Gold Standard for the Global Goals

TEMPLATE

MONITORING REPORT

PUBLICATION DATE **14.10.2020**

VERSION **v. 1.1**

RELATED SUPPORT **- TEMPLATE GUIDE Monitoring Report v. 1.1**

This document contains the following Sections

KEY PROJECT INFORMATION

Key Project Information

GS ID (s) of Project (s)	11709
Title of the project (s) covered by monitoring report	Methane Reduction from Rice Cultivation in Punjab Pakistan
Version number of the PDD/VPA-DD (s) applicable to this monitoring report	5.5
Version number of the monitoring report	3.6
Completion date of the monitoring report	03/04/2025
Date of project design certification	16/02/2024
Date of Last Annual Report	N/A
Monitoring period number	1
Duration of this monitoring period	22/06/2022- 16/11/2023 (both days are included)
Project Representative	Ceres Enve
Host Country	Pakistan
Activity Requirements applied	☐ Community Services Activities ☐ Renewable Energy Activities ☒ Land Use and Forestry Activities/Risks & Capacities ☐ N/A
Methodology (ies) applied and version number	GS Methodology for Methane Emission Reduction by Adjusted Water Management Practice in Rice Cultivation (v1.0)
Product Requirements applied	☒ GHG Emissions Reduction & Sequestration ☐ Renewable Energy Label ☐ N/A

Table 1 - Sustainable Development Contributions Achieved

Sustainable Development Goals Targeted	SDG Impact	Amount Achieved	Units/ Products
13 Climate Action (mandatory)	Amount of GHGs emissions avoided or sequestered	Baseline:137,409 Project:75,830 Net Benefit:46,714	tCO2e
12 Responsible Consumption and Production	Average reduction (%) in synthetic fertiliser used per ha	35%	Percentage
1 No Poverty	Change in farmer income as a result of project	Baseline: 17,976 Project: 12,320 Net savings: 5,656	Rs/ha
2 Zero Hunger	Crop yield in kilograms per hectare and year as result of the project's intervention	Baseline: 3,100 Project: 3,644 18% increase	kg/ha/year
3 Good Health and Well-being	Number of farmers avoided open burning of biomass, crop residue	2022: 700 farmers 2023: 2000 farmers	Number
6 Clean Water and Sanitation	Number of farmers and others who have applied water management practices as a result of project activity	2022: 700 farmers 2023: 2000 farmers	Number
4 Quality Education	Number of employees provided skill development training	11 employees 11 training sessions 467 farmers in 2022 and 1437 farmers in 2023 19 training sessions on the implementation of AWD method.	Number
8 Decent Work and Economic Growth	Economic value generated locally via employment	11 employees	Number

Table 2 – Product Vintages

		Amount Achieved		
Start Dates	**End Dates**	**VERs**	**…**	**…**
22/06/2022	31/12/2022	10,867		
01/01/2023	16/11/2023	35,847		

SECTION A. DESCRIPTION OF PROJECT

A.1. General description of project

NetZeroAg introduced AWD method to a group of 2000 farmers on 24,462 ha (60,448 acres) in mostly Sheikhupura and in neighboring districts Gujranwala 1, Sialkot, Nankana Sahib of Punjab Province, Pakistan. The project aims to avoid methane emissions related with the conventional farming (CF) techniques implemented to harvest Super Basmati and Basmati-515. The company, along with its local subsidiary Rice Partners; provided advisory services to participating farmers about the selection of seed, sowing methods, planting implements, optimum planting time, judicious use of fertilizers and pesticides, better agronomy practices and the implementation of AWD through site visits, audio calls IEC material and SMS services. A crop check system which is a guidebook to grow rice eco-friendly for farmers is established and field officers worked in close contact with all farmers for the implementation of sustainable farming techniques.

The technique of alternate-wetting-drying (AWD) uses a more controlled irrigation strategy that can significantly reduce methane emissions as well as water use and pumping costs. Water is withdrawn from paddy fields in mid-season with no negative impact on yield and reapplied only as needed. By shifting to alternate wetting and drying methods, Pakistan can reduce the emissions related with rice cultivation by 48% to 70% according to a study carried out in 2016[1].

NetZeroAg implemented AWD method to a group of 2,000 farmers on 24,462 ha (60,448 acres) in mostly Sheikhupura and in neighboring districts Gujranwala 1, Sialkot, Nankana Sahib of Punjab Province, Pakistan during this monitoring period. The project avoided methane emissions related with the conventional farming (CF) techniques implemented to harvest Super Basmati and Basmati-515.

[1] Pakistan Low Carbon Scenario Analysis, IISD ECN Report with Support of CCRD and PITCO (https://cdkn.org/sites/default/files/files/Pakistan-GHG-Emissions-Reference-Case-Report-Oct-27.pdf)

The project has achieved **46,714 tCO2e** during the cultivation period of 133 days on average starting by plant establishment on **22/06/2022** and ending with the harvest on **16/11/2022** for the 2022 season and 126 days from **15/06/2023** to **16/11/2023** for the 2023 season. The plant establishment date is the earliest date recorded as per the sampled logbooks. The harvest date is the final date as recorded by the same sample group.

A.2. Location of project

Sheikhupura, Gujranwala 1, Sialkot, Nankana Sahib Districts, Punjab Province, Pakistan

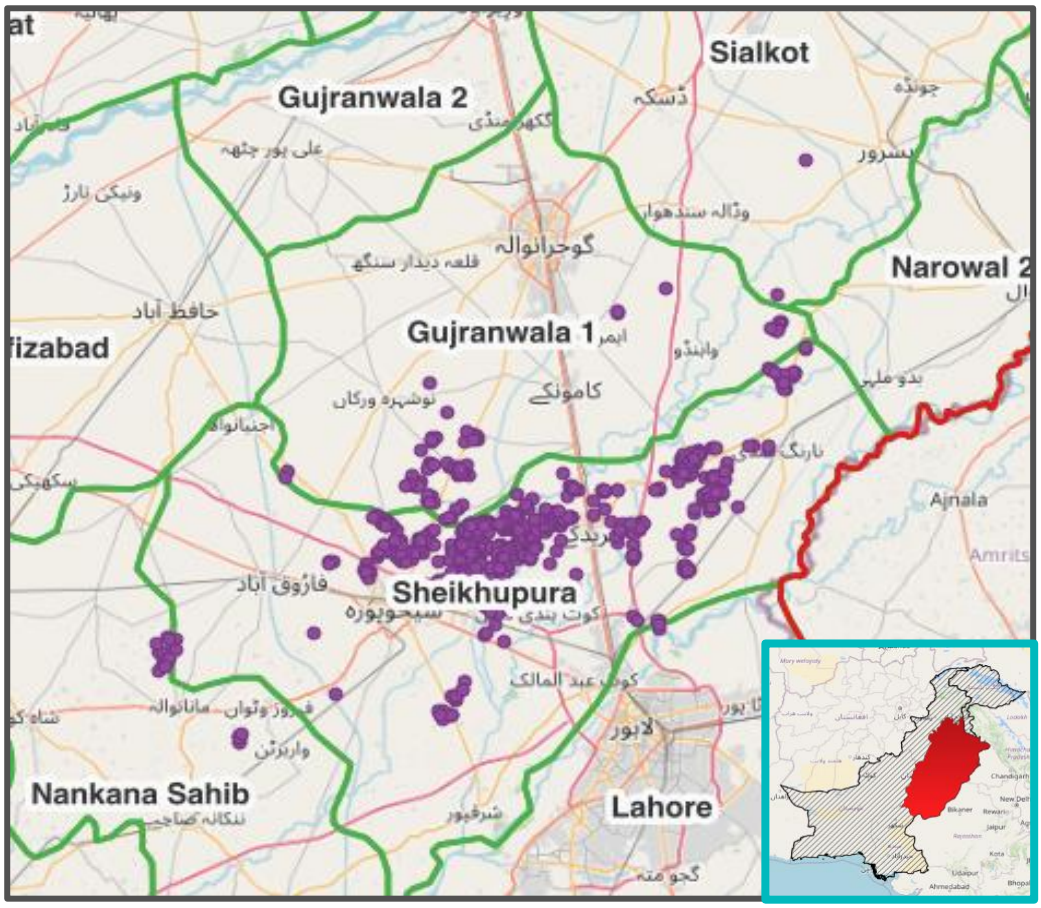

Figure 1.Farmer points in the Districts of Punjab Province

Table 2. Project Boundary Coordinates (GPS Coordinates)

Point No	Latitude	Longitude	Point No	Lattitude	Longitude
1	32.271993	74.566942	14	31.427440	73.737237
2	32.283672	74.542585	15	31.485842	73.923807
3	32.046201	74.343479	16	31.533575	74.078955
4	32.000553	74.113063	17	31.578811	74.171880
5	31.985853	73.953629	18	31.686762	74.251500
6	31.902463	73.804733	19	31.694783	74.282938

7	31.846711	73.599488	20	31.689404	74.342322
8	31.816671	73.601952	21	31.833438	74.455490
9	31.712869	73.622186	22	32.036778	74.582585
10	31.612079	73.643024	23	32.064638	74.544905
11	31.553763	73.619357			
12	31.470907	73.573850			
13	31.430394	73.573918			

A.3. Reference of applied methodology

GS Methodology for Methane Emission Reduction by Adjusted Water Management Practice in Rice Cultivation

Version 1.0.

Sectoral Scope: 15 Agriculture

Applicable tools for the methodology are as follows:

- GS4GG Land Use and Forestry Activity Requirements
- Risk and Capacities Guidelines

A.4. Crediting period of project

The project has renewable crediting period of 5 years (22/06/2022-21/06/2027)

The project implementation has commissioned by plant establishment on **22/06/2022.**

SECTION B. IMPLEMENTATION OF PROJECT

B.1. Description of implemented project

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The AWD water regime generally starts two weeks after transplanting. In AWD, irrigation water is applied a few days after the disappearance of the ponded water. The rice field is left to semi-dry, but only to a point where the soil remains wet for sustained plant growth. The number of days of non-flooded soil between irrigations can vary from 1 to more than 10 days depending on soil type, weather and crop growth stage. The soil water content can easily be monitored by using a 'field water tube' (pani pipe), so that the farmer can re-flood the field once a certain water level (e.g. 15 cm below the soil surface) is reached (Figure 2). After irrigation the water depth will gradually decrease. When the water level drops to 15 cm below the surface of soil, the field is re-flooded to a water depth of about 6-9 cm before draining again. This cycle is done repeatedly except during flowering stage of crop growth when the plants are very sensitive to dry conditions and field is kept in flooded conditions.

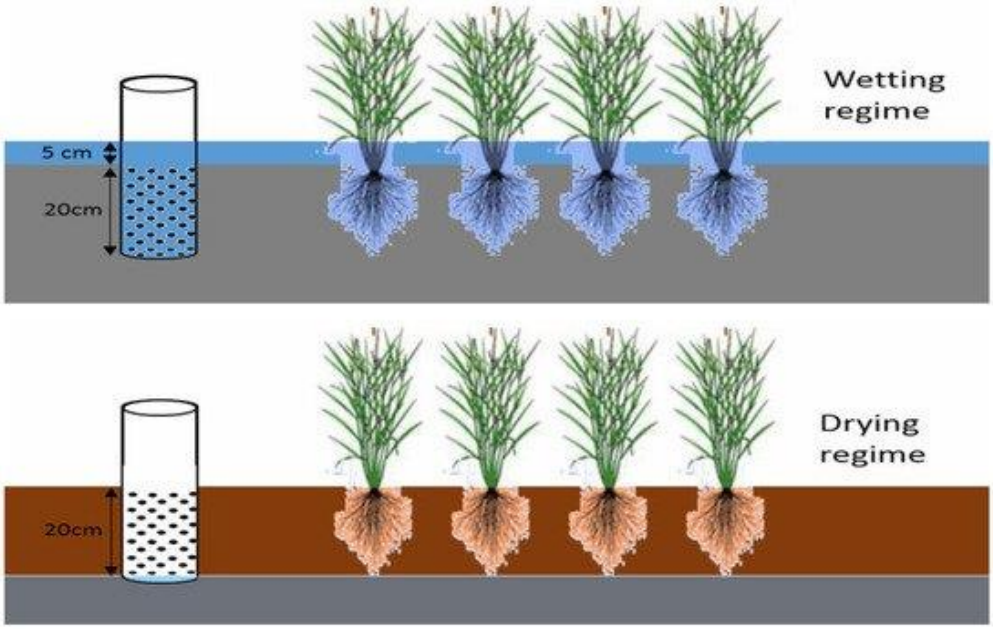

Figure 2 AWD irrigation cycle

The field tube (pani pipe) can be made of 30 cm long plastic pipe or bamboo, and should have a diameter of 10−15 cm so that the water table is easily visible, and it is easy to remove soil inside. The tube is perforated with many holes on all sides, and placed into the soil so that 15 cm protrudes above the soil surface. Once the field is flooded, the water level inside the tube shall be same as outside the tube.

It is particular to mention that basmati rice crop matures in 130-140 days after its transplanting.

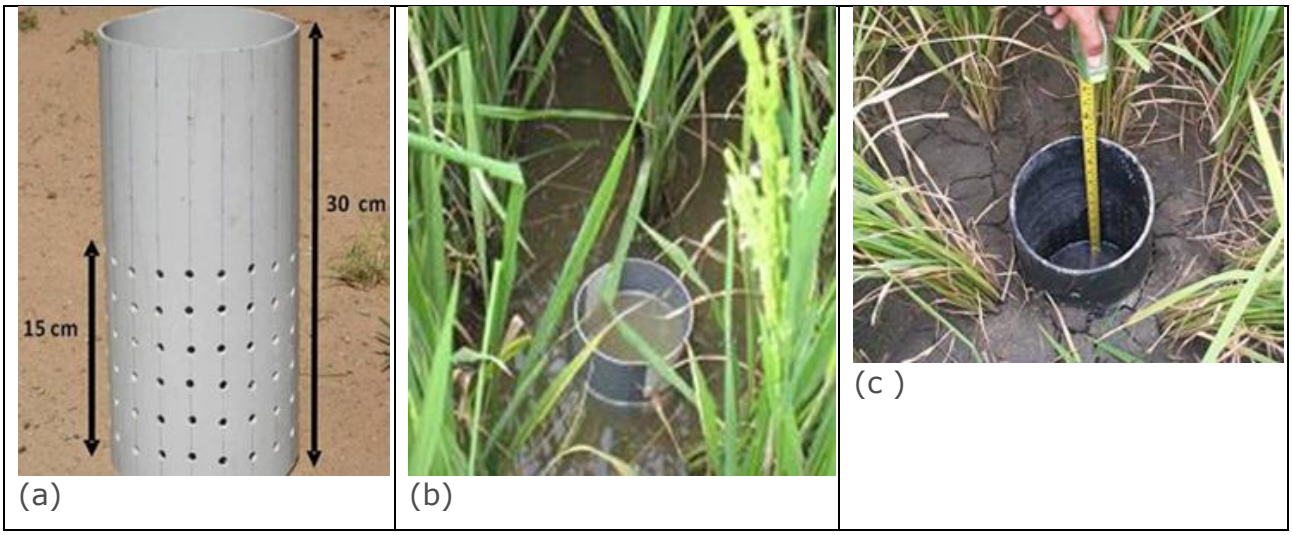

Figure 3 (a) Field water tube made up of PVC (b) A field tube in flooded fields (c)

Water level at 15cm below the soil surface, time to irrigate the field again. In general, lowland rice-growing areas where soils can be drained in weekly intervals are suitable for AWD. Farmers must have control over irrigation of their fields and know that they will have access to water once fields have drained. Figure.4 below shows flow diagram of typical implementation of AWD throughout the cultivation period.

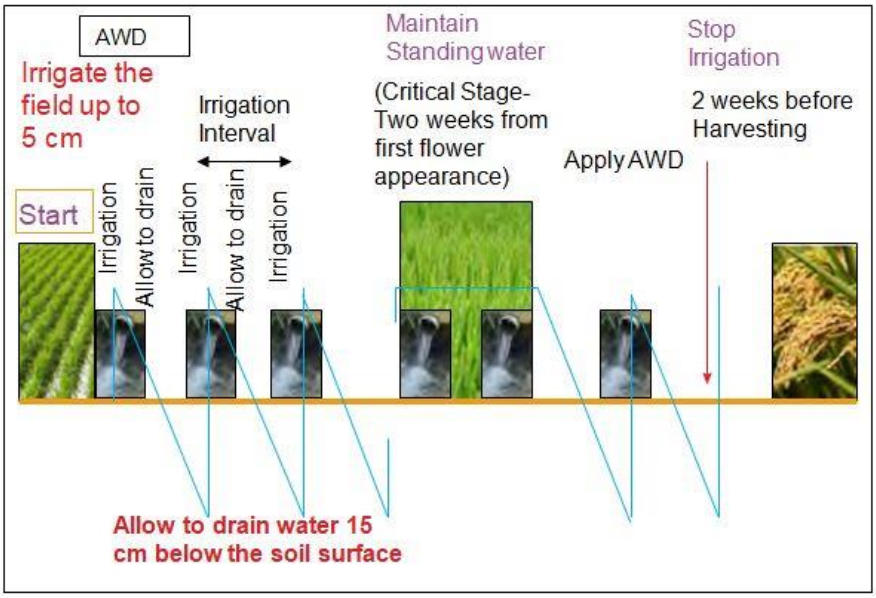

Figure 4 [2] Implementation of AWD throughout the cultivation period.

NZA has carried out the following supportive activities for the successful implementation of the project:

Farmers' Selection. This is very important and key component for the success of any biological or social project in the farming community. The participating farmers must be so sensitized that they should be cooperating all the time and willing to adopt any innovative practices communicated to them by the Project Field Team. In this regards, **700** farmers based on the RPL database were selected to implement the project on Methane Reduction in the Paddy Fields in Sheikhupora, Pakistan. Besides farmers' willingness/interest, education level of the farmer himself or his family member was also considered, so that he could read the text messages, IEC material and other communication methods by the team. This has been raised to **2000** farmers in the second year of implementation.

Farmers' Fields Selection. Once the most cooperating and interested farmers are selected, then it comes to select their fields which are easily accessible, well leveled and near to the irrigation water source. In this regard, the RPL spent over one month to finalize and complete this exercise of field selection. The farmers' fields which were out of the reach of the Project Field Team.

Capacity Building of Farmers. A group of farmers were invited in a village in the month of May to introduce and educate them project aims and objectives and ill-effects of flooding the rice fields, remaining project farmers were communicated through SMS, telephonic calls and field visits by the field officers. Lecturers on the Alternate Wetting & Drying (AWD) technique were also given by the Rice Experts. Even in the individual meetings at the Farm level, AWD technique was demonstrated to the farmers so that they could install the *Plastic Tubes* in their rice fields and record water-level readings without any support of the Project Teams. Farmers were also assured that there would

[2] https://doa.gov.lk/rrdi_technology_soilscience_iawd/

be no reduction of rice yield with this AWD technique as this was the major concern of the many farmers.

Recording of Rice Transplanting Dates. Mostly, rice transplanting in Punjab starts from mid-June to end of July. As a requirement, the rice transplanting dates of each farmers' fields were noted to plan next activities by the Project Team. The rice transplanting dates for majority of the farmers fall in the month of July.

Delivery of the Water Tubes ("*Pani Pipes*"). Usually, *Water Tubes* are 30cm long plastic pipes with 10-15 cm diameter, half of it (15 cm) perforated for water entry, inserted in the soil. These PVC water pipes were prepared and timely delivered (one for one acre) to each famer during the rice transplantation period. If a farmer holds 10 acre of rice crop, he was given 10 pieces of water tubes.

Installation of Water Tubes. As scheduled, after 2 weeks of rice transplantation, installation of *plastic tubes* at each farm was ensured. In most of the cases, *plastic tubes* were installed in the presence of any member of the Project Team. Dates of the tube installation in every field were noted which varied from field to field depending on the date of rice transplanting.

The AWD tubes were installed from 11 July -17 Aug and 1 July – 6 Aug for season 2022 and 2023 respectively. They were removed 20-30 days before harvesting between 8-25 Oct and 16-29 Oct in 2022 and 2023 respectively.

Farmers' Training in Water Measurement at the Spot. At the time of tube installation in the rice fields, farmers himself or any other educated family member were again educated how to note water falling level in the tube and then irrigating the field as per water tube. This was very crucial moment and farmers were again advised to strictly adhere to scheduling irrigations to their rice fields as per water tubes readings.

Summary of Technical Specifications

List of the facilities, systems and equipment that will be installed	• Laser land leveling before the implementation of the method. The need

	for levelling will be checked once in every 3 years. • Technical guidance and farmers' training, spot-visit of the RPL technical team, • Provision & installation of AWD tubes
The age and average lifespan of the equipment	Laser land leveling lasts 3-4 years, while span life of AWD tubes is 10 years.
Duration of the method	Starting two weeks after transplanting until the harvest on November

AWD tubes are installed at the center of each acre in the participating fields. The distance between two tubes ranges between 100-1000 meters depending on the land location. Total area is 60,448 acres; therefore same number of tubes or more were installed under the project activity. The tubes are made of plastic and perforated with holes.

The soil type or quality in the most of the project farms is heavy clay or clay-loam. Heavy clay soil has high water absorbing and retaining ability compared to the clay-loam soil. Both the soil types exist in the rice area and can retain water moisture for about 3-7 days after irrigation. These soil types are considered as the best soil types for paddy cultivation. Wetland preparation (ploughing in flooded fields) is commonly practiced before rice transplanting to stop downward movement (percolation) of water.

Continuous flooding of water is implemented by the farmers in the project area. After transplanting, water levels should be around 3 cm initially, and gradually increase to 5−10 cm (with increasing plant height) and remain there until the field is drained 7−10 days before harvest[3]. The rice grower is required to do similar preparation for the project implementation as per the baseline scenario. The farmer needs a tube well

[3] How to manage water? (http://www.knowledgebank.irri.org/step-by-step-production/growth/water-management)

or sufficient canal water share, water channels, well levelled fields, self or rented tractor, and availability of farm labour. Once a field is transplanted with 25-30 days old rice seedlings by hired labour, then the farmer needs to irrigate the rice fields regularly on alternative days till the crop completes its tillering phase. Then, the project scenario differs at this stage from baseline by installing a plastic tube in every acre of a participating farm to control or manage irrigation schedules. The water tubes are made by 30 cm long PVC pipes with 10-15 cm diameter, half of it is perforated to allow water entry inside the pipe. The perforated part is inserted in the soil while non-perforated portion remains above the field surface. When a field is irrigated or flooded, the water level in the pipe comes to in equilibrium with the field water level. As the field water or field-saturation level in the field drops, it becomes visible in the plastic tube. When the water level in the tube drops to 15 cm from the surface, then the field is required to re-irrigate.

Regular Inspection of the Farms. During the rice season (from tube installation to rice harvest), the Project Team worked hard for regular visiting each and every farm to monitor the *plastic water tubes* and irrigation data, so that a complete picture of the water saving could be achieved. During the entire rice season, the team remained in the field from morning to evening for strictly and smooth implementation of the project agenda as per project objectives.

Crop Harvest Dates. In Punjab, rice crop is matured and harvested mechanically in the period October-November. However, the Basmati rice is harvested in the month of November. The dates of rice harvesting at each farm was noted to calculate exact number of irrigations under the project studies. Contrary to varying rice transplanting dates, rice harvesting at every farm remain the same. It means, rice harvesting through Combine Harvester is completed in 1-2 days, depending upon the size of farm.

The latest date for start of harvest is recorded as 16/11/2022 for 2022 season and 16/11/2023 for 2023 season.

Water Usage Data Compilation. At the end of the rice season, total water usage through number of irrigations based on the individual rice fields was compiled against each farm. This exercise took several days to complete final water usage or water saving at each participating farm.

Medical camps for the smallholder farmers in the rice transplantation season
Other social work for the farmer community to improve their livelihood.

B.1.1 Forward Action Requests
As per CL-02 raised during the design review, the verifying VVB shall verify every 3 years the renewed laser land levelling of the project area. The PD shall include this as a monitoring parameter in section B.7.
PD has included the monitoring parameter in Section D.2. below and will update the PDD during the renewal of CP.

B.2. Post-Design Certification changes
>>
B.2.1. Temporary deviations from the approved Monitoring & Reporting Plan, methodology or standardized baseline
The contribution to SDG 5 is temporarily excluded from the monitoring plan. Women involvement in the farm activities are limited to helping their husbands at farm in rice crop sowing, eradication of weeding and assisting in harvesting of rice crop. Although all farmers have received trainings on gender equity, the wives are not paid for their work at the farm. Therefore, the contribution to SDG 5 will be re-assessed in next verification.

B.2.2. Corrections
The earliest date of land preparation has been recorded as 11/05/2022 from the sampled logbooks. Therefore, the project start date is revised from 02/05/2022 to 11/05/2022.

In the registered PDD, CO2 emissions from land preparation were calculated based on the difference between baseline and project emissions due to a material mistake. This value is now recalculated using actual emissions and has been excluded from the ER calculations.

B.2.3. Changes to start date of crediting period
N/A
B.2.4. Permanent changes from the Design Certified monitoring plan, applied methodology or applied standardized baseline

As per CL-02 raised during the design review, the verifying VVB shall verify every 3 years the renewed laser land levelling of the project area. The PD shall include this as a monitoring parameter in section B.7.
Laser leveling results in a precisely leveled field; resulting in more evenly maturing crops, higher yields and reducing water and agro-chemical use. If done properly, laser leveling should not be needed for another 4 years. A light tillage should follow leveling to loosen the soil for planting (IRRI[4]).
PD has included the monitoring parameter in Section D.2. below.

B.2.5. Changes to project design of approved project
N/A

[4] http://www.knowledgebank.irri.org/step-by-step-production/pre-planting/land-preparation/laser-leveling

SECTION C. DESCRIPTION OF MONITORING SYSTEM APPLIED BY THE PROJECT

Monitoring of cultivation practice by the farmers

The Monitoring Plan applied involves a number of key elements that ensure high-quality, unbiased and reliable information regarding the performance of the project in terms of implementation and outcomes, and for the purposes of calculating Verified Emission Reductions (VERs) following Gold Standard Methodology for Methane emission reduction by adjusted water management practice in rice cultivation (version 1.0).

Below is the description of the steps in monitoring plan.

1. Registration of the farmer: Project Implementer will make an agreement with each farmer including the following information:
    - Name and surname of the small holder
    - National ID #
    - Village, Tehsil and District
    - GPS Coordinates
    - Area of the own land or leased land in acres
    - Liabilities and benefits for the smallholder
    - Name and surname and contact details of the land owner (if applicable)
    - Transfer of carbon rights

    Project Implementer has developed a project database for identification of each project field including name and address/GPS coordinates of the rice farmer, size of the field. This list provides the exact land size as per the land titles or lease agreements provided during the signature of agreement. Then, each farmer is identified with a GPS point on the map and his land is digitized separately.

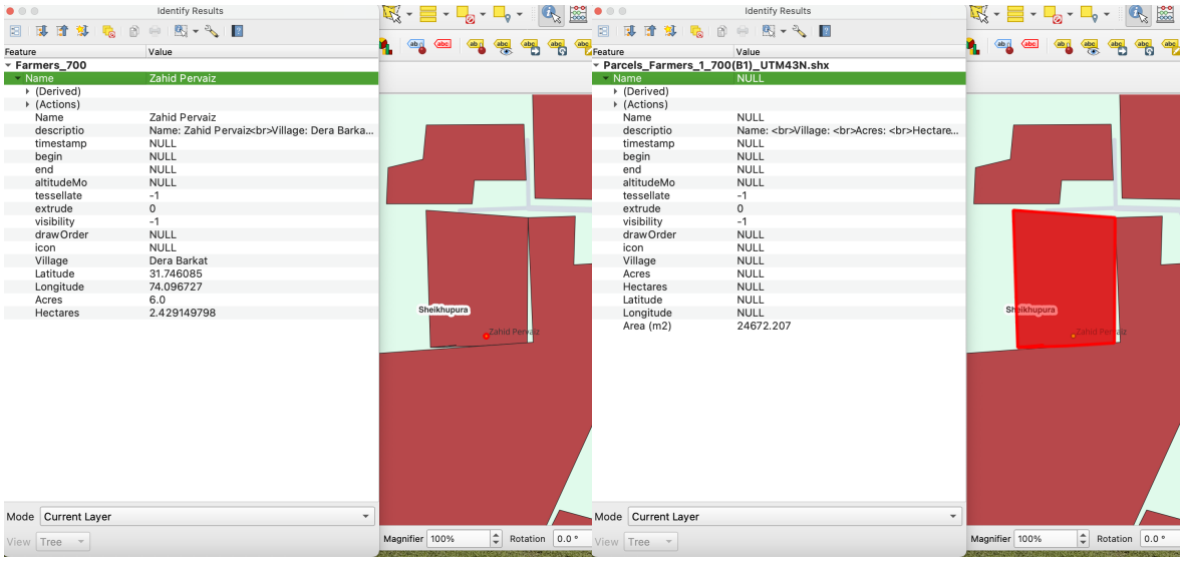

Figure 5. Screenshot from the project database

2. Logbooks: A cultivation logbook shall be maintained for all project fields starting from land preparation up to the harvesting. With the help of the logbook, following parameters shall be documented by the farmers:
    - Sowing date
    - Fertilizers, organic amendments, and crop protection application (date and amount)
    - Incidents of crop residue burning after harvest, if any
    - Water regime on the field (dry/moist/flooded) and dates when the water regime is changed from one status to another
    - Yield

    In addition, farmers shall state whether they have followed fertilization recommendations provided with the introduction of the AWD method.

The logbooks are maintained by the field officers for each farmer in paper form in local language, then translated to English and transferred to excel sheets.

Proper training and technical support will be given to the farmers in terms of field preparation, irrigation, drainage and use of fertilizers. A team will be established for the purpose and will visit the villages in the project area regularly. They will suggest on the changes to make optimum water management in paddy fields, use of fertilizers and pesticides as well as harvesting techniques.

Recommended dose of Nitrogen for Punjab is as per Rice Research Institute ranges between 41-54 kg/acre (Report uploaded separately). The project applies 43.5 kgN/acre calculated as follows:

Urea: 75 kg/acre x 46% N=34.5 kgN/acre
DAP: 50 kg/acre x 18%N= 9 kgN/acre

Leaf Color Charts (LCC) are used to predict timing of application. This is identified as real-time N management option[5]. The farmers monitor the rice leaf color at 7- to 10-day intervals from tillering to about 5−10 days after panicle initiation. Farmers apply fertilizer N whenever the leaves become more yellowish-green than a critical threshold value indicated on the LCC.

Leaf color is typically monitored a total of four to six times per cycle. The effective use of real-time N management requires the selection of an N dose and a critical threshold LCC color that ensure 2−3 N applications in an average yielding field or year. In fields and years with above average growth and crop N demand, rice leaves will turn yellow more rapidly, resulting in more N applications and hence more fertilizer N use. In fields and years with below average growth and crop N demand, the rice will require less N and leaves will remain greener longer, resulting in fewer N applications and less fertilizer N use. The critical threshold value can be adjusted for cultivars and crop establishment method. Thresholds for cultivars with inherently yellowish leaves should be more yellowish green than for cultivars with inherently dark green leaves.

Management and Operational System:
Management and Operational System deals with approaching day-to-day as well as strategic business issues systematically. Project management and operation deals with planning, allocating the resources, orientation of the staff and farmers, fixing responsibilities, capacity building, motivating, implementing the activities, monitoring day to day progress, and timely removing hinderances to achieve specific goals.

[5] https://pdf.usaid.gov/pdf_docs/PA00K938.pdf

The figure below shows the organizational chart of the company. 11 employees work for Rice Partners. Head of the Sustainability is responsible to monitor and report the agricultural activities on the project fields. Food Technologist and Agronomist reports to the Head of Sustainability. Those two branches of management comprise the field team. Soil Officer and Entomology Officer report to the Agronomist. One Quality Controller works with Food Technologist.

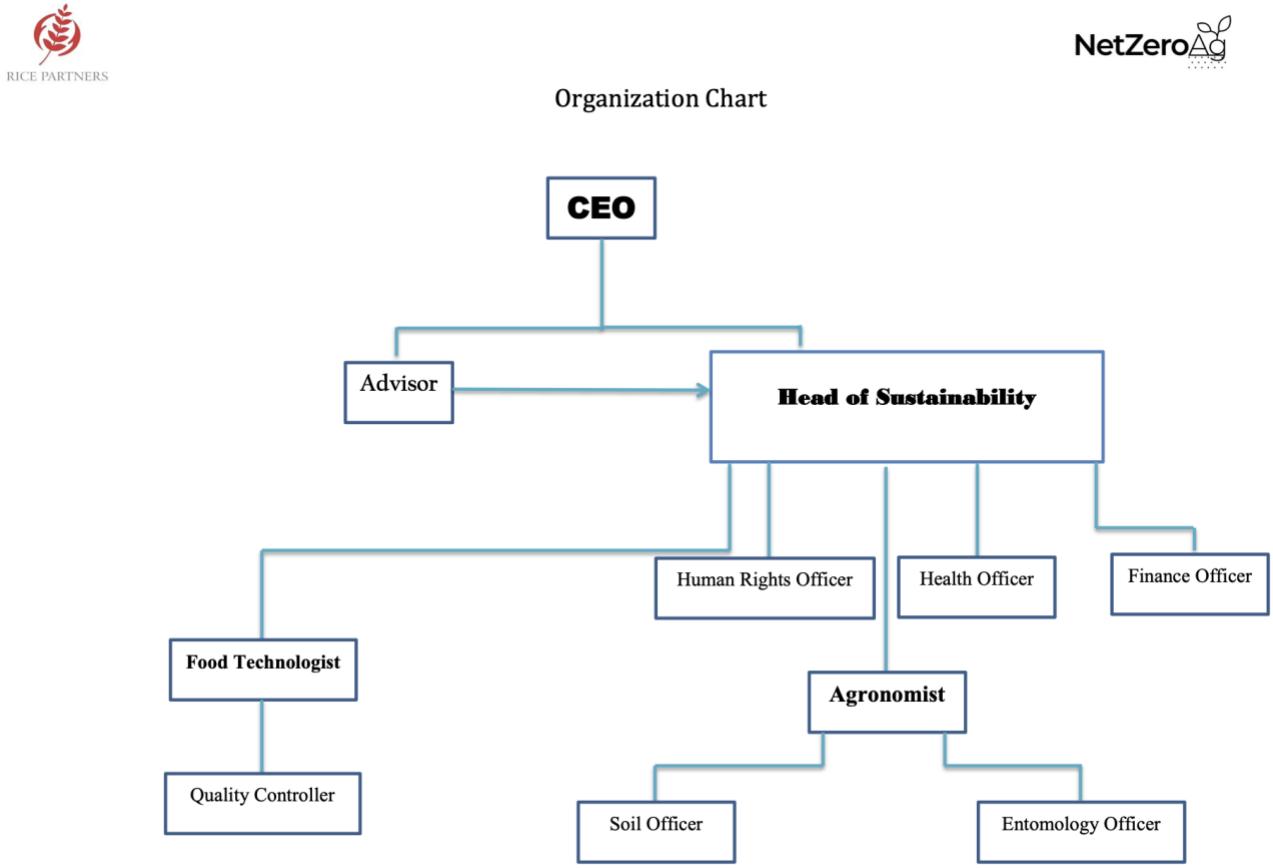

Figure 6. Organizational Chart

The decision-making process remains the sole responsibility of the Project Developer while the implementation of project activities remains with the Field Team, who report directly to the Project Developer on daily basis.

Quality Assurance and Quality Control

Agricultural activities are followed by crop check system from land preparation till harvesting. The system identifies the procedures for all activities including land preparation, plant nursery, transplantation, fertilizer application, irrigation schedule, weeds, insects and diseases and harvesting the crop.

Through pesticide control program, the company advises the farmers how to use pesticides, ensures the safety measures are followed while applying pesticides in the rice crop. Complete information about chemical program is disseminated to all stakeholders through frequent field visits of the field team, text messaging, robbo calls and printed educational & informational material. Separate training programs for the farm labor, pesticides applicators, service-providers and pesticide dealers to realize the significance of the matter and perform their duties as responsible persons. All the relevant information on time, dose and type of pesticides usage by each farmer is recorded in the logbook.

SECTION D. DATA AND PARAMETERS

D.1. Data and parameters fixed ex ante or at renewal of crediting period

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Data/parameter -AWD 1	GWP_{CH4}
Unit	$tCO_2e/tCH4$
Description	Global warming potential of CH4
Source of data	IPCC AR5
Value(s) applied	28
Choice of data or Measurement methods and procedures	As per GS requirements, all Project Design Documents (PDDs) or PoA Design Documents (PoA-DDs, CPA/VPA-DDs), as applicable, where the time of first submission is on or after 01 January 2021 shall use the IPCC AR5 GWP values for demonstrating additionality, determining contributions to SDGs and calculating ex-ante emission reductions and removals.
Purpose of data	Calculation of baseline emission and project emission
Additional comment	-

Data/parameter -AWD 2	GWP_{N2O}
Unit	$tCO_2e/tN2O$
Description	Global warming potential of N2O
Source of data	IPCC AR5
Value(s) applied	265
Choice of data or Measurement methods and procedures	As per GS requirements, all Project Design Documents (PDDs) or PoA Design Documents (PoA-DDs, CPA/VPA-DDs), as applicable, where the time of first submission is on or after 01 January 2021 shall use the IPCC AR5 GWP values for demonstrating additionality, determining contributions to SDGs and calculating ex-ante emission reductions and removals.
Purpose of data	Calculation of baseline emission and project emission
Additional comment	-

Data/parameter- AWD 3	$EF_{BL,c}$
Unit	kgCH4/ha/day
Description	Baseline emission factor for continuously flooded fields without organic amendments
Source of data	Default value for South Asia
Value(s) applied	1.0769
Choice of data or Measurement methods and procedures	The baseline and project emissions are estimated with the help of national data or IPCC tier 1 default values for emission and scaling factors. The approach shall be explained and justified in the PDD.
Purpose of data	Calculation of baseline emission
Additional comment	Determined ex ante prior to the start of the project activity (in this case, the ex ante value should be used to

	calculate emissions reduction during the crediting period) or monitored annually.

Data/parameter -AWD 5	CF_{N2O}
Unit	kg N_2O/kg N input
Description	N_2O-factor based on IPCC guidelines (2019). Apply value 0.00314 kg N_2O/kg N input. This is to be applied to compensate for increase in N_2O emissions in AWD rice fields as compared to continuously flooded rice fields.
Source of data	IPCC AR5
Value(s) applied	0.00314
Choice of data or Measurement methods and procedures	The rate of fertilizer application will be monitored to compensate N_2O emissions related with AWD method.
Purpose of data	Calculation of project emission
Additional comment	-

Data/parameter- AWD 6	$SF_{BL,w}$
Unit	
Description	Baseline scaling factors to account for the differences in water regime during the cultivation period. Values given below can be applied.
Source of data	The average values in 2019 refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	1

Water regime during the cultivation period		$SF_{BL,w}$ *or* $SF_{P,w}$
Irrigated	Continuously flooded	1
	Single drainage period	0.71
	Multiple drainage periods	0.55

Choice of data or Measurement methods and procedures	Default value as per the methodology
Purpose of data	Calculation of baseline and project emission
Additional comment	

Data/parameter- AWD 6	$SF_{P,w}$
Unit	
Description	Project scaling factors to account for the differences in water regime during the cultivation period. Values given below can be applied.

Water regime during the cultivation period		$SF_{BL,w}$ *or* $SF_{P,w}$
Irrigated	Continuously flooded	1
	Single drainage period	0.71
	Multiple drainage periods	0.55

Source of data	The average values in 2019 refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	0.55
Choice of data or Measurement methods and procedures	Default value as per the methodology
Purpose of data	Calculation of baseline and project emission
Additional comment	

Data/parameter- AWD 7	$SF_{BL,p}$
Unit	
Description	Baseline scaling factors to account for the differences in water regime in the pre-season before the cultivation period. Use the following values:

	Water regime prior to rice cultivation: $SF_{BL,p}$ or $SF_{P,p}$ Non-flooded pre-season<180 days (indicating double cropping): 1 Non-flooded pre-season>180 days (indicating single cropping): 0.89
Source of data	IPCC guidelines (2019), volume 4, Chapter 5.5, Table 5.13.
Value(s) applied	0.89
Choice of data or Measurement methods and procedures	Default value as per the methodology
Purpose of data	Calculation of baseline and project emission
Additional comment	

Data/parameter- AWD 7	$SF_{P,p}$
Unit	
Description	Project scaling factors to account for the differences in water regime in the pre-season before the cultivation period. Use the following values: Water regime prior to rice cultivation: $SF_{BL,p}$ or $SF_{P,p}$ Non-flooded pre-season<180 days (indicating double cropping): 1 Non-flooded pre-season>180 days (indicating single cropping): 0.89
Source of data	IPCC guidelines (2019), volume 4, Chapter 5.5, Table 5.13.
Value(s) applied	0.89
Choice of data or Measurement methods and procedures	Default value as per the methodology
Purpose of data	Calculation of baseline and project emission

Additional comment	

Data/parameter- AWD 8	$SF_{BL,o}$
Unit	
Description	Baseline or project scaling factors should vary for both type and amount of organic amendment applied
Source of data	IPCC guidelines (2019), volume 4, Chapter 5.5, Table 5.14.

Water regime prior to rice cultivation	$SF_{BL,o}$ *or* $SF_{P,o}$
Non-flooded pre-season<180 days (indicating double cropping)	2.88
Non-flooded pre-season>180 days (indicating single cropping)	1.48

Pakistan Country Report Scoping Study
Average number of cattles:8
Average droppings per day: 15kg/head
Percentage applied as farm yard manure: 59%
Average land holdings: 27 acre
Burning Crop Residue: Farmer's Choice Among Various Practices[6]

Value(s) applied	1.27
Choice of data or Measurement methods and procedures	Default value as per the methodology The rate of farmyard manure applied is calculated as 2.37 t/ha/year. SFo calculated as per the equation $(1+(0.02 \times 0.19)+(2.37 \times 0.21)^{0.59}$ as 1.27.
Purpose of data	Calculation of baseline and project emission

[6] http://www.aerc.edu.pk/wp-content/uploads/2019/12/Paper-845-TANVIR-AHMED-V-1.pdf

Additional comment	

Data/parameter- AWD 8	$SF_{P,o}$
Unit	
Description	Project scaling factors should vary for both type and amount of organic amendment applied
Source of data	IPCC guidelines (2019), volume 4, Chapter 5.5, Table 5.14.

Water regime prior to rice cultivation	$SF_{BL,o}$ *or* $SF_{P,o}$
Non-flooded pre-season<180 days (indicating double cropping)	2.88
Non-flooded pre-season>180 days (indicating single cropping)	1.48

Pakistan Country Report Scoping Study
Average number of cattles:8
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Percentage applied as farm yard manure: 59%
Average land holdings: 27 acre
Burning Crop Residue: Farmer's Choice Among Various Practices[7]

Value(s) applied	1.27
Choice of data or Measurement methods and procedures	Default value as per the methodology The rate of farmyard manure applied is calculated as 2.37 t/ha/year. SFo calculated as per the equation $(1+(0.07x0.19)+2.37 \times 0.21)^{0.59}$ as 1.27.
Purpose of data	Calculation of baseline and project emission

[7] http://www.aerc.edu.pk/wp-content/uploads/2019/12/Paper-845-TANVIR-AHMED-V-1.pdf

Additional comment	

SDG 2

Data/parameter	Crop Yield in kilograms per hectare and year
Unit	kg/ha
Description	Average crop yield per hectare in Punjab
Source of data	ADB Report[25]
Value(s) applied	3,100 kg/ha
Choice of data or Measurement methods and procedures	Average yield has been taken as a benchmark to demonstrate that no penalty in yield is expected by the implementation of the project.
Purpose of data	Demonstration of contribution to the SDG 2
Additional comment	-

D.2 Data and parameters monitored

>>

SDG 13

Data / Parameter-AWD 14	A_y
Unit	Ha
Description	Aggregated project area in given season s
Source of data	Land area survey documentation of the project
Value(s) applied	2022: 7,082 2023: 24,462[8]
Measurement methods and procedures	GPS or satellite data crosschecked by the project database including farmer names and locations.
Monitoring frequency	Annual
QA/QC procedures	The project database is developed and maintained by the project owner. The size of project fields, GPS coordinates, names of the farmers will be included in the database. The fields are crosschecked by satellite data. Project database are set up including data and information that allow an unambiguous identification of participating rice farms, including name and address of the rice farmer, size of the field and cultivation practices and water regimes. The carbon transfer agreements with farmers are renewed each season and the farmers confirm their intent to maintain the AWD practice on an annual basis. If any farmer dropped the implementation is predicted, the respective emission reductions are not included.
Purpose of data	Calculation of baseline and project outcomes
Additional comment	Only complaint farms are considered.

Data / Parameter- AWD 15	L_y

[8] Total area was estimated as 60,400 acres without the complete farmers records provided. Once the list of farmers compiled, it is revised as 60,448 acres and converted to 24,462 ha.

Unit	Days/year
Description	Cultivation period of rice in year y
Source of data	Farm log books
Value(s) applied	2022: 133 days 2023:126 days
Measurement methods and procedures	The cultivation period is between 120-140 days in Pakistan, 130 days has been taken as an average for ex-ante calculations. Farmers logbook are used to calculate the average cultivation period for each season by sampling the logbooks. The project owner maintains the farmer logbooks.
Monitoring frequency	Annual
QA/QC procedures	The cultivation period should be between 120-140 days as per the literature review[9] The total harvesting date should be within this range.
Purpose of data	Calculation of baseline and project outcomes
Additional comment	Only complaint farms are considered.

Data / Parameter- AWD 16	Water regime-on-season
Unit	
Description	Water regime can be categorised as Continuously flooded, Single Drainage, Multiple Drainage
Source of data	Farm log books

[9] A comparative assessment of rice straw management alternatives in Pakistan in a life cycle perspective http://www.jseejournal.com/media/216/attachment/A%20comparative%20assessment%20pp.%2021-29.pdf

Value(s) applied	Multiple drainage by applying Alternate Wetting and Drying (AWD) method.
Measurement methods and procedures	Farmers logbook are used to check the water regime-on-season. Random sampling is used to monitor the value. The project owner maintains the farmer logbooks. The implementation of AWD is recorded as AWD tube installation and removal dates and number of irrigation events per month.
Monitoring frequency	Annual
QA/QC procedures	Randomly selected farmers' logbooks are cross-checked for the dates of AWD implementation.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Only compliant farms are considered.

Data / Parameter- AWD 17	Water regime-pre-season
Unit	
Description	Water regime can be categorized Flooded, Short drainage <180d), Long drainage (>180d)[10]
Source of data	Interview with the farmers
Value(s) applied	Long drainage
Measurement methods and procedures	The project owner records the information. Random sampling is used to monitor the value.
Monitoring frequency	Annual
QA/QC procedures	Randomly selected farmers' logbooks are cross-checked for the dates of AWD implementation.
Purpose of data	Calculation of baseline and project emissions

[10] The rice is cultivated only in Kharif season in Punjab Pakistan. This is due to the reason that Kharif season (summer monsoon) provides the ideal heat conditions for rice cultivation. Rice is highly sensitive to frost, which is common in Punjab during December–January; therefore it is cultivated during May-November(Kharif season). Wheat is the dominant Rabi crop in Punjab, planted right after the rice harvest. Farmers prefer to rotate between rice (Kharif) and wheat (Rabi) to maintain soil fertility and maximize land use. The practice of cultivating rice in the Kharif season in Punjab has been followed for centuries.

Additional comment	

Data / Parameter- AWD 18	Organic amendment
Unit	kg
Description	Organic amendment can be categorised Straw on-season, Green manure, Straw off-season, Farm yard manure, Compost, No organic amendment
Source of data	Burning Crop Residue: Farmer's Choice Among Various Practices[11] Pakistan Country Report, Scoping Study, April 2021 Farmer Log books
Value(s) applied	Straw-off season (0.07 t/ha) and farmyard manure (2.37 t/ha)[12]
Measurement methods and procedures	Interview with farmers, log books Random sampling is used to monitor the value.
Monitoring frequency	Annual
QA/QC procedures	Randomly selected farmers' logbooks are cross-checked.
Purpose of data	Calculation of baseline and project emissions
Additional comment	No other organic amendments other than crop residue and farm yard manure applied during the monitoring period.

Data / Parameter- AWD 19	Synthetic fertilizer

[11] http://www.aerc.edu.pk/wp-content/uploads/2019/12/Paper-845-TANVIR-AHMED-V-1.pdf
[12] Although none of the farmers reported to apply farmyard manure, the projecta ccounted the same amount of applicaiton for the sake of conservativeness.

<table>
<tr><td>Unit</td><td>kg</td></tr>
<tr><td>Description</td><td>Quantity of synthetic fertiliser applied in the project fields.</td></tr>
<tr><td>Source of data</td><td>Log books</td></tr>
<tr><td>Value(s) applied</td><td>
<table>
<tr><th>Type of fertilizer</th><th>% N by weight</th><th>kg/acre</th><th>kgN/ha</th></tr>
<tr><td>Urea</td><td>46%</td><td>50</td><td>56.83</td></tr>
<tr><td>DAP</td><td>18%</td><td>50</td><td>22.24</td></tr>
<tr><td>Total</td><td></td><td></td><td>79.07</td></tr>
</table>
</td></tr>
<tr><td>Measurement methods and procedures</td><td>Project: Interview with farmers, log books
Random sampling is used to monitor the value.</td></tr>
<tr><td>Monitoring frequency</td><td>Annual</td></tr>
<tr><td>QA/QC procedures</td><td>Randomly selected farmers’ logbooks are cross-checked.</td></tr>
<tr><td>Purpose of data</td><td>Calculation of baseline and project emissions</td></tr>
<tr><td>Additional comment</td><td></td></tr>
</table>

Data / Parameter- AWD 20	$Q_{F,i}$
Unit	Liter
Description	Quantity of fossil fuel consumed by farming equipment, specialised vehicles (tractors, land movers etc.) during land preparation for implementing the project. The same will be used in calculating project emissions from land preparation.
Source of data	Section 2.4. Energy Efficiency in Agriculture Sector, National Action Plan[13]
Value(s) applied	55.35 L/ha
Measurement methods and procedures	Operational records, 85% and 100% of the land is cultivated by efficient tractors in 2022 and 2023 respectively. Total land accounted are as follows: 2022: 5,991 ha 2023: 17,380 ha
Monitoring frequency	Only year 1 of field operation of respective project fields
QA/QC procedures	IPCC default values to be applied for emission calculation. Efficiency of equipment (if required) shall follow manufacturer's manual, or details of comparable devices.
Purpose of data	Calculation of baseline and project emissions
Additional comment	To be monitored only for the first year of field operation. Emissions from land preparation beyond first year of field operation is deemed to be insignificant.

Data / Parameter	Laser levelling applied to the fields

[13] https://neeca.pk/neecagov/neecafiles/DRAFT-NEEC-ACTION-PLAN-2023-2030.pdf

Unit	N/A
Description	Laser leveling results in a precisely leveled field; resulting in more evenly maturing crops, higher yields and reducing water and agro-chemical use. The need for laser levelling will be assessed pre-season.
Source of data	Observations
Value(s) applied	No leveling required
Measurement methods and procedures	IRRI guidelines will be followed for laser levelling[14].
Monitoring frequency	Once in 3 years
QA/QC procedures	N/A
Purpose of data	
Additional comment	If done properly, laser leveling should not be needed for another 4 years. A light tillage should follow leveling to loosen the soil for planting.

SDG 12

Data / Parameter	Amount of nutrient N applied per ha
Unit	kg/ha
Description	Amount of N applied per ha during the project implementation
Source of data	Project database
Value(s) applied	79.07
Measurement methods and procedures	The project database is developed and maintained by the project owner. Random sampling is used to monitor the value.

[14] http://www.knowledgebank.irri.org/step-by-step-production/pre-planting/land-preparation/laser-leveling

Monitoring frequency	Annually
QA/QC procedures	Project database is cross-checked by the farmers
Purpose of data	Calculation of project outcomes
Additional comment	

SDG 3

Data / Parameter	Number of farmers adopted practices promoted by the project.
Unit	Number
Description	Number of farmers who avoid open burning of crop residues
Source of data	Project database
Value(s) applied	2022: 700 2023:2000
Measurement methods and procedures	Interviews with farmers about open burning of crop residues.
Monitoring frequency	Annually
QA/QC procedures	Project database will be cross-checked by the farmers agreements and logbooks.
Purpose of data	Calculation of project outcomes
Additional comment	

SDG 1

Data / Parameter	Change in farmer income as a result of project, by gender
Unit	Rs/ha
Description	Reduced cost of farming due to increased harvest and water savings
Source of data	Farmers' Logbooks

Value(s) applied	5,656
Measurement methods and procedures	Average electricity savings per farmer will be calculated from sampled Logbook records. Total number of irrigation events will be monitored and subtracted from 25 irrigation events on average occurred in continuously flooded fields. The number of avoided irrigation event is multiplied by the average electricity consumption for one hectar and then by the unit electricity price for agriculture. The project owner maintains the farmer logbooks. Random sampling is used to calculate average number of irrigation events. Annual loyalty fee will be paid to the compliant farmers within one year of credit issuance. This will be monitored and added to savings.
Monitoring frequency	Annually
QA/QC procedures	The values will be cross-checked by water consumption and hours spent to irrigate one acre from sampled logbooks.
Purpose of data	Calculation of project outcomes
Additional comment	An annual loyalty fee will be provided to the farmers once the project starts generating carbon credits. The amount will be added as contribution to farmers' income.

SDG 2

Data / Parameter	Crop yield in kilograms per hectare and year as result of the project's intervention
Unit	kg/ha/year
Description	Aggregated annual yield per ha of all farmers implementing AWD method
Source of data	Farmers Logbook
Value(s) applied	2022: 3,624.70 2023: 3,663.30

Measurement methods and procedures	Aggregated yield is divided into the total project area. The project owner maintains the farmer logbooks. Random sampling is used to calculate average yield per ha.
Monitoring frequency	Annually
QA/QC procedures	The annual yield will be cross-checked by the company records.
Purpose of data	Calculation of project outcomes
Additional comment	At least 10% increase on the annual yield is expected compared to the baseline scenario of 3,100 kg/ha/year.

SDG 6

Data / Parameter	Number of farmers and others who have applied water management practices as a result of project activity
Unit	Number
Description	Number of farmers with water savings
Source of data	Project database
Value(s) applied	2022: 700 2023:2000
Measurement methods and procedures	The project database will be developed and maintained by the project owner.
Monitoring frequency	Annually
QA/QC procedures	Project database will be cross-checked by farmer agreements and logbooks.
Purpose of data	Calculation of project outcomes
Additional comment	

SDG 4

Data / Parameter	Number of employees provided skill development training
Unit	Number
Description	a) Hours of training given to the farmers for the implementation of AWD method b) Hours of skill development courses for under 18 boys and girls
Source of data	a) Training records, attendance sheets, pictures b) Paybills
Value(s) applied	a)19 trainings, each one hour provided to 467 farmers in 2022 and 1437 farmers in 2023. b) 3 skill courses for girls and boys
Measurement methods and procedures	Date, subject and length of trainings will be recorded along with the attendance sheet. The project owner will organize the trainings and record the attendance.
Monitoring frequency	Annually
QA/QC procedures	Attendance sheets will be kept for cross-checking
Purpose of data	Calculation of project outcomes
Additional comment	All farmers are educated on the following issues in addition to the AWD method: Human right Gender Decent working conditions Crop management Water management

SDG 8

Data / Parameter	Economic value generated locally via employment
Unit	Number
Description	Number of employees

Source of data	Social Security Records, Pay bills
Value(s) applied	11 employees
Measurement methods and procedures	The project owner will keep the records of employment.
Monitoring frequency	Annually
QA/QC procedures	The number of employees will be crosschecked by paybills issued by the company.
Purpose of data	Calculation of project outcomes
Additional comment	

Data / Parameter	Quality of employment
Unit	Number
Description	Number of trainings on child rights, personal health and hygiene.
Source of data	Training records, attendance sheets, pictures
Value(s) applied	11 trainings
Measurement methods and procedures	Date, subject and length of trainings will be recorded along with the attendance sheet.
Monitoring frequency	Annually
QA/QC procedures	Attendance sheets will be kept for cross-checking
Purpose of data	Calculation of project outcomes
Additional comment	

Safeguarding Principles Monitoring

Principle 9.6

Data / Parameter	Proper application of chemical pesticides and herbicides
Unit	-
Description	

Source of data	Farmers logbooks, random sampling is used to monitor pre-defined levels of application of chemical pesticides and herbicides. Training records
Value(s) applied	-
Measurement methods and procedures	The project owner monitors amount of pesticides and herbicides used through logbooks.
Monitoring frequency	Annually
QA/QC procedures	The implementation of pesticides and herbicides shall be in line with pesticide usage plan.
Purpose of data	Complying with measures as per Safeguarding assessment.
Additional comment	

D.3. Comparison of monitored parameters with last monitoring period

Data/Parameter	Value obtained in this monitoring period	Value obtained last monitoring period
A_y	2022: 7,082 ha 2023: 24,462 ha	N/A
L_y	2022: 133 days 2023:126 days	N/A
Water regime-on-season	Multiple drainage by applying Alternate Wetting and Drying (AWD) method	N/A
Water regime-pre-season	Long drainage	N/A
Organic amendment	Straw-off season (0.07 t/ha) and farmyard manure (2.37 t/ha)	N/A
Synthetic fertilizer	79.07 kgN/ha	N/A
$Q_{F,i}$	55.35 L/ha	N/A
Laser levelling applied to the fields	No levelling required after the first implementation.	N/A

Amount of nutrient N applied per ha	79.07 kgN/ha	N/A
Number of farmers adopted practices promoted by the project.	2022: 700 2023:2000	N/A
Change in farmer income as a result of project, by gender	5,656 Rs/ha	N/A
Crop yield in kilograms per hectare and year as result of the project's intervention	2022: 3,624.70 kg/ha/year 2023: 3,663.30 kg/ha/year	N/A
Number of farmers and others who have applied water management practices as a result of project activity	2022: 700 2023:2000	N/A
Number of employees provided skill development training	a)19 trainings, each one hour provided to 467 farmers in 2022 and 1437 farmers in 2023 b) 3 skill courses for girls and boys	N/A
Economic value generated locally via employment	11 employees	N/A
Number of trainings on child rights, personal health and hygiene.	11 trainings	N/A
Proper application of chemical pesticides and herbicides	-	N/A

D.4. Implementation of sampling plan

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As per the methodology Methane Emission Reduction by Adjusted Water Management Practice in Rice Cultivation (v 1.0) 4.2.4 " Reporting and verification shall be done on the basis of samples of the log-books from the farmers, according to the latest version of the "Standard for sampling and surveys for CDM project activities and programme of activities".

(i) Objective and Reliability Requirements:

Every farmer owning the paddy fields is regarded as an isolate unit or modelling unit. Each modelling unit has homogeneous characteristics in terms of growth pattern, management and start date. The monitoring of project parameters is done at the farm level. The sampling plan is for 700 households involved in this project. The project had applied AWD method with the same type, same category and same technology. The farmers agree to switch from traditional continuously flooded method during rice cultivation in the project area to AWD method. The farmers' logbooks should be sampled for assuring the project activity. In this case, the project proponent shall use 90/10 confidence/precision according to the sampling standard mentioned above.

(ii) Target Populations:

- The target population are all farmers in the project database which will implement AWD method.
- The farmers are grouped into a single stratum as per FAO's agro-ecological zone methodology. Agro-ecological zoning refers to the division of an area of land into land resource mapping units, each having a unique combination of landform, soil and climatic characteristics, and/or land cover with a specific range of potentials and constraints for agricultural land use. Following data set has been used to draw the boundaries of each zone in Punjab Pakistan[15]. The project fields are located within X. Rice -wheat zone as per the referred study (Please see Figure.8 above).

[15] https://www.fao.org/3/ca6938en/ca6938en.pdf

Table 3 Parameters for the definition of agro-ecological zones by FAO

Sr. No.	Dataset	Source
1	Topography	30m ASTER-GDEM
2	Soil data (soil, texture, EC, pH)	Government of Punjab, Pakistan
3	Climatic data (maximum temperature, minimum temperature, wind speed, humidity, sunshine hours)	Pakistan Meteorological Department
4	Rainfall	Pakistan Meteorological Department
5	Land cover and land use	FAO
6	Groundwater quality data (EC, SAR, RSE)	PIDA, Government of Punjab
7	Groundwater depth	PIDA, Government of Punjab
8	Surface water	PIDA, Government of Punjab
9	Admin boundaries	UAAR-IGEO Repository
10	Crop production and yield data	Crop Reporting Survey, Government of Punjab

No further stratification is applicable for the project fields. Water regime in rice-wheat zone is long drainage for pre-season for all farmers. The fields are dried after rice cultivation for wheat season. The project targets the farmers who implement continuously flooded on their fields on season. This is confirmed before the project implementation and carbon transfer agreement is signed with the farmer.

Application of organic amendments is very limited among rice farmers. Only 0.8% of the farmers incorporate complete straw into to soil before wheat season. Farmyard manure is not abundant and 2.37t per hectare is applied to the field. Inorganic fertilizers are the common source for plant nutrient.

Sampling Method:

The sampling method for all monitored parameters is Simple Random Sampling and samples are randomly selected from the primary sampling units as illustrated above.

Sampling Frame:

The sample frame refers to all the information sources on the Database. There are two primary mechanisms for data collection: the Registration process for each farmer and the logbooks kept to confirm the AWD method is being implemented.

Confidence/precision level:
As the project proponent chooses to inspect annually, a 90 per cent confidence interval and a 10 per cent margin of error shall be achieved for the sampled parameters. In cases where survey results indicate that 90/10 precision is not achieved, the lower bound of the 90 per cent confidence interval of the parameter value may be chosen as an alternative to repeating the survey efforts to achieve the 90/10 precision

Sample Size:

Project Developer envisages that a total of 700 farmers in the first year and 2000 farmers in second year. Hence, population size, N, is taken as 700 households for the first year and 2000 for the second year.

It is expected at least 95% of farmers followed AWD practice. Hence the expected proportion p is taken as 0.95.

To estimate the sample size for parameter for proportion of farmers, the following equation is used:

$$n \geq \frac{1.645^2 N \times p(1-p)}{(N-1) \times 0.1^2 \times p^2 + 1.96^2 p(1-p)}$$

Where:

n	Sample size
N	Population size (Total number of households/ICS)
p	Expected proportion
1.645	Represents the 90% confidence required
0.1	Represents the 10% relative precision

Sample size calculation:

Parameter	Population size (N)	Expected proportion (p)	Required Sample Size

Proportion of farmers implemented AWD method	700	95%	20
Proportion of farmers implemented AWD method (2nd year)	2,000	95%	21

If the sample size calculation returns a value of less than 30 samples, a minimum sample size of 30 shall be chosen when the parameter of interest is a proportion.

Each farmer has given a number and 30 of them has been selected for each season by random sampling.

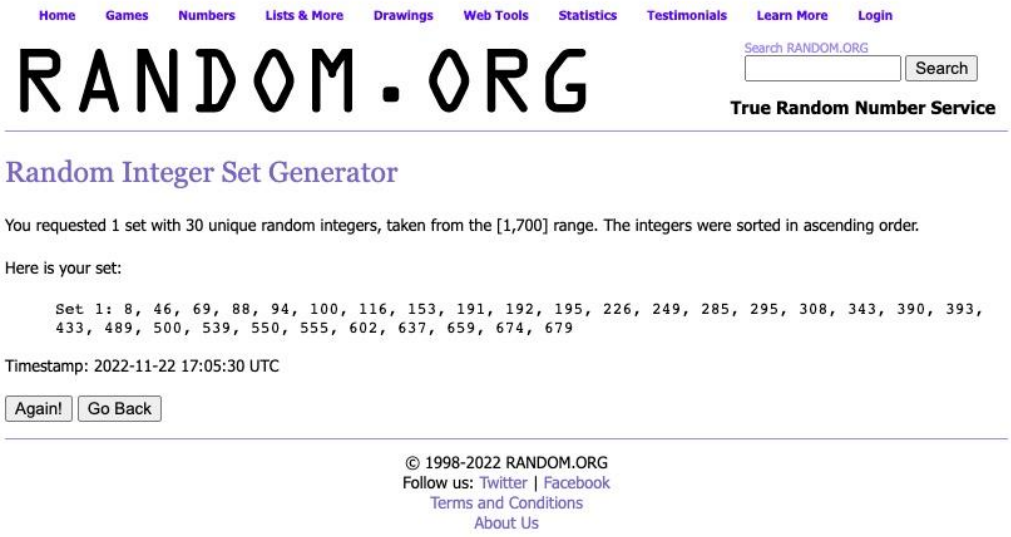

Figure 7 Random numbers selected for 2022

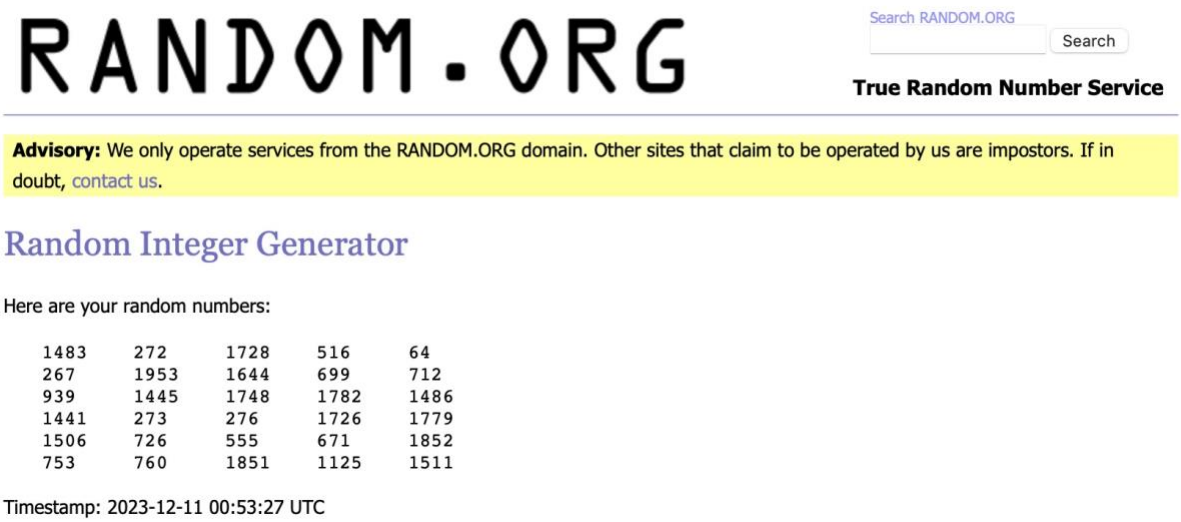

Figure 8. Random numbers selected for 2023

The number of irrigation events and average yield are calculated from the sampled logbooks. There is no requirement for meeting a certain precision level for those parameters. However, precision above 90/10 have been achieved.

Monitoring data will be stored for at least two years.

SECTION E. CALCULATION OF SDG IMPACTS

E.1. Calculation of baseline value or estimation of baseline situation of each SDG Impact

SDG 13 Climate Action

Baseline Emissions

Emission reductions under the simplified approach shall be estimated using the following equations:

$$ER_y = (EF_{ER} x\ A_y x L_y x 10^{-3} x GWP_{CH4})\ x(1 - U_d) \qquad \textit{Eq.10}$$

$$EF_{ER} = EF_{BL} - EF_P \qquad \text{Eq. 11}$$

$$EF_{BL} = EF_{BL,c} x\ SF_{BL,w} x\ SF_{BL,p} x SF_{BL,o} \qquad \text{Eq. 12}$$

$$EF_P = EF_{BL,c} x\ SF_{P,w} x\ SF_{P,p} x SF_{P,o} \qquad \text{Eq.13}$$

Where:

ER_y	= Emission reductions in year *y* (tCO_2e)
EF_{ER}	= Adjusted daily emission reduction factor ($kgCH_4/ha/day$). Alternatively, seasonal emission factor ($kgCH_4/ha/season$) may be determined.
L_y	= cultivation period of rice in a year y, (days/year)
A_y	= Area of project fields in year *y (ha)*
GWP_{CH4}	= Global warming potential of CH_4 ($t\ CO_2e/t\ CH_4$)
U_d	= Uncertainty deductions: Apply default value of 15% for IPCC default values (global, regional or country specific)
EF_{BL}	= Baseline emission factor ($kgCH_4/ha/day$) or ($kgCH_4/ha/season$)
EF_P	= Project emission factor ($kgCH_4/ha/day$) or ($kgCH_4/ha/season$)
$EF_{BL,c}$	= Baseline emission factor for continuously flooded fields without organic amendments ($kgCH_4/ha/day$) or ($kgCH_4/ha/season$)
$SF_{BL,w}\ or\ SF_{P,w}$	= Baseline or project scaling factors to account for the differences in water regime during the cultivation period
$SF_{BL,p}\ or\ SF_{P,p}$	= Baseline or project scaling factors to account for the differences in water regime in the pre-season before the cultivation period
$SF_{BL,o}\ or\ SF_{P,o}$	= Baseline or project scaling factors should vary for both type and amount of organic amendment applied

Baseline emission factor is calculated as per the Equation 12 as follows:

$EF_{BL,c}$	= 1.0769 $kgCH_4$/ha/day
$SF_{BL,w}$	= 1.0 for continuously flooded (Table 4 of the methodology)
$SF_{BL,p}$	= 0.89 for single cropping (Table 5 of the methodology)
$SF_{BL,o}$	= 1.27 for single cropping (Table 6 of the methodology) and for application of farmyard manure (calculated)

EF_{BL}= 1.0769 $kgCH_4\ ha^{-1}d^{-1}$ x 1.0x 0.89 x 1.27 = 1.22 $kgCH_4\ ha^{-1}d^{-1}$

The average days of cultivation as per the sampled logbooks are 133 days.

The project area is 7,082 ha.

BE_{2022}= 1.22 $kgCH_4\ ha^{-1}d^{-1}$ x 133 days x7,082 ha x 10^{-3}x 28

= **32,143 tCO2e for 2022**

BE_{2023}= 1.22 $kgCH_4\ ha^{-1}d^{-1}$ x 126 days x24,462 ha x 10^{-3}x 28

= 105,267 tCO2e for 2023SDG 12 Responsible Consumption and Production

Parameter: Average reduction (%) in synthetic fertilizer used per ha.

The synthetic fertilisers use in rice fields is 121 kgN/ha during the 2018-2019 harvest season in Pakistan and increasing annually.

SDG 1. No Poverty

Parameter: Change in farmer income as a result of project, by gender

Total number of irrigation events is taken as 25 in baseline scenario and total electricity cost would be 8,988 Rs/ha[16] and 17,976 Rs/kWh for 2 seasons.

SDG 2. Zero Hunger

Parameter: Crop yield in kilograms per hectare and year as result of the project's intervention

[16] The unit cost of electricity is assumed as 8.69 Rs/kWh and each irrigation event 41.4 kWh.

The average yield per ha is announced as 3,100 kg/ha in 2016-17 season (ADB Report).

SDG 3. Good health and wellbeing

Parameter: Number of farmers avoided open burning of biomass, crop residue

Most of the farmers burn the crop residues in the baseline scenario. Awareness raising activities will be conducted for farmers not to burn the crop residues.

SDG 6 Clean Water and Sanitation

Parameter: Number of farmers and others who have applied water management practices as a result of project activity.

Normally, 25-27 irrigation events take place for continuously flooding system. For an average of 25 irrigation events; total water consumption amounts to 19,050 m^3 per hectare.

SDG 4 Quality Education

Parameter: Number of employees provided skill development training

No training about sustainable farming practices is available before the project implementation.

No trainings or skill development course are available for the youth.

SDG 8 Decent Work and Economic Growth

Parameter: Equally economic value generated locally via employment

Employment opportunities will be created by the project implementation.

Training sessions will be organized for employees.

E.2. Calculation of project value or estimation of project situation of each SDG Impact

SDG 13 Climate Action

Project Emissions:

Project Emissions

The project scenario assumes reverting from continuously flooded to AWD method. Therefore; project emission factor is calculated as per the Equation 13 as follows:

$EF_{BL,c}$	= 1.0769 kgCH4/ha/day
$SF_{P,w}$	= 0.55 for AWD (Table 4 of the methodology)
$SF_{P,p}$	= 0.89 for single cropping (Table 5 of the methodology)
$SF_{P,o}$	= 1.27 for single cropping (Table 6 of the methodology) and for application of farmyard manure (calculated)

EF_P = 1.0769 $kgCH_4$ $ha^{-1}d^{-1}$ x 0.55 x 0.89 x (1.27) = 0.67 $kgCH_4$ $ha^{-1}d^{-1}$

Project emissions are calculated as follows:

PE_{2022}= 0.67 $kgCH_4$ $ha^{-1}d^{-1}$ x 133 days x7,082 ha x 10^{-3}x 28

= **17,738 tCO2e**

PE_{2023}= 0.67 $kgCH_4$ $ha^{-1}d^{-1}$ x 126 days x 24,462 ha x 10^{-3}x 28

= **58,092 tCO2e**

CO2 Emissions: Quantity of fossil fuel consumed has been accounted for land preparation activities as per 3.6.7 of the methodology:" The project emissions shall be estimated based on equipment usage for land preparation, fuel consumption and resulting emissions. Emissions from land preparation will be ascertained during the first year of field operation."

Total CO2e emissions based on a consumption of 49.42 L/ ha has been calculated with the data collected for land preparation activities from field. 85% of the farmers has done all land preparation activities in 2022 while 100% of farmers has done the same on 2023. Total project emissions calculated is as follows:

	Project	**% to the total ERs**
Total tCO2 (2022)	910	**8%**
Total tCO2 (2023)	2,641	**7%**
TOTAL	3,551	**7.6%**

N_2O project emissions:

N_2O emissions from fertiliser application shall be considered as project emissions. As per the registered PDD, the application rate of N is 107.49 kgN/ha for the project scenario. Tha applied rate during the monitoring period has been calculated through sampled farmer logbooks as 79.07 kgN/ha. As per 3.6.6 of the applied methodology, in case the application rate of fertilizers does not exceed that of baseline, an N_2O correction factor shall be applied due to the expected increase in N_2O emissions in AWD systems in comparison to continuously flooded rice field systems. The N_2O emission is calculated as per the equation below.

$$PE_{N,AWD} = \sum_{g}^{G} (Q_{N,g}\ x\ A_{g,i})\ x\ CF_{N2O}\ x\ 10^{-3}\ x\ GWP_{N2O}$$

Where:

$PE_{N,AWD}$	= Project emissions (N_2O) from N-inputs in the project fields (tCO_2e) where application rate of N-input in the project does not exceed the baseline.
$Q_{N,g}$	= Application rate of N-input in the project scenario where the application rate does not exceed that of baseline (kg N inputs per hectare)
CF_{N2O}	= N_2O correction factor based on IPCC guidelines (2019). Apply 0.00314 kg N_2O/kg N input.
$A_{g,i}$	= Area of project fields of group g, where the application rate of N-input in the project does not exceed that of baseline

466 ERs and 1,610 ERs have been deducted from the net ERs for 2022 and 2023 respectively.

Emission Reductions:

Emission reductions are calculated by Equation 10 as follows:

EF_{ER}	= 1.22-0.67 =0.55 $kgCH_4$/ha/day.
L_y	= 133 days/year 2022 = 126 days/ year 2023
A_y	= 7082 *ha 2022* *=24,462 ha 2023*
GWP_{CH4}	= 28 tCO_2e/t CH_4*
U_d	= 15% default value

* As per GS requirements, all Project Design Documents (PDDs) or PoA Design Documents (PoA-DDs, CPA/VPA-DDs), as applicable, where the time of first submission is on or after 01 January 2021 shall use the IPCC AR5 GWP values for demonstrating additionality, determining contributions to SDGs and calculating ex-ante emission reductions and removals.

ER_{2022}=0.55 $kgCH_4$/ha/day x 133 days/year X 10^{-3} x 7082 ha x 28 tCO_2e/t CH_4 x (1-0.15)

= 12,244 tCO_2e

Applying N2O correction factor and CO_2 deduction ; net ERs are calculated as:

12,244 tCO_2e -466 tCO_2e **–** 910 tCO_2e **= 10,867 tCO_2e**

ER_{2023}=0.55 $kgCH_4$/ha/day x 126 days/year X 10^{-3} x 24,462 ha x 28 tCO_2e/t CH_4 x (1-0.15)

= 40,098 tCO_2e

Applying N2O correction factor and CO_2 deduction; net ERs are calculated as:

40,098 tCO_2e -1,610 tCO_2e – 2,641 tCO_2e **= 35,847 tCO_2e**

SDG 12 Responsible Consumption and production

The project applies following amounts of fertilizer as a standard for both 2022 and 2023 seasons:

Type of fertilizer	**% N by weight[17]**	**kg/acre**	**kgN/ha**
Urea	46	50	56.83
DAP	18	50	22.24
		TOTAL N	79.07

The amount of fertilizers applied to the field have decreased by 35% compared the baseline amount of 121 kgN/ha.

Before our intervention farmers apply 100kg urea/acre, now the quantity has been reduced 50kg urea/acre per acre. This is due to the raised awareness among farmers and usage of leaf color charts.

SDG 1. No Poverty

Parameter: Change in farmer income as a result of project, by gender

Considering that 41.4 kWh/ha is consumed for each irrigation event and a cost of 8.69 Rs/kWh; total cost per ha is 5,960 Rs/ha in 2022 and 6,368 Rs/ha in 2023 for 16.57

[17] https://macropakistani.com/what-is-the-use-of-fertilizers-in-pakistan/

and 17.70 irrigation event respectively. (12,320 Rs/ha in total). Total savings add up to 5,656 Rs/ha during the monitoring period calculated as follows:

Savings as per baseline: 17,976 Rs/ha- 12,320 Rs/ha =5,656 Rs/ha

No loyalty fee has been paid yet as no credits have been issued.

SDG 2. Zero Hunger

Parameter: Crop yield in kilograms per hectare and year as result of the project's intervention

The protocol for receiving farmers' paddy for purchase is implemented as per Crop Check Program. Every load of paddy coming into the mill for drying are sampled randomly and analyzed prior to being purchased at the mill gate. The samples are tested for moisture content, number greens and immature, prior to being dried in a microwave down to 14% and reweighed. The samples are then de-husked, the brown rice is graded. The farmers load of paddy are issued a batch or lot number and brought to the dryer.

The average yield of 700 farmers is 3,624.70tonnes/ha as per the sampled logbooks and increased to 3,663.30 for 2000 farmers in 2023. On average 18% increase has been observed in this monitoring period.

SDG 3. Good health and wellbeing

The following SMS have been sent to farmers 4-5 times in 2022 and 8 times in 2023 during the period 25 November- 5 December. All of the farmers followed the recommendations on avoiding open burning.

	Dear Farmers, Aslam O Alykum Don't burn the rice crop residue incorporate them into soil and increase the fertility of soil. Play your role to protect the environment For more details contact at the following numbers: 03027171488 03424158835 03015409877 03008594937

SDG 6 Clean Water and Sanitation

Parameter: Number of farmers and others who have applied water management practices as a result of project activity.

All farmers (2022:700, 2023:2000) saved irrigation events compared to the baseline and therefore water as per the sampled Farmers Logbooks. Average irrigation events is 16.57 for 2022 and 17.70 for 2023. Total amount of saved water reached to 11,988.8 m^3 per ha during the monitoring period.

SDG 4 Quality Education

Parameter: Number of employees provided skill development training

All farmers were visited on field and received the trainings about various subjects including human rights, gender, decent working conditions, crop management, water management.

Additionally, 467 farmers in 2022 and 1437 farmers in 2023 have been reached directly through 8 and 11 multi stakeholder workshops respectively:

2022	2023
• 18 May 2022	• 19-20 June 2023
• 27 June 2022	• 1 July 2023
• 11 July 2022	• 11 July 2023
• 11 August 2022	• 12 July 2023
• 7,8,9 September 2022	• 18 July 2023
• 10 October 2022	• 4 August 2023
	• 6 August 2023
	• 8 August 2023
	• 20 August 2023
	• 24 August 2023

All farmers are regularly visited during the project implementation.

Following skill development courses are available annually for under-18 boys and girls:

For Boys	**For Girls**
Rice plant operator	Beautician
Electrician	Tailoring
Plumber	Computer Application
Rice/Paddy quality checker	Cooking
Welders	Embroidery
Computer application	

During this monitoring period 160 youngsters have attended and got certifications from the courses: Beautician, Tailoring and Computer Application.

SDG 8 Decent Work and Economic Growth

Parameter: Equally economic value generated locally via employment

11 employees are working full- time for the project and 6 employees support project implementation:

Full-time	**Part-time**
Admin Officer	CEO
Project Officer Human Rights	Advisor
Food Technologist	Head of Sustainability
Agronomist	Finance Officer
Soil Scientist	Project Officer Health
Entomologist	HR Office (F)

Field officer/Social Mobilizer	
Field officer/Social Mobilizer	
Field officer/Social Mobilizer	
Field officer/Social Mobilizer (F)	
Field officer/Social Mobilizer (F)	

11 one-day trainings were organized and 4 of them were held before the project implementation, 7 of them held during the implementation. The date and subject of trainings are shown in the table below.

1	Staff Training on Methane Reduction Program	9th April, 2022	Conference Hall RPL
2	Staff Refresher Training on Methane Reduction Program	17th May, 2022	Conference Hall RPL
3	Staff Refresher Training on Methane Reduction Program	15th June, 2022	Conference Hall RPL
4	Staff Refresher Training on Methane Reduction Program	19th July, 2022	Conference Hall RPL
5	Staff Refresher Training on Methane Reduction Program	16th August, 2022	Conference Hall RPL
6	Staff Refresher Training on Methane Reduction Program	12th Sep, 2022	Conference Hall RPL
7	Staff Refresher Training on Methane Reduction Program	17th Oct, 2022	Conference Hall RPL
8	Staff Refresher Training on Methane Reduction Program	14th June. 2023	Conference Hall RPL
9	Staff Refresher Training on Methane Reduction Program	27th July, 2023	Conference Hall RPL
10	Staff Refresher Training on Methane Reduction Program	22nd Aug, 2023	Conference Hall RPL
11	Staff Refresher Training on Methane Reduction Program	6th Oct, 2023	Conference Hall RPL

E.3. Calculation of leakage

Any effects of the project activity on GHG emissions outside the project boundary are deemed to be negligible and do not have to be considered under this methodology.

E.4. Calculation of net benefits or direct calculation for each SDG Impact

SDG	SDG Impact	Baseline estimate	Project estimate	Net benefit
13	Amount of GHGs emissions avoided or sequestered	137,409	75,830	46,714
12	Average reduction (%) in synthetic fertilizer used per ha	122 kg N/ha	79.07 kg N/ha	35% decrease
1	Change in farmer income as a result of project, by gender	5,752 Rs/ha	5,656 Rs/ha	5,656 Rs/ha
2	Crop yield in kilograms per hectare and year as result of the project's intervention	3,500 kg/ha	3,644 kg/ha	3,644 kg/ha
3	Number of farmers adopted practices promoted by the project	-	2022: 700 2023: 2000	2022: 700 2023: 2000
6	Number of farmers and others who have applied water management	-	2022: 700 2023: 2000	2022: 700 2023: 2000

	practices as a result of project activity			
4	Number of employees provided skill development training	-	467 farmers in 2022 and 1437 farmers in 2023 19 Stakeholder workshops 11 employees 11 trainings	467 farmers in 2022 and 1437 farmers in 2023 19 Stakeholder workshops 11 employees 11 trainings
8	Economic value generated locally via employment	-	11 employees	11 employees

E.5. Comparison of actual SDG Impacts with estimates in approved PDD

SDG	Values estimated in ex ante calculation of approved PDD for this monitoring period	Actual values[18] achieved during this monitoring period
13	Baseline: 139,735 Project: 77,113 Net Benefit: 50,408 ER(2022): 11,324 ER(2023): 39,084	Baseline: 137,409 Project: 75,830 Net Benefit:46,714 ER(2022): 10,867 ER(2023): 35,847
12	107.5 kg N/ha	79.05 kg N/ha
1	2,876 x2= 5,752 Rs/Ha	5,656 Rs/ha

[18] Whenever emission reductions are capped, both the original and capped values used for calculations must be transparently reported. Use brackets to denote original values.

2	At least 10% increase from the baseline yield of 3,100	18% increase on average
3	**2000** farmers	700 farmers in 2022 2000 farmers in 2023
6	**2000** farmers	700 farmers in 2022 2000 farmers in 2023
4	10 employees 2000 farmers	467 farmers in 2022 and 1437 farmers in 2023 19 stakeholder workshops 11 employees 11 trainings
8	10 employees	11 employees

E.5.1. Explanation of calculation of value estimated ex ante calculation of approved PDD for this monitoring period

All values are estimated on cultivation season basis annually as per the registered PDD. The annual emission reductions are estimated as 11,324 tCO2e for 700 farmers in 2022 and 39,084 tCO2e for 2000 farmers in 2023 based on 130 days of cultivation period.

E.6. Remarks on increase in achieved SDG Impacts from estimated value in approved PDD

SDG 13: The ex-ante value estimated for SDG 13 is 11,324 tCO2e for 2022 and 39,084 tCO2e for 2023 based on 130 days of cultivation period. The amount achieved this monitoring period is 10,867 t CO2e based on 133 days of cultivation period in 2022 and 35,847tCO2e based on 126 days in 2023 on average. This is 4.2% and 9% lower than the estimated amounts in 2022 and 2023, respectively.

As the cultivation period in Pakistan Ranges between 120-140 days, ex-ante emission reduction as calculated based on 130 days average. The total emission reductions achieved annual changes due to the length of cultivation period. This is reflected to the total emission reductions calculated for the monitoring period. CO2 deductions applied for the monitoring period have further decreased the net amount of emission reductions.

SDG 12: The total fertilizer applied to the fields remained lower than expected thanks to AWD technique[19] and leaf color charts provided to the farmers.

SDG 1: Total savings has been calculated as 5,656 Rs/ha ; that is slightly lower than 5,752 Rs/ha ex ante estimate based on 17 irrigation events per season. This is due the number irrigation events occur as 16.57 in 2022 and 17.70 in 2023.

SDG 2: Total yield per ha was expected to increase by at least 10%. This has been achieved and exceeded by 8% on average.

SDG 3: All farmers are committed to avoid crop residue burning after harvest. This is confirmed by the interviews.

SDG 6: All farmers who voluntarily joined the project have implemented AWD method and saved water successfully.

SDG 4: Training sessions has reached 1,904 farmers in total during the monitoring period. As all fields are visited regularly, refresher trainings will be organized in the next seasons.

SDG 8: 11 employees have been permanently hired for the project; that is closely estimated in the registered project documentation.

SECTION F. SAFEGUARDS REPORTING

Principle 9.6 Pesticides and Fertilisers is monitored. The implementation of pesticides and herbicides will be in line with pesticide usage plan. Please see Section D.2.

[19]Recent studies showed that AWD can increase Nitrogen Use Efficiency (5.11 Irrigation Management, Environment friendly nitrogen management practices in wetland paddy cultivation at https://www.frontiersin.org/articles/10.3389/fsufs.2023.1020570/full)

SECTION G. STAKEHOLDER INPUTS AND LEGAL DISPUTES

G.1. List all Inputs and Grievances which have been received via the Continuous Input and Grievance Mechanism together with their respective responses/mitigations.

36 comments from the farmers have been received during the monitoring period. All of them were related to the implementation of the AWD method including application of fertilizers and pesticides, preparation of land. The project team solve the issues and recorded in the process book.

G.2. Report on any stakeholder mitigations that were agreed to be monitored.

N/A

G.3. Provide details of any legal contest that has arisen with the project during the monitoring period

N/A

Revision History

Version	Date	Remarks
1.1	14 October 2020	Hyperlinked section summary to enable quick access to key sections Improved clarity on Key Project Information Section for POA monitoring Forward action request section Improved Clarity on SDG contribution/SDG Impact term used throughout Clarity on safeguard reporting Clarity on design changes Leakage section added for VER/CER projects Addition of Comparison of monitored parameters with last monitoring period Provision of an accompanying Guide to help the user understand detailed rules and requirements
1.0	10 July 2017	Initial adoption