



**Verified Carbon
Standard**

BIOCHAR PROJECT-1 BY WEACTION



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Document Prepared by WeAct Pty Ltd.

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The project activity is biochar production facility in the Telangana district of India which intends to address the issue of crop residue in the region while addressing the soil carbon improvement with the application of biochar. Biochar is a carbon-rich charcoal-like substance produced from the pyrolysis or heating of biomass materials in a low-oxygen environment. While biochar has a long history of use in various cultures around the world, its adoption and exploration in India have been relatively recent. Thus, the concept of biochar production and utilization needs a reasonable amount of efforts that mainly includes awareness, both technological and financial inclusions, waste collection & handling practice; monitoring etc. which can ensure sustainable production and application of biochar.

In the mid-2010s, the International Biochar Initiative (IBI) and other global organizations actively promoted biochar research and adoption and knowledge exchange programs and international conferences facilitated the dissemination of information about biochar's potential benefits and best practices. The use of charcoal and biochar in agriculture has a traditional history in India, primarily in the form of "terra preta" soils found in the Amazon basin. Research institutions, such as the Indian Council of Agricultural Research (ICAR) and various agricultural universities, initiated studies and trials to investigate the benefits of biochar application in different crops and soil types. While biochar shows promise in various agricultural and environmental applications, its widespread adoption and integration into Indian farming systems are still ongoing processes.

- **A summary description of the technologies/measures to be implemented by the project:**

This project activity is a voluntary initiative in the state of Telangana in India by WeAct Pty Ltd., a carbon asset management and carbon financing entity from Australia who deals in such GHG projects globally to address the concerns of climate change and ensures long term sustainability. The project activity uses Low technology production facilities. The project includes the soil-pit methods and box-kiln method which are two common low-tech approaches that can serve as a starting point for small-scale production, experimentation, and community-level initiatives. This process mainly designed based on limited airflow to ensure the biomass undergoes pyrolysis, a process where it decomposes in the absence of oxygen. The project activity mainly targets to include single type of waste biomass i.e. "Cotton Stalk" used as feedstock to produce biochar and the resulting biochar to be utilized in soil application.

- **About the project how it is expected to generate GHG emission reductions or removals:**

This project activity is a greenfield project, in the baseline scenario at production stage, no biochar is produced for the purpose of the project activity. As per the provision of the applied methodology VM0044, in low technology settings the total organic carbon content of the produced biochar is the foundation of the GHG calculations. The value is derived from the mass of biochar, its respective organic carbon content, and the decay rate of organic carbon in the biochar taken over a period of 100 years (100-year permanence value).

- **Brief description of the scenario existing prior to the implementation of the project:**

The scenario prior to the project activity is that the waste biomass (i.e. cotton stalks) is either left to decay or combusted. However, a survey related to the baseline scenario has been conducted in the project region and it has been established that the waste biomass (i.e. cotton stalks) only have the fate as: combustion of biomass and such burning mostly open burning which is a prevailing practice and a concern in the region.

- **An estimate of annual average and total GHG emission reductions and removals.**

The project activity is expected to generate an annual average of 22,376 tCO₂e emission reductions which is estimated based on a projected generation of biochar from cotton stalks as feedstock during each harvesting season in each year. During the current monitoring period the net GHG emission removals achieved by the project is 10 tCO₂e.

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Joint Validation/ Verification	12-April-2023 to 30-June-2023	VCS	4K Earth Science Private Limited (4KES)	NA
Monitoring Period	12-April-2023 to 30-June-2023	VCS	4K Earth Science Private Limited (4KES)	02 Months, 19 Days
Total				02 Months, 19 days

1.3 Sectoral Scope and Project Type

Complete the table below with information relevant for non-AFOLU projects:

Sectoral scope¹	13
Project activity type	Waste Handling and Disposal (WHD)

¹ Projects, activities, or methodologies may be developed under any of the 16 VCS sectoral scopes: <https://verra.org/programs/verified-carbon-standard/vcs-program-details/#sectoral-scopes>.

1.4 Project Eligibility

1.4.1 General eligibility

The project is eligible to participate in the VCS Program based on the following eligibility conditions:

- **The project activity is included under the scope of the VCS Program and not excluded under Table 2.1 of the VCS Standard v4.7. The details are as follows:**

As per 2.1 of the VCS Standard, following conditions are fulfilled:

- (i) Project includes Methane (CH₄) which is one of the Kyoto Protocol GHGs, Also, the project activity is considered under an existing VCS Methodology, i.e. VM0044. Hence section 2.1.1 is fulfilled.
- (ii) As per the Table 1, of section 2.1.3, the exclusion conditions do not apply to gasification, pyrolysis, combusting biofuels, biogas, fractions of renewable biomass in refuse-derived fuels, agro/forest biomass residues in waste streams that are sent to landfills, CO₂ capture and storage from renewable biomass combustion, or thermal efficiency improvements (e.g., cook stoves.). This Project handles crop residues (cotton stalks) and process involves is the pyrolysis. Hence, this project is eligible.
- **The project activity met the requirements related to the pipeline listing deadline, followed by the opening meeting with the validation/verification body, and the validation deadline.**

The listing process of the project was completed; project was open for public comment from 23-August-2023 to 22-September-2023, whereas the start date of the project is 12-April-2023.

- **Demonstration of methodology applicability under the VCS Program, as follows:**

The eligibility of the project activity under the scope of the VCS Program has been demonstrated based on the applicability conditions of the applied methodology (VM0044, version 1.1), as follows:

SN	Condition	Justification
1	The project activity must install and operate a new (greenfield) biochar production facility(ies) where the project proponent must 1) source waste biomass, 2) produce biochar and 3) ensure the biochar is utilized in soil or non-soil application. GHG benefits are credited only for the biochar that is utilized in the eligible soil and non-soil applications.	Eligible: • The project activity is a greenfield biochar production facility. • The feedstock is cotton stalk, which is a waste biomass. • The produced biochar will be utilized for soil application only.
2	Technological Scope:	Eligible:

	(i) The methodology is applicable when biochar is produced from eligible waste biomass through a thermochemical process such as pyrolysis, gasification, and biomass boilers and the biochar is subsequently applied to an end-use (soil or non-soil applications). Torrefaction and hydrothermal carbonization as processes of biochar production are excluded from this methodology. (ii) The methodology is applicable to projects using either low or high technology production facilities to produce biochar, as per the definitions of each provided in Section 3 of this methodology. (iii) The biochar producers must have a health and safety program to protect workers from airborne pollutants and other hazards.	• The project activity involves pyrolysis process and subsequently applied for soil application only. • The project activity involves low technology production facilities (i.e. pit method and box kiln method) to produce biochar. • There is a proper health & safety procedure proposed under this project to support the workers with safe working environment.
3	Feedstocks and production scope: The feedstock used to produce biochar must meet all following conditions to be eligible: - Feedstock must be purely biogenic waste biomass and not purpose-grown, - Feedstock must have been otherwise left to decay or combusted for purposes other than energy production. Additional guidance on how to demonstrate fate of waste biomass in the absence of the project activity is provided in Appendix 2, - Feedstock must not have been imported from other countries, - Feedstock must meet the sustainability conditions provided in Table 1 of the methodology. This table is not an exhaustive list of waste biomass examples.	Eligible: • The project activity involves only cotton stalk as feedstock, which is a biogenic waste biomass and hence not purpose-grown. • In absence of the project, the feedstock would have been combusted without any energy production or similar purposes. The fate of the biomass feedstock is referred in line with the Appendix 2 of the methodology; a detailed baseline study has been conducted for the same. In order to assess the requirements of Appendix 2 of the methodology, PP has included an assessment table under the Appendix-4 of the PD-MR. • The project boundary is limited to the Sangareddy district of Telangana state in India. The feedstock is also sourced within the same region. Hence, there is no import of feedstock.

		The feedstock being used under the project activity is cotton stalks, which falls under the Sustainability criteria (a) of the category-1 “agricultural waste biomass”; the project is designed to use “cotton stalks” (i.e. single biomass feedstock) directly from fields and not from a centralized biomass processing operation.
4	Biochar made from a single or mixed eligible feedstock types must comply with the latest version of the IBI Biochar Testing Guidelines or the EBC Production Guidelines.	Eligible: The biochar under this project activity is produced from a single feedstock type, i.e. cotton stalk and follows the requirements of IBI Biochar guideline. More details are provided under the Appendix 3 of this document.
5	The waste biomass used as feedstock to produce biochar and the resulting biochar to be utilized in soil or non-soil applications may be transported via ships, boats, and vehicles other than road transportation up to a distance of 200 km. However, it must only be transported by vehicles (i.e., road transportation) for distances more than 200 km as defined under CDM Tool 12: Project and leakage emissions from transportation of freight.	Eligible: The biochar under this project activity is produced using waste biomass and shall be utilized only for soil applications in and around the fields where the biomass waste is generated. Hence there is no involvement of dedicated transportation facilities; hence Tool 12 is not applied. During the baseline study, an assessment was conducted related to the fate of the biomass feedstock and their coverage. The identified regions (identified part of the feasibility assessment of this project) are defined within nearby periphery which are very much within a distance of 100 km from the identified biochar production site. Also, this distance related parameter can be further cross checked during verification from the Biochar Application logs.
6	Mineral additives such as lime, rock minerals, and ash may comprise up to 10 percent of the mass when added. If the addition exceeds 10 percent on a dry weight basis, the biochar producer must present laboratory tests indicating that the final product meets IBI Biochar Testing Guidelines or EBC Production Guidelines thresholds for organic and inorganic contaminants.	Not applicable. The production process of biochar under the project activity does not include any additive.

7.	Other evidence that may be used to demonstrate compliance with waste biomass sustainability criterion are biomass certification schemes such as the Roundtable on Sustainable Biomaterials (RSB), International Sustainability and Carbon Certification (ISCC) or any other certification scheme approved and/or endorsed by a relevant legislative body or international body such as the European Union, CORSIA, and national/state governments.	Not applicable as the biomass feedstock (i.e. cotton) is locally procured from the nearby fields where baseline is open burning without any purpose or end use. Hence, no specific compliance criteria related to sustainability is involved. However, during the baseline assessment biomass feedstock availability and chain of custody of the feedstock to biochar was assessed. The requirements are fulfilled and availability of feedstock was fairly established which confirms that there is sustainability of biomass waste in the project region, The baseline study report could be referred for furtherance.
7	Biochar is eligible to be utilized and accounted for under the methodology if it is being utilized within one year of its production. Biochar is subject to natural decay and the permanence of biochar is calculated for a period of 100 years. To adhere to the decay factor established for 100 years and prevent any decay before application, biochar must be utilized in soil or non-soil applications within the first year of its production.	Eligible: The biochar produced under the project activity shall be utilized for soil applications within one year of its production.
8	Biochar is eligible to be used as a soil amendment on land other than wetlands. Eligible land types include cropland, grassland, vegetated urban soils, and forest. Biochar is eligible to be applied either to the soil surface or subsurface. For surface application, the biochar must be mixed with other substrates such as compost, manure or digestate from anaerobic digestion. For subsurface application, the biochar may be applied either as a unique soil amendment or mixed with other substrates. For any soil application, the biochar must: (a) comply with biochar material standards to avoid the risk of transferring unwanted heavy metals and organic contaminants to soil. Project proponents must meet the	Eligible: The biochar produced under the project activity shall be used for soil applications. Depending on the farmers' requirement it can be used as soil amendment on land both to the soil surface and/or subsurface. In all cases, the biochar application shall meet the requirements of IBI Biochar Testing Guidelines. A laboratory analysis was conducted on the biochar samples produced under the project activity using the IBI Guideline requirements. The results shows that the H:C ratio is 0.54 which is less than 0.7 More details can be referred from the Lab Test Report².

² Report ID: QSS/05/VSH/0442/23-24, dated 12/05/2023.

	IBI Biochar Testing Guidelines or EBC Production Guidelines or relevant national regulations for avoiding soil contamination. (b) have a hydrogen to organic carbon molar ratio (H:Corg) of less than or equal to 0.7.	
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- **Other relevant eligibility information:**

This applied methodology stipulates some conditions under which methodology is not applicable, such non-eligibility related information are discussed below:

- (a) The methodology must not be applied if biochar is used for energy purposes, burned as a fuel (e.g. as a substitute for charcoal or coke) or used in other soil or non-soil applications where biochar cannot be demonstrated to be a long lived and persistent carbon sink.
 - As discussed under the design of the project, the biochar under the project activity shall be used only for soil applications within 200 km distance which will lead to a long lived and persistence carbon sink. Thus, there are no usage/application related to energy, fuel or non-soil applications considered under this project activity.
- (b) Biochar must not be used in applications in which substantial amounts of the biochar are oxidized (e.g., burned or used as a reduction agent in steel production, processed into activated carbon, or other uses that are fossil fuel intensive.
 - There is no non-soil application of biochar considered under the project activity. Also, during the soil application there will not be any process which leads to burning or oxidization of the biochar.
- (c) Non soil applications are ineligible under the methodology if there is a loss of more than 50 percent of the carbon measured by dry weight basis (e.g. g., some activated carbon, due to excessive fossil fuel input, results in a loss of more than 50 percent of the original biochar carbon material and therefore would not be eligible).
 - There is no non-soil application of biochar considered under the project activity.

1.4.2 AFOLU project eligibility

Not applicable.

1.4.3 Transfer project eligibility

Not applicable as there is no transfer of project and the project activity is not a CPA.

1.5 Project Design

The project has been designed as:

☒ Multiple locations or project activity instances (but not a grouped project)

The project has been designed to include multiple options/approaches as biochar production facility. These options are as follows:

Approach 1: Multiple biochar production in-situ earth-pits³ across the project boundary

Approach 2: Multiple biochar production moveable Box-Kiln⁴ across the project boundary

Approach 3: Centralized biochar production pit(s) for different regions across the project boundary

Thus, biochar production may be considered in-situ facilities or in central facilities (as low technology facility) with multiple locations, but within the same project boundary; however these are not be considered as instances and hence not being developed as a grouped project.

1.6 Project Proponent

Organization name	WeAct Pty Ltd
Contact person	Satish Duvvuru
Title	Director
Address	5/663 Victoria Street, Victoria 3067, Australia.
Telephone	+61-409 135 580
Email	satish@weact.com.au

³ Here “Earth-pit” is considered as a category which may include different types of pits, mainly two types are defined under this project activity such as (i) regular soil pits, (ii) steel-shield soil pits; as referred under the Table 3 in Cornelissen et al. (2016), as referred under the applied Methodology.

⁴ Here “box-kiln” is considered as a category of type “shallow steel pyramidal and octagonal” as per Table 3 in Cornelissen et al. (2016), as referred under the Methodology.

1.7 Other Entities Involved in the Project

Organization name	Not applicable.
Role in the project	Not applicable.
Contact person	Not applicable.
Title	Not applicable.
Address	Not applicable.
Telephone	Not applicable.
Email	Not applicable.

1.8 Ownership

The project ownership is with WeAct Pty Ltd.

In accordance with the VCS Program specifications on project ownership, the project ownership is meant to be arising by virtue of a statutory, property or contractual right in the biochar production plants/facilities, equipment or process etc. that generates GHG emission reductions and/or removals. Therefore, the ownership of the project is entirely with WeAct explained based on the following parameters:

- (i) In this project activity, the entire project is financed by WeAct Pty Ltd. where low technology biochar production facility(s) are fully operated by WeAct with the help of local representative⁵, thus ownership is solely with WeAct by virtue of a statutory, property and contractual rights.
- (ii) The required feedstock to the project is purchased by WeAct from the farmers and FPIC form is signed with each of these farmers where voluntary participation and no other rights are confirmed by the farmer.
- (iii) All the equipment, instruments, monitoring devices etc. used in the biochar production process were purchased and owned by WeAct.

1.9 Project Start Date

Project start date	12-April-2023
Justification	As per the VCS Standard, the project start date of a non-AFOLU project is the date on which the project began generating GHG emission reductions or removals. Therefore, the start date of this project activity is considered as the date of production of first batch of biochar under the project activity which is 12-April-2023.

⁵ "Aranya Agriculture Alternatives" is the local entity acting as representative of WeAct at the project site. Aranya is a local entity having experience of practicing permaculture in the project region, hence a credible representative of WeAct. However, Aranya does not own or does not have any rights to process, equipment, devices as well as to carbon credits to be generated under the project activity. The MoU between WeAct and Aranya has been submitted for further reference.

1.10 Project Crediting Period

Crediting period	☒ Seven years, twice renewable ☐ Ten years, fixed ☐ Other (state the selected crediting period and justify how it conforms with the VCS Program requirements)
Start and end date of first or fixed crediting period	Start date of first crediting period: 12-April-2023 End date of first crediting period: 11-April-2030

1.11 Project Scale and Estimated GHG Emission Reductions or Removals

Indicate the estimated annual GHG emission reductions/removals (ERRs) of the project:

- ☒ < 300,000 tCO₂e/year (project)
☐ ≥ 300,000 tCO₂e/year (large project)

Table below for the first crediting period⁶ (being renewal crediting period):

Calendar year of crediting period	Estimated GHG emission reductions or removals (tCO ₂ e)
Year 1 (12 April 2023 to 11 April 2024)	21,326
Year 2 (12 April 2024 to 11 April 2025)	21,326
Year 3 (12 April 2025 to 11 April 2026)	21,326
Year 4 (12 April 2026 to 11 April 2027)	21,326
Year 5 (12 April 2027 to 11 April 2028)	21,326
Year 6 (12 April 2028 to 11 April 2029)	21,326
Year 7 (12 April 2029 to 11 April 2030)	21,326
Total estimated ERRs during the first or fixed crediting period	149,282
Total number of years	7
Average annual ERRs	21,326

⁶ The project has been designed to adopt any low-tech facility (as included under the section 1.12) as may be the case practiced by PP during the season. However, during the first monitoring period Box-Kiln method has been used for biochar production; hence for the purpose of ex-ante ER reporting in the VCS PD-MR the results for approach 3 has been included. Whereas, during each monitoring period MR will report which of the approaches & methods being used for biochar production and accordingly ex-ante value shall be considered for ER comparison. For more details related to the ex-ante calculations for the three approaches, ER sheet is referred; and the ex-ante presentation of the ERs for all the three approaches are included under Section 5.4 of this document.

1.12 Description of the Project Activity

The project activity is a non-AFOLU project under VCS, mainly engaged in the process of Biochar production using low technology facilities with the fate of Cotton Stalk as sustainable biomass waste as feedstock. However, the design of the project activity includes multiple methods/approaches for biochar production facility ensuring a practical and sustainable way of producing biochar in the project region. The prescribed methods/approaches are as follows:

Approach 1: Multiple biochar production in-situ earth-pits across the project boundary

Approach 2: Multiple biochar production moveable Box Kiln across the project boundary

Approach 3: Centralized biochar production earth-pit(s) for different regions across the project boundary

The project proponent may decide to select either of the approaches or combination of two or all three approaches depending on the situations in each season of cotton harvesting that lead to generation of stalk as waste biomass.

About the technology type:

Low-technology biochar production facilities as per EBC production Guidelines.

About low-tech methods:

Two methods are prescribed: **(i)** Earth-pits, and **(ii)** Box-Kiln

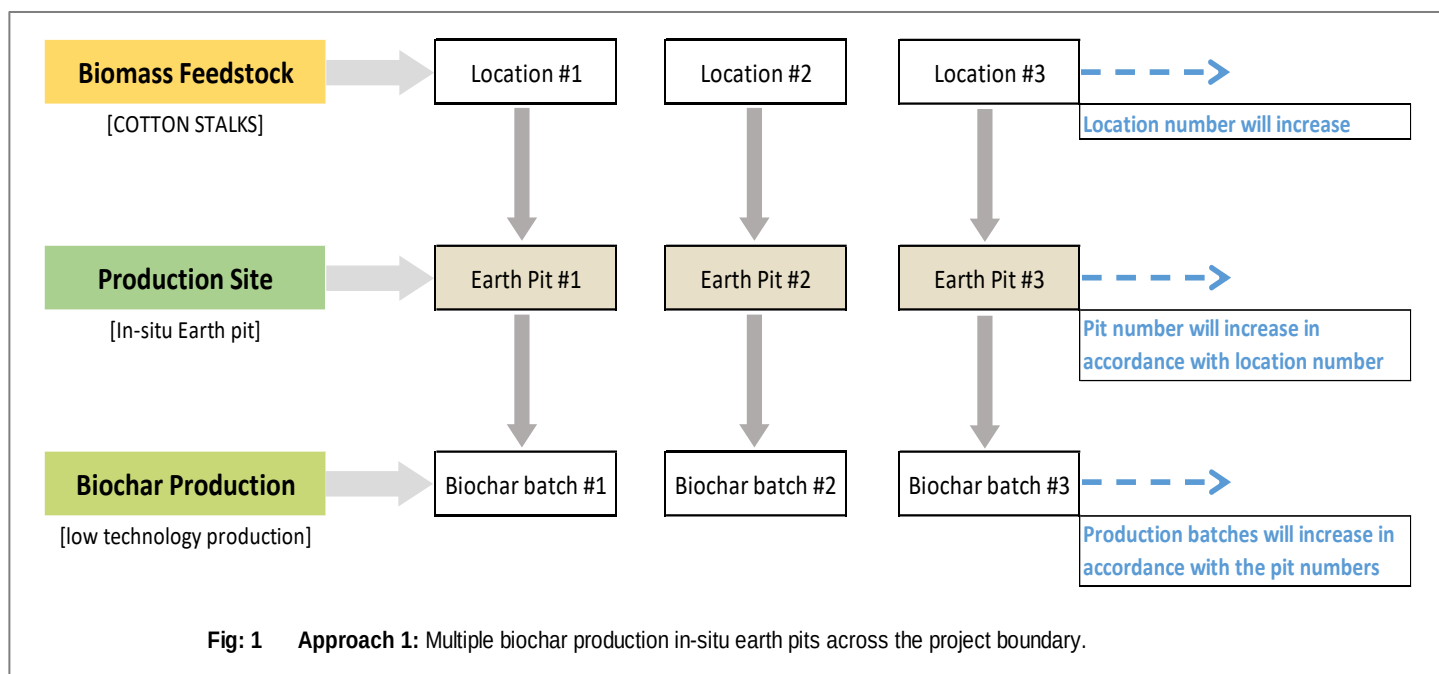
- Under the Earth-pits (also called soil-pits), following two methods are included under the project activity: **(a)** regular soil-pits and **(b)** steel-shield soil-pits
- Under the Box-kiln, following method is included under the project activity: moveable/portable shallow steel type.

More details are already included under the section 1.5 above. Also, the facility types are demonstrated under the three approaches in this section below.

This project activity is not a grouped project. This is to mention that “there will be increase in number of pits/kiln as the project progress”, it means there could be multiple locations within the same project activity, not a separate instance as a project activity under a group. It means no new instances shall be added, but there would be multiple locations within the same project boundary considered. This is generally applicable to the Approach type 1 & Approach type 2 prescribed below. Here location refers to source of feedstock (which are mainly the locations of farmers who supply feedstock). The total number of locations (i.e. sources/farmers) shall be updated into the project database during each monitoring period; however total location points, i.e. total number of farmers shall be limited within the project boundary.

- **Approach 1:** Multiple biochar production in-situ earth-pits across the project boundary.

Following is the representative diagram of the overall project operation under the approach 1. Under this approach main operational element is the “Earth-Pit” (please refer to the footnote #1 for types) and such earth pits will be developed in each season in and around the fields where waste will be generated/collected; hence this is an in-situ project design. Such pits will be created during the biochar production season, recorded properly (such as geo-coordinates, photos, videos etc.) and then shall be filled up post-production is over.



Note: the above diagram is only for representative purpose; thus during each monitoring period exact project specific flow diagram of the selected approach(s) shall be provided under the Monitoring Report.

The reference specifications of Earth-Pit (regular soil-pits and regular steel-shield soil-pits):

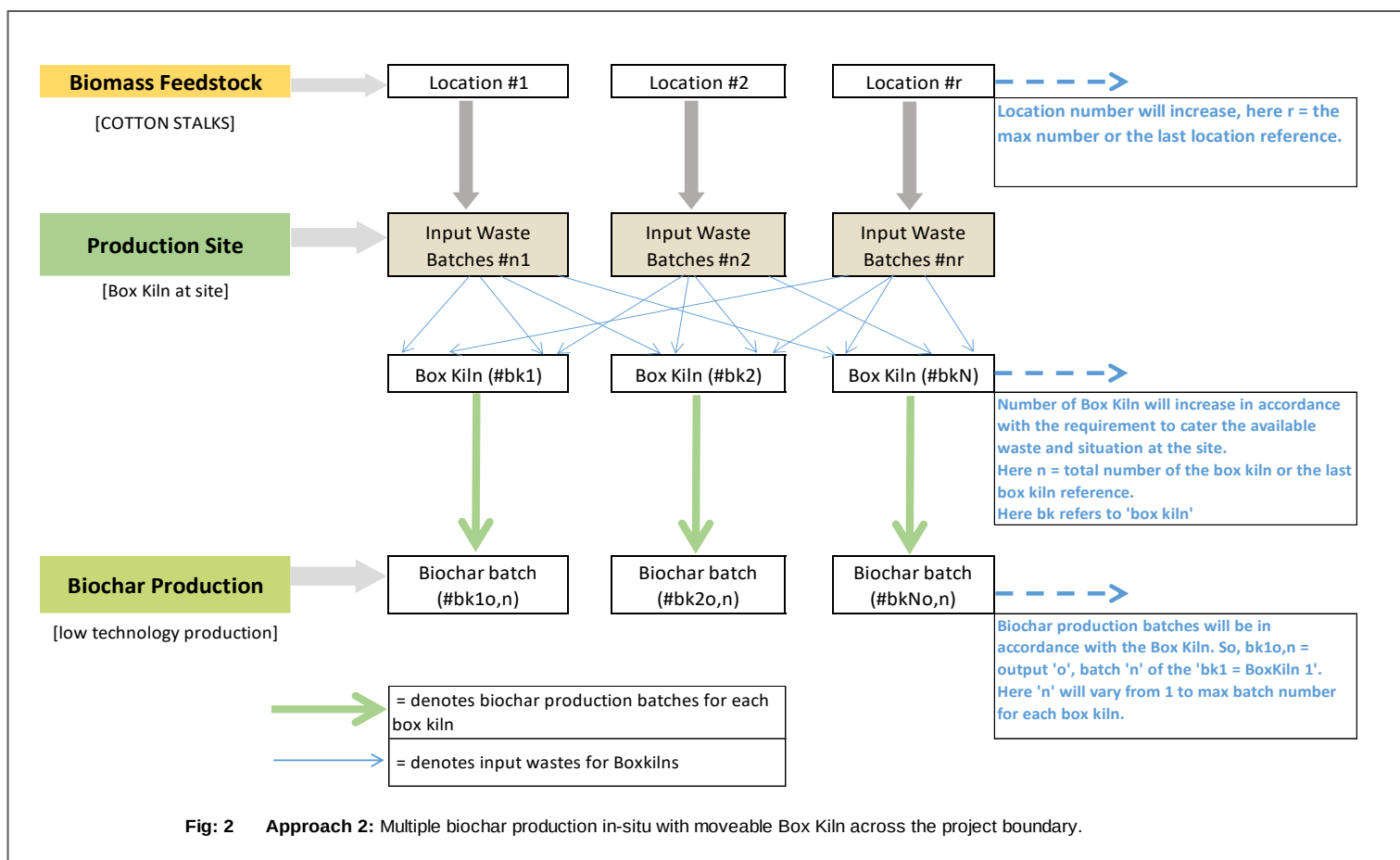
Size	: 12 x 4 x 3 (ft)
Volume	: 4 cubic meter.
Burning times	: 2 hours approx.
Input	: 1300 kgs at 12%-13% moisture.
Output Biochar	: 360-400kgs. (i.e. yield efficiency about 27% to 30%)
Fire dousing method	: Covered method preferred, alternatively water can also be used
Life of the pit ⁷	: Each pit will be considered as seasonal.

- **Approach 2:** Multiple biochar production moveable Box-Kilns across the project boundary.

Following is the representative diagram of the overall project operation under the approach 2.

Under this approach main operational element is moveable “Box-Kiln” (please refer to footnote #2 for more reference); there will be multiple box-kilns to be specifically designed and developed to produce biochar; hence this approach is similar to an in-situ biochar production method where production facility will be portable and can cater to wastes collected at different locations. Each time a batch of biochar is produced using a particular kiln, the input waste batch(s) and output biochar batch(s), geo-coordinates, photos, videos etc. shall be recorded.

⁷ The technical specifications (all the types included under this section) are considered from the tech parameter assurance letter issued by a third-party agency. The copy of the letter is submitted for reference.



Note: the above diagram is only for representative purpose; thus during each monitoring period exact project specific flow diagram of the selected approach(s) shall be provided under the Monitoring Report.

The reference specifications of Box Kiln:

Dimensions:

Top	: 12 x 6 (ft)
Height	: 4 ft
Base	: 10 x 4 (ft)
Iron sheet	: 2mm, side reinforcement with 50 mm
"L" angle	: 6mm Thick
Batch capacity	: input 2,000kgs @ 12 to 13 % Moisture.
Output (efficiency)	: 28 to 32 %, i.e. 560kgs to 640kgs.
Time	: 2hrs to 2:30 mins.
Batch Loading top-up.	: 10 to 12 time batch loading of approximately 200 kgs of Biomass per top-up.
Temperature	: 400- 600 degrees centigrade
Fire dousing method	: Covered method preferred, alternatively water can also be used.
Life of the box-kiln	: Upto 4 years.

- **Approach 3:** Centralized biochar production earth pit(s) for different regions across the project boundary.

Following is the representative diagram of the overall project operation under the approach 3.

Under this approach main operational element is a fixed Earth-pit in a centralized location within the project boundary. The biomass wastes will be collected from different fields and will be diverted to the central production facility where batch wise biochar production shall be performed. However, depending on the point of waste collection and geographical spread, PP may decide to go for more than one centralized Pit. Whereas at present only a single centralized earth-pit is denoted for representation purposes.

(a) The reference specifications of Earth Pit (Centralized):

Dimensions

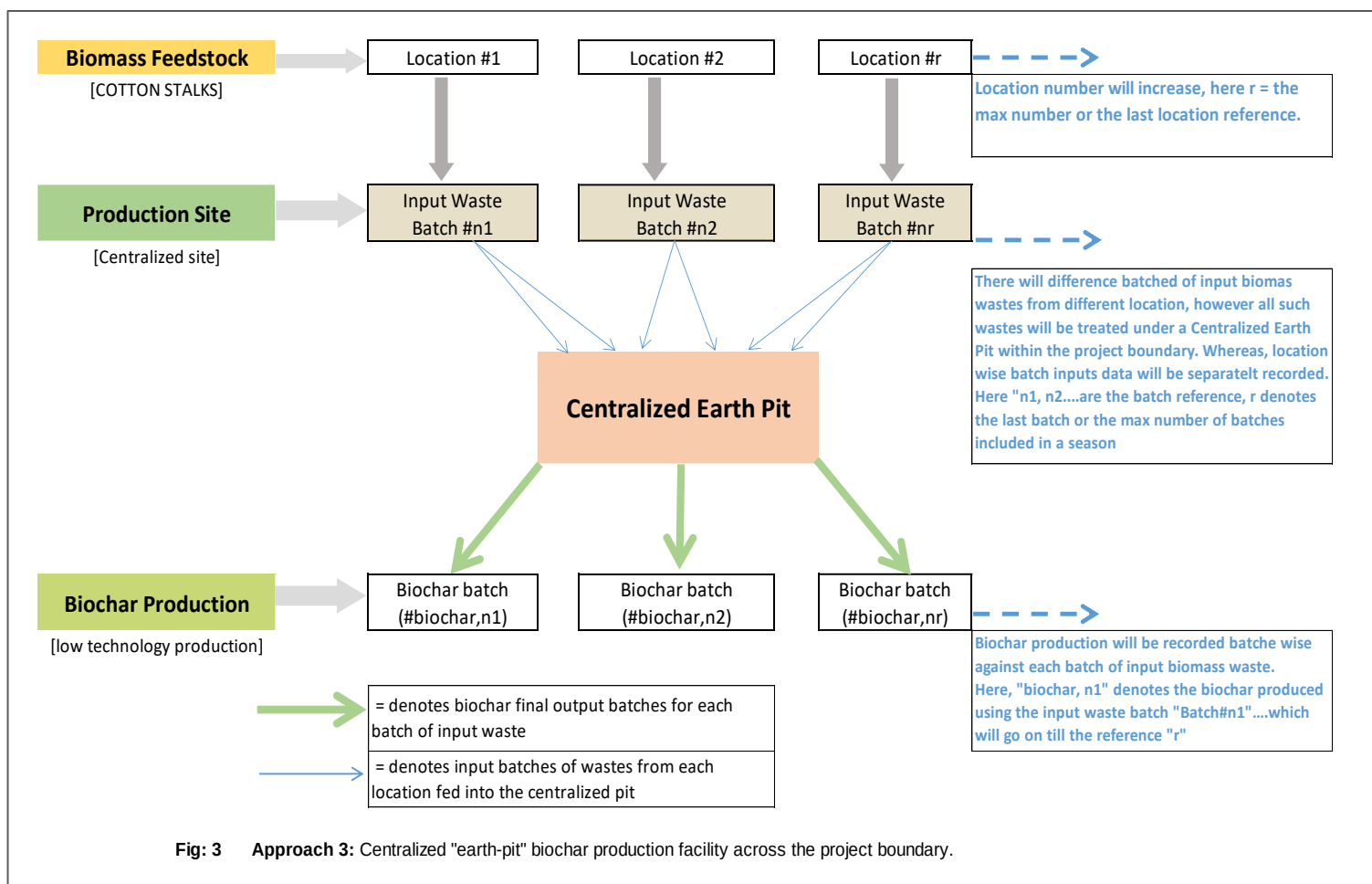
Size	: 16 x 8 x 3 (ft)
Volume	: 10 cubic meters.
Input	: 3,000 kgs @12-13 % moisture.
Output (efficiency)	: 28% to 32%, i.e. 840 to 960 kgs (approx.)
Fire dousing method	: Covered method preferred, alternatively water can also be used.
Life of the pit type	: Upto 3 years.

(b) The reference specifications of Earth Pit with steel-shield (Centralized):

Dimensions

Size	: 15 x 7 x 4 (ft)
Volume	: 11 cubic meters.
Sheet Thickness	: 2mm
Input	: 4,000 kgs @12-15 % moisture.
Output (efficiency)	: 25% to 30%, i.e. 1000 to 1200 kgs (approx.)
Fire dousing method	: Covered method preferred, alternatively water can also be used.
Life of the pit type	: Upto 3 years.

A common representative diagram of this Approach 3 is given below.



Note: The above diagram is only for representative purpose; thus during each monitoring period exact project specific flow diagram of the selected approach(s) shall be provided under the Monitoring Report.

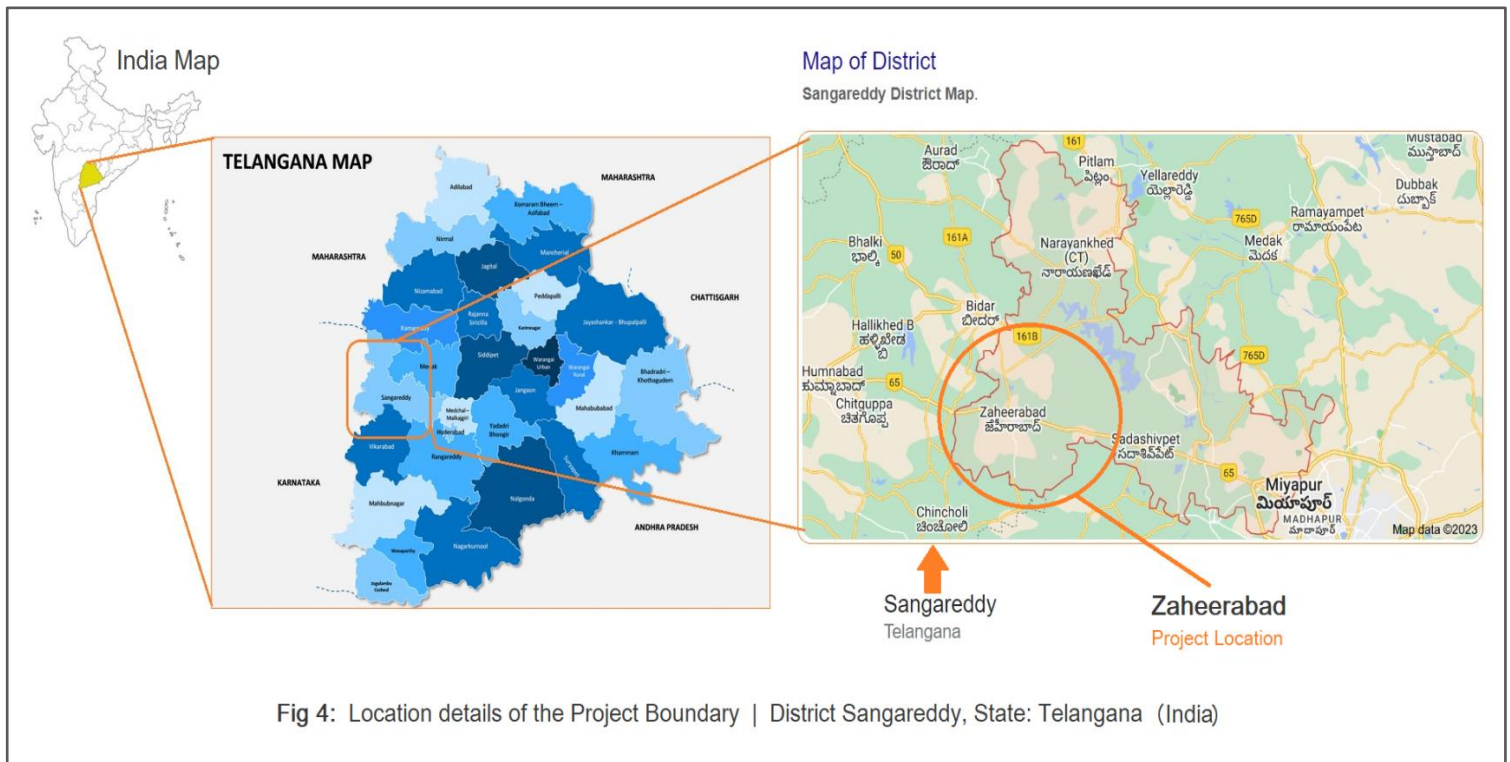
1.13 Project Location

The project is designed to cater a wider project boundary (as can be identified from the three approaches prescribed under the project design), but within the district of Sangareddy in the state of Telangana. Thus, the project location is within the territorial boundary as follows:

Village : multiple villages across three mandalas
Region : Zaheerabad
District : Sangareddy
State : Telangana
Country : India

Geo-coordinates : Latitude 17° 37' 9.9" N and Longitude 78° 4' 56.31" E

Currently geo-coordinates at the district level mentioned as a project design, whereas actual geo-coordinates of the biochar production facilities will be reported during the actual monitoring of the project. For the purpose of representation, a KML file is submitted which also includes the location references for the first monitoring period considered under this Joint PD-MR document. The KML generated map is attached under the Appendix 5 of this PDMR.



1.14 Conditions Prior to Project Initiation

The conditions existing prior to project initiation are as follows:

- 1) The cotton wastes in the region are commonly burnt in open fields (primary practice).
- 2) Sometime some portion of the cotton wastes may be left in the field for open decay.
- 3) There was no treatment process of these cotton wastes; hence no biochar production activity was taken place in the baseline.

Thus, in the absence of the project activity, waste biomass is either combusted or left to decay for purposes other than energy production and is not utilized for producing biochar for soil or non-soil applications.

Also, it is confirmed that the project has not been implemented to generate GHG emissions for the purpose of their subsequent reduction, removal, or destruction. This is being a biochar project activity with an intended soil application; hence GHG emissions are removed through biochar as a long-lived and persistent carbon sink.

1.15 Compliance with Laws, Statutes and Other Regulatory Frameworks

There is no specific compliance law exclusively dedicated to biochar production in India.

In the host country India, there are various policies and frameworks in each state. Also, there are central level laws and frameworks; however, there are no specific laws, statutes or any regulatory framework on biochar production and utilization. In this regard, PP has reviewed the “Telangana State Pollution Control Board (TSPCB)” and also reviewed compliance with “Solid Waste Management Rules: The Solid Waste Management Rules, 2016 in India. It can be observed that such policies and frameworks provide a comprehensive framework for waste management in India but there is no dedicated regulation or compliance requirement for cotton waste as well as for biochar produced from such waste.

1.16 Double Counting and Participation under Other GHG Programs

1.16.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

☐ Yes ☒ No⁸

1.16.2 Registration in Other GHG Programs

Is the project registered or seeking registration under any other GHG programs?

☐ Yes ☒ No

⁸ The project has never been applied under any other GHG programs other than the current application under VCS of VERRA. Hence it can be confirmed that project is never rejected by any other GHG programs. The project reduces GHG emissions from activities that are not included in any emissions trading program or any other mechanism that includes GHG allowance trading and include details about any such programs or mechanisms. The project has never sought or received any another form of GHG-related environmental credits including renewable energy certificates. A declaration shall be provided by PP confirming the same.

1.16.3 Projects Rejected by Other GHG Programs

Has the project been rejected by any other GHG programs?

☐ Yes ☒ No

1.17 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

1.17.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit?

☐ Yes ☒ No

1.17.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system?

☐ Yes ☒ No

1.17.3 Supply Chain (Scope 3) Emissions

Do the project activities specified in Section 1.12 affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No⁹

⁹ The project activity does not include a long supply chain network of organizations, instead entire project is locally managed, operated and biochar is produced with the help of a local representative entity using locally manufactured low technology facilities. The entity does not intend to account or offset or notify any scope-3 related activities. Thus, the project does not affect emissions associated with a good or service. Also, a statement/declaration shall be provided from the entities involved in the process confirming no potential risk of such scope-3 emission double claiming.

1.18 Sustainable Development Contributions

1.18.1 Sustainable Development Contributions Activity Description

The project activity contributes to sustainable development (SD) in various ways. The project being in the category of agricultural wastes management and overall process involves significant resources, the project certainly achieves a high level of SD indicators which can be monitored and reported. A summary of the overall SD contributions are given below:

Environmental Sustainability: This project leads to an effective management of cotton waste that helps reduce environmental pollution as in absence of the project cotton wastes would have been degraded via open burning or open decay. Since the project implements biochar production from the cotton wastes, thus the waste is transformed into valuable resources as soil amendments which reduces the need for chemical fertilizers, mitigates greenhouse gas emissions, and promotes soil health, biodiversity, and water conservation etc.

Resource Conservation: This project helps utilizing the biomass wastes for a meaningful purpose rather than being discarded; it leads to significant resource conservation. By efficiently managing and utilizing these waste streams into biochar with soil application, the project reduces the demand for virgin resources, such as synthetic fertilizers. This promotes resource conservation and minimizes the pressure on natural ecosystems.

Technology & knowledge sharing: Additionally, the project being first-of-its-kind in the region, it will also create awareness and knowledge transfer related to waste handling, management and production of biochar. Through initial R&D and subsequent field level experiments, testing, training etc. project will also contribute to educational engagement, qualitative and quantitative aspects for the community, beneficiaries, stakeholders etc.

Good Health & Well-being: The project certainly improves environmental aspects, as explained above. Especially the baseline scenario of the project is attached to a high level burning of wastes in the region which is now avoided, hence directly benefits to the health of the communities due to reduction in smoke, air-particulate matters etc. Also, the waste management and systematic way of biochar production leads to a dedicated framework both in terms of resources utilization, knowledge sharing, economic upliftment, useful products and improved agricultural activities etc.; hence directly contributes to overall well-being in the region.

Rural Development and Economic Opportunities: The project envisages creating local employment and income-generation opportunities in rural areas as project activities are confined in and around the village communities. For example, setting up of biochar production units (via either of the approaches discussed under the project design) has engaged people from local communities and contributed to the local economy by means of adding earning to the households. Such economic-benefits attached to the project are gender un-biased, which means both male and female are getting direct and indirect employment across various functions of the project, leading to gender equality as well. Also, the end product from the project is Biochar which will be targeted for soil-applications; thus the project helps turning agricultural wastes into marketable products or say as much desired organic fertilizers, farmers can generate additional income and improve their livelihoods.

Soil Health and Fertility: Biochar has beneficial effects on soil health and fertility. It improves soil structure, water holding capacity, and nutrient retention. By enhancing soil health, biochar can increase agricultural productivity, reduce the need for synthetic fertilizers, and decrease nutrient runoff, which helps prevent water pollution and eutrophication.

Since biochar-amended soils have the potential to improve water quality by reducing nutrient leaching and runoff, it can directly impact life above the ground as well as below water as it can help retain and slowly release nutrients, minimizing their movement into water bodies. This helps protect aquatic ecosystems, prevent water pollution, and maintain water quality for both human consumption and biodiversity conservation.

Climate Change Mitigation and Adaptation: The climate change mitigation is one of the key integral benefits attached to this project. Biochar is a stable form of carbon that can be incorporated into soil. By adding biochar to agricultural lands, carbon is sequestered for long-lived periods, effectively removing carbon dioxide from the atmosphere. This process helps mitigate climate change by reducing greenhouse gas emissions and offsetting carbon footprints. Additionally, the sustainable management of agricultural waste can contribute to climate change mitigation by reducing greenhouse gas emissions associated with the baseline practices such as open burning, open decay etc. Also as already mentioned in the previous para, this sustainable waste management practices improve soil fertility and water management, enhancing resilience to climate change impacts for long term.

Circular Economy Approach: This project can be attributed to embrace a circular economy approach by closing the loop in the waste management system. Conventionally, the cotton waste is being considered as a burden, being brunt without the purpose driven approach. Whereas under the project level the waste is now seen/realized as a valuable resource that can be recycled and reused, i.e. production of biochar which goes for soil applications to enable various positive gains. Thus, by integrating waste input into the overall waste management system, the project maximizes resource efficiency to result in a useful product and minimizes waste generation in the region.

Overall, it can be summarized that the project contributes to sustainable development by promoting various aspects including (but not limited to) environmental conservation, resource efficiency, rural development, climate change mitigation, and the transition towards a circular economy. It aligns agricultural practices with the principles of sustainable development, fostering a more resilient and equitable agricultural sector. Therefore, PP attributes the following SDG indicators in this project activity:



1.18.2 Sustainable Development Contributions Activity Monitoring

- **A summary description of project activities implemented during the monitoring period that result in SD contributions:**

During the current monitoring period (i.e. from 12-April-2023 to 30-June-2023), the project activity has been partially implemented (i.e. a pilot run) using the two approaches, viz. Approach 1 (in-situ earth-pits) and Approach 2 (moveable box kiln). These activities were implemented in Jarasangam Mandala, under the region Zaheerabad in the Sangareddy District of Telangana. There were two main cotton waste collection points viz. Kambalpallu and Narsapoor, a total quantity of 696.15 tons of cotton waste collected during the season and about 51.28 tons of cotton wastes were treated during the current monitoring period to produce about 25.35 tons of biochar.

Thus, during the current monitoring period all expected SD contributions such as environmental sustainability, resource conservation, local employment, good health & well-being etc. are resulted.

- **An explanation of how project activities result in the SD contributions described in Table 1 of this report:**

During the current monitoring period (i.e. from 12-April-2023 to 30-June-2023), the project activity was at pilot phase, hence it has partially contributed to certain SDG benefits which are reported under the Table 1, as the project proceeds more and more contributions under the identified SDGs shall be achieved and reported.

- **Identification of which SD contributions described in Table 1 of this report contribute to achieving any nationally stated sustainable development priorities, including any provisions for monitoring and reporting the same:**

As stated in the United Nations and mentioned under NITI Aayog, the Government of India has decided to contribute to various SDGs. There are five SDGs which were identified as nationally stated goals in priority¹⁰, viz. SDG 1, 3, 5, 13 and 15.

This project activity is designed to have achieved 11 SDGs (as described under the previous section) and these five indicators (i.e. SDG 1, 3, 5, 13 & 15) are part of these eleven goals, thus all nationally stated or intended SD indicators were identified under the project activity. More details are discussed under the 'Table 1' below.

¹⁰ https://www.niti.gov.in/sites/default/files/2020-07/SDX_Index_India_Baseline_Report_21-12-2018.pdf

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator ¹¹	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	1.1	User defined indicator under SDG 1.1: Strengthen financial conditions of local people to reduce risk of low income vulnerability against the poverty line, according to national definitions; to be estimated by means of employment generated at project level.	Implemented activities to increase	Current Contribution: 25 employments. About 25 people are employed in the project activity during the current monitoring period. (i) About 5 direct engagements (ii) About 20 indirect/contractual engagement	Overall Contribution: employment of 25 resources. The project has increased the 25 participants' total daily income that directly helps strengthening financial conditions of these beneficiaries. Thus, the total contribution achieved over the project lifetime so far is equal to the contributions monitored and reported as on 30 June 2023,

¹¹ This is a joint VCS PD & MR, therefore this section keeps the provision of all possible SDGs which are potentially associated with the project during its lifetime. However, project was at its pilot phase during the first verification which is part of this Joint VCS PDMR. Some of the SDG indicators were partially established or monitored during this initial phase, whereas provisioned for more robust monitoring under the project during future monitoring period. Therefore, PP has considered a conservative approach and currently 7 SDGs are reported with contributions achieved specific to current monitoring period and supporting evidences were also submitted (which are for SDG #1.1, 4.4, 5.1, 8.6, 8.8, 12.4 and 13); thus as per the VCS requirement minimum of three SDGs are achieved and reported, please refer to this table 1 below for details.

2)	3.9	User defined indicator under SDG 3.9: Environmental health by removing environmental hazards: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination, which will be estimated by means of (i) total quantity of waste reduced at project level and (ii) rate of decrease in illness and/or deaths reported by local stakeholders, to be accessed from any sampling survey	Implemented activities to decrease	Current Contribution: Not claimed. Project has lowered the air born environmental hazards by equivalent to a biomass waste amount of 51,280 kgs of cotton stalks in the project region, which would otherwise have been openly combusted leading to air contamination that can directly affects the health. However, the project is at pilot phase during this current monitoring period, hence this indicator shall be monitored and reported from the next monitoring cycle.	Not applicable.
3)	4.4	4.4 By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. To be monitored from employment and training records.	Implemented activities to increase	Current contribution claim: 25 resources. About 25 resources are engaged under this project will get regular training, technological know-how, etc. which enhances their skills and giving direct and indirect job opportunities. Additionally, each and every farmer who will be part of this project either by means of contributor of waste or by means of user of biochar, will be substantially receive relevant skills and entrepreneurship opportunities.	Overall Contribution: 25 resources. The total contribution achieved over the project lifetime so far is equal to the contributions monitored and reported as on 30 June 2023.

4)	5.1	User defined indicator under SDG 5.1: Promote and achieve gender equality and empower all women and girls. Target: to achieve a minimum 10% of total employment as female employees in each monitoring period. To be monitored from employment records.	Implemented activities to increase	Current contribution: Female gender ratio of 20%. Currently around 20% of the local resources engaged in the project is from female gender. And this ratio is expected to grow as the project proceeds	Overall Contribution: 20% of female gender in employment at project level. The total contribution achieved over the project lifetime so far is equal to the contributions monitored and reported as on 30 June 2023.
5)	8.6	User defined indicator under SDG 8.6.1. Substantially reduce the proportion of youth (aged 15-24 years) not in employment, education or training Target: to engage minimum of 2 youth resources in each year under direct or indirect employment program such as Internships, skill training, etc. To be monitored from employment database.	Implemented activities to decrease	Current contribution: engaged 3 youth resources. Currently project includes 3 youths who were not in employment. Thus, 3 such beneficiaries are added during the current monitoring period, which is expected to grow as the project proceeds.	Overall Contribution: 3 youth resources. The total contribution achieved over the project lifetime so far is equal to the contributions monitored and reported as on 30 June 2023.

6)	8.8	User defined indicator under SDG 8.8.1 fatal and non-fatal occupational injuries per 100,000 workers, by sex and migrant status, to be assessed and reported from the monthly safety monitoring database Target: to achieve zero fatal & non-fatal occupational injuries at project level.	Implemented activities to decrease	Current contribution: Zero injuries. Zero occupational injuries, zero mortality achieved during the monitoring period. Project activity deployed required health & safety measures (such as safety gears, handling tools etc.) as part of regular operating practices, monitored on monthly basis in a dedicated reporting format.	Overall Contribution: Zero injuries. The total contribution achieved over the project lifetime so far is equal to the contributions monitored and reported as on 30 June 2023.
7)	9.1	User defined indicator under SDG 9.1: Develop quality, reliable, sustainable and resilient infrastructure, to support economic development and human well-being, to be monitored through details of development, photos, etc.	Implemented activities to increase	Current contribution: Not claimed. The project activity has deployed biochar production facilities and addressed the concern of crop residue open burning. Also, the application of biochar into the soil brings a sustainable practice via economic development, human well-being and a climate resilient infrastructure in the region. During the current monitoring period 1 box-kiln is developed for biochar production which is included into the GHG accounting. Also 6 soil-pits were developed to pilot run cotton wastes for biochar conversion, along with some local infrastructure development in the project region. However during the monitoring period such developments were not completed, also their positive impacts and related measurements were not documented, hence they are excluded from the current period. Thus, this indicator shall be monitored and reported from the next monitoring cycle.	The total contribution achieved over the project lifetime so far is equal to the contributions monitored and reported as on 30 June 2023.

8)	12.4	User defined indicator under 12.4.2: Proportion of hazardous waste treated or removed at project level, by type of treatment; which will be assessed in terms of the following: Waste type: Cotton Stalks (crop residue) Treatment type: conversion to Biochar using low-tech facilities To be monitored from project database.	Implemented activities to decrease. (Achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.)	Current contribution: 51,280 kgs of hazardous waste (i.e. cotton stalks) During the current monitoring period a measured quantity of 51,280 kgs of hazardous waste (i.e. cotton stalks) treated under the project and converted to biochar of quantity 12,460 kgs for soil application. This has contributed to sustainable consumption of waste in the region and also sustainable production patterns of biochar for a meaning output.	The total contribution achieved over the project lifetime so far is equal to the contributions monitored and reported as on 30 June 2023.
9)	13.0	User defined indicator: Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	Current contribution: removal of 10,000 kgs of CO₂eq. By converting 51,280 tons of cotton stalk waste into biochar of quantity around 12,460 the Project has prevented the release of or removal of 10,000 kgs of carbon into the atmosphere during the monitoring period.	The total contribution achieved over the project lifetime so far is equal to the contributions monitored and reported as on 30 June 2023.
10	The other indicators, viz. SDG 14, 15 and 17 are currently not monitored and hence not attributed, The same will be included during next monitoring period.				

1.19 Additional Information Relevant to the Project

Leakage Management

As per the applied methodology and per the project design, there is no specific risk of any leakage. Hence no leakage management is required.

Commercially Sensitive Information

There is no such information which is considered as commercially sensitive that has been excluded from the public version of the project description.

Further Information

There is no other information that relates to any additional relevant legislative, technical, economic, sectoral, social, environmental, geographic, site-specific and/or temporal information that may have a bearing on the eligibility of the project, the net GHG emission reductions or removals, or the quantification of the project's net GHG emission reductions or removals.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Stakeholder Identification	The main stakeholders to this project are: 1) Local farmers (source of biomass feedstock and sink for using the biochar) 2) End beneficiaries of the biochar (farmers for biochar application) 3) Local authorities such as village admin office (Gram Panchayat), mandal offices, etc. 4) Local community members (at village level) 5) Local contractors, skilled and unskilled labours who can/will take part in the project in due course etc. The procedures or methods used for identifying and engaging local stakeholders: For the purpose of identifying relevant stakeholders, WeAct has consulted with Aranya Agriculture Alternatives who is working in the region since more than couple of decades, has access to the villages, communities and all regions within the project boundary and also has great level of experience to understand the source of biomass wastes, their availability, potential way to develop biochar projects, utilization of biochar etc. Hence, stakeholder identification was effective and relevant, the invitation process was initiated by Aranya team.
Legal or customary tenure/access rights	Not Applicable.
Stakeholder diversity and changes over time	The identified stakeholders represent all levels of the social, economic and cultural background, hence there was diversity within stakeholder groups. However, since the stakeholder consultation was conducted at project level accessible to all invitees, conducted in local languages (Telugu) followed by regional/national languages, hence there was no differences and concerns for interactions between the stakeholder groups were envisaged/realized. Hence, there was no requirement for any changes in the make-up of the stakeholder group over time.

Expected changes in well-being	The key expected changes in well-being and other stakeholder characteristics relative to the baseline scenario are: (i) Environmental well-being due to cotton waste management which used to be an environmental hazard in the region due to open burning at baseline scenario. (ii) Financial gain due to better production with biochar enriching the soil carbon and reduced chemical fertilization. (iii) Access to better agriculture practices, more qualitative input due to more awareness and capacity building. It will also lead to social-economical well-being with better conservation practices on soil, water, etc. (iv) Local employment generation (both direct and indirect jobs) that leads to better financial security, hence positive impact on livelihood. Also, as verified from the stakeholders' feedback forms and the minutes of the meetings, there was no negative comment or any specific inputs that needs any immediate action. Also, the overall outcome of the consultation was positive and stakeholders displayed a great level of support and willingness towards this project. Hence, there is no requirement of any update in the project design or any part of the project activity.
Location of stakeholders	The location of stakeholders: All stakeholders are from nearby villages in the project region where project activity is being designed and implemented. The areas outside the project area that are predicted to be impacted by the project: The entire area of the project boundary will be positively impacted, hence there will be certainly cascading effects in the nearby region. As informed under the baseline study assessment, entire Telangana state is into cotton production and cotton stalk burning is a prevailing practice which is a concern. Therefore, positive outcome of this project activity will certainly spread awareness on management of cotton wastes with biochar production which will lead to more adoption of such project activities across the state,
Location of resources	As informed under the project design, the cotton stalk is the primary biomass waste considered under the project. Thus, the source of this biomass wastes are the key resources for the project which are procured from the cotton farmers in

	the nearby region (within 200 km distance); and similarly the produced biochar will be utilized for soil application at fields within the nearby region (i.e. within 200 km distance). Thus, the project boundary established under the project shall be the location of territories and resources which stakeholders own or to which they have customary access.
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2.1.2 Stakeholder Consultation and Ongoing Communication

Date of stakeholder consultation	07-April-2023
Stakeholder engagement process	The procedures or methods used for identifying and engaging local stakeholders: For the purpose of inviting and engaging local stakeholders, PP has identified the relevant stakeholders across the project region and then identified a suitable date and venue for the meeting. To have a wider coverage of the invitation, PP has notified about this meeting on a state level newspaper on 17-March-2023 which was 3 weeks prior to meeting date. This notification was served both in English and vernacular language. Additionally, personal invitation letters were submitted to the nearby concern authorities such as Gram Panchayat, Head of the govt. schools, authorities at Mandal level functions etc. Also, some posters and bills were published in and around the project region to inform all local beneficiaries in the communities. The procedures or methods used for documenting the outcomes of the local stakeholder consultation.
Consultation outcome	<u>Summary and the overall outcome of the meeting:</u> On the day of the meeting, a proper arrangement was done for all the invitees so that they can easily reach the venue. The meeting was started with a welcome note from Mrs. Padmavathi Kappola, the Permaculture Specialist from “Aranya Agriculture Alternatives” who is a known personality among the communities due to her extensive work in the agriculture practices across the region. She put forwarded the objectives of the consultation and also gave a short description of the project activity. The meeting was further addressed by Mr. Satish Reddy, Director of WeAct Pty Ltd., explained the background of the project from the perspective of carbon revenue. Mr. Uday Dodi, acting as the Biochar Technical Expert from WeAct addressed the gathering and responded to few project specific understanding amongst the attendees.

	During the meeting Mrs. Padma demonstrated the preparation of soil with Biochar and its application. All possible types of comments, queries, know-how etc. were invited from all the attendees and properly responded by PP. In order to record the outcomes of the consultation, a dedicated questionnaire was designed by PP prior to the meeting and feedback/suggestions/inputs etc. were taken directly from all the attendees. Thus, the method of documenting outcomes of the meeting was transparent, open, based on real-time inputs. These feedback forms were considered as the primary records of the outcomes of the consultation. From the overall feedback, it can be concluded that there is no negative remark or there was no suggestion that relates to project design change or overall approach of the project. The feedback forms and concluding discussions with the stakeholders fairly concluded the following notes: • There is no discussion around consent to project design and implementation of the project, • There is no specific risks identified for the stakeholders and the region, instead expected positive outcome on many aspects. • There is no direct or indirect involvement of costs from any of the participants/beneficiaries of the project, WeAct is developing the project under direct financing with carbon, hence no negative remark on costs and benefits of the project, • There will not be any negative impact related to local laws and regulations including workers' rights etc.
Ongoing communication	The mechanism for on-going communication with local stakeholders: To establish an on-going continuous communication and feedback mechanism with the local stakeholders, an opinion poll was taken during the feedback round of the consultation. The stakeholders were open for all types of communication protocol such as telephonic, feedback register at site office etc. Based on the common suggestions received from majority of the respondent, it has been concluded that one Feedback/Input Register shall be prepared and kept at the office of Aranya such that local stakeholders can access any point of time and input their suggestions/concerns/grievances etc. Additionally, there is one local point of contact assigned on behalf of PP to whom stakeholders can directly communicate in case of any emergency.

Stakeholder input	Stakeholder's inputs were captured in a pre-designed feedback form. During the Q&A rounds all required clarifications were given to stakeholders. Overall feedback are supportive and they appreciate the project initiatives, Since there was no negative comments received, the design change related requirements are not received.
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2.1.3 Free Prior and Informed Consent

Obtaining consent	Free Prior Informed Consent (FPIC) is adopted at project level for all farmers included into the project activity. The project activity does not involve any resources which need customary rights or agreement for operation. The project is completely a voluntary initiative, it does not involve any land rights, property rights, statutory authority or related attributes of stakeholders. Instead, the outputs (i.e. biochar) and the positive impacts shall be utilized amongst the stakeholders (i.e. the farmers who will be the beneficiaries). Therefore, at the time of stakeholders' consultation FPIC was not envisaged. However, as the best practice in the process of consultation, PP has informed all the stakeholders about the consultation at least 3 weeks prior to the meeting by submitting personal letters, local advertisement, banner publicity etc. Also, a newspaper advertisement was circulated to reach out to the wider base of attendees, followed by feedback & voluntary consent from the stakeholders. Thus, there was a free prior intimation and informed consent for these stakeholders meeting and performed accordingly. Additionally, at the time of implementation of the project proper FPIC forms were signed.
Outcome of FPIC	The stakeholders attended the session and also supported the project. The feedback forms were received without any negative remark or concerns. It thus provided assurance to all the stakeholders that the project has not encroached on land, does not involve any relocation of people, and forced physical or economic displacement. Followed by this consultation, PP signed FPIC forms with the project stakeholders who participated into the project which confirms positive outcome of FPIC process.

2.1.4 Grievance Redress Procedure

Development process	The process used to develop the grievance redress procedure: To received on-going continuous communication and feedback mechanism with the local stakeholders, an opinion poll was taken during the feedback round of the consultation. The stakeholders were open for all types of
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	communication protocol such as telephonic, feedback register at site office etc. Based on the common suggestions received from majority of the respondent, it has been concluded that one Feedback/Input Register shall be prepared and kept at the office of Aranya such that local stakeholders can access any point of time and input their suggestions/concerns/grievances etc. Additionally, there is one local point of contact assigned on behalf of PP to whom stakeholders can directly communicate in case of any emergency.
Grievance redress procedure	Currently no grievance has been raised or received. Hence, no redressal procedure has been established. However, as informed above, there is a particular process developed through which any grievance received shall be reviewed and addressed promptly.

Grievances received	Resolution and outcome
During the current monitoring period, no grievance has been received.	There is no negative outcome, hence no resolution is required. Hence, not applicable.
...	...

2.1.5 Public Comments

Comments received	Actions taken
No comment received during the public commenting period.	Since there was no public comment received during the commenting period, no action was taken. Hence, not applicable.
...	

2.2 Risks to Stakeholders and the Environment

There is no negative or adverse impact and harm associated with the project activity. PP has observed that while biochar production has several potential positive environmental and socio-economic impacts (as discussed under the previous sections), it is important to consider and mitigate any potential negative effects if arises. In this regard, a detailed stakeholders' consultation was conducted on 07-April-2023 and feedback and inputs were taken from the stakeholders. However, no negative remark or no specific harm was realized in the project activity. Hence, currently no mitigation action plan is required.

Also, the project does not encounter with any negative environmental impacts. Rather, due to the inherent nature of the project (i.e. handling biomass waste and conversion to biochar for further application in soil), project contributes positively towards the environment, such as avoidance of waste burning, avoidance of any open decay, reduction in chemical fertilizer usages, increase in productivity via improvement in soil, water, etc. Additionally, at project level PP has provisioned for all required health & safety measures, Also, the Aranya team, who is the local implementing

partner for WeAct, is led by woman and women engagement is equally considered, hence safety and security practices are already included into the process.

Thus, there are no particular risks identified in this project. The following table is, therefore, filled with “No Risk Identified” status.

	Risks identified	Mitigation or preventative measure taken
Natural and human-induced risks to stakeholders' wellbeing	No Risk Identified	Currently no mitigation or preventive measures are required as project has not faced or identified any such risk. Project has undergone stakeholders' consultation round, followed by positive FPIC, there was no such risk reported. Additionally, PP has implemented policies and regular monitoring practice to avoid or prevent any such risk.
Risks to stakeholder participation	No Risk Identified	This biochar production activity is a completely voluntary activity owned & controlled by WeAct and farmers who participated in supplying the feedstock and/or biochar usage, are free to choose whether they take part or not. There is an FPIC process for all the participants. Thus, the project does not pose any risks to stakeholder participation. Also, the PP is ensuring open and transparent dialogue with the stakeholders through continuous input in the form of grievance or feedback input mechanism.
Working conditions	No Risk Identified	No risk identified as required safety measures are adopted at project level and internal policies and their regular monitoring practices are also adopted to avoid or prevent any such risk.
Safety of women and girls	No Risk Identified	There is no safety related risk identified in the project for women and girls. While gender ratio is also contributed by female employment at this project level, but at the production sites no woman or female is involved which further discards such risk. Additionally, PP has implemented policies and regular monitoring practice to avoid or prevent any such risk.
Safety of minority and marginalized groups, including children	No Risk Identified	The project activities are completely controlled and managed by WeAct with the help of local representative 'Aranya'. The local farmers are involved in the supply chain either in supplying feedstock or in using biochar or in both scenarios. Thus, there is no direct involvement of any

		minority and marginalized groups; hence no risks of safety are identified. However, PP has implemented policies and regular monitoring practice to avoid or prevent any such risk.
Pollutants (air, noise, discharges to water, generation of waste, release of hazardous materials)	No Risk Identified	Currently no such risks envisaged at project level as compared to baseline scenario. In this regard, PP has already consulted The Mandal Agriculture Office (MAO) of Jharasangam via written letter communication which was acknowledged & signed by the MAO official confirming that there are no negative environmental and social impacts associated with the biochar production. However, PP has implemented policies and regular monitoring practices (including Material Safety Datasheet protocol) to avoid or prevent any such risk if arises.

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

Discrimination and sexual harassment	There is no discrimination or sexual harassment has occurred or will occur under the project activity. This has been ensured by adopting a Human Rights Policy ¹² at project level, developed by Aranya, approved & accepted by WeAct.
Management experience	The project is being managed at ground level, at operational level by Aranya. Aranya ¹³ has been working into the agriculture and community sector, having rich experience of managing similar projects and engaging communities.
Gender equity in labor and work	The organization structure at project level has been designed and developed to include social aspects ¹⁴ , such as attention towards gender equality in resources, equal pay structure etc.
Human trafficking, forced labor, and child labor	Project does not and will not use victims of human trafficking, forced labor, and child labor. This condition has been already established under the Human Rights Policy deployed under the project activity.

2.3.2 Human Rights

¹² The copy of the Policy is referred and submitted to VVB.

¹³ The credibility and experience of Aranya can be referred from their web interface: <https://permacultureindia.org/>.

¹⁴ The employment details of the working resources are referred. Both gender, work and pay structure can be reviewed from these employment documents.

The project recognizes, respects, and promotes the protection of the rights of IPs, LCs, and customary rights holders in line with applicable international human rights law. In this regard, Human Right Policy is referred which has been developed to ensure the project will function under the required guidance of Human Rights and shall comply with the requirements of the United Nations Declaration on the Rights of Indigenous Peoples and ILO Convention 169 on Indigenous and Tribal Peoples.

2.3.3 Indigenous Peoples and Cultural Heritage

The project preserves and protects cultural heritage as part of project activities. This can be referred from the project boundary diagram (KML file submitted) which ensures that there is no cultural heritage in the project sites or the project operation does not involve or interact with any activity related to indigenous people's rights, culture and cultural heritage.

A policy named "Generic Policies & Practices¹⁵" has been deployed by PP to ensure that the project is aware of such conditions or concerns and are adequately addressed at project level at all point of time,

2.3.4 Property Rights

Rights to territories and resources	The project does not involved any legal or customary tenure/access rights to territories, property, and resources, including collective and/or conflicting rights, held by stakeholders. The project has been independently and voluntarily developed by WeAct Pty Ltd, for the specific purpose, i.e. biochar production from cotton stalks; and an MOU has been established with Aranya Agriculture Alternatives for the implementation of the project. Thus, no binding rights, engagement are involved.
Respect for property rights	Since no specific property rights are involved, hence there are no measures implemented in this regard.

2.3.5 Benefit Sharing

Process used to design the benefit sharing plan	Currently no benefit sharing plan is applicable. There are no affected stakeholder groups, whereas there will be beneficiaries of biochar who will receive biochar for soil applications. Additionally, there are regular awareness, training, capacity building exercises conducted by PP with the help of Aranya team, these events are inclusive of local stakeholders and hence there are associated benefits to the community under this project. Thus, the stakeholders (i.e. the beneficiaries) will receive both direct and indirect benefits in terms of income from sale of feedstock and receipt of biochar for usage; and from the trainings & capacity building etc. respectively.
--	--

¹⁵ PP has developed a generic policy indicating different practices, the same can be referred. Document Reference "Generic Policies & Practices"

Summary of the benefit sharing plan	Currently not applicable.
Approval and dissemination of benefit sharing plan	Currently not applicable.
Benefit sharing during the monitoring period	Not applicable during the current monitoring period. However, all records of direct & indirect benefits (as mentioned above) received by the beneficiaries are submitted to VVB for reference.

2.4 Ecosystem Health

	Risks identified	Mitigation or preventative measure taken
Impacts on biodiversity and ecosystems	No risk Identified.	Currently no measures are applicable as project activity does not alter or influence any elements related to biodiversity and local ecosystem. Instead, project is positively impacting the local soil due to biochar's soil application while avoidance of cotton stalk burning directly reduces the risk of pollution hazards in the local area.
Soil degradation and soil erosion	No risk Identified.	Currently not applicable as no such probable risk is associated with the project. Instead, there will be improved soil carbon due to application of biochar, overall improvement in soil health.
Water consumption and stress	No risk Identified.	Currently no mitigation or preventive measure required as project does not depend on water availability, only minor water consumption is there during fire dosing. Also, there is no risk observed in the region related to availability, consumption pattern and stress in water ¹⁶ .
Usage of fertilizers	No risk Identified.	Currently no measures are required as project does not lead to increase in fertilizers usage in the region, Instead, there will be reduction in use of chemical fertilizer due to soil application of biochar.

¹⁶ As per the report published by Government, the Central Ground Water Board's (CGWHAssessment indicates that the net groundwater availability for future irrigation in Telangana is approximately 7,139 million cubic meters, with a stage of groundwater extraction around 50% (source: https://www.cgwb.gov.in/sites/default/files/MainLinks/Telangana_State_Resource_Report_2020.pdf?utm_source=chatgpt.com).

Also, as per the CGWB report, most of the area is having water levels below 5 mbgl, whereas Water levels ranges from 5-10 m and above 10m water levels in Sangareddy and other few regions.

(source: https://www.cgwb.gov.in/old_website/District_Profile/Telangana/Medak.pdf)

2.4.1 Rare, Threatened, and Endangered species

Is the project located in or adjacent to habitats for rare, threatened, or endangered species?

☐ Yes

☒ No

Species and habitat	Not Applicable.
...	...

2.4.2 Introduction of species

Species introduced	Classification	Justification for use	Adverse effects and mitigation
Not Applicable	-	-	-

Existing invasive species	Mitigation measures to prevent spread or continued existence of invasive species
Not Applicable	

2.4.3 Ecosystem conversion

Not applicable as the project is of Non-AFOLU category.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	VM0044	METHODOLOGY FOR BIOCHAR UTILIZATION IN SOIL AND NON SOIL APPLICATIONS	1.1

3.2 Applicability of Methodology

SN	Applicability condition	Justification of compliance
1.	The project activity must install and operate a new (greenfield) biochar production facility(ies) where the project proponent must 1) source waste biomass, 2) produce biochar and 3) ensure the biochar is utilized in soil or non-soil application. GHG benefits are credited only for the biochar that is utilized in the eligible soil and non-soil applications.	Eligible: - The project activity is a greenfield biochar production facility. - The feedstock is cotton stalk, which is a waste biomass. - The produced biochar will be utilized for soil application only.
..	Technological Scope: (i) The methodology is applicable when biochar is produced from eligible waste biomass through a thermochemical process such as pyrolysis, gasification, and biomass boilers and the biochar is subsequently applied to an end-use (soil or non-soil applications). Torrefaction and hydrothermal carbonization as processes of biochar production are excluded from this methodology. (ii) The methodology is applicable to projects using either low or high technology production facilities to produce biochar, as per the	Eligible: - The project activity involves pyrolysis process and subsequently applied for soil application only. - The project activity involves low technology production facilities (i.e. pit method and box kiln method) to produce biochar. - There is a proper health & safety procedure proposed under this project to support the workers with safe working environment.

	definitions of each provided in Section 3 of this methodology. (iii) The biochar producers must have a health and safety program to protect workers from airborne pollutants and other hazards.	
2.	Feedstocks and production scope: The feedstock used to produce biochar must meet all following conditions to be eligible: - Feedstock must be purely biogenic waste biomass and not purpose-grown, - Feedstock must have been otherwise left to decay or combusted for purposes other than energy production. Additional guidance on how to demonstrate fate of waste biomass in the absence of the project activity is provided in Appendix 2, - Feedstock must not have been imported from other countries, - Feedstock must meet the sustainability conditions provided in Table 1 of the methodology.	Eligible: - The project activity involves only cotton stalk as feedstock, which is a biogenic waste biomass and hence not purpose-grown. - In absence of the project, the feedstock would have been combusted without any energy production or similar purposes. The fate of the biomass feedstock is referred in line with the Appendix 2 of the methodology; a detailed baseline study has been conducted for the same. - The project boundary is limited to the Sangareddy district of Telangana state in India. The feedstock is also sourced within the same region. Hence, there is no import of feedstock. - The feedstock being used under the project activity is cotton stalks, which falls under the Sustainability criteria (a) of the category-1 “agricultural waste biomass”; the project is designed to use cotton stalks directly from fields and not from a centralized biomass processing operation.
3.	Biochar made from a single or mixed eligible feedstock must comply with the latest version of the IBI Biochar Testing Guidelines or the EBC Production Guidelines.	Eligible: The biochar under this project activity is produced from a single feedstock type, i.e. cotton stalk and follows the requirements of IBI Biochar guideline. More details will be provided during the course of validation & verification.

4.	The waste biomass used as feedstock to produce biochar and the resulting biochar to be utilized in soil or non-soil applications may be transported via ships, boats, and vehicles other than road transportation up to a distance of 200 km. However, it must only be transported by vehicles (i.e., road transportation) for distances more than 200 km as defined under CDM Tool 12: Project and leakage emissions from transportation of freight.	Eligible: The biochar under this project activity is produced using waste biomass and shall be utilized only for soil applications in and around the fields where the biomass waste is generated. Hence there is no involvement of dedicated transportation facilities; hence Tool 12 is not applied.
5.	Mineral additives such as lime, rock minerals, and ash may comprise up to 10 percent of the mass when added. If the addition exceeds 10 percent on a dry weight basis, the biochar producer must present laboratory tests indicating that the final product meets IBI Biochar Testing Guidelines or EBC Production Guidelines thresholds for organic and inorganic contaminants.	Not applicable. The production process of biochar under the project activity does not include any additive.
6.	Other evidence that may be used to demonstrate compliance with waste biomass sustainability criterion are biomass certification schemes such as the Roundtable on Sustainable Biomaterials (RSB), International Sustainability and Carbon Certification (ISCC) or any other certification scheme approved and/or endorsed by a relevant legislative body or international body such as the European Union CORSIA, and national/state governments.	Project has not been applied under any compliance scheme, hence no other evidence is required or used.
7.	Eligible biochar end-use application criteria: A. Biochar is eligible to be utilized and accounted for under the methodology if it is being utilized within one year of its production. Biochar is subject to natural decay and the permanence of biochar is calculated for a period of 100 years. To adhere to the decay factor established for 100 years and prevent any decay before application, biochar must be	Eligible: A. The biochar produced under the project activity shall be used for soil applications within 1 year of its production. B. The biochar produced under the project activity shall be used for soil applications. Depending on the farmers' requirement it can be used as soil amendment on land both to the soil surface and/or subsurface. In all cases, the biochar application shall meet the

	utilized in soil or non-soil applications, as appropriate, within the first year of its production. B. Biochar is eligible to be used as a soil amendment on land other than wetlands. Eligible land types include cropland, grassland, and forest. Biochar is eligible to be applied either to the soil surface or subsurface. For surface application, the biochar must be mixed with other substrates such as compost, manure or digestate from anaerobic digestion. For subsurface application, the biochar may be applied either as a unique soil amendment or mixed with other substrates. For any soil application, the biochar must: (a) comply with biochar material standards to avoid the risk of transferring unwanted heavy metals and organic contaminants to soil. Project proponents must meet the IBI Biochar Testing Guidelines or EBC Production Guidelines or relevant national regulations for avoiding soil contamination. (b) have a hydrogen to organic carbon molar ratio (H : C_{org}) of less than or equal to 0.7	requirements of IBI Biochar Testing Guidelines. More details are provided under the Appendix 2 of this document. C. The H: C_{org} ratio of the biochar tested with value less than 0.7.
8.	Biochar is eligible to be used in non-soil applications including but not limited to cement, asphalt, and any other applications where longterm storage of the biochar is possible. Only biochar produced in high technology production facilities, as defined under the methodology, is eligible to be used in non-soil applications.	Not applicable as the project will only be used for soil-application.
9.	Project proponents must demonstrate that bio char and/or final products are long lived via credible evidence such as laboratory results, peer reviewed research papers or any other third	Biochar production deploys Pyrolysis method, which is high temperature ranging between 650°C and 750°C (Cornelissen et al. 2016). Such temperatures yield robust biochar with

	party evaluated product assessment, such as decay rate analysis, as applicable. The information provided must include the lifetime of the product in which biochar is stored long term. The resultant product must be compliant with national/international product quality standards/specifications as applicable (e.g. the American Concrete Institute Standards in the US).	significant resistance to decay. The Intergovernmental Panel on Climate Change (IPCC) has reported that biochar produced under these conditions retain 89% of their mass after a century (IPCC, 2019¹⁷) “Pyrolysis temperature influences biochar stability, with temperatures > 500 °C generally leading to longer-term half-lives (> 1000 years)” (Ippolito et al., 2020¹⁸). Another notable study by Spokas (2010¹⁹) supports the long-term stability of high-temperature biochar.
10.	This methodology is not applicable under the following conditions: (a) The methodology must not be applied if biochar is used for energy purposes, burned as a fuel (e.g. as a substitute for charcoal or coke) or used in other soil or non-soil applications where biochar cannot be demonstrated to be a long lived and persistent carbon sink. (b) Biochar must not be used in applications in which substantial amounts of the biochar are oxidized (e.g., burned or used as a reduction agent in steel production, processed into activated carbon, or other uses that are fossil fuel-intensive (c) Non-soil applications are ineligible under the methodology if there is a loss of more than 50 percent of the carbon measured by dry weight basis (e.g., some activated carbon, due to excessive fossil fuel input, results in a loss of more than 50 percent of the original biochar carbon material and therefore would not be eligible).	The biochar produced under the project is considered only for soil application. Thus, it will not be used in application in which substantial amounts of the biochar are oxidized.

¹⁷ https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/4_Volume4/19R_V4_Ch02_Ap4_Biochar.pdf

¹⁸ <https://doi.org/10.1007/s42773-020-00067-x>

¹⁹ <https://doi.org/10.4155/cmt.10.32>

3.3 Project Boundary

Following table defines the project boundary and identifies the relevant GHG sources, sinks and reservoirs for the project and baseline scenarios:

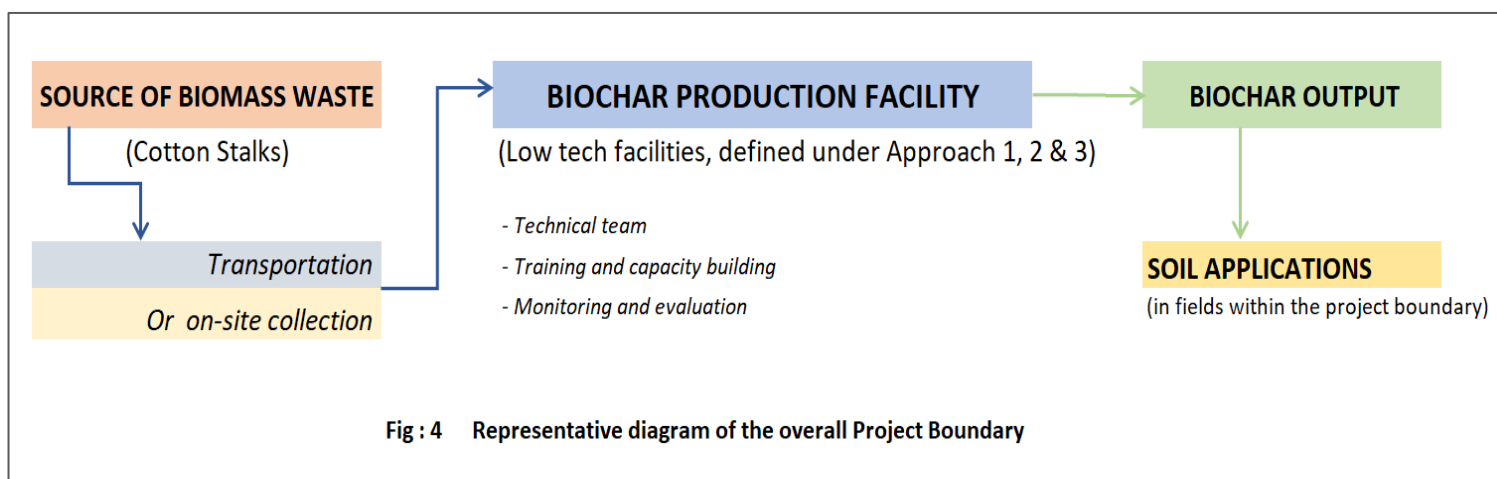
Source		Gas	Included?	Justification/Explanation
Baseline	Feedstock Production	CO ₂	NO	Excluded. Waste biomass is considered renewable per eligibility CH ₄ No conditions.
		CH ₄	NO	
		N ₂ O	NO	
		Other	NO	
	Feedstock Transportation	CO ₂	NO	Expected to be de minimis if distance between sourcing sites and production facility is less than 200 kilometers.
		CH ₄	NO	
		N ₂ O	NO	
		Other	NO	
	Combustion, aerobic and anaerobic decomposition of feedstocks	CO ₂	NO	Possible emissions from decay or combustion of biomass in the absence of project activity are excluded. Baseline emissions are assumed to be zero (a conservative assumption).
		CH ₄	NO	
		N ₂ O	NO	
		Other	NO	
Project ²⁰	Feedstock Production	CO ₂	NO	Purpose-grown crops are ineligible, hence there are no emissions from feedstock production. Waste biomass is also considered renewable per the CDM renewable biomass definition (EB23 Annex 18) and applicability conditions (see Table 1).
		CH ₄	NO	
		N ₂ O	NO	
		Other	NO	
	Pyrolysis, or thermochemical conversion (low technology systems)	CO ₂	NO	Low technology systems are provided a default emission value based on published literature (Cornelissen et al., 2016).
		CH ₄	YES	
		N ₂ O	NO	
		Other	NO	
	Electricity and/or fossil fuels consumed during eligible thermochemical process	CO ₂	YES	Included. Emissions associated directly with project activity due to use of fossil fuel. However, there is no use of electricity in the process.
		CH ₄	NO	
		N ₂ O	NO	
		Other	NO	
	Biochar transportation	CO ₂	NO	Expected to be de minimis if distance between production facility and end-use destination is less than 200 kilometers.
		CH ₄	NO	
		N ₂ O	NO	
		Other	NO	
	Pre-treatment of feedstocks (e.g., grinding, drying)	CO ₂	NO	Excluded as there is no such pre-treatment occurs at project level.
		CH ₄	NO	
		N ₂ O	NO	
		Other	NO	

²⁰ Additionally, H* (i.e. High-carbon fly ash diversion) could be a parameter under project emission. However, as per the provision of the methodology the applicability conditions state that qualifying biomass facilities that divert a portion of their biomass away from renewable energy production to biochar (high-carbon fly ash) must divert less than 5 percent of the total biomass used on an annual basis. In addition, the biomass facility must demonstrate that they are not replacing the biomass lost with fossil fuel sources. Since, in the current project activity both the conditions are not applicable, hence biomass-based heat or electrical production loss can be considered de minimis. Hence it's excluded.

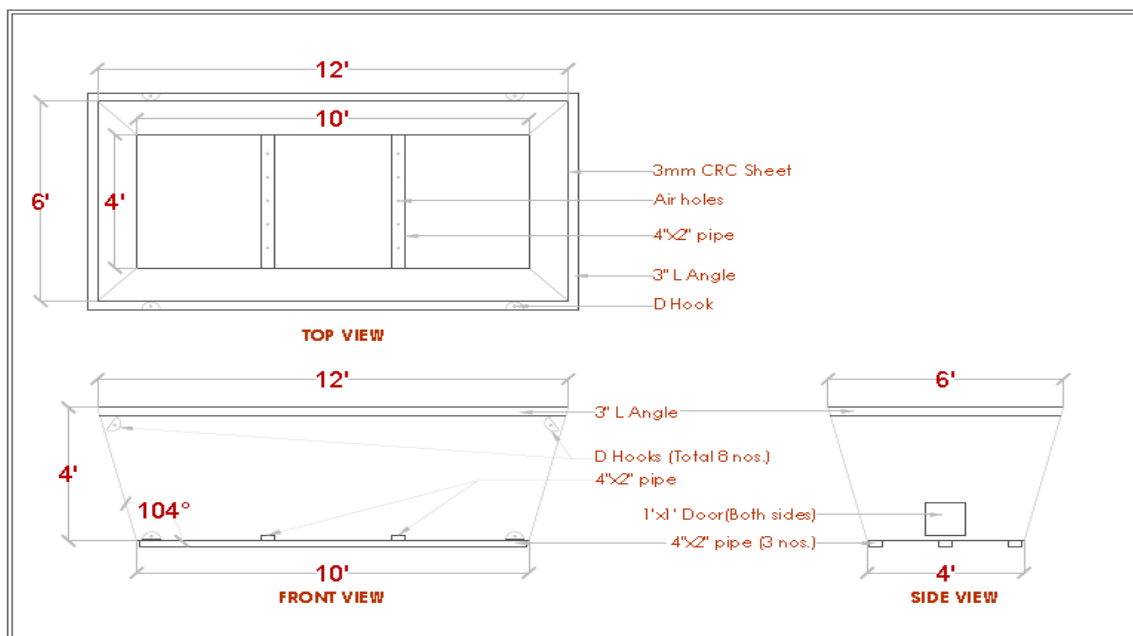
Source	Gas	Included?	Justification/Explanation
Biochar application (e.g., preparation of biochar for final use)	CO ₂	NO	No direct or indirect emission is anticipated in the process.
	CH ₄	NO	
	N ₂ O	NO	
	Other	NO	

The spatial extent of the project boundary is demonstrated below, it encompasses the geographic area including:

- 1) Initial waste biomass (i.e. cotton stalks) is sourced;
- 2) Waste biomass is treated for the purpose of biochar production using one or more of the given Approaches (i.e. Approach 1, 2 and/or 3) defined under the project design;
- 3) The final application of biochar into soils.



Following section includes some representative diagram (Fig 5) the box-kiln equipment involved in the biochar production facility under the project (referred under the current monitoring period):



3.4 Baseline Scenario

The baseline scenario is that in which, in the absence of the project activity, the cotton waste (i.e. stalks) biomass is mainly combusted without any utilization for purposes and is not utilized for producing biochar for either soil or non-soil application.

As per the applicability conditions of the methodology, the waste biomass must only have the following fates: decay (aerobic or anaerobic) or combustion of biomass for purposes other than energy production. The resulting emission avoidance potential for the project activity feedstock has been excluded (a conservative assumption).

In this regard, a detailed baseline survey²¹ was conducted and it has been confirmed that the baseline scenario has the fate as “combustion of biomass for the purposes other than energy production”. Additionally, an official communication was held with “The Mandal Agriculture Officer (MAO) of Jharasangam, Sangareddy district” to collect government records related to the baseline scenario. The letter was acknowledged by the Agriculture office endorsing the availability of Cotton Stalks in the region and open field burning as the common prevailing practice; additionally it is also acknowledged that biochar production is not a prevailing practice in the region.

Also, the emissions avoidance associated with the feedstock at baseline is excluded; hence baseline scenario of the project is in line with the requirement of the applied methodology.

About the baselines survey:

- Type of the survey : Primary survey conducted by a third-party agency
- Survey method : Sampling method using “Simple Random Sampling” Guidelines prescribed under CDM Guidelines & Standards.
- Coverage : The entire project boundary of Telangana state
- Sample size of the survey : 78 respondents
- Results of the survey : Satisfactory, results are found within the prescribed Confidence & precision range. Here, 100% of the respondents confirmed the baseline scenario, i.e. availability of cotton stalk and their open burning/combustion without any utilization for any purpose.

(Further details of the survey can be referred in the Baseline Survey Report, as referred under the footnote reference below).

Rational/Appropriateness of using survey method instead of other alternatives:

The methodology gives provision of including “evidence (but are not limited to) related to annual government records, records of a waste disposal facility, and records of a production facility. In the absence of records, the project proponent must utilize data from existing literature, existing survey data of similar industries in the same region or conduct its own survey”.

²¹ There was a third-party assessment to identify and establish the baseline scenario of this project. Reference: “Baseline Survey & Biochar Project Feasibility Report”, issued in February 2023.

This assessment was based on a primary survey conducted in the project region, followed by a desk review, literature review and concluded with a detailed feasibility study of the project. The copy of the baseline study report is now submitted to VVB.

Project proponent has already conducted desk review and communicated with the local govt. official seeking official records. However, no specific records were readily available for comprehensive assessment. Also, there was no other similar type of project in the region, hence existing survey or similar references are also not available. Therefore, PP has decided to conduct a primary survey with the help of a third-party agency. Thus, the selection of conducting an own survey is appropriate and in line with the methodological requirements.

3.5 Additionality

The additionality of the project is demonstrated in accordance with the applied methodology taking into account the following parameters:

Project activities must not be mandated by any law, statute, or other regulatory framework, or for UNFCCC non-Annex I countries, any systematically enforced law, statute, or other regulatory framework.

The project is a biochar production activity by utilizing waste biomass (i.e. cotton wastes) which fate in absence of the project activity would have been open burning without production of biochar or similar products. Thus, from the existing or baseline scenario of the project it's evident that the project activities are not mandated by law, statute or any regulatory framework in the host country.

Additionality based on an activity method for the demonstration, as follows:

Step 1: Regulatory Surplus

The regulatory surplus scenario is demonstrated below in accordance with the rules and requirements regarding regulatory surplus set out in the latest version of the VCS Standard and VCS Methodology Requirements. As per VCS Standard, "Regulatory surplus means that project activities are not mandated by any law, statute, or other regulatory framework, or for UNFCCC non-Annex I countries, any systematically enforced law, statute, or other regulatory framework."

As demonstrated under the previous section the biochar production in the state of Telangana or even in any state in the host country India is not a mandatory requirement. The Indian government has been promoting sustainable agriculture practices, including the use of organic amendments like biochar, through initiatives such as the National Mission for Sustainable Agriculture (NMSA) and the National Biochar Initiative. These initiatives aim to enhance soil fertility, improve crop yields, and promote sustainable agricultural practices but not a mandatory regulation or enforced law in the country.

Step 2: Positive List

As per the appendix 1 of the Methodology, it uses an activity method for demonstrating additionality with the processing of waste biomass to biochar as the basis for a positive list. This approach stipulates that the total waste biomass converted to biochar amounts to less than five percent of the total waste biomass available worldwide.

Five percent is the activity penetration threshold set by the VCS Methodology Requirements and is determined by taking the "Observed Activity (OA)" divided by the "Maximum Adoption Potential (MAP)". Where the result of this equation is less than five percent, the project activity may be considered additional.

Activity penetration is calculated as:

$$AP_y = \frac{OA_y}{MAP_y} \times 100$$

Where:

AP_y = Activity penetration of the project activity in year y (percent)

OA_y = Observed adoption of the project activity in year y

MAP_y = Maximum adoption potential of the project activity in year y

As per the baseline survey, the total observed adoption (i.e. the expected capacity of the project design) of the project activity in a year is about 100,000 tons. Thus, $OA_y = 100,000$ tons/y

For the purposes of this methodology, the maximum adoption potential of this activity is the number of **tons** of waste biomass that could be converted to biochar worldwide. As per the demonstration under the Appendix 1 of the methodology, the maximum adoption potential of this activity is limited to $MAP_y = 1.369$ billion tons.

Thus, the calculated activity penetration rate is

$$\begin{aligned} AP_y &= [(0.1 \text{ million tons}) / (1,300 \text{ million tons})] \times 100 \\ &= 0.0077\%, \text{ which is } < 5\%. \end{aligned}$$

Thus, the project activity is deemed additional under the positive list.

3.5.1 Regulatory Surplus

Is the project registered or seeking registration in an UNFCCC Annex 1 or Non-Annex 1 country?

☐ Annex 1 country

☒ Non-Annex 1 country

Are the project activities mandated by any law, statute, or other regulatory framework?

☐ Yes

☒ No

If the project is located inside a Non-Annex 1 country and the project activities are mandated by a law, statute, or other regulatory framework, are such laws, statutes, or regulatory frameworks systematically enforced?

☐ Yes

☒ No

There is no existing mandated laws, statutes, or other regulatory frameworks that require project activities; this is evident (i.e. evidence of systematic non-enforcement) can be referred from the baseline study. It confirms that at the baseline scenario or the existing scenario in absence of

the project activity is the open burning of biomass wastes (i.e. cotton stalks) which has been the prevailing practice since years. Whereas the state Telangana is one of key Cotton producing states in India. Therefore, the condition related to regulatory surplus can be referred.

3.5.2 Additionality Methods

- This section refers that “where the methodology applies an activity method for the demonstration of additionality, include a statement that notes that conformance with the positive list is demonstrated in the Applicability of Methodology section above”.

Yes, this methodology applies an activity method and positive list assessment has been conducted, hence the previous section shall be referred.

3.6 Methodology Deviations

PP has considered a methodological deviation related to two aspects of monitoring:

A. Method of measurement of Moisture Content:

The moisture content measurement method for the biomass and biochar, which is a monitoring and reporting parameter in the project to establish the dry weight of the biomass and produced biochar. The details of the deviation are as follows:

- 1) Methodology requires adjustment of moisture for both biomass and biochar
- 2) Methodology (version 01 which was considered at the time of project design and initial listing) does not mandate any specific method of measuring moisture content, however the current version 1.1 refers as follows:

“In cases where moisture content of feedstocks is required, ASTM D4442 20 Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials can be used as a guide. The method involves drying samples to a constant weight in a ventilated oven at 102 to 105 °C.”
- 3) However, PP has initially evaluated this practice of oven drying method but found difficult to adopt this method as the project was initiated in a village level with low technology facilities under a decentralized approach with box kiln and soil pits. Therefore, PP has adopted direct measurement using Digital Moisture Meters. This approach was discussed (prior to adoption) with VERRA team and based on VERRA's response it was adopted during the first monitoring period.

Therefore, it has been considered under methodological deviation. More details are referred below for further clarity:

PP would like to clarify that prior to the listing of the VCS-PD-MR, PP has submitted a series of communications with VERRA team to clarify some requirements included under this methodology. There was one clarification related to moisture measurement and the following understanding was noted from VERRA's reply that: “as per the VCS Standard, “methodology deviations can be requested in certain cases where alternative methods may be more efficient for project-specific circumstances” which seems to fit your case with the use of digital moisture meters”. The copy of the email communication is submitted to VVB. Thus, based on this clarification and based on the methodology which does not state such direct oven method as “only or mandatory” process, this deviation has been considered into the project. However, PP

keeps both the provision, viz. (i) direct measurement using digital moisture meter and (ii) oven method under the monitoring requirements so that depending on the possibility and feasibility, one of the methods can be considered during a monitoring period.

B. Frequency of monitoring of parameter H:C_{org}:

As per methodology, frequency of monitoring/recording of this parameter has been prescribed as “Each batch of biochar produced at the production facility”. However, the current project activity is designed based on monotype feedstock and hence biochar-type produced is also same/uniform across the project. Additionally, the feedstock (i.e. Cotton stalk) is seasonal and hence biochar production is also seasonal. Therefore, it is proposed that the value of H:C shall be evaluated using laboratory analysis once in each seasonal production as characteristic of the biochar output is expected to be uniform.

Now, based on the above clarification, PP would like to confirm the following:

- During the current monitoring period, digital measurement method has been adopted using digital moisture meter. In case of oven drying method initial weight with moisture and weight after oven drying both are taken and then manually calculation is performed as per standard procedure. Whereas in case of current method (i.e. digital moisture meter) which has been considered as part of this methodological deviation, the drying and separate weighing is not required. The digital moisture meter has induction terminals that touch the sample and then it generates the moisture level and displays on the digital screen instantly²². Hence during the current monitoring period there was no requirement of drying.
- The parameter H:C ratio has been lab tested from the biochar sample produced during the current monitoring and found within the prescribed range of >0.7. The same has been reported for the current monitoring period.
- These deviations will not negatively impact the conservativeness of the quantification of GHG emission reductions or removals. This is because the Digital meters are new, all technical specifications are provided; and values are comparable to prior experience of evaluating moisture contents in such products. The deviation of moisture measurement method relates only to the criteria and procedures for monitoring or measurement and does not relate to any other part of the methodology.
- Similarly, the deviation related to the frequency of monitoring & recording of H:C_{org} will not impact on the outcome of GHG removals mainly because the quantity of biochar produced during the current monitoring period was extremely small, hence there is apparently no batch variation.

²² Sample copies of the digital moisture meter are included under the Appendix 6 of the report.

4 IMPLEMENTATION STATUS

4.1 Implementation Status of the Project Activity

The implementation status of the project activity is demonstrated as per the following information:

- **The operation of the project activity(s) during this monitoring period, including any information on events that may impact the GHG emission reductions or removals and monitoring.**

The project activity has been designed and developed in the recent time and the initial pilot run and data recording activities were started from 12-April-2023. Therefore, the start date of the current monitoring period is also the start date of the project activity. During this period, the project activity undergone a pilot run as per the designed specification under the Approach 1 (i.e. earth-pits) and 2 (box-kiln). There was no event that may impact the GHG emissions reduction or removals and its monitoring. However, the production of biochar is seasonal as it's based on cotton stalks as feedstock which is a seasonal waste biomass.

- **Leakage and non-permanence risk factors are being monitored and managed:**
Since the project activity is a non-AFOLU project, hence this is not required.
- **Important dates of the overall implementation of the project activity:**
The chronological events of the project activity are as follows:

Event	Date	Remarks
MoU between WeAct Pty Ltd. & Aranya Agriculture Alternatives	03-Feb-2022	Objective of this MoU was to conduct a feasibility study of the biochar and bio-compost related project from crop residues, to evaluate the baseline scenarios of such biomass waste, availability, issues etc. in the target regions. Thereby to establish a pilot project.
Awareness and sensitization of the communities, farmers, etc.	April 2022 and onward	Objective was to create awareness about importance of sustainable agriculture, mainly with the help of soil improvement using Biochar, Bio-Compost etc. Also to understand the situation crop residue burning and then to inform about the possible way of avoiding such practice, etc.
Evaluation of biochar production technologies, possible options of production etc.	July 2022 and continuous process	Objective was to evaluate all technical know-how related to biochar product in accordance with the local conditions, to understand effective utilization etc.

Clarifications taken from VERRA on the New Biochar Methodology, its application, monitoring parameters etc.	August 2022 to April 2023	Objective was to understand requirements of different monitoring parameters under various project scenarios. Understand various intricacies of low and high-tech facilities, series of follow up clarifications prior to the project design.
Baseline Survey for the project	December 2022 to January 2023	Detailed study of the biomass waste, availability, accessibility, prevailing practice, etc. Refer: Baseline Survey Report ²³ , issued on 25 th February 2023.
Pilot run of the biochar production	April 2023	Initial batches of biochar produced in the project boundary.
Stakeholders' Consultation	07 April 2023	Local stakeholders' consultation to receive feedback on the overall project activity and way forward. It also includes assessment of environmental safeguards, socio-economic aspects of the project etc.
Project Commissioning date	12 April 2023	The date of production of first batch of biochar under the project activity.
Lab Testing of the Biochar Samples	12 May 2023	Lab testing of biochar sample to evaluate all parameters, including H:C ration as per the provision of the methodology and IBI Guideline.

²³ The baseline study was conducted by a third-party organization (report submitted to VVB), who is having sectoral knowledge, experience and understanding of the carbon related requirements. The study was an assessment which is a combination of a primary sampling survey and a detailed literature review from the secondary data under desk research. The assessment also included a technical feasibility analysis of the biochar project under carbon mechanisms, hence all eligibility criteria, applicability conditions and technical monitoring requirements of the projects are outlined under the Report.

5 QUANTIFICATION OF ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The procedure for quantification of baseline emissions removals is considered in accordance with the applied methodology. The relevant choices for this project activity are as follows:

Net GHG emission reductions and removals are calculated as per the equation 15, as follows:

$$ER_y = ER_{SS,y} + ER_{PS,y} - PE_{AS,y} - LE_y \quad (15)$$

Where:

ER_y = Net GHG emissions reductions and removals in year y (tCO₂e)

$ER_{SS,y}$ = GHG emission reductions at sourcing stage in year y (tCO₂e)

$ER_{PS,y}$ = GHG emission removals at production stage in year y (tCO₂e)

$PE_{AS,y}$ = GHG emissions at application stage in year y (tCO₂e)

LE_y = Total leakage emissions in year y (tCO₂e)

Sourcing Stage:

Emission reductions at the sourcing stage are calculated using equation 14, as follows:

$$ER_{SS,y} = BE_{SS,y} - PE_{SS,y} \quad (14)$$

Where:

$ER_{SS,y}$ = GHG emission reductions at sourcing stage in year y (tCO₂e)

$BE_{SS,y}$ = Baseline emissions at sourcing stage in year y ; conservatively assumed default value of zero (tCO₂e)

$PE_{SS,y}$ = Project emissions at sourcing stage in year y , conservatively assumed to be zero (waste biogenic source material is considered as renewable biomass) (tCO₂e)

As per para 8.1.1 of the methodology, “Following the CDM EB23 Annex 18: Definition of renewable biomass, waste biomass may be classified as renewable. As the decay rate pathway of diverse feedstock types varies by region and time, the methodology defines the default net baseline emission avoidance as zero following a conservative scenario ($ER_{SS,y}$).

Thus, $ER_{SS,y} = 0$.

Production Stage:

In the baseline scenario at production stage, no biochar is produced for the purpose of the project activity and therefore no GHG removals or related emissions are considered.

Application Stage:

Emissions at application stage refer to GHG emissions associated with the post-production and end-use application of biochar. In the baseline scenario at application stage, since no biochar was produced, no GHG removals or related emissions are considered.

5.2 Project Emissions

Sourcing Stage:

At the sourcing stage, the methodology relies on the collection of waste biomass. Therefore, the emissions at the sourcing stage ($PE_{SS,y}$) are set to zero.

Production Stage:

In the project scenario, the net GHG balance depends on the organic carbon content at the biochar production stage. As per the Para 8.2.2 of the methodology, the equation 1 summarizes the carbon balance at the production stage y comparing the difference between the stabilized carbon content in the biochar and the resulting project emissions from feedstock pre-treatment (where applicable) and from conversion of waste biomass into biochar. The former includes emissions from energy consumption of drying and pre-processing feedstocks, and the latter includes other relevant emissions from the production facilities. The project emission removals during production at the biochar facility are as follows:

$$ER_{PS,y} = \sum_t \left(\left(\sum_k CC_{t,k,y} \times \frac{44}{12} \right) - \left(\sum_p PE_{PS,t,p,y} \right) \right) \quad (1)$$

Where:

$ER_{PS,y}$ = GHG emissions removals at production stage in year y (tCO₂e)

$CC_{t,k,y}$ = Organic carbon content on a dry weight basis for biochar type t used for application type k in year y (tonnes)

$PE_{PS,t,p,y}$ = Project emissions at production stage for production of biochar type t at production facility p in year y (tCO₂e)

$\frac{44}{12}$ = Coefficient to convert organic carbon to tCO₂e

The project activity is designed to adopt low-technology²⁴ biochar production facility. Hence, as per the para 8.2.2.2 of the methodology, following steps are adopted:

²⁴ Low technology production facilities are all production facilities that do not meet the conditions defined under high technology production. The project includes earth-pits and box-kiln, which are categorized as low-tech facilities.

Step 1: Estimate organic carbon content ($CC_{t,k,y}$) of biochar for low technology facilities

In low technology settings the total organic carbon content of the produced biochar is the foundation of the GHG calculations. The value is derived from the mass of biochar, its respective organic carbon content, and the decay rate of organic carbon in the biochar taken over a period of 100 years (100-year permanence value).

For low technology production facilities, a conservative approach has been selected, related to the organic carbon content of biochar (F_{Cp}), based on feedstock type and heating temperature as provided in Table 4 which draws from IPCC Method for Estimating the Change in Mineral Soil Organic Carbon Stocks from Biochar Amendments: Basis for Future Methodological Development. In Equation 6 below, permanence (the fraction of carbon in the biochar remaining after 100 years) is included.

$$CC_{t,k,y} = \sum_p (M_{t,k,p,y} \times F_{Cp,t,p} \times PR_{de,k}) \quad (6)$$

Where:

- $CC_{t,k,y}$ = Organic carbon content on a dry weight basis for biochar type t used for application type k in year y (tonnes). Biochar type is based on the feedstock used to produce the biochar.
- $M_{t,k,p,y}$ = Mass on a dry weight basis of biochar type t for application type k produced at production facility p in year y (tonnes)
- $F_{Cp,t,p}$ = Organic carbon content of biochar type t produced in production facility p per tonne of biochar, taken on a dry weight basis (percent). For low technology production facilities, this is determined through laboratory material analysis of biochar where possible. Otherwise, values are obtained from Table 4 per type of feedstock. Where feedstocks are mixed, the most conservative value of the relevant feedstocks must be used.
- $PR_{de,k}$ = Permanence adjustment factor due to decay of biochar to be defined for application type k (dimensionless). Biochar is subject to natural decay rate when used in soil applications such as in agriculture, forests, croplands, or grasslands. Many low technology production facilities do not measure the temperature at biochar production. A default value of 0.56²¹ must be used where pyrolysis temperature is unknown. This follows a conservative approach for carbon permanence.

Determining F_{Cp} : Values for organic carbon content per tonne of biochar per production type

As per the provision of the methodology, project proponents using low technology production facilities may adopt values from IPCC (2019) for different feedstocks and production types (Table 4). Further, project proponents may also refer to other scientific literature such as Woolf et al. (2021).

PP has followed the default value as per the Table 4 of the methodology. Since the feedstock type is Cotton stalks and process follows pyrolysis method, it is considered to be in the category of woody biomass Feedstock and value considered as 0.77 for F_{cp} .

The Calculation:

Parameter		Value	Unit / Remarks
$M_{t,k,p,y}$	=	25000	tons/yr
$F_{cp,tp}$	=	0.77	For wood type, pyrolysis process - as per applied methodology
$PR_{de,k}$	=	0.56	Default value, as per methodology
$CC_{t,k,y}$	=	10780	Tons

Step 2: Estimate project emissions $PE_{PS,t,p,y}$ for low technology facilities:

Emissions under the project scenario are determined using the following equation (7):

$$PE_{PS,p,y} = (P_{ED,p,y} + P_{EP,p,y} + P_{EC,p,y}) \times \frac{\sum_t \sum_k M_{t,k,p,y}}{M_{p,y}} \quad (7)$$

Where:

- $PE_{PS,p,y}$ = Project emissions at the production stage at production facility p in year y (tCO₂e)
- $P_{ED,p,y}$ = Emissions associated with the pre-treatment of waste biomass at production facility p in year y (tCO₂e)
- $P_{EP,p,y}$ = Emissions associated with the conversion of waste biomass into biochar at production facility p in year y (tCO₂e)
- $P_{EC,p,y}$ = Emissions due to the utilization of auxiliary energy for the purpose of pyrolysis at production facility p in year y (tCO₂e)

Determining $P_{ED,p,y}$:

Emissions associated with the pre-treatment of feedstock at production facility p in year y for low technology facilities.

Energy consumption for necessary pre-treatment of waste biomass must be accounted for. This may include feedstock preparation (e.g., feedstock agglomeration, homogenization, pelletizing) either inside the production facility or in field preparation, drying of wet biomass, or other processes. If the energy source is renewable, $P_{ED,p,y}$ must be zero. Otherwise, it must be calculated using the equation 8, as follows:

$$P_{ED,p,y} = P_{EDE,p,y} + P_{EDF,p,y} \quad (8)$$

Where:

- $P_{ED,p,y}$ = Emissions associated with pre-treatment of feedstock at production facility p in year y (tCO₂e)
- $P_{EDE,p,y}$ = Emissions associated with grid-connected electricity utilized for pre-treatment of waste biomass at production facility p in year y (tCO₂e). $P_{EDE,p,y}$ must be calculated as per the provisions of CDM Tool 05: *Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation*.
- $P_{EDF,p,y}$ = Emissions associated with combustion of fossil fuels utilized for pre-treatment of waste biomass at production facility p in year y (tCO₂e). $P_{EDF,p,y}$ must be calculated as per the provisions of CDM Tool 03: *Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion*.

Since there is no pre-treatment involved in the current project design, hence **this equation shall not be applied for any calculation.**

Determining $P_{EP,p,y}$:

Emissions associated with the thermochemical process (pyrolysis) at production facility p in year y for low technology facilities

In the absence of direct emission measurements that can reliably measure and report project emissions, data from peer-reviewed literature must be used in the following equation 9, as follows:

$$P_{EP,p,y} = \sum_k \sum_t (F_e \times GWP_{CH_4} \times M_{t,k,p,y}) \quad (9)$$

Where:

- $P_{EP,p,y}$ = Emissions associated with the conversion of waste biomass into biochar at production facility p in year y (tCO₂e)
- F_e = Average methane emissions from producing one tonne of biochar in year y (tCH₄/tonne). Values from Table 3 in Cornelissen et al. (2016)²² may be used based on the corresponding kiln type (i.e., low technology production facility type). Where the kiln type is not listed a default average emission factor of 0.049 t CH₄/tonne may be conservatively used based on the value for traditional kilns since simple low-cost technologies are known to emit higher levels of CH₄.²³ Project proponent may propose more appropriate values based on scientific studies, research papers or any other credible documentation and/or information related to the utilized production technology.
- GWP_{CH_4} = Global warming potential of methane. Use value referenced in the latest version of the VCS Standard
- $M_{t,k,p,y}$ = Mass on a dry weight basis of biochar type t and application type k produced at production facility p in year y (tonnes)

The Calculation:

Parameter		Value	Unit / Remarks	Source
F_e				Table 3 in Cornelissen et al. (2016) https://doi.org/10.1371/journal.pone.0154617
(a) For Soil Pit	=	0.032	tCH ₄ /tonne	
(b) For Steel-shield soil Pit	=	0.014		
(c) For box kiln (Shallow steel type)	=	0.026		
GW _{PCH₄}	=	28	-	IPCC default value

P _{EP,y}	=	22,400	Tons	Applicable for regular soil pits
	=	9,800	Tons	Applicable for Steel Shield soil pits
	=	18,200	Tons	Applicable for box kiln

Determining $P_{EC,p,y}$:

Emissions due to the utilization of auxiliary energy for the purpose of pyrolysis

When external energy is required to initiate and maintain the pyrolysis reactor, it must be accounted as project emissions. If the source of auxiliary energy is renewable, $P_{EC,p,y}$ must be zero. Otherwise, it must be calculated using the equation 10, as follows:

$$P_{EC,p,y} = P_{ECE,p,y} + P_{ECF,p,y} \quad (10)$$

Where:

- $P_{EC,p,y}$ = Emissions due to the utilization of auxiliary energy for the purpose of pyrolysis at production facility p in year y (tCO₂e)
- $P_{ECE,p,y}$ = Emissions associated with use of grid-connected electricity utilized for starting the reactor at production facility p in year y (tCO₂e). $P_{ECE,p,y}$ must be calculated as per CDM Tool 05: *Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation*.
- $P_{ECF,p,y}$ = Emissions associated with combustion of fossil fuels utilized for starting the reactor at production facility p in year y (tCO₂e). $P_{ECF,p,y}$ must be calculated as per the provisions of CDM Tool 03: *Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion*.

Since this project is a low-technology facility and no pyrolysis reactor is involved, hence there is no use of any auxiliary energies. **Hence, $P_{EC,p,y} = 0$.**

Application Stage:

As per para 8.2.3 of the methodology, in the project scenario, emissions associated with processing and utilizing biochar after its production will have a potential impact on the overall emission removal potential. Equation 11 below determines the GHG emissions at the application stage.

$$PE_{AS,y} = \sum_k \sum_t (E_{P,t,k,y} + E_{ap,t,k,y}) \quad (11)$$

Where:

- $PE_{AS,y}$ = GHG emissions at application stage in year y (tCO₂e)
- $E_{P,t,k,y}$ = Emissions from processing of biochar type t for application type k in year y (tCO₂e)
- $E_{ap,t,k,y}$ = Emissions from utilization of biochar type t for application type k in year y (tCO₂e)

However, biochar produced in the project activity is not processed using any energy application such as grid electricity, fossil fuel etc. **Hence, $E_{P,t,k,y}$ is Zero.**

GHG emissions resulting from fossil fuel combustion or mixing of biochar with fertilizer products are considered negligible. **Thus, $E_{ap,k,y}$ is zero.**

5.3 Leakage Emissions

In the case of biochar use, leakage emissions are primarily attributed to transport emissions at various stages of the biochar life cycle. Emissions due to activity-shifting leakage or biomass diversion are considered zero, as currently only waste biomass is eligible for biochar production. Quantification of leakage emissions are considered using equation 13, as follows:

$$LE_y = LE_{as,y} + LE_{bd,y} + LE_{ts,y} + LE_{tap,y} \quad (13)$$

Where:

LE_y = Total leakage emissions in year y (tCO₂e)

$LE_{as,y}$ = Leakage due to activity shift in year y (tCO₂e). Leakage due to activity shift is zero as use of purposely grown biomass for production of biochar is currently not allowed.

$LE_{bd,y}$ = Leakage due to biomass diversion in year y (tCO₂e). Leakage due to biomass (waste/residue) diversion is considered negligible since only biomass which would have been combusted or left to decay is utilized for biochar production.

$LE_{ts,y}$ = Leakage emissions from transportation of waste biomass from sourcing to biochar production facility in year y (tCO₂e). As per CDM Tool 16: *Project and leakage emissions from biomass*,²⁵ GHG emissions must be accounted for only if transportation distance is more than 200 km. Project proponent must use CDM Tool 12: *Project and leakage emissions from transportation of freight*²⁶ to calculate $LE_{ts,y}$.

$LE_{tap,y}$ = Leakage emissions from transportation of biochar from the production facility to the site of end application in year y (tCO₂e). As per CDM Tool 16: *Project and leakage emissions from biomass*, GHG emissions must be accounted for only if transportation distance is more than 200 km. Project proponent must use CDM Tool 12: *Project and leakage emissions from transportation of freight* to calculate $LE_{tap,y}$.

Determining $LE_{ts,y}$: Emissions related to leakage from transportation of biochar from sourcing to biochar production facility:

Project emissions from transportation of biochar from the place of origin of the waste biomass to the production site may have the following components:

(i) **Transport emissions from field to the production facility**

$LE_{ts,y}$ is considered zero if transportation distance (to and from—round trip) is less than 200 km. Project emissions from transportation of biochar shall be calculated as per the latest version of “CDM Tool 12: Project and leakage emissions from transportation of freight”.

Determining $LE_{tap,y}$: Emissions related to leakage from transportation of biochar from production facility to site of end-use application

Project emissions from transportation of biochar from facility to end-use application may have the following components:

Transport emissions from biochar facility to processing facility;
AND
Transport emissions from processing facility to end-use site;
OR
Transport emissions from biochar facility to end-use site.

$LE_{tap,y}$ is considered zero if transportation distance (to and from—round trip) is less than 200 km. Project emissions from transportation of biochar must be calculated as per the latest version of CDM Tool 12: Project and leakage emissions from transportation of freight.

5.4 Estimated GHG Emission Reductions and Carbon Dioxide Removals

The procedure for estimation of net GHG emission reductions and removals include all relevant equations described under the previous section 5.3.

The ex-ante calculation (estimate²⁵) of baseline emissions/removals, project emissions/removals, leakage emissions and net GHG emission reductions and removals in the table(s) below for the project crediting period, separately presented for different low-tech facilities proposed under the project design.

For Approach 1 (i.e. for low-tech facility with different Earth-pits):

Table A: For regular soil-pits:

Vintage Period	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
Year 1 (12 April 2023 to 11 April 2024)	0	17,126	0	17,126
Year 2 (12 April 2024 to 11 April 2025)	0	17,126	0	17,126
Year 3 (12 April 2025 to 11 April 2026)	0	17,126	0	17,126
Year 4 (12 April 2026 to 11 April 2027)	0	17,126	0	17,126
Year 5 (12 April 2027 to 11 April 2028)	0	17,126	0	17,126

²⁵ The ex-ante calculation will vary depending on the type of low-tech facility being used. PP has already proposed three different approaches under the project design, therefore ex-ante estimates are done for each type of facility. However, PP has anticipated that approach 1 (i.e. earth-pits) may become more suitable followed by the approach 2 and 3. Therefore, final calculation will be based on type of low-tech facilities (or combination) and may vary significantly as compared to the ex-ante estimate. Also, for the purpose of ex-ante estimate an annual projection of 100,000 tons of biomass waste is considered under this project activity which may lead to an annual avg. generation of about 25,000 tons of biochar on dry weight basis.

Year 6 (12 April 2028 to 11 April 2029)	0	17,126	0	17,126
Year 7 (12 April 2029 to 11 April 2030)	0	17,126	0	17,126
Total	0	119,882	0	119,882

Table B: For steel-shield soil-pits:

Vintage Period	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
Year 1 (12 April 2023 to 11 April 2024)	0	29,726	0	29,726
Year 2 (12 April 2024 to 11 April 2025)	0	29,726	0	29,726
Year 3 (12 April 2025 to 11 April 2026)	0	29,726	0	29,726
Year 4 (12 April 2026 to 11 April 2027)	0	29,726	0	29,726
Year 5 (12 April 2027 to 11 April 2028)	0	29,726	0	29,726
Year 6 (12 April 2028 to 11 April 2029)	0	29,726	0	29,726
Year 7 (12 April 2029 to 11 April 2030)	0	29,726	0	29,726
Total	0	208,082	0	208,082

For Approach 2 (i.e. for low-tech facility with box-kiln):

Table C: For box-kiln (i.e. falls under the category of shallow steel octagonal kiln):

Vintage Period	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
Year 1 (12 April 2023 to 11 April 2024)	0	21,326	0	21,326
Year 2 (12 April 2024 to 11 April 2025)	0	21,326	0	21,326
Year 3 (12 April 2025 to 11 April 2026)	0	21,326	0	21,326
Year 4 (12 April 2026 to 11 April 2027)	0	21,326	0	21,326

Year 5 (12 April 2027 to 11 April 2028)	0	21,326	0	21,326
Year 6 (12 April 2028 to 11 April 2029)	0	21,326	0	21,326
Year 7 (12 April 2029 to 11 April 2030)	0	21,326	0	21,326
Total	0	149,282	0	149,282

Detail calculations are referred under the ER calculation sheet, please refer to the excel file.

6 MONITORING

6.1 Data and Parameters Available at Validation

Data / Parameter	$FC_{p,t,p}$
Data unit	Percent (%)
Description	Organic carbon content of biochar for each biochar type t produced in production facility p per ton of biochar, on a dry weight basis (%)
Source of data	Default value provided in Table 4 of the methodology: “values for Organic Carbon Content in Biochar from Table 4AP.1 of IPCC (2019)”.
Value applied:	0.77
Justification of choice of data or description of measurement methods and procedures applied	The project is designed based on single feedstock, i.e. Cotton Stalks as biomass waste. Therefore, the value has been considered for the category “wood” and for the pyrolysis process. Default value considered using IPCC (2019) states global estimates of organic carbon content of biochar as a function of feedstock and heating temperature.
Purpose of Data	Calculation of project emissions
Comments	Fixed for the entire crediting period.

Data / Parameter	$PR_{de,k}$
Data unit	Dimensionless
Description	Permanence adjustment factor due to decay of biochar (dimensionless) to be defined for application type k
Source of data	Default Values from Table 4AP.2 of IPCC (2019), as prescribed under the methodology
Value applied:	0.56
Justification of choice of data or description of measurement methods and procedures applied	As per methodological choice, for low technology production facilities, project proponents must use a conservative default value of 0.56 (Figure 4Ap.1 in IPCC, 2019) Biochar is a stable material that may be used for soil and non-soil applications. As a material, it has a decay rate that must be accounted for. This parameter considers how much of the original carbon will

	remain in the biochar and may be accounted as a carbon sink after its final application. IPCC and EBC are internationally recognized, and the data provided in the guidelines are peer reviewed.
Purpose of Data	Calculation of project emissions
Comments	Fixed for the entire crediting period.

Data / Parameter	GWP _{CH4}
Data unit	tonnes CO2e per tonne CH4 (t CO2e/t CH4)
Description	Global warming potential of methane
Source of data	IPCC Fifth Assessment Report
Value applied:	28
Justification of choice of data or description of measurement methods and procedures applied	The VCS Standard requires that CH4 is converted to CO2e using the 100-year global warming potential derived from the most recent IPCC Assessment Report, fifth version, IPCC 2019..
Purpose of Data	Calculation of project emissions
Comments	Fixed for the entire crediting period.

Data / Parameter	F _e
Data unit	tonnes CH4 per tonne biochar (t CH4/t)
Description	Average methane emissions from producing one tonne of biochar in year y in a low technology production facility
Source of data	Table 3 in Cornelissen et al. (2016)
Value applied:	For earth-pit type: (a) Soil Pit: 0.032 (b) Steel-shield Soil Pit: 0.014 For box-kiln (category: shallow steel type octagonal): 0.026
Justification of choice of data or description of	As per the methodological choice, it is prescribed that if kiln type is known and represented in Table 3, corresponding values may be used for F _e . Here, the project includes both soil-pits and steel-shield soil pits and also box-

measurement methods and procedures applied	kiln is another type. The value for these two soil-pits are mentioned in the Table 3. Also, the box kiln is considered as a traditional shallow steel type octagonal kiln. Hence, these values are considered from the Table 3.
Purpose of Data	Calculation of project emissions
Comments	Fixed for the entire crediting period.

Data / Parameter	Biomass categories and quantities used for selection of the baseline scenario and production of biochar utilized in the project activity
Data unit	tonnes (t) on dry basis
Description	Category: Agriculture waste (cotton stalks) Source: produced on-site during the season by the farmers, obtained from the farmers during the production phase Fate in absence of the project activity: in absence of the project activity the cotton stalks would have been openly combusted without further utilization. Sustainability criteria compliance for respective category as indicated in Table 1: In line with the table 1, the sustainability criteria are referred for the feedstock category “agricultural waste biomass”. Here, the project proponent is using agricultural waste biomass directly from fields and not from a centralized biomass-processing operation. In the baseline agriculture waste biomass was burned without energy production (e.g., open burning of stubble). A baseline survey is referred in this regard. For selection of the baseline scenario, at validation, an ex-ante estimation of these quantities shall be provided.
Source of data	On-site assessment of biomass categories and quantities
Value applied	100,000
Description of measurement methods and procedures applied	Use weigh bridge or an equivalent measuring method. Adjust by moisture content in order to determine the quantity of dry biomass.
Frequency of monitoring/recording	Data monitored continuously and aggregated at least monthly.
QA/QC procedures applied	The biomass weighing data shall be recorded at the point of weighing and records shall be available during monitoring & verification. If required annual energy balance that is based on recorded quantities and quantities converted to biochar in a season can be referred.
Purpose of data	Monitoring of eligible biomass categories and quantities used as feedstock for production of biochar

Calculation method	NA
Comments	Baseline assessment study can also be referred to understand the various parameters prescribed under the Description Section above.

6.2 Data and Parameters Monitored²⁶

Data / Parameter	$M_{t,k,p,y}$
Data unit	tonnes (t)
Description	Mass on dry weight basis of biochar type t and application type k produced at production facility p in year y
Source of data	On-site measurements
Description of measurement methods and procedures applied	Use weighing tools (such as weighing scales and weighbridge). The moisture content is to be adjusted in order to determine quantity of dry weight biomass.
Frequency of monitoring/recording	Monitored continuously, recorded at least monthly
Value applied:	To be applied on actual
Monitoring equipment	Weighing scales and/or Weighbridge
QA/QC procedures applied	Calibrate weighing scales and/or weighbridge as per manufacturer's specifications or at least every three years. In case public weighbridges, the status of calibration can be verified from the operator. Amount of biochar applied must be cross checked with sales records or distribution records kept by the local representative.
Purpose of data	Calculation of project emissions
Calculation method	NA
Comments	Each biochar quantity shall be weighed separately for each biochar type t and each biochar production facility p. Moisture content shall be monitored for each batch of biochar type t. The weighted average value shall be calculated for each monitoring period.

²⁶ The project is promoting only low-technology facilities for biochar production. Therefore, some of the parameters listed in the methodology are not applicable, such as $M_{p,y}$, T_{prod} , WSp . Hence not applicable and not included under this section.

	However, the current project activity design is based on biochar produced using a single type of biomass waste, i.e. Cotton Stalk, Hence, biochar type “t” remains the same across the project.
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Data / Parameter	H:C _{Org}
Data unit	Dimensionless
Description	Ratio of hydrogen to organic carbon
Source of data	Laboratory Analysis
Description of measurement methods and procedures applied	Laboratory analysis following IBI Biochar Testing Guidelines or EBC Production Guidelines.
Frequency of monitoring/recording	To be taken samples from random batches of biochar produced at the production facility (please refer to “comments” below for more details)
Value applied:	To be applied on actual
Monitoring equipment	-
QA/QC procedures applied	Laboratory must be accredited and/or approved by the relevant national agency to conduct required material analysis.
Purpose of data	Used to demonstrate eligibility for use in soil applications. As per applicability condition 10 of the methodology, biochar used in soils must have an H:C _{Org} of less than 0.7.
Calculation method	NA
Comments	The methodology provisions this value for each batch of biochar produced in the facility, However, the current project activity is designed based on monotype feedstock and hence biochar type is also same/uniform across the project. Additionally, the feedstock (i.e. Cotton stalk) is seasonal and hence biochar production is also seasonal. Therefore, it is proposed that the value of H:C shall be evaluated using laboratory analysis once in each seasonal production as characteristics of the biochar output is expected to be uniform.

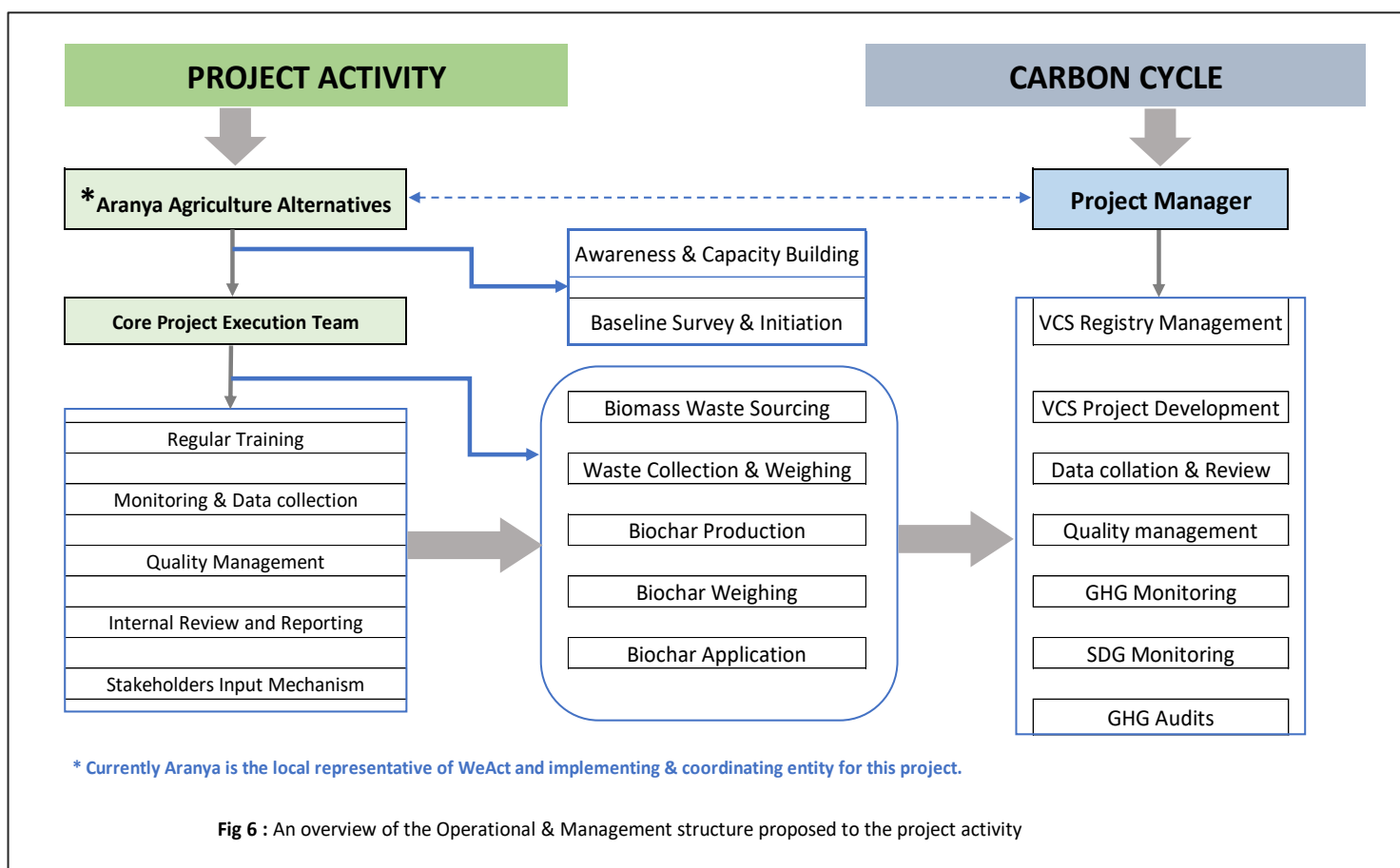
6.3 Monitoring Plan

The monitoring plan for the project activity is designed to capture all required monitoring parameters for an accurate recording of GHG data, estimation of GHG emission reduction results and overall management of the project.

Objective: The main objective of the monitoring is to prove the carbon sink from the final application of biochar and to quantify the emissions resulting from the project scenario during the project crediting period, prior to each verification. To achieve transparency and accuracy that allows the quantification and proof of GHG emissions at the three stages covered by this methodology: sourcing, production, and application.

Operation and Management system:

Following is the representative flow chart to demonstrate the organizational structure for GHG data collection and overall management system. This structure may be revised on time-to-time basis depending on the project requirement and for continuous improvement in the monitoring process.



The key aspects of the monitoring plan are as follows:

A. Description of Monitoring Tasks:

The overall monitoring of the project will be locally managed by the authorized representative “Aranya Agriculture Alternatives”. The field officers will regularly inspect and report data in prescribed formats. There are three stages of the biochar value chain under the project viz, Sourcing, Production and Application; to be performed as follows:

- **Sourcing Stage:**

Dedicated team will be engaged in identifying farmers (i.e. cotton farmers) who are willing to supply feedstock (i.e. sale of cotton stalks to WeAct), followed by signing of FPIC form to include them into the project database. Thereafter, collection, weighing and unloading of feedstock shall be performed during the production time, which can be termed as “procurement process”.

There are three plausible approaches prescribed under the project where both in-situ production and/or centralized production will be achieved at project level. Under any of the approaches all these activities such as identification of farmers, FPIC enrolment, weighing, loading & unloading etc. shall be performed; hence at the sourcing stage, the team will be engaged, and same method shall be adopted for sourcing to complete the “procurement process” under any of the approaches. More details are included under the “Data Management Practice” below.

- **Production Stage:**

There will be dedicated team who will be engaged in production process. The production team includes qualified trained resources for biochar production, measurement, safety monitoring, monitoring and recording of production data for each batch, . These monitoring activities shall be performed by the team irrespective of the approach undertaken at the project level, followed by data management practices. More details are included under the “Data Management Practice” below.

- **Application Stage:**

Once the biochar produced by the project is ready for application, dedicated team will be engaged in identifying farmers (i.e. proposed within 100 km radius) who are willing to apply biochar for soil application (i.e. voluntary participation into the project), followed by signing of FPIC form to include them into the project database. Thereafter, distribution of biochar, weighing, measurement & recording of data, and final application into the soil etc. shall be performed in presence of the local team. All required data points including quantity, date of application, geo-coordinates, etc. shall be properly recorded; more details are included under the “Data Management Practice” below.

B. Data Management Practice:

Following are the main aspects of data management:

- Data for each of the prescribed parameters (i.e. Section 6.2 above) shall be monitored individually and will constitute the main database
- Primary Data shall be collected/recorded/kept by the core project team.
- Primary mode of data recording will be either hard copies (e.g. receipts, invoices, log books etc.) or digital data (e.g. excel entries) or both.
- Internal data review, quality check etc. to be performed by project manager(s).
- For the purpose of Carbon accounting, the data shall be periodically collated and to be submitted to the Carbon team. All data will be recorded and stored across the crediting period of the project, while digital records will be kept for lifetime.

- As per the requirement of the project, various data collection, data recording and data management tools can be adopted by PP; however at present only manual practice followed by digital records are provisioned under the management plan.

Additionally, the following elements will be included in the main 'Project Database':

For Sourcing stage :

- Village Name
- Farmer Reference and details
- Geo-coordinates of farmers field locations and distance to the production facility
- Date of collection
- Vehicle type and details
- Number of trips
- Vehicle Load in each trip

For Production stage :

- Identification of method/kiln type (i.e. earth-pit or Box-kiln or others)
- Location references of the production facilities
- Batch wise recording of biochar production data for each location
- Date references

For Application stage :

- Identification of beneficiaries for soil application
- Details of the beneficiaries
- Quantity of biochar given to beneficiaries
- Location reference of the fields where biochar to be applied
- Date references

C. Monitoring tools:

Following are the main monitoring tools proposed under the current project activity:

Public weigh bridge	– for input biomass waste weighing
Weighing scales	– for biochar weighing
Moisture meters	– for measure moisture content of biomass & biochar

D. Internal Auditing and QA/QC procedure:

As part of continuous improvement and to ensure qualitative implementation and monitoring of the entire process, PP has proposed an internal QA/QC procedure and an internal audit practice at team level. The key elements of these practices are as follows:

- Regular trainings to be conducted (say at least one training every quarter in a calendar year)– both technical and non-technical.
- There will be one Project manager at execution team level, he/she will review the database entries every month and provide a conformity report to Carbon Team on quarterly basis.
- To ensure testing/calibration of the monitoring equipment (wherever applicable) as per manufacturers' specification or at least once in five years. Details are included below, followed by information reported under the section 7.1.
- Project Manager to conduct one internal audit of all the monitoring data once in every six months. Any non-conformance identified to be reported to the carbon team and

necessary actions to be taken under the supervision of the Carbon Project Manager. The internal audit report can be practiced annually which will include details of both the half yearly audits.

- Any finding/observation/non-conformity etc. identified during the internal audits shall be addressed by the Carbon team before preparing for any periodic verification of the GHG data.

a) Testing/Calibration of Monitoring devices:

Primarily, the testing or calibration process is prescribed as per manufacturers' specification. However, at project level the core project execution team (as nominated under the fig.6) shall be responsible for monitoring the requirements of conducting such periodic test/calibration.

Procedure:

The technical team member(s) from the "Core Project Execution Team" shall regularly monitor the performance of the monitoring equipment(s). As part of the "Internal Review and Reporting", the concerned person shall identify the due date of such Test/Calibration and shall report to the Project Manager (as referred under the fig.6). Accordingly, the Project Manager shall communicate to the responsible party for completing such due test/calibration and the same will be performed within the due date.

Traceability:

The traceability of the testing/calibration process shall be considered from the confirmation letter or the tests certificate etc. Such records shall be kept with the project team throughout the crediting period of the project upto 2 years of the end of the period.

Details of calibration requirement for main monitoring devices:

(i) Weighing Scale:

Make	Hindustan Scale Company
Serial number	47421
Accuracy class	0.02
Calibration Frequency	Calibration of the weighing scale is as per manufacturer's specifications or at least every three years.

(ii) Weighbridge:

Make	SRK Industries
Serial number	SP22UB50T031
Accuracy class	III, verification scale interval 10
Calibration Frequency	Calibration of the weighbridge is conducted by operator as per manufacturer's specifications (currently government operated weighbridge is considered, hence testing/calibration is under the purview of operator)

(iii) Moisture Meter:

Make	Metravi – Digital Moisture Meter
Serial number	ET-99M
Accuracy class	0.1%
Calibration Frequency	Calibration is not applicable. The Digital Moisture Meter has been introduced as the interim measure for moisture recording during the pilot launch that covers the first monitoring period (current period). This is considered under methodological deviation.

Project activity shall deploy oven method for moisture measurement, which will be introduced during the subsequent monitoring period. Accordingly, the monitoring instruments/devices shall be included in the future verification periods.

b) Uncertainty Situations :

- During the project operation, uncertain situations may arise such as loss of primary data, emergency shut down situations, natural calamities etc.
During such events, PP may decide to follow one of the following measures:

- (i) In case of primary data sources are lost, PP may decide to forego the claim of Emission Reduction for that particular period as a conservative approach, OR
- (ii) PP may refer to any backup data, duplicate data, reference information etc. which are credible to establish the data sources and shall not double account any emission reduction results.

E. Other Practices:

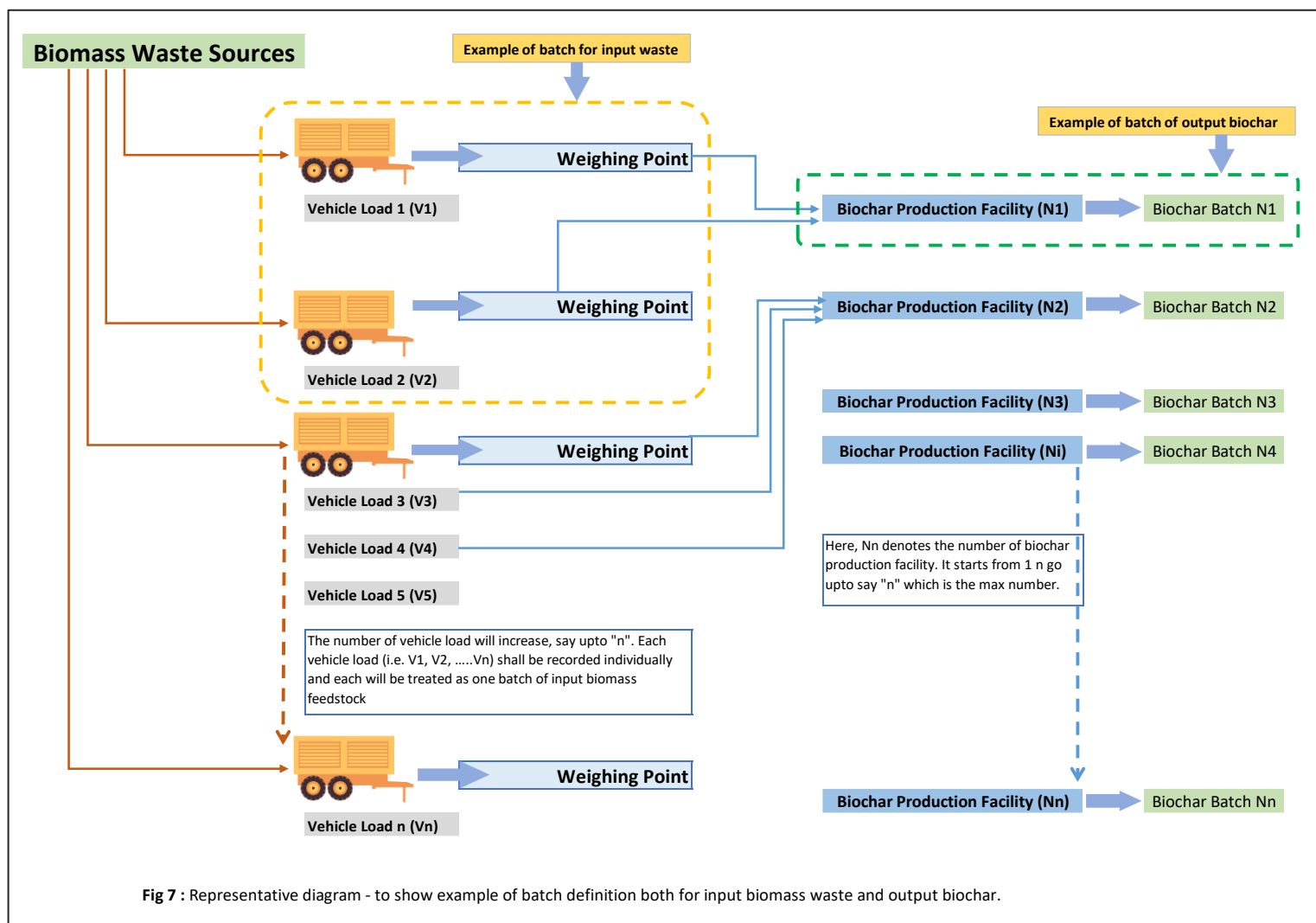
In order to establish a reliable, transparent and accurate monitoring practice, following provisions are prescribed as part of the monitoring plan:

(a) Batch Definition :

- The project promotes low-tech facilities and also to be operated in village level under decentralized set up or centralized set up, but without any continuous processing units/facilities. Therefore, batch definition is considered based on time of production, number of input and output loads, etc.
- For the purpose of batch wise monitoring of input biomass waste data and output biochar data, a batch is defined under the project activity as follows:
 - (i) **For input biomass waste:** a batch of biomass waste is a full load vehicle (i.e. truck load, tractor load etc.) which is weighed and recorded before going into the biochar production facility.
 - (ii) **For output biochar produced:** a batch of biochar is the total produced quantity of biochar via one-time conversion of total input biomass wastes (i.e. single or multiple batches of biomass waste) fed into a particular production facility or site in a particular day (e.g. into box-kilns or into earth pit(s) in a particular day of production in one site). Thus, the total quantity of biochar coming out of one full production day of one production site is one batch.

Note: Thus from the above batch definitions, it is to be noted that one batch of biochar may or may not be equal to one batch of biomass waste; generally multiple batches of biomass waste will lead to one batch of biochar output. Similarly, one batch of biochar produced in a day in a particular production site may or may not be equal to the total volume of one kiln or one pit; generally it will be multiple pits or kilns (as may be the types of low-tech facilities being considered during each season in a year)

A representative diagram is given below to establish the batch definitions (but these examples are not limited, there is possibility of various such combinations):



Example 1:

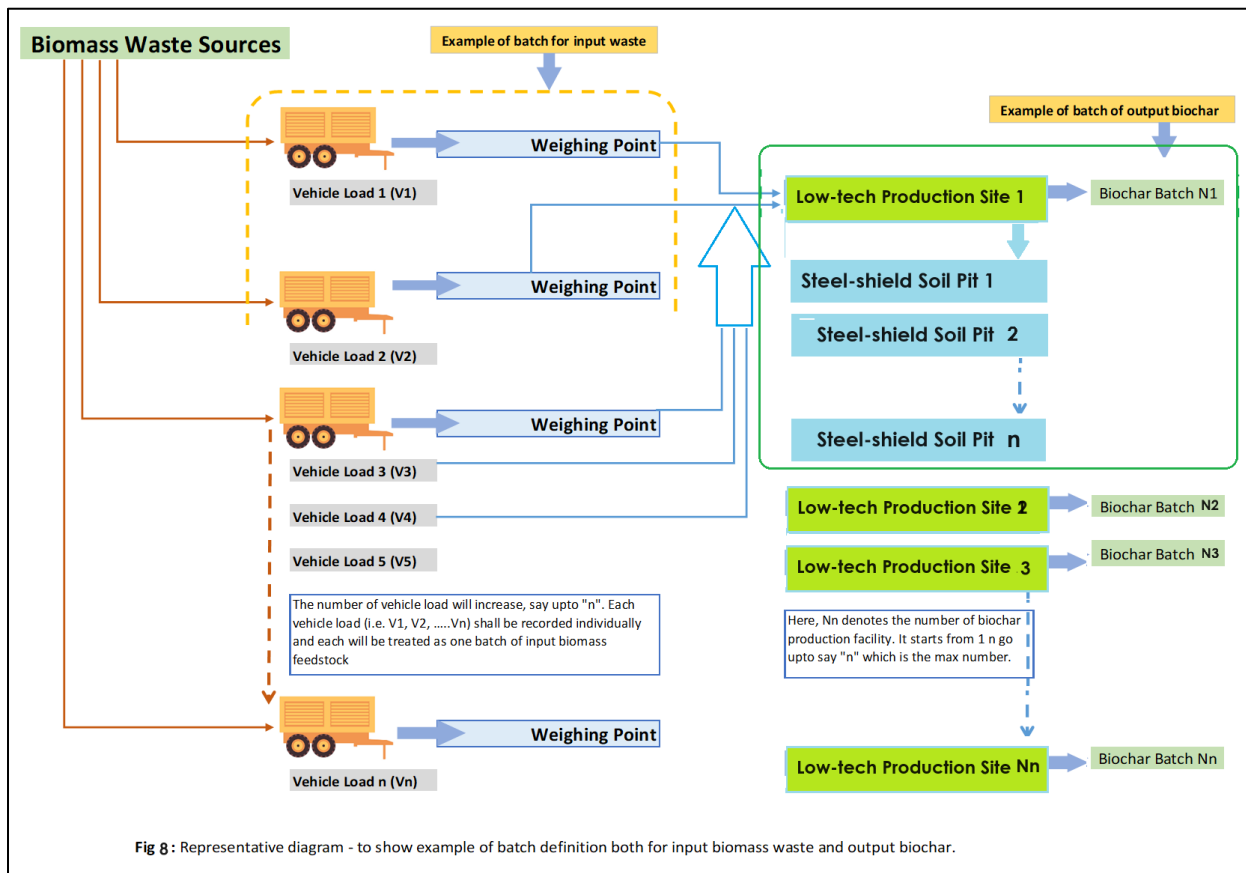
As can be observed in the representative diagram above, each vehicle load (i.e. denoted as V_n , where V refers to vehicle type (e.g. truck, tractor etc.) and n refers to number) will be recorded for weight & moisture as single batch. Similarly, each time there is a production of biochar from a particular facility (say N_n , where N is the facility reference no. and n is the batch number) will be recorded for weight & moisture and will be a single batch.

Thus, as per this batch definition a batch of single output of biochar can be converted from a single or multiple batches of input biomass waste. Hence,

1 Biochar Batch = $\sum$ Batch(s) of input biomass waste (V_n),
 where weight of input biomass waste will be based on vehicle loads (V),
 n will be the reference number of each batch. Thus, n can be as low as 1 or can be multiple in numbers.

Example 2:

As mentioned under the example 1, there are batch production of biochar from a particular facility, say 'Facility N1', and output is 'Batch N1'. Here, Facility N1 could be a combination of more than one similar type of low-tech units (i.e. Soil pits or Box kilns). Whereas, biochar Batch N1 becomes the total volume of biochar produced across the same low tech units under "Facility N1". Thus, under such cases, "Facility N1" can be also denoted as "Production Site N1". A representative diagram for the example 2 is given below:



Thus, as per this batch definition a batch of single output of biochar can be converted from a single or multiple batches of input biomass waste. Hence,

1 Biochar Batch =

$\sum$ volume of biochar produced from multiple low-tech units of similar type, with multiple batches of input biomass waste (Vn),

Where, similar type of low-tech units means either sample types of soil pits or same types of box kiln.

Here, the weight and moisture values of each batch of input biomass waste shall be recorded, whereas for biochar there will be single record of weight & moisture.

(b) Method of Weighing of Biomass Waste (i.e. Cotton Stalks):

With the help of weigh bridge, to be measured based on vehicle load (such as truck load, tractor load etc.)

Alternative methods can be used in line with the provision of the methodology and VCS guidelines.

(c) Method of Weighing of Biochar Waste (i.e. output product):

With the help of weighing scales.

Such scales can be fixed and/or portable/moveable; details to be included into the database.

Alternative methods can be used in line with the provision of the methodology and VCS guidelines.

(d) Method of measuring moisture contents of biomass & biochar:

Either of the following methods shall be considered:

- (i) With the help of moisture meters.
- (ii) With the help of oven drying method.

In case moisture meters, methodological deviation shall be applied during the monitoring & verification. This method has already been justified under the Methodology Deviation section 3.6.

In case of moisture meters, data to be logged into register and/or excel file. Also, photographs (random samples) of such readings shall be kept for cross referencing purposes.

In case of oven drying method, moisture measurement log-books and calculations shall be maintained.

(e) Method of monitoring SDG parameters:

- Direct monitoring based on records (such as employment agreement, work contracts, training records, etc.)
- Based on primary records such as direct sampling survey with beneficiaries
- Based on third party reports such as NGO statistics, survey reports etc.
- Any other method which can allow SDG claims to be recorded and verified, etc.

F. Provision for Sampling Method:

At project monitoring level, sampling is not envisaged as all the ex-post monitoring parameters²⁷ will be recorded in detail. Also, the input values to the ER calculation shall use the entire data as per primary records.

²⁷ However, for the particular parameter “H:C_{org}” it is prescribed that the biochar samples shall be taken from random batches of biochar produced at the production facility. However, this sample does not refer or relate to any Sampling Survey method, instead a sample means “small portion of the biochar” taken for testing.

7 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

7.1 Data and Parameters Monitored

All data and parameters monitored during the current monitoring period (12-April-2023 to 30-June-2023). The data and parameters determined or available at validation which remain fixed throughout the project crediting period are included in Section 6.1 (Data and Parameters Available at Validation) above.

Data / Parameter	M _{t,k,p,y}																
Data unit	tonnes (t)																
Description	Mass on dry weight basis of biochar type t and application type k produced at production facility p in year y																
Source of data	On-site measurements																
Description of measurement methods and procedures applied	Use weighing scales. The moisture content has been adjusted in order to determine quantity of dry weight biomass.																
Frequency of monitoring/recording	Monitored continuously, recorded both daily and monthly																
Value applied:	12.46																
Monitoring equipment	(i) Weighing Scale: <table border="1"> <tr> <td>Make</td><td>Hindustan Scale Company</td></tr> <tr> <td>Serial number</td><td>47421</td></tr> <tr> <td>Accuracy class</td><td>0.02</td></tr> <tr> <td>Date of last calibration</td><td>05 March 2023</td></tr> </table> (ii) Weighbridge: <table border="1"> <tr> <td>Make</td><td>SRK Industries</td></tr> <tr> <td>Serial number</td><td>SP22UB50T031</td></tr> <tr> <td>Accuracy class</td><td>III, verification scale interval 10</td></tr> <tr> <td>Date of last calibration</td><td>15 January 2023</td></tr> </table>	Make	Hindustan Scale Company	Serial number	47421	Accuracy class	0.02	Date of last calibration	05 March 2023	Make	SRK Industries	Serial number	SP22UB50T031	Accuracy class	III, verification scale interval 10	Date of last calibration	15 January 2023
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Make	SRK Industries																
Serial number	SP22UB50T031																
Accuracy class	III, verification scale interval 10																
Date of last calibration	15 January 2023																
QA/QC procedures applied	Calibration of the weighing scale and/or weighbridge is as per manufacturer's specifications or at least every three years. Currently public weighbridge was used for measuring. Amount of biochar produced and applied are available in logbooks for further cross checking. Thus, data quality shall be ensured from the cross-checking methods and also due to the regular or timely testing/calibration of the devices.																

	Data will be stored both digitally and in hard copies upto 2 years beyond the end of the crediting period.
Purpose of data	Calculation of project emissions
Calculation method	NA
Comments	The current project activity design is based on biochar produced using a single type of biomass waste, i.e. Cotton Stalk, Hence, biochar type “t” remains the same across the project and usage is considered for soil-application only hence “k” = soil application. Also, production facility considered for this entire period was box-kiln, hence “p” = box-kiln. The moisture content values are recorded using moisture meter and to be included in the ER sheet. Both the monitoring equipment are available in the project. However, during the current monitoring period biochar weights were recorded using weighbridge only.

Data / Parameter	H:C _{org}
Data unit	Dimensionless
Description	Ratio of hydrogen to organic carbon
Source of data	Laboratory Analysis (see below “comments” section for details)
Description of measurement methods and procedures applied	Laboratory analysis following IBI Biochar Testing Guidelines or EBC Production Guidelines.
Frequency of monitoring/recording	To be taken samples from random batches of biochar produced at the production facility (please refer to “comments” below for more details)
Value applied:	0.54
Monitoring equipment	-
QA/QC procedures applied	Laboratory is an accredited approved by the relevant national agency to conduct required material analysis. Thus, data quality shall be ensured from the certified lab tested reports which are from the accredited lab. Data will be stored both digitally and in hard copies upto 2 years beyond the end of the crediting period.
Purpose of data	Calculation of project emissions
Calculation method	NA
Comments	The current project activity it is proposed that the value of H:C shall be evaluated using laboratory analysis once in each seasonal production as characteristics of the biochar output is expected to be uniform. Also, this is only a reporting parameter and value is not used in the ER calculation. Current value is considered from laboratory test report. QSS Lab Report reference: QSS/05/VSH/0442/23-24

	PP has also reviewed value from literature review which is found to have values in the range of 0.23 ~ 0,76. Source: Scientific Report, Published: 04 March 2016 https://www.nature.com/articles/srep22644
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Data / Parameter	Biomass categories and quantities used for selection of the baseline scenario and production of biochar utilized in the project activity
Data unit	tonnes (t) on dry basis
Description	Category: Agriculture waste (cotton stalks) Source: produced on-site during the season by the farmers, obtained from the farmers during the production phase Fate in absence of the project activity: in absence of the project activity the cotton stalks would have been openly combusted without further utilization. Sustainability criteria compliance for respective category as indicated in Table 1: In line with the table 1, the sustainability criteria are referred for the feedstock category “agricultural waste biomass”. Here, the project proponent is using agricultural waste biomass directly from fields and not from a centralized biomass-processing operation. In the baseline agriculture waste biomass was burned without energy production (e.g., open burning of stubble). A baseline survey is referred in this regard. For selection of the baseline scenario, at validation, an ex-ante estimation of these quantities shall be provided.
Source of data	On-site assessment of biomass wastes
Description of measurement methods and procedures applied	Quantity measured using public weighbridge. Adjust by moisture content in order to determine the quantity of dry biomass.
Frequency of monitoring/recording	Data monitored continuously (for each trip) and aggregated monthly.
Value applied:	51.28
Monitoring equipment	Manual method, and use of weighbridge for measuring biomass quantity
QA/QC procedures applied	The biomass weighing data was recorded at the point of weighbridge and records are available for verification. Thus, data quality shall be ensured from the cross-checking methods of data logs and also from the records maintained at the weighbridge operator. Additionally, there will be regular or timely testing/calibration of the devices.

	Data will be stored both digitally and in hard copies upto 2 years beyond the end of the crediting period.
Purpose of data	Monitoring of eligible biomass categories and quantities used as feedstock for production of biochar
Calculation method	NA
Comments	The moisture content values are recorded and to be included in the ER sheet.

7.2 Baseline Emissions

Sourcing Stage

As per the section 5.1 of this report, the Baseline emissions at sourcing stage in year y ; conservatively assumed default value of zero (tCO_2e).

Production Stage:

In the baseline scenario at production stage, no biochar is produced for the purpose of the project activity and therefore no GHG removals or related emissions are considered.

Application Stage:

In the baseline scenario at application stage, since no biochar was produced, no GHG removals or related emissions are considered.

7.3 Project Emissions

Sourcing Stage

As per the section 5.2 of this report, at the sourcing stage, the methodology relies on the collection of waste biomass (i.e. cotton stalks). Therefore, the emissions at the sourcing stage ($PE_{ss,y}$) are set to zero.

Production Stage:

In the project scenario, the net GHG balance depends on the organic carbon content at the biochar production stage. The equation 1 is referred, in this project activity the pre-treatment process is not involved, hence the latter includes other relevant emissions from the production facilities only. Thus, The project emission removals during production at the biochar facility are as follows:

$$ER_{PS,y} = \sum_t \sum_k \sum_p \left(CC_{t,k,y} \times \frac{44}{12} \right) - PE_{PS,t,p,y} \quad (1)$$

Where:

- $ER_{PS,y}$ = GHG emissions removals at production stage in year y (tCO₂e)
 $CC_{t,k,y}$ = Organic carbon content on a dry weight basis for biochar type t used for application type k in year y (tonnes)
 $PE_{PS,t,p,y}$ = Project emissions at production stage for production of biochar type t at production facility p in year y (tCO₂e)
 $\frac{44}{12}$ = Coefficient to convert organic carbon to tCO₂e

The project activity has adopted low-technology²⁸ biochar production facility. Hence, as per the para 8.2.2.2 of the methodology, following steps are adopted:

Step 1: Estimate organic carbon content ($CC_{t,k,y}$) of biochar for low technology facilities

Equation 6 of the methodology applied:

$$CC_{t,k,y} = M_{t,k,p,y} \times F_{CP,t,p} \times PR_{de,k} \quad (6)$$

Where:

- $CC_{t,k,y}$ = Organic carbon content on a dry weight basis for biochar type t used for application type k in year y (tonnes). Biochar type is based on the feedstock used to produce the biochar.
 $M_{t,k,p,y}$ = Mass on a dry weight basis of biochar type t for application type k produced at production facility p in year y (tonnes)
 $F_{CP,t,p}$ = Organic carbon content of biochar type t produced in production facility p per tonne of biochar, taken on a dry weight basis (percent). F_{CP} for low technology production facilities is determined through laboratory material analysis of biochar where possible. Otherwise, F_{CP} values are obtained from Table 4 per type of feedstock. Where feedstocks are mixed, the most conservative F_{CP} value of the relevant feedstocks must be used.
 $PR_{de,k}$ = Permanence adjustment factor due to decay of biochar to be defined for application type k (dimensionless). Biochar is subject to natural decay rate when used in soil applications such as in agriculture, forests, croplands, or grasslands. Many low technology production facilities do not measure the temperature at biochar production. A default value of 0.56²² must be used where pyrolysis temperature is unknown. This follows a conservative approach for carbon permanence.

²⁸ The project design includes earth-pits and box-kiln, which are categorized as low-tech facilities. During the current monitoring period only box-kiln was utilized.

The value calculated for $CC_{t,k,y}$ for the current monitoring period as follows:

Parameter	Values	Units	Source
$M_{t,k,p,y}$	12.46	Tons	Production Log & Moisture data
$F_{Cp,tp}$	0.77	-	Default value provided in Table 4 of the methodology: "values for Organic Carbon Content in Biochar from Table 4AP.1 of IPCC (2019)".
$PR_{de,k}$	0.56	-	Default Values from Table 4AP.2 of IPCC (2019), as prescribed under the methodology

Thus, $CC_{t,k,y} = 5.4$ tons

Step 2: Estimate project emissions $PE_{PS,t,p,y}$ for low technology facilities:

Emissions under the project scenario are determined using the following equation (7):

$$PE_{PS,t,p,y} = \sum_t [(P_{ED,p,y} + P_{EP,p,y} + P_{EC,p,y})] \quad (7)$$

Where:

- $PE_{PS,t,p,y}$ = Project emissions at the production stage for production of biochar t at production facility p in year y (tCO_{2e})
- $P_{ED,p,y}$ = Emissions associated with the pre-treatment of waste biomass at production facility p in year y (tCO_{2e})
- $P_{EP,p,y}$ = Emissions associated with the conversion of waste biomass into biochar at production facility p in year y (tCO_{2e})
- $P_{EC,p,y}$ = Emissions due to the utilization of auxiliary energy for the purpose of pyrolysis at production facility p in year y (tCO_{2e})

Here,

$$P_{ED,p,y} = 0$$

(Since there is no pre-treatment involved in the current project design, hence **this equation shall not be applied for any calculation**)

$$P_{EC,p,y} = 0$$

(Biochar produced in the project activity is not processed using any energy application such as grid electricity, fossil fuel etc. Also, GHG emissions resulting from fossil fuel combustion or mixing of biochar with fertilizer products are considered negligible.)

$P_{EP,p,y}$:

In the absence of direct emission measurements that can reliably measure and report project emissions, data from peer-reviewed literature must be used in the following equation 9, as follows:

$$P_{EP,p,y} = \sum_k \sum_t (F_e \times GWP_{CH_4} \times M_{t,k,p,y}) \quad (9)$$

Where:

$P_{EP,p,y}$ = Emissions associated with the conversion of waste biomass into biochar at production facility p in year y (tCO₂e)

F_e = Average methane emissions from producing one tonne of biochar in year y (tCH₄/tonne). Values from Table 3 in Cornelissen et al. (2016)²⁵ may be used based on the corresponding kiln type (i.e., low technology production facility type). Where the kiln type is not listed a default average emission factor of 0.049 t CH₄/tonne may be conservatively used based on the value for traditional kilns since simple low-cost technologies are known to emit higher levels of CH₄²⁶. Project proponent may propose more appropriate values based on scientific studies, research papers or any other credible documentation and/or information related to the utilized production technology.

GWP_{CH_4} = Global warming potential of methane. Use value referenced in the latest version of the *VCS Standard*

$M_{t,k,p,y}$ = Mass on a dry weight basis of biochar type t and application type k produced at production facility p in year y (tonnes)

The value calculated for $P_{EP,p,y}$ for the current monitoring period as follows:

Parameter	Values	Units
F_e	0.026	tCH ₄ /ton of biochar
GWP_{CH_4}	28	-
$M_{t,k,p,y}$	12.46	Tons

Thus, $P_{EP,p,y} = 9.07 \text{ tCO}_2\text{e}$

7.4 Leakage Emissions

As per the provision of the section 5.3 of the report, the Leakage emission is Zero.

(The transportation distance (to and from—round trip) for both biomass collection and the biochar application site is less than 200 km. This can be verified from the logs records. Additionally, feedstock is not purposely grown and there is no diversion of biomass for the biochar production in the project)

7.5 GHG Emission Reductions and Carbon Dioxide Removals

The net GHG emission reductions and removals achieved for this monitoring period is as follows:

$$ER_{PS,y} = \sum_t \sum_k \sum_p \left(CC_{t,k,y} \times \frac{44}{12} \right) - PE_{PS,t,p,y} \quad (1)$$

$$ER_{PS,y} = (5.4 \times 44/12) - 9.07 = 10 \text{ tCO}_2\text{e (rounded down value)}$$

Vintage period	Baseline emissions (tCO ₂ e)	Project emissions (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Reduction VCU (tCO ₂ e)	Removal VCU (tCO ₂ e)	Total VCUs (tCO ₂ e)
Year 1 (12-April-2023 to 30-June-2023)	0	9.07	0	0	19.70	10
Total	0	9.07	0	0	19.70	10

The comparison of estimated ex-ante GHG emission reductions and removals and the achieved emission reductions and removals for this monitoring period:

Vintage period	Ex-ante estimated reductions/removals	Achieved reductions/removals	Percent difference	Explanation for the difference
Year 1 (12-April-2023 to 30-June-2023)	4,674 tCO ₂ e ²⁹	10 tCO ₂ e	-99.79%	This is because during the current monitoring period only a very small portion of biomass was considered for biochar conversion as part of an initial pilot run. As per ex-ante estimate it was expected to have about 21,900 tons of biomass to be treated amounting to an estimated production of about 5,480 tons of biochar production during this monitoring period. Whereas total biochar produced (measured quantity) during this period was only 12.46 tons.
Total	4,674 tCO ₂ e	10 tCO ₂ e	-99.79%	

²⁹ This is the calculated ex-ante equivalent value for the current monitoring period. Calculation is referred in the ER sheet.

APPENDIX 1: COMMERCIALLY SENSITIVE INFORMATION

Section	Information	Justification
<u>NA</u>	NA	NA

APPENDIX 2: STAKEHOLDER CONSULTATION DOCUMENTS

Some representative photos of the Local stakeholders' consultation include below (whereas all other supporting documents related to the Stakeholders' consultation submitted to VVB):

**PUBLIC NOTICE
(STAKEHOLDERS
CONSULTATION):**

We, **"WeAct Pty Ltd."** hereby invite all local, regional and any relevant people to join us in a consultation round for a Biochar production project(a VCS carbon project) being developed in Telangana. Proposed Venue is: Aranya Permaculture farm, Bidakanne Village Jharasangam Mandal, Sangareddy Dt, Telangana State, India on 7th April 2023, time : 11.00 am

Contact:
PRANEET REDDY
Project Coordinator
Contact: +91 – 9989799294,
9949062295
Title under VCS: Biochar
Project-1 by WeAct

[illegible]

పజ్జిక నోటీసు
స్టేక్ హోల్డర్స్ కన్వల్యేషన్ /
స్థానిక ప్రజలతో సంప్రదింపులు
మేము అనగా వియార్క్ ప్రాప్రైటరీ లిమిటెడ్, తెలంగాణాలో అభివృద్ధి చేస్తున్న బయోచార్ అత్యుత్తమ ప్రాజెక్ట్ (అనగా VCS కార్బన్ ప్రాజెక్ట్) కోసం స్థానిక, ప్రాంతీయ మరియు సంబంధిత వ్యక్తులందరినీ సంప్రదింపుల కొరకు ఆహ్వానిస్తున్నాము. ఈ సంప్రదింపులు జరిగే స్థలము అరణ్య పర్యావరణపు ఫార్మి, బీడకన్నే గ్రామము, ఝరానగం మండలము, సంగారెడ్డి జిల్లా, తెలంగాణ రాష్ట్రము. తేది: 7th ఏప్రిల్, 2023, సమయం: ఉదయము: 11.00 గంటలకు.
సంప్రదించవలసినవారు:
ప్రజేష్ రెడ్డి, ప్రాజెక్ట్ కో-ఆర్డినేటర్
సంప్రదించవలసినవారి నెంబర్
+91- 9989799294, 9949062295
Title Under VCS:
బయోచార్ ప్రాజెక్ట్-I,
వియార్క్ ప్రాప్రైటరీ లిమిటెడ్



APPENDIX 3: THE IBI BIOCHAR TESTING GUIDELINES OR THE EBC PRODUCTION GUIDELINES.

This section includes the key requirements of these guidelines and their relevance/compliance to this project activity:

THE IBI GUIDELINES:

As per IBI Standard v2.1³⁰, the section 3.1 specifies “General Feedstock Material Requirements”, as follows:

The materials used as feedstocks for biochar production have direct impacts on the nature and quality of the resulting biochar. Although the focus of this document is on the biochar material, some restrictions have been applied to feedstock contents and quality. To qualify as biochar feedstock under these standards, the feedstock may be a combination of biomass and diluents, but may not contain more than 2% by dry weight of contaminants (following Brinton 2000). Any diluents that constitute 10% or more by dry weight of the feedstock material must be reported as a feedstock component.

Feedstocks are differentiated into two types: unprocessed feedstocks and processed feedstocks, with different requirements for sampling and analysis of potential toxic substances. Suitable feedstocks include but are not limited to biomass residues, which may contain a minimal quantity of contaminants (see above) as part of the feedstock. Feedstock that may have been grown on contaminated soils is considered to be a processed feedstock and must meet the toxicant assessment testing frequency requirements for processed feedstocks given in Section 5.5 Category B Testing Frequency.

Municipal Solid Waste (MSW) containing hazardous materials or wastes may not be included as eligible feedstock under these standards. It is the manufacturer’s responsibility to ensure that biochar feedstock materials are free of hazardous materials.

Justification:

- (1) The biomass feedstock considered under the project activity is single type, which is Cotton Stalks.
- (2) The cotton stalks are under the category of “unprocessed”.
- (3) Since cotton stalks are biomass residue, hence it fulfils the statement “Suitable feedstocks include but are not limited to biomass residues”.
- (4) Since cotton is a regular seasonal crop in the project region in Telangana, hence the soil is not considered as contaminated soil, this is regular agriculture productive soil.

Further References:

A detailed baseline study and project feasibility assessment was conducted by PP via a third party agency; which confirms that cotton waste being utilized under the project activity is not part of municipal wastes. The baseline scenario (as established under primary survey) confirms that cotton stalks are only burnt at fields after the harvesting season; which rules out all possibility of treating them as municipal waste.

³⁰ https://biochar-international.org/wp-content/uploads/2023/01/IBI_Biochar_Standards_V2.1_Final-2.pdf

Additionally, biochar supply chain considered under the project includes cotton waste sourcing, biochar production and biochar utilization; which are considered in situ and instant batch-wise production. Therefore, raw material storage related concerns are eliminated; similarly biochar produced from the project is being utilized in the nearby fields which will be before the next cotton cropping season. Thus, safety issues related concerns are minimized under the project. Nevertheless, PP has developed on MSDS framework for operation which is being followed to ensure best management practice with biochar in line with the IBI Standard.

Regarding Test Category as per IBI Biochar Standards:

The project has adopted the “Test Category-A”. This is because the applied methodology requires testing of biochar for H:C ratio, hence PP considers “Test Category-A” as per the biochar IBI Standard.

THE EBC PRODUCTION GUIDELINES:

As per the EBC Guidelines, section 4 of the version 10.3³¹ (dated 5 April 2023):

All biomasses included in the EBC positive list may be used individually or in combination as feedstock for the production of EBC biochar. For each certification class certain restrictions apply, which are set out in the EBC positive list. For example, not all biomasses that may be used for EBC-Feed. Within a batch, the type of biomass may not be changed, and the mixing ratios may not change by more than 20% (cf. 2.5).

Only biomass and no fossil carbon may be used to produce biochar. The EBC positive list (Appendix 1) indicates which types of biomasses are permissible for each application class.

- The feedstock used under the project is cotton stalk, which are residue, hence non-fossil carbon.
- Also, the Appendix 1 of the EBC Guidelines “Positive list³² of permissible biomasses for the production of biochar” includes cotton under the eligible feedstock, hence EBC Guideline is fulfilled.

³¹ https://www.european-biochar.org/media/doc/2/version_en_10_3.pdf

³² https://www.european-biochar.org/media/doc/2/positive-list_en_v10_3.pdf

APPENDIX 4: DEMONSTRATION OF FEEDSTOCK AS WASTE BIOMASS

As per the Appendix 2 of the methodology, this appendix provides procedures to demonstrate that the fate in the absence of the project activity biochar feedstock was waste biomass category in the baseline scenario (i.e., in the absence of the project activity) as required by the applicability conditions.

SN	Condition	Justification
1	Assessment of feedstock biomass use must cover the five years preceding the project start date. All qualitative and quantitative information on biomass use in the baseline scenario should be determined via consultation with the manager/landowner that the biomass is sourced from or with the contracted supplier (e.g., biomass broker/intermediary).	The project is inclusive of local cotton farmers as supplier of biomass feedstock; these farmers are conventional farmers since generations and hence availability of their cotton stalks in each season are a permanent scenario. This was established during the detailed Baseline Survey and Assessment (Report submitted), also acknowledged by Mandal Agriculture Office (MAO). Thus, the survey was primary with farmers as real time respondents and their inputs were taken for assessment considering their historic cotton farming and scenario of cotton wastes. Therefore, the condition related to assessment of “five years preceding the project start date” has already been addressed while conducting the survey and arriving at the baseline scenario.
2	The following list specifies the allowable sources of information on biomass use in the baseline scenario with priority from higher to lower preference, as available. The principle of conservatism must be applied in all cases: - Where the source of biomass can be identified, and the biomass is not used in the baseline scenario: - Historical management plans, receipts, or other records from the areas where the biomass is sourced from showing that the biomass was not used for alternative purposes in the five years preceding the project start date. These may be supplemented with other forms of evidence such as remote sensing (e.g., satellite imagery) or	Yes, category 1 is applicable. The project includes only ‘Cotton Stalk’ as biomass feedstock for biochar production which has been identified and baseline scenario was also established as “in absence of the project, the feedstock would have been combusted without any usages or purposes”. However, sources of information for this biomass feedstock at baseline scenario could not be identified from any historical management plans, receipts or from any other govt. records etc. This is because there was open burning practice by farmers and no waste management practice was observed. Therefore, PP has considered primary

	documentation from comparable sourcing areas. OR b. Substantiation via a signed attestation from the manager/landowner or supplier stating that the biomass was not used for alternative purposes in the five years preceding the project start date. This includes new sources of biomass that did not exist (e.g., residues from a new food processing mill) before the project start date. The attestation must not deviate from other available evidence such as remote sensing (e.g., satellite imagery) or documentation from comparable sourcing areas.	survey via third-party agency³³ to establish the baseline scenario, biomass feedstock, availability etc. Additionally, some of the public literatures³⁴ were reviewed, also acknowledgement (of the feedstock availability, baseline scenario) received from local Mandal Agriculture Office (MAO)³⁵. Thus, option (a) is applicable in the given list that specifies the allowable sources of information on biomass use in the baseline scenario. Note: Additionally, as mentioned above the respondents (i.e. farmers) to the primary survey provided inputs stating that the biomass was not used for alternative purposes since beginning. The signed questionnaires from the farmers can be considered equivalent to the relevant documents for substantiation of this requirement. Similarly, the farmers who supply feedstock to the project sign FPIC form which is also an equivalent document for substantiation. Therefore, option (b) can also be referred.
	2. Where the source of biomass can be identified and (some or all) the biomass is used in the baseline scenario: a. Historical management plans, receipts, or other records from the areas where the biomass is sourced from showing that the biomass supply is sufficient to satisfy project demand without compromising future non-project biomass delivery commitments. This must be demonstrated through an analysis of historical biomass volumes delivered annually in the five years	Not applicable as the biomass has not been used in the baseline scenario.

³³ Baseline Survey Report (Feb 2023) is submitted.

³⁴ Sources:

- Cotton Outlook 2023: https://pitsau.edu.in/files/AgriMkt/2023/March/cotton-March-2023.pdf?utm_source=chatgpt.com
- SEASON AND CROP COVERAGE REPORT YASANGI- 2023-24 (Dept. of Agriculture, Telangana): https://agri.telangana.gov.in/open_record_view.php?ID=1263

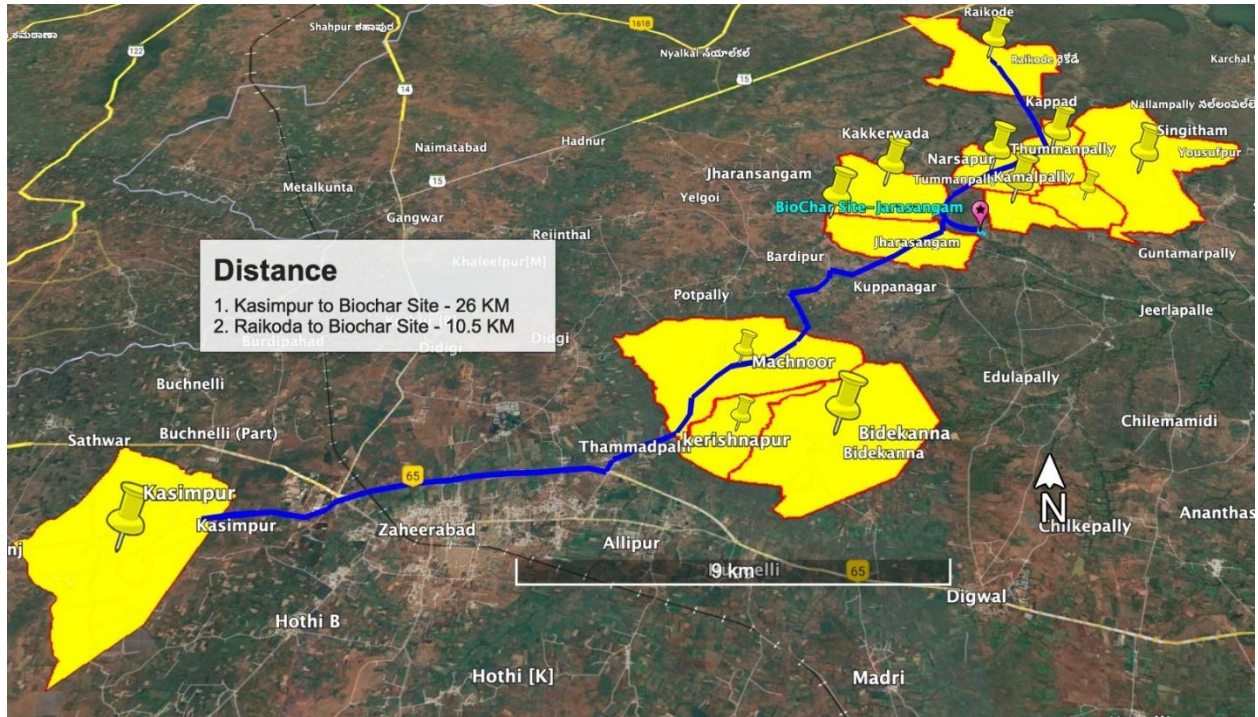
³⁵ The acknowledgement received from Mandal Agriculture Office (MAO) of Jharasangam on the letter dated 25th Jan 2024.

	preceding the project start date combined with expected project- and non-project-related volumes for the duration of the project crediting period. OR b. Substantiation via a signed attestation from the manager/landowner or supplier stating that the available biomass supply is sufficient to satisfy project-related demand without compromising future biomass delivery commitments. This must be supplemented by an analysis of historical biomass volumes delivered annually in the five years preceding the project start date combined with expected project- and non-project-related volumes for the duration of the project crediting period. The attestation must not deviate from other available evidence such as remote sensing (e.g., satellite imagery) or documentation from comparable sourcing areas.	
	3. Where the source of biomass cannot be identified (e.g., the biomass is sourced from a biomass residue market with unknown producers): a. Demonstration that there is an abundant, unutilized surplus of the same or similar type of biomass in the project region. This must be demonstrated through an analysis showing that the total biomass quantity available is at least 25 per cent larger than the total biomass quantity used (including by the project	Not applicable as the biomass source is identified.

	facility) for that type of biomass. The analysis should be based on an annual assessment of biomass availability and use in the five years preceding the project start date. Where historical data is not available on an annual basis for the five years preceding the project start date, at least one year of data may be used as evidence. This should be complemented with additional evidence demonstrating that the available data is representative of the five years preceding the project start date. The project region should be adjusted to reflect characteristics specific to the biomass type and markets (e.g., wood residues for bioenergy production) where the project is located.	
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APPENDIX 5: TOTAL PROJECT AREA DEMONSTRATED IN KML:

The total targeted areas to be covered under the project will be limited within the Sangareddy district of Telangana state. Therefore, the overall project boundary is demarcated using KML as follows:



APPENDIX 6: SAMPLE COPIES OF DIGITAL MOISTURE METER:

Metravi ET-99M Digital Moisture Meter

Metravi ET-99M is a professional, conductivity moisture tester designed to measure moisture content in wood, sawn timber, cardboard, paper, as well as hardened materials like plastic, concrete and mortar, using pin probe sensors.

The instrument has Wood, Building and Hold Modes, as well as Automatic Shutdown, Backlight On/Off and Low Power reminder functions.



Metravi ET-99M Digital Moisture Meter

WOOD MODE:- RANGE: 6 TO 99%, ACCURACY: $\pm 4\%$, RESOLUTION: 0.1%
 BUILD MODE:- RANGE: 0.2 TO 2%, ACCURACY: 0.1%, RESOLUTION: 0.1%
 QUICK RESPONSE. DATA HOLD,
 USER-SELECTABLE WOOD/BUILDING MATERIAL MODES
 AUTO POWER-OFF. LOW BATTERY INDICATION.



DESCRIPTION	ADDITIONAL INFORMATION	SPECIFICATIONS
• Wood/Building Material Modes • WOOD MODE - Range: 6 to 99% - Accuracy: $\pm 4\%$ - Resolution: 0.1% • BUILD MODE - Range: 0.2 to 2% - Accuracy: $\pm 0.1\%$ - Resolution: 0.1% • Quick response • Data Hold • Auto Power-Off • Low battery indication		

