.14% and 16.51% of the total state's geographical area (ISFR 2021) and TOF can be increased through the project's plantation activities that will not jeopardize food security, forests and biodiversity which is disappearing at an alarming rate.

The A/R VCS project activity does not have any negative environmental impact because the project activity will directly improve the conditions of the environment due to various plantation activities.

By the plantations that enable sustainable agroforestry, timber production, this project will fight deforestation and thus contributes to the preservation of biodiversity, quality of water resources

and the fight against soil erosion. Also, the project is designed to increase sequestration capacity of CO2, therefore playing a positive role in regulation of climate change.

2.4 Public Comments

Public comments if received shall be addressed by project proponent.

2.5 AFOLU-Specific Safeguards

Through the local stakeholder meeting conducted it has been realized that there are no risks to the local farmers of Rajasthan, Gujarat, Maharashtra and MP under the project area.

The suggestions and feedback provided by the stakeholders are described in section 2.2 (Local Stakeholder Consultation section). This section focuses on discussing the risks due to the project implementation. Overall no risk is reported.

Risks to local population

There are no risks associated with the local population. The impacts on populations are mainly positive.

Food security of local populations

Due to mono cropping pattern in agriculture, the soil gradually gets degraded, which limits the growth of agricultural crops. But, the agroforestry pattern will naturally fertilize the soils with nitrogen and carbon. Improvement in soil fertility improves the quality of crop thereby ensuring enhanced returns to the farmers.

Increased incomes

This project will increase farmer's cash flows and incomes through the sale of agricultural production and timber, as well.

Negative impacts of the project on local populations are negligible.

The grievance redress procedure will be set up as stated in the rules and requirements of the VCS standard v4.3

1) The project proponent shall attempt to amicably resolve all grievances and provide a written response to the grievances in a manner that is culturally appropriate.

2) Any grievances that are not resolved by amicable negotiations shall be referred to mediation by a neutral third party.

3) Any grievances that are not resolved through mediation shall be referred either to a) arbitration, to the extent allowed by the laws of the relevant jurisdiction or b) competent courts in the relevant jurisdiction, without prejudice to a party's ability to submit the grievance to a competent supranational adjudicatory body, if any.

If grievances of the landowner occur that could jeopardize the project performance or continuity that would be taken care by the project proponent.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The CDM consolidated methodology AR-ACM0003: Afforestation and reforestation of lands except wetlands -Version 02.0 is applied.

In addition, the following tools are applied by the project:

- Combined tool to identify the baseline scenario and demonstrate additionally in A/R CDM project• activities (Version 01)
- Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM projectactivities (Version 04.2)
- Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities (Version 01.1.0)
- VCS AFOLU Non-Permanence Risk Tool (Version 4.0)

3.2 Applicability of Methodology

CONDITION	JUSTIFICATION
The land subject to the project activity does not fall in wetland category	As per the IPCC GPG LULUCF 2003, wetlands are defined as lands that are covered or saturated by water for all or part of the year (e.g., peatland) and that does not fall into the forest land, crop land, grass land or settlements categories including reservoirs, natural rivers and lakes. The project site consists of degraded agricultural land and does not cover any wetlands. Hence, this criterion is applicable.
Soil disturbance attributable to the project activity does not cover more than 10 per cent of area in each of the following types of land, when these lands are included within the project boundary: (i) Land containing organic soils;	The project area is characterized as degraded land. The type of soil in the project area are red, yellow, loamy, sandy and sandy loam soils as described in section 1.13 and, thereafter, does not fall within the types of land referred in points (i) and (ii). Such croplands under tropical conditions have less carbon compared to plantations and forest cover. Therefore, it is

(ii) (ii) Land which, in the baseline, is subjected to land-use and management practices and receives inputs listed in appendices 1 and 2 to this methodology.	expected for soil organic carbon to increase more in the presence of the project activity relative to the previous land use. The lands of Appendix 1 refer to cropland in which soil disturbance is restricted. Plantation in the area, and cultivation with reduced tillage and limited use of inputs are followed by the planters which is not restricted in the methodology. Therefore, the project area does not classify as land listed in Appendix 1. The lands of Appendix 2 refer to grassland in which soil disturbance is restricted. There are no grasslands in the project area with the use of any inputs. Therefore, the project area does not classify as land listed in Appendix 2.
Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities: a) Forestation of the land within the proposed project boundary performed with or without being registered as the A/R CDM project activity shall not lead to violation of any applicable law even if the law is not enforced. b) This tool is not applicable to small - scale afforestation and reforestation project activities	a) The project is in compliance with applicable legal and regulatory requirements. b) This project is not a small-scale afforestation and reforestation project, as it does not fulfil the small-scale conditions as defined by VCS.
Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities.	This tool has no internal applicability conditions.
Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities: This tool is applicable when the areas of land, the baseline scenario, and the project activity meet the following conditions: a) The areas of land to which this tool is applied: i. Do not fall into wetland category; or ii. Do not contain organic soils as defined in “Annex A: glossary” of the IPCC GPG LULUCF 2003. iii. Are not subject to any	a) Project lands are not wetlands or peatlands. The project area is characterized as degraded land. The type of soil in the project area are red, yellow, clay, loamy, sandy and sandy loam soils. Such lands under tropical conditions have less carbon compared to plantations and forest cover. The lands of Table 1 refer to cropland in which soil disturbance is restricted. Plantation in the area and cultivation with reduced tillage and limited use of inputs are followed by planters which is not restricted in the methodology. Therefore, the project area does not classify as

of the land management practices and application of inputs as listed in the Tables 1 and 2. b) The A/R CDM project activity meets the following conditions: i. Litter remains on site and is not removed in the A/R CDM project activity; and ii. Soil disturbance attributable to the A/R CDM project activity, if any, is: • In accordance with appropriate soil conservation practices, e.g. follows the land contours. • Limited to soil disturbance for site preparation before planting and such disturbance is not repeated.	land listed in Table 1. The lands of Table 2 refer to grassland in which soil disturbance is restricted. There are no grasslands in the project area with the use of any inputs. Therefore, the project area does not classify as land listed in Table 2. b) In this project case litter is not removed and soil disturbances are limited to those during site preparation (digging of holes to plant seedlings).

3.3 Project Boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Above ground biomass	CO_2	Yes	CO2 emissions from removal of preexisting vegetation are conservatively considered
		CH_4	No	Pre-existing vegetation is not slashed nor burned
		N_2O	No	Pre-existing vegetation is not slashed nor burned
		Other	-	
	Below ground biomass	CO_2	Yes	CO2 emissions from removal of preexisting vegetation are conservatively considered
		CH_4		Pre-existing vegetation is not slashed nor burned
		N_2O		Pre-existing vegetation is not slashed nor burned
		Other		
Project	Above ground biomass	CO_2		This is the major carbon pool of the project activity
		CH_4		Biomass in project scenario is not slashed nor burned

Source		Gas	Included?	Justification/Explanation
		N_2O		Biomass in project scenario is not slashed nor burned
		Other		
	Below ground biomass	CO_2		This is the major carbon pool of the project activity
		CH_4		Biomass in project scenario is not slashed nor burned
		N_2O		Biomass in project scenario is not slashed nor burned
		Other		

3.4 Baseline Scenario

Following Section 5.2, paragraph 11 of AR-ACM0003, the baseline scenario of the agroforestry project is discontinuation on the pre-project land uses, that is agriculture activity and further continuation of the land uses will be agroforestry plantations, for a minimum period of 30 years.

On plantation farms, it means continuation of cropping management practices and reduce the process of degradation and loss of tree cover due to edaphic conditions.

Most Likely Scenario: The methodology requires justification that "the most likely baseline scenario of the large-scale A/R CDM project activity is considered to be the land-use prior to the implementation of the project activity, either grasslands or croplands." The baseline field observation as detailed in the "Project Summary" worksheet indicates the project areas are grassland and cropland prior to implementation of the project activity. That this is also the most likely use of the project areas, without the project activity, is supported by:

- The project areas are private lands owned by subsistence farmers conducting the project activity. They have a history of farming and use of the land, other than natural forest or long-term forestry practice.
- These lands are located in an area populated by subsistence farmers, who use wood for their primary fuel. As supported by the references below, wood use, agriculture and increasing population have been key factors in deforestation.
- These factors lead to the conclusion that there is no reason to believe that the project areas will revert to forest area without intervention.
- There are no alternative uses of this land that can be reasonably expected.

Literature Regarding Changes in Baseline Carbon Stocks: There is a clear pattern of rural firewood use and forest degradation in Gujarat, Madhya Pradesh, Rajasthan and Maharashtra that supports the case that carbon stocks on each individual project area would be expected to decline or, at best, are increasing at a rate of less than 10% compared to the expected removal by sinks. The lands of and surrounding the project areas have been degrading for decades, due to human intervention. Overall, fuel wood accounts for about 60% of the total fuel consumption in rural India. In estimating fuel wood consumption, the Forest Survey of India showed only 17 million tones to be available on a sustainable basis and 86 million tonnes were not.

The specific project areas are part of this environment. They are lands owned and used by the rural residents and are subject to constant pressure to provide fuel wood, food and livelihood form these subsistence-level farmers.

3.5 Additionality

The demonstration and assessment of the additionality of the project is made in accordance with the applied methodology (AR-ACM0003, Version 01.0.0) following the steps of the "Combined tool to identify the baseline scenario and demonstrate additionally in A/R CDM project activities" (Version 01)

STEP 0. Preliminary screening based on the starting date of the A/R project activity

The planting activity was conducted from July 2019, which is before the registration date and after 31 December 1999. The starting date of the A/R project was 2019, which was after 31 December 1999.

The incentive from the planned sale of carbon credits was seriously considered in the decision to proceed with the project activity..

STEP 1. Identification of alternative scenarios

Sub-step 1a. Identify credible alternative land use scenarios to the proposed project activity

According to additionally tool, the alternative land use scenario of the proposed project includes:

The scenario applicable for Degraded land under cultivation are as follows;

- Scenario 1: Continuation of existing land use or status quo
- Scenario 2: Proposed project not undertaken as an A/R Carbon project
- Scenario 3: Commercial plantations on these lands

Degraded land: The land for the project belongs to the individual small and marginal farmers as well as large community land/large farmers. The ownership lies with the land owner. Currently, this land category is subjected to degradation or usage under other agricultural practices. Another alternative is to implement the A/R activity not as a Carbon project

Sub-step 1b. Consistency of credible alternative land use scenarios with enforced mandatory applicable laws and regulations

The implementation of A/R activity is not a mandatory requirement, the public and private lands would continue to be in the degraded state unless taken action.

Step 2: Barrier analysis

The barrier analysis is used to demonstrate that the alternative use of public and private lands for A/R activity faces investment, technological and ecological barriers.

Investment barrier:

No private capital is available from domestic or international capital markets due to risks associated with investments in forestry projects also the banks in India are conservative and have stringent lending guidelines and high-interest rates for this kind of forestry plantation due to environmental risk factors and no returns. As a case, some bank has an interest rate from 7-13 percent for the agriculture segment[4]. The expected financial benefits obtainable through carbon finance will support the project to overcome the obstacle to some extent. Moreover, banks provide loans only for timber plantations, not for agroforestry plantations[5]. Farmers are marginal / small farmers and don't have the initial capital to invest in plantations.

Further, the revenue's to the individual farmers are accrued only after 4-5 years when the trees starts bearing fruits/timber/bamboo products, till that time they have to invest time and resources to nurture and develop the orchard.

This barrier prevents the alternative land use scenarios 2 and 3 (Afforestation/reforestation of the land within the boundaries of the project activities performed without being registered as the ARR VCS project activity.

Technological barriers

Lack of access to planting materials, constraining in using fertilizers, and breakdown of the agricultural economy (including lack of seeds and agricultural equipment) is among the major technological barriers. These barriers have been identified, for example by NABARD, to be among the main reasons for the decrease in agricultural land use and organic farming[6]. The

[4] http://www.aryavart-rrb.com/interest_rates_adv.html

[5] https://www.nabard.org/auth/writereaddata/file/Forestry.pdf

[6] https://www.nabard.org/demo/auth/writereaddata/File/OC%2038.pdf

result of these constraints is to reduce productivity (increase the farm gate cost of fertilizers) and declines the soil organic carbon content with a resultant decline in soil fertility. Due to some regulations and risks associated with agroforestry, the farmers are not having an interest in the plantation[7]. Local communities are committed to planting trees, but without the carbon component, they do not have adequate access to technical and organizational assistance.

Communities need the support of NGOs/FPOs to implement and maintain the project as they are not used to cultivating plants that don't produce immediate output or other parts for nourishment purposes. In fact, at the beginning of the project, it was difficult to receive support and collaboration from the local people. The proposed project activity has anyhow been able to surpass the initial difficulties working together with the local communities and offering local people knowhow and training.

Barriers related to local tradition

Policy initiatives and strict trade regulations has not supported the wide adaptation of agroforestry in various states. Through prominent agroforestry models being developed in different parts of the country, there is no clear-cut mechanism from seed procurement to marketing of the products in the country (Chavan, S. B. et al)[8].

Barriers due to local ecological conditions:

The local ecological conditions only allow some species to grow but not the fruit-bearing species. The land has been identified as degraded and less productive as per the survey. Due to the limited availability of water, the land is a best case option for water intensive agriculture activities. The land has been degraded because of excessive usage of fertilizer and pesticides in the baseline. In the baseline, the land will continue to be degrading because of chemical use and it will continue to harm the environment in the absence of implemented project activity. The farmers were trained to shift to organic habits and nature-based pesticides (For example- Neem extract, salt water and whitewash). The farmers are provided with the training and participation is ensured in the plan.

Barriers relating to markets, transport, and storage; -

Unregulated and informal markets for products and services prevent the transmission of effective information to project participants; -

The remoteness of land area and undeveloped roads and infrastructure incur large transportation expenditures, thus eroding the competitiveness and profitability of products from the land use.

[7] https://agricoop.nic.in/sites/default/files/National%20Agroforestry%20Policy%202014.pdf

[8] Chavan, S. B. et al. "National Agroforestry Policy in India: a low hanging fruit." **Current Science** 108 (2015): 1826-1834.

Possibilities of large price risk due to the fluctuations in the price's products over the project period in the absence of efficient markets and insurance mechanisms

The absence of facilities to convert, store and add value to products resulting from land-use limits the possibilities of carbon capture is not a common and feasible land-use scenario for these projects.

Outcome of Step 2a:

- Investment Barrier ((barriers no access to funding)
- Technological Barrier.
- Barriers related to local tradition
- Barriers due to local ecological conditions:
- Barriers relating to markets, transport, and storage; -

Sub-step 2b: Elimination of land use scenarios that are prevented by the identified barriers:

The alternative scenarios are prevented by at least one of the barriers listed in Step 2a, thus these alternative scenarios are eliminated from further consideration.

Project Alternative	Barrier Faced
Continuation of existing land use or status quo	No Barrier faced
Proposed project not undertaken as an A/R Carbon project	Investment Barrier Technological Barrier Barriers related to local tradition Barriers due to local ecological conditions: Barriers relating to markets, transport, and storage
Commercial plantations on these lands	No Barrier faced

The only alternative scenario not prevented by any barrier is the scenario "The continuation of the current situation, not requiring any investment or expenses to maintain the current situation i.e. continuation of the pre-project land use". In accordance with the applied tool this alternative scenario is identified as the baseline scenario.

Outcome of Sub-step 2b:

List of land use scenarios that are not prevented by any barrier:

- Continuation of pre-project land use (degraded land with no plantation or agricultural land)

Sub-step 2c. Determination of baseline scenario: Scenario 1, continuation of pre-project use, remains the possible baseline scenario.

According to the tool: Is Plantation without being registered as an A/R CDM project activity included in the list of land use scenarios that are not prevented by any barrier? NO

→ If no, then:

Does the list contain only one land use scenario? YES

→ If yes, then the remaining land use is the baseline scenario.

STEP 3. Investment analysis (if needed) Scenario 1 remains the only possible baseline scenario, which makes investment analysis not necessary.

STEP 4. Common practice analysis In the project area, i.e. There is no ARR activities have been implemented previously specifically for implementation of Agro-forestry projects, which is similar to this VCS project. Therefore, the project is not a common practice in the project area.

Outcome: The project is additional.

3.6 Methodology Deviations

There are no methodological deviations.

4 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 BaselineEmissions

The baseline net GHG removals by sinks shall be calculated as follows:

$C_{BSL,t} = C_{TREE} \_ B_{SL,t} + C_{SHRUB} \_ B_{SL,t} + C_{DW} \_ B_{SL,t} + C_{LI} \_ B_{SL,t}$ Equation (1)

Where:

$C_{BSL,t}$ = Baseline net GHG removals by sinks in year t; t CO2-e

C_{TREE} _ $B_{SL,t}$ = Change in carbon stock in baseline tree biomass within the project boundary in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO2-e

C_{SHRUB}_ $B_{SL,t}$ = Change in carbon stock in baseline shrub biomass within the project boundary, in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO2-e

C_{DW} _ $B_{SL,t}$= Change in carbon stock in baseline dead wood biomass within the project boundary, in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t CO2-e

C_{LI} _ $B_{SL,t}$ = Change in carbon stock in baseline litter biomass within the project boundary, in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t CO2-e

4.2 ProjectEmissions

The actual net GHG removals by sinks are estimated using the equation 2 of the methodology AR ACM0003 (Version 02.0).

$\Delta C_{ACTUAL,t} = \Delta C_{P,t} - GHG_{E,t}$Equation (2)

Where:

$\Delta C_{ACTUAL,t}$ = Annual actual net GHG removals by sinks at time t; t CO2-e yr-1

$\Delta C_{P,t}$ = Change in carbon stocks in project, occurring in the selected carbon pools, at time t; t CO2-e yr-1

$GHG_{E,t}$= Increase of non-CO2 GHG emissions within the project boundary as a result of the implementation of the A/R project activity, in year t; t CO2-e

As mentioned before, the use of fire for site preparation and/or to clear the land of harvest residue prior to replanting is not part of the project activities and therefore non-CO2 GHG emissions are considered as zero.

Change in the carbon stocks in project, occurring in the selected carbon pools in year t shall be calculated as follows:

$$\Delta C_{P,t} = \Delta C_{TREE\_PROJ,t} + \Delta C_{SHRUB\_PROJ,t} + \Delta C_{DW\_PROJ,t} + \Delta C_{LI\_PROJ,t} + \Delta C_{SOC\_AL,t}$$

Equation (3)

Where:

$\Delta C_{P,t}$ = Change in the carbon stocks in project, occurring in the selected carbon pools, in year t; t CO2-e

$\Delta C_{TREE\_PROJ,t}$= Change in carbon stock in tree biomass in project in year t, as estimated in the tool " Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO2-e

$\Delta C_{SHRUB\_PROJ,t}$ = Change in carbon stock in shrub biomass in project in year t, as estimated in the tool " Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO2-e

$\Delta C_{DW\_PROJ,t}$= Change in carbon stock in dead wood in project in year t, as estimated in the tool " Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t CO2-e

$\Delta C_{LI\_PROJ,t}$ = Change in carbon stock in litter in project in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t CO2-e

$\Delta C_{SOC\_AL,t}$= Change in carbon stock in SOC in project, in year t, in areas of land meeting the applicability conditions of the tool "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities", as estimated in the same tool; t CO2e

4.3 Leakage

The calculations for leakage are determined through Tool AR0015: Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity.

$LK_{AGRIC,t} = (44/12) \times (\Delta C_{BIOMASS,t} + \Delta SOC_{LUC,t})$ (Equation 4)

$\Delta C_{BIOMASS,t} = [1.1 \times b_{TREE} \times (1+R_{TREE}) + b_{SHRUB} \times (1+ RS)] \times CF \times A_{DISP,t}$(Equation 5)

$\Delta_{SOCLUC,t} = SOC_{REF} \times (f_{LUP} \times f_{MGP} x f_{INP} - f_{LUD} \times f_{MGD} \times f_{IND}) \times A_{DISP,t}$(Equation 6)

Where:

$LK_{AGRIC,t}$ = Leakage emission resulting from displacement of agricultural activities in year t; t CO2e

$\Delta C_{BIOMASS,t}$ = Decrease in carbon stock in the carbon pools of the land receiving the activity displaced in year t; t d.m.

CF = Carbon fraction of woody biomass; dimensionless.

$A_{DISP,t}$ = Area of land from which agricultural activity is being displaced in year t; ha.

b_{TREE} = Mean above-ground tree biomass in land receiving the displaced activity; t d.m. ha-1.

R_{TREE} = Root-shoot ratio for trees in the land receiving the displaced activity; dimensionless.

b_{SHRUB}= Mean above-ground shrub biomass in land receiving the displaced activity; t d.m. ha-1.

RS = Root-shoot ratio for shrubs in the land receiving the displaced activity; dimensionless.

$\Delta SOC_{LUC,t}$ = Change in soil organic carbon (SOC) stock due to land-use change in the land receiving the displaced activity in year t; tC ha-1.

SOC_{REF} = SOC stock corresponding to the reference condition in native lands by climate region and soil type applicable to the land receiving the displaced activity; t C ha-1.

f_{LUP},f_{MGP}, f_{INP} = Relative SOC stock change factors for land-use, management practices, and inputs respectively, applicable to the receiving land before the displaced activity is received; dimensionless.

f_{LUD}, f_{MGD}, f_{IND} = Relative SOC stock change factors for land-use, management practices, and inputs respectively, applicable to the receiving land after the displaced activity has been received; dimensionless.

t = 1, 2, 3 …years elapsed since the start of the A/R CDM project activity.

As there is no displacement of agricultural production within the project boundary as a result of the project activities, leakage emissions are considered to be zero for the life of the project.

4.4 Estimated Net GHG Emission Reductions and Removals

The ex-ante estimation of tree biomass in the first group of instances and the grouped was performed taking into account the initial studies of the project proponent.

The calculations for Agroforestry and Bamboo/timber plantation were calculated separately and the total has been presented below.

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2019	0	0	0	0
2020	0	9330	0	9330
2021	0	22003	0	22003
2022	0	37830	0	37830

2023	0	56811	0	56811
2024	0	70201	0	70201
2025	0	83590	0	83590
2026	0	96979	0	96979
2027	0	110368	0	110368
2028	0	123758	0	123758
2029	0	137147	0	137147
2030	0	150536	0	150536
2031	0	163925	0	163925
2032	0	177315	0	177315
2033	0	190704	0	190704
2034	0	204093	0	204093
2035	0	217482	0	217482
2036	0	230871	0	230871
2037	0	244261	0	244261
2038	0	257650	0	257650
2039	0	267300	0	267300
2040	0	265389	0	265389
2041	0	260612	0	260612
2042	0	250099	0	250099
2043	0	237155	0	237155
2044	0	229712	0	229712
2045	0	219974	0	219974
2046	0	210236	0	210236

2047	0	200499	0	200499
2048	0	190761	0	190761
Total	0	4916593	0	4916593

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	Location of project area
Data unit	Latitude and longitude
Description	Single point location of a discrete project area
Source of data	GPS
Value applied:	As per Work Sheet, field data
Justification of choice of data or description of measurement methods and procedures applied	Direct measurement of latitude and longitude of a point within a project area using a GPS. Used to provide a simple location of a discrete project area.
Purpose of Data	Calculation of project emissions
Comments	None

Data / Parameter	Total area of project
Data unit	Hectare
Description	Size of the area where the project activity has been implemented.
Source of data	Data is provided by Project proponent
Value applied:	As per the data sheet provided by Project Proponent

Justification of choice of data or description of measurement methods and procedures applied	
Purpose of Data	Calculation for emission reduction both estimated and actual
Comments	None

Data / Parameter	Mean Annual Increment (MAI)
Data unit	Tonnes per hectare per year
Description	Average growth of tree per year
Source of data	Forest Departments/ Peer reviewed literature
Value applied:	Varies as per the species
Justification of choice of data or description of measurement methods and procedures applied	It is used to calculate the biomass of tree species.
Purpose of Data	Calculation of estimated emissions reduction
Comments	None

Data / Parameter	Soil Organic Carbon (SOC)
Data unit	Tonnes/ hectares
Description	Soil organic carbon (SOC) refers only to the carbon component of organic compounds.
Source of data	Laboratory testing of soil sample to calculate percentage organic carbon
Value applied:	
Justification of choice of data or description of measurement methods	N/A

and procedures applied	
Purpose of Data	Calculation of estimated emissions reduction
Comments	None

Data / Parameter	Carbon Fraction (CFtree)
Data unit	tC/t.d.m
Description	Carbon fraction of tree biomass
Source of data	This carbon fraction was taken from IPCC (2006), Guidelines for National Greenhouse Gas Inventories-Volume 4 Agriculture, Forestry and Other Land Use, Forestry, Table 4.3, tropical/subtropical wood
Value applied:	0 .49
Justification of choice of data or description of measurement methods and procedures applied	Direct measurement of latitude and longitude of a point within a project area using a GPS. Used to provide a simple location of a discrete project area.
Purpose of Data	Calculation of project emissions
Comments	None

Data / Parameter	Wood density
Data unit	T dm/m3
Description	Weight to volume equation for six tree species selected for project.
Source of data	FAO Appendix 1 - List of wood densities for tree species from tropical America, Africa, and Asia.
Value applied:	Default Value according to the tree species
Justification of choice of data or description of measurement methods and procedures applied	Every tree species have their defined wood density value provided by FAO 0.67 is taken as default value from Good Practices IPCC Guidelines, 1996.

Purpose of Data	Calculation of project emissions
Comments	None

Data / Parameter	CO2e
Data unit	tCO2/tC
Description	Factor applied to convert the tree carbon sequestered to tree CO2e sequestered
Source of data	IPCC default value.
Value applied:	44/12=3.67
Justification of choice of data or description of measurement methods and procedures applied	IPCC default value.
Purpose of Data	Calculation of project emissions removal
Comments	None

Data / Parameter	Root-to-Shoot Ratio (R)
Data unit	Dimensionless
Description	Root-shoot ratio appropriate for biomass stock
Source of data	Values from IPCC Good Practice Guidance for LULUCF (2003) Table 3A.1.8 average belowground to aboveground biomass ratio (rootshoot ratio, r) in natural regeneration by broad category (tonnes dry matter/tonne dry matter)
Value applied:	0.27
Justification of choice of data or description of measurement methods and procedures applied	The ratios of belowground to aboveground biomass (root-to-shoot ratio) is used to account for belowground biomass in living biomass estimations as it is not possible to estimate BGB through measurement for a living tree species.

Purpose of Data	Calculation of project emission removals
Comments	None

5.2 Data and Parameters Monitored

Data / Parameter	DBH
Data unit	meters
Description	Diameter at breast height of tree
Source of data	Field measurements
Description of measurement methods and procedures applied	Measurements will be performed by the team
Frequency of monitoring/recording	At the start of the project activity and every five year since the initial verification and certification of an A/R project activity
Value applied:	
Monitoring equipment	Diameter tape
QA/QC procedures applied	Standard operating procedures are made to ensure the correct and validating data collection for each of the monitoring parameters
Purpose of data	Calculation of actual project emissions
Calculation method	Measured all tree species that are equal or more than 10 cm girth within the sample plot. Girth of the tree is measured at 1.37 m height. From the Girth at breast height (GBH), DBH is calculated using the formula DBH= GBH/(PI)
Comments	None

Data / Parameter	Vtree
Data unit	m^3
Description	Stem volume of trees of species in sample plot of stratum at time

	tcalculated using volume equations.
Source of data	Volume equations of each species were taken from India State of Forest Report, 2019 and Volume Equations for Forests of India in peer reviewed publications.
Description of measurement methods and procedures applied	For most of the tree species, FSI regional volume equations will be applied for the volume estimations The general equation used for tree species is V=(-0.003013/D2H+ 0.351923)*D2H
Frequency of monitoring/recording	At the start of the project activity and every five year since the initial verification and certification of an A/R project activity.
Value applied:	It will be calculated
Monitoring equipment	N/A
QA/QC procedures applied	Standard operating procedures are made to ensure the correct and validating data collection for each of the monitoring parameters.
Purpose of data	Calculation of actual project emissions
Calculation method	Every tree has defined equations to calculate volume
Comments	None

Data / Parameter	BGBtree
Data unit	t.d.m/ha
Description	The root-shoot ratio used to determine the proportion of belowground biomass in relation to the aboveground biomass.
Source of data	Field measurements
Description of measurement methods and procedures applied	Measurements will be performed by the team
Frequency of monitoring/recording	At the start of the project activity and every five year since the initial verification and certification of an A/R project activity.
Value applied:	It will be calculated

Monitoring equipment	
QA/QC procedures applied	Standard operating procedures are made to ensure the correct and validating data collection for each of the monitoring parameters.
Purpose of data	Calculation of project emissions
Calculation method	BGB= 0.27* AGB (IPCC, 2006)
Comments	None

Data / Parameter	Standard Deviation
Data unit	t d.m. (or t d.m. ha-1)
Description	Estimated standard deviation of biomass stock in stratum i
Source of data	Calculated
Description of measurement methods and procedures applied	
Frequency of monitoring/recording	At the start of the project activity during pilot survey
Value applied:	
Monitoring equipment	It is calculated for every strata
QA/QC procedures applied	N/A
Purpose of data	Calculation of uncertainty of project emissions/removals
Calculation method	N/A
Comments	None

Data / Parameter	AGBtree
Data unit	t.d.m/ha
Description	Above ground Biomass of trees planted under agroforestry
Source of data	Field measurements
Description of measurement methods and procedures applied	
Frequency of monitoring/recording	At the start of the project activity and every five year since the initial verification and certification of an A/R project activity
Value applied:	It will be calculated
Monitoring equipment	N/A
QA/QC procedures applied	Standard operating procedures are made to ensure the correct and validating data collection for each of the monitoring parameters.
Purpose of data	Calculation of actual project emissions
Calculation method	AGB= Volume* Wood density* BEF
Comments	None

Data / Parameter	dSOC
Data unit	tC/ha/y
Description	The rate of SOC changes within the project boundary under baseline conditions.
Source of data	N/A
Description of measurement methods and procedures applied	Value of the calculation model “Tool for estimation of changes in soil organic carbon stocks due to the implementation of A/R CDM project activities”.

Frequency of monitoring/recording	At the start of the project activity and every five year since the initial verification and certification of an A/R project activity
Value applied:	It will be calculated
Monitoring equipment	N/A
QA/QC procedures applied	Standard operating procedures are made to ensure the correct and validating data collection for each of the monitoring parameters.
Purpose of data	Calculation of carbon stock density of soil organic carbon (SOC)
Calculation method	
Comments	None

Data / Parameter	Wi
Data unit	Dimensionless
Description	Relative weight of the area of stratum I, the area of the stratum i divided by the project area.
Source of data	Calculated
Description of measurement methods and procedures applied	
Frequency of monitoring/recording	Measured at each verification event
Value applied:	Summation of Wi is 1
Monitoring equipment	N/A
QA/QC procedures applied	N/A

Purpose of data	Calculation of baseline emissions
Calculation method	The area of the stratum i divided by the project area.
Comments	None

Data / Parameter	Htree
Data unit	meters
Description	Height of tree
Source of data	Field measurements
Description of measurement methods and procedures applied	
Frequency of monitoring/recording	At the start of the project activity and every five years since the initial verification and certification of an A/R project activity.
Value applied:	Height of all project trees will be measured
Monitoring equipment	Altimeter
QA/QC procedures applied	Standard operating procedures are made to ensure the correct and validating data collection for each of the monitoring parameters.
Purpose of data	Calculation of project emissions
Calculation method	Measured height of all tree within the sample plot with the help of Ravi altimeter (A height measurement instrument). Measured data is initially recorded in the survey sheets which will be later entered in to Excel format for CER calculation.
Comments	None

Data / Parameter	Ai

Data unit	Hectare
Description	Area of stratum i
Source of data	As per data sheet
Description of measurement methods and procedures applied	
Frequency of monitoring/recording	Measured at start of the project and at each verification event
Value applied:	
Monitoring equipment	N/A
QA/QC procedures applied	N/A
Purpose of data	Calculation of baseline and project emissions
Calculation method	Calculation of actual net GHG removals by sinks
Comments	None

Data / Parameter	Project trees
Data unit	Count of tree in numbers
Description	The number of six tree species year wise for each project area provided by Project proponent
Source of data	As per sheet
Description of measurement methods and procedures applied	Trees were physically counted in the field.
Frequency of monitoring/recording	Measured at start of the project and at each verification event
Value applied:	
Monitoring equipment	N/A

QA/QC procedures applied	N/A
Purpose of data	Calculation of baseline and project emissions
Calculation method	Calculation of actual net GHG removals by sinks
Comments	None

Data / Parameter	Biomass Expansion Factor (BEF)
Data unit	Dimensionless
Description	Biomass expansion factor, expressing the additional biomass of a tree when only stem volume is known
Source of data	Values from IPCC Good Practice Guidance for LULUCF (2003) Table 3A.1.1012. Default values of biomass expansion factors (BEFs).
Description of measurement methods and procedures applied	Value is taken according to the plantation models (canopy density cover).
Frequency of monitoring/recording	
Value applied:	3.4
Monitoring equipment	N/A
QA/QC procedures applied	N/A
Purpose of data	Calculation of project emission removals
Calculation method	
Comments	None

5.3 Monitoring Plan

Accordance with Section 6.1 of Methodology AR-ACM0003 (version 2.0), the purpose of this monitoring plan is to collect all relevant data necessary for:

(a) Verification that the applicability conditions listed under paragraphs 3 and 4 has been met;

(b) Verification of changes in carbon stocks in the pools selected;

(c) Verification of project emissions and leakage emissions.

The methods for calculating biomass consist of multiple unit measurements that follow allometric calculations. Major eligible carbon pools are Above Ground Biomass (AGB), Below Ground Biomass (BGB) and Soil Organic Carbon (SOC).

The steps involved in the process of assessing Carbon Stock are:

1. Delineation of the project boundaries

With the help of geo-coordinates collected from the respective divisional forest office of Gujarat, base map for each site was prepared. And on the basis of these base maps, project areas are delineated and demarcated to facilitate accurate measuring, monitoring, accounting and verification of the project activities.

2. Stratification, Mapping and Sampling Design

The project area would be divided into homogenous strata based on i.e. plantation model such as high density block plantation, low density block plantation and periphery and boundary plantation through preliminary field survey and further through satellite imagery analysis.

3. Estimation of number of sample plots

The formula for estimating the number of sample plots to be laid out at each pilot project site that will be statistically significant is mentioned below.

$$n = \frac{N * t_{VAL}^{\ 2} * \left(\sum_i w_i * s_i \right)^2}{N * E^2 + t_{VAL}^{\ 2} * \sum_i w_i * s_i^{\ 2}}$$

Where,

E = Allowable error or the desired half-width of the confidence interval. Calculated by multiplying the mean carbon stock by the desired precision (that is, mean carbon stock x 0.1, for 10 per cent precision),

t = Sample statistic from the t-distribution table for 90% confidence level at infinite degree of freedom is 1.645 (A default value, also referred in tools for calculating sample plots in afforestation and reforestation CDM projects).

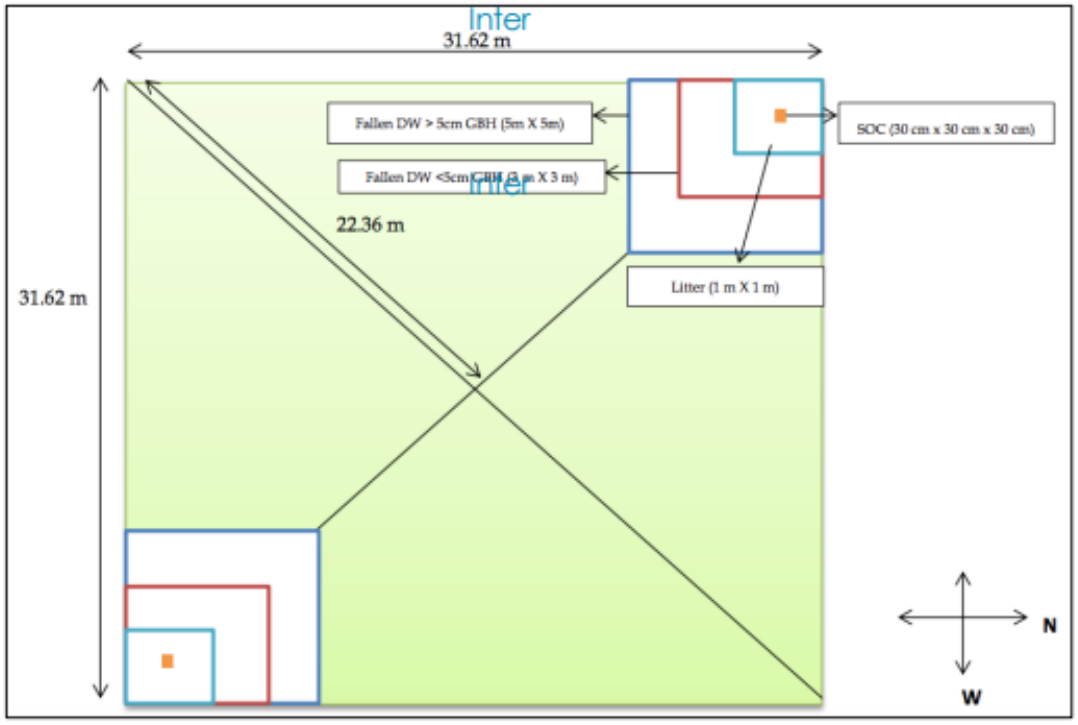
N = Number of sampling units for stratum (total area divided by plot area)

n = Number of sampling units in the population s = Standard deviation of stratum

4. Laying out of Permanent Sample Plots

Stratified random sampling will be done to lay out the sample plots in each project site. In addition, geo-coordinates of all the project sites will be calculated with the help of GPS and post stratification map will be created with the help of GIS after the first monitoring to concentrate on the possible changes of the project boundary. Square plot each of 31.62 m x 31.62 m size is laid in each site as shown in Figure 17.

Figure 3: Technique of laying down the plots



5. Measurement of Above Ground Biomass, Below Ground Biomass and Soil Organic Carbon

Calculation of above ground biomass, below ground biomass and soil organic carbon would be carried out by taking the reference of IPCC Good practices guidelines and volume equations given by FSI (ISFR, 2019).

Biomass of trees is estimated by following non-destructive method. The DBH (at 1.37m) and height of individual trees greater than or equal to 10 cm DBH are measured in each permanent square plot of 1000 m^2 plot using diameter tape, altimeter and linear tape. The measurement of trees is started from the edge, moving inwards, and marking each tree to prevent accidentally counting it twice.

Precautionary measures will be taken into account when measuring the trees, and personnel have been trained and briefed to follow these measures:

i. Measurement instruments are to be kept in a position that perpendicularly cuts the tree axis at 1.3m.

ii. If the DBH measuring tape is used, make sure it is not twisted and is stretched snug around the tree, perpendicular to the stem. Nothing must prevent a direct contact between the tape and the bark of the tree being measured.

iii. On inclined terrain, DBH tree measurement at 1.3m is taken from the highest part of terrain.

iv. For forked trees (trees where the stem or trunk divides), measuring varies depending on to the point at which the stem forks. If the fork begins below 1.3m height, each stem having the diameter required (≥10 cm in the whole plot, ≤10cm and ≥ 2.5 cm for plantations ≤5 years old) will be considered as a tree and will be measured. Diameter measurement of each stem will be taken at 1.3m height. If the fork begins at 1.3m or higher, the tree will be counted as a single tree. The diameter measurement is thus carried out below the crotch intersection point, just below the bulge that could influence the DBH.

v. Trees with an irregular stem at 1.3m, like trees with bulges, wound, hollows, and branches, etc. at breast height, are to be measured just above the irregular point, there where the irregular shape does not affect the stem.

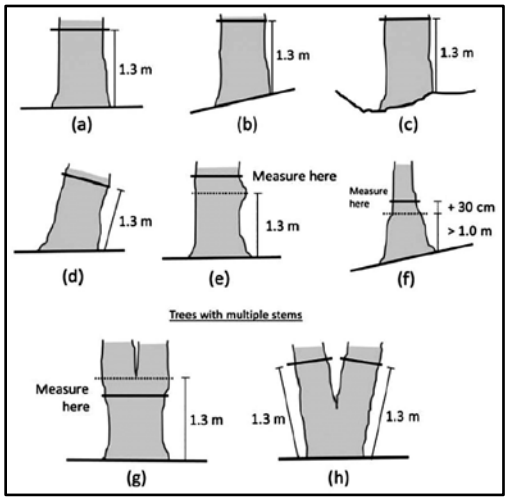


Figure 4: Tree measurement

The collected data from the field survey will be recorded in electronic database, which will be further analysed. The database will also consist of information such as shape files of the project areas, totalarea of every farm under the project, details and information about the farmer and species grown in the area and GPS coordinates of the farmlands.

6 ACHIEVED GHG EMISSIONM REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

To be updated later

Data / Parameter	
Data unit	*Indicate the unit of measure*
Description	*Provide a brief description of the data/parameter*
Value applied:	*Provide the monitored value for the data/parameter*
Comments	*Provide any additional comments*

6.2 Baseline Emissions

To be updated later

6.3 Project Emissions

To be updated later.

6.4 Leakage

To be updated later

6.5 Net GHG Emission Reductions and Removals

To be updated later

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)

Year A				
Year…				
Total				

For AFOLU projects, use the following table:

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)	Buffer pool allocation	VCUs eligible for Issuance
Year A						
Year…						
Total						

APPENDIX X: <TITLE OF APPENDIX>

Use appendices for supporting information. Delete this appendix (title and instructions) where no appendix is required.