JCM Project Design Document Form

A. Project description

A.1. Title of the JCM project

Methane gas reduction project in Bulacan Province through AWD (Alternate Wetting and Drying) implementation in rice paddies

A.2. General description of project and applied technologies and/or measures

This project aims to collaborate with local farmers in the Philippines who practice continuous flooding rice cultivation and to introduce Alternate Wetting and Drying (AWD) in target fields to reduce methane emissions.

Rice cultivation in Bulacan Province and in the Philippines at large is predominantly characterized by irrigated, flooded fields. Baseline information collected to establish existing cropping practices shows that the plots are irrigated and under continuous flooding. Before planting, the land is ploughed to stir up the soil, so it is ready for the seedlings. After plowing, the paddies are flooded, and the seedlings are planted by hand in neat rows about 12 cm apart. Watering of the fields is only stopped after rice matures to allow for smooth harvesting.

Despite the positive aspects that rice cultivation brings to society and the world at large, it is also a major emitter of essential and long-lasting greenhouse gasses (hereafter, “GHGs”) including CH_4 and N_2O, posing a significant danger to sustainable agriculture.[1] It has been established that rice fields emit around 30% and 11% of global agricultural CH_4 and N_2O emissions, respectively.[2][3] Asia accounts for about 90% of global rice production, [4] and the Philippines stands out as a significant contributor both to the extensive rice yields and GHG emission, with 3,625 kg of CH_4 per hectare was emitted from irrigated rice field.[5]

Therefore, the current project activities focus on modifying irrigation practices from continuous flooding to intermittent flooding by employing alternative wetting and drying (AWD) techniques. AWD is a simple and inexpensive way of reducing water consumption in rice production by 30%, creating conditions that significantly reduce GHG emissions.[2] It involves periodic draining of the field to a certain threshold, usually 15 cm below the soil surface, and re-flooding. A perforated tube placed in the soil enables the farmer to monitor the water level below the soil surface to determine the optimal time for irrigation.

In addition to reducing water consumption, the AWD technology has also been proven to

effectively mitigate GHGs, specifically methane, from rice production by 30-70%, without causing a yield reduction.[6] During the dry phases, the methane-producing bacteria are inhibited, thus, setting a condition to reduce GHG emissions. Even when methane production temporarily ceases during dry periods, methane can still remain trapped in the soil of rice paddies. Thus, the application of AWD to rice production is essential in ensuring that the during wet phases CH_4 emission is reduced as it is shown in studies to have reduced 19.8% of annual CH4 emissions.[7].

A.3. Location of project, including coordinates

Country	Republic of the Philippines
Region/State/Province etc.:	Province of Bulacan
City/Town/Community etc:	(1) Municipality of Baliwag (2) Municipality of Pulilan (3) Municipality of San Miguel (4) Municipality of San Ildefonso (5) Municipality of San Rafael
Latitude, longitude	(1) N 14° 54' 11" and E 120° 51' 11" (2) N 14° 57' 00" and E 120° 54' 00" (3) N 15° 04' 00" and E 120° 56' 00" (4) N 15° 08' 45" and E 120° 58' 24" (5) N 15° 01' 48" and E 120° 52' 48"

A.4. Name of project participants

The Republic of the Philippines	University of the Philippines – Los Baños (UPLB)
Japan	Green Carbon, Inc. Nippon Koei Co., Ltd Fuyo General Lease Co., Ltd.

A.5. Duration

Starting date of project operation	1/08/2024
Expected operational lifetime of project	10 years

A.6. Contribution from Japan

Japan contributes to this project through direct investment and the development of a carbon credit generation platform (currently under development). This initiative is driven by the

demand for carbon credits from Japan, and the associated funding enables the project's implementation—making these investments a clear and vital contribution from Japan.

Green Carbon, the project proponent, is also developing a digital platform to streamline the management of data required for carbon credit generation. Once completed, this platform will significantly reduce the administrative burden on farmers. For instance, to date, it is said that project developers usually have very little support for organizing inputs for the carbon reduction calculations. To address this, we will facilitate the transition from paper-based logbooks to our digital platform, where farmers can enter their daily activities such as field operations, water management, and input usage. The app will also provide alert notifications for missing entries, helping to improve data completeness and support effective farm management. To ensure ease of use, intuitive icons and guided inputs will be implemented based on the typical sequence of farming activities. These features will not only enhance the accuracy of data collection for carbon credit issuance but also empower farmers in the Philippines with better tools for farm monitoring and planning.

More importantly, the introduction of the carbon credit system incentivizes the adoption of Alternate Wetting and Drying (AWD), which contributes to methane emission reductions in the Philippines and supports sustainable agriculture through capacity building for local farmers. In essence, the GHG emission reduction from AWD implementation is measured and converted into carbon credits, which are sold to generate additional income for these farmers. Studies have also indicated potential increase in rice yield due to AWD. [6]

This initiative aligns with Japan's commitment to advancing climate solutions and innovation through the Joint Crediting Mechanism (JCM). The project leverages Japan's expertise in Monitoring, Reporting, and Verification (MRV) technologies to ensure transparency, accountability, and environmental integrity in carbon credit generation.

Beyond financial and technical contributions, the project fosters international collaboration by facilitating the transfer of low-emission agricultural technologies and best practices to stakeholders in the Philippines, strengthening regional cooperation on climate action. The model combining carbon finance with sustainable agricultural practices is designed to be scalable and replicable across other Southeast Asian countries with similar rice cultivation conditions, promoting broader climate benefits.

Capacity building is a core component, with workshops and on-field training empowering local farmers and communities to adopt climate-smart agricultural techniques. This strengthens local ownership, resilience, and ensures long-term sustainability of the project beyond its official period.

In addition to reducing greenhouse gases, the project delivers multiple environmental, social, and economic co-benefits aligned with the Sustainable Development Goals (SDGs), including:

Goal 1 – No Poverty
By promoting AWD during rice cultivation, the project improves yields and helps farmers in low-income regions increase their net income. Green Carbon also shares carbon credit revenues with participating farmers, enhancing their financial stability.

Goal 2 – Zero Hunger
AWD not only reduces methane emissions but also enhances root health, improves resistance to lodging and extreme weather, and supports stable yields. Positive results have been confirmed in trials conducted by Green Carbon in partnership with universities across several countries.

Goal 5 – Gender Equality
The project actively encourages female participation by offering training opportunities and promoting women's access to resources and economic activities.

Goal 6 – Clean Water and Sanitation
AWD is a water-efficient irrigation method that manages flooding in rice fields more sustainably. Research indicates it can reduce water use by up to 30% without compromising yields.[2] [6]

Goal 8 – Decent Work and Economic Growth
The project creates local employment opportunities by hiring field staff from surrounding villages to support AWD implementation and monitor water management practices.

Goal 12 – Responsible Consumption and Production
The employment of AWD addresses Target 12.2, which aims for sustainable management and efficient use of natural resources. Efficient use of resources, especially water, is vital as the Philippines faces challenges including 50 major rivers are considered biologically dead, alongside rising potable water costs.[8]

Finally, the project strictly follows internationally recognized methodologies for quantifying GHG reductions and is submitted for validation under JCM whilst considering other international best practices ensuring its credibility, transparency, and contribution to global climate goals.

B. Application of an approved methodology(ies)

B.1. Selection of methodology(ies)

Selected approved methodology No.	JCM_PH_AM004
Version number	Ver1.0

B.2. Explanation of how the project meets eligibility criteria of the approved methodology

Eligibility criteria	Descriptions specified in the methodology	Project information
Criterion 1	The project field is rice paddy field that changes water regime 1 during cultivation period from continuously flooded to single or multiple drainage, or from single to multiple drainage. For the former, farmers had not practiced single or multiple drainage in the two years prior to the project's start, and for the latter, farmers have not conducted multiple drainage in the past 2 years prior to the start of the project.	This project involves collaboration with farmers in the Province of Bulacan who traditionally practiced continuous flooding irrigation. The project introduces Alternate Wetting and Drying (AWD) irrigation practices. Therefore, it entails a transition from continuous flooding to multiple drainage, fulfilling this criterion.
Criterion 2	A drainage is considered fully completed when the water level is observed to reach 15cm below the soil surface. To maintain yield, irrigation is carried out within 2 days after the completion of the drainage.	This project collaborates with a local university specializing in the implementation of Alternate Wetting and Drying (AWD), whereby irrigation is promptly conducted after achieving a water level of 15 cm or below.

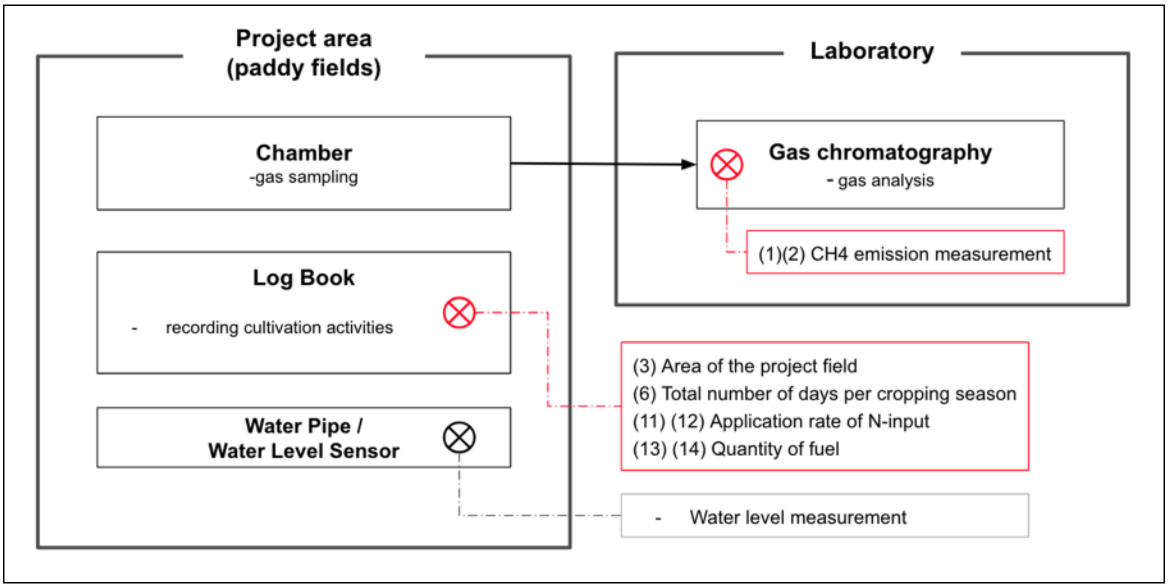
Criterion 3	Single or multiple drainage is not required by the local or national legislation in the project field.	In the Philippines and the Province of Bulacan, the introduction of AWD is recommended to secure water resources, but adoption among farmers remains low due to its limited direct benefits. Thus, the carbon finance mechanism introduced by this project serves as an incentive for adoption.

C. Calculation of emission reductions

C.1. All emission sources and their associated greenhouse gases relevant to the JCM project

Reference emissions	
Emission sources	GHG type
CH_4 generated from rice paddy field due to activity of microorganism under anaerobic soil condition.	CH_4
N_2O emissions from fertilizer application.	N_2O
CO_2 emissions due to the utilization of drainage pumps used to drain water from rice paddy fields.	CO_2
CO_2 emission due to utilization of irrigation pumps	CO_2
Project emissions	
Emission sources	GHG type
CH_4 generated from rice paddy field due to activity of microorganism under anaerobic soil condition.	CH_4
N_2O emissions from fertilizer application	N_2O
CO_2 emissions due to the utilization of drainage pumps used to drain water from rice paddy fields.–	CO_2
CO_2 emission due to utilization of irrigation pumps.	CO_2

C.2. Figure of all emission sources and monitoring points relevant to the JCM project



C.3. Estimated emissions reductions in each year

Year	Estimated Reference emissions (tCO_2e)	Estimated Project Emissions (tCO_2e)	Estimated Emission Reductions (tCO_2e)
2024	8,151.09	4,563.96	3,587.13
2025	35,350.29	19,848.74	15,501.55
2026	130,398.15	73,337.22	57,060.93
2027	289,938.66	163,316.56	126,622.10
2028	449,479.17	253,295.90	196,183.27
2029	478,621.53	269,938.02	208,683.52
2030	478,621.53	269,938.02	208,683.52
Total (tCO_2e)			816,322.01

D. Environmental impact assessment	
Legal requirement of environmental impact assessment for the proposed project	No

E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

To solicit comments from the local stakeholders, the project participant conducted a local stakeholders consultation meeting as follows:

Pulilan

- Date /Time: 27 June 2024 9:00-11:30
- Venue: Residence of Joselito Calderon, Brgy Tinejero, Pulilan, Bulacan
- Attendees (total of 20 participants representing the following organizations):

-Green Carbon, Inc. (project developer)
-Local Government of Pulilan (LGU)
-Farmers of Pulilan
-The University of Philippines Los Banos (UPLB)

Baliwag

- Date /Time: 27 June 2024 13:30-16:00
- Venue: Barangay Calantipay, Barangay Hall of Baliwag, Bulacan
- Attendees (total of 25 participants representing the following organizations):

-Green Carbon, Inc. (project developer)
-Local Government of Baliwag (LGU)
-Farmers of Baliwag
-The University of Philippines Los Banos (UPLB)

San Miguel

- Date /Time: 28 June 2024 9:00-11:30
- Venue: Brgy Camias, Brgy Hall, San Miguel, Bulacan
- Attendees (total of 19 participants representing the following organizations):

-Green Carbon, Inc. (project developer)
-Local Government of San Miguel(LGU)
-Farmers of San Miguel
-Agricultural Technicians (ATs)
-The University of Philippines Los Banos (UPLB)

San Ildefonso

- Date /Time: 16 July 2024 9:00-12:00
- Venue: Barangay Telapatio, Barangay Hall, San Ildefonso, Bulacan
- Attendees (total of 10 participants representing the following organizations):

-Green Carbon, Inc. (project developer)
-Local Government of San Ildefonso (LGU)
-Farmers of San Ildefonso

-The University of Philippines Los Banos (UPLB)

San Rafael

◆ Date /Time: 15 January 2025 8:00-10:30

◆ Venue: Dr. Guizano, Brgy. Capihan, San Rafael, Bulacan

◆ Attendees (total of 35 participants representing the following organizations):

-Green Carbon, Inc. (project developer)

-Local Government of San Rafael (LGU)

-Farmers of San Rafael

- Agricultural Technicians (ATs)

-The University of Philippines Los Banos (UPLB)

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The public and private entities mentioned above have been identified as stakeholders, and invitations were sent via letter or email through the office of the Municipal Agriculturist. This was done as the project participant, Green Carbon, Inc., has agreed to cooperate in proceeding with the project. Email / Letter/Phone call/SMS were sent a week before the date of the meeting to different Government Offices involved in the meeting together with the Farmers Cooperative and Association involved in rice production.

◆ Meeting agenda

-Opening remark

-Participants introduction

-Project outline and project benefit

-Discussion on procedure of the project

-Open forum (Q & A)

-Closing remark

◆ Summary

AWD was introduced to the farmers as a water saving technology. Types of greenhouse gases, specifically methane, nitrous oxide and carbon dioxide were discussed as types of greenhouse gases that affect climate change.

The trainers discussed how to perform AWD to the farmers - from the plot allocation all the way to lab analysis. The farmers also participated in demos and were taught how to use the pipes, irrigate, perform sampling using gas chambers, and the timelines to perform AWD. The trainers

also discussed the performance of gas chromatography from the gas sampling using chambers, up to the analysis level and its relevance. Gas chromatography is done to check the effectiveness of AWD in yield and growth of plants as well as the size of leaf. Soil testing is also done prior to performing gas chromatography and sampling.

E.2. Summary of comments received and their consideration

Stakeholders	Comments received	Consideration of comments received
Farmers	Concerns over the AWD that they might change their cropping techniques given the joining of the project	The project will not change any of their agricultural practices other than their water management regime
Farmers	How long will the project be?	The minimum duration of the project is at least 2 years, allowing for comparison between wet and dry season cropping.
Farmers	Are there any requirements for the farmers who would like to join the project?	The only requirement is that they should be classified as irrigated rice producers.
Farmers	What is the minimum size of farm lands farmers must possess to join?	There is no minimum farm size required, as long as we can gather a total of at least 200 hectares for the entire municipality.
LGU Representatives	What would be the participation of the MAO during the implementation of the project?	The MAO will monitor the implementation of the project and will also support GC and UPLB during water monitoring and gas sampling.
Farmers / Farmer Leaders	Some farmers and ATs sought clarification on eligibility and participation, asking if there were minimum land requirements, what to do if the field was located near a road, and whether they could join the project if they had already planted	While we addressed these inquiries directly during the training, in addition, we organized regular communication channels with the farmers via FB messenger, with UPLB in order to monitor any comments and queries along the

	crops. Additionally, they inquired about the gas sampling process, including the number of plots needed and the distance considerations for selecting participating farmers. Several questions focused on the formal agreements and compensation, with farmers asking if there was a contract between their municipality and Green Carbon, and whether they would need to spend any money to join the project.	project. It was stressed that UPLB and GC Local staff will constantly be available for any challenges or queries regarding the new methodology done by the farmers. Farmers were reassured that all costs, including equipment and supplies, would be covered by the project, and were informed about the compensation structure for their participation in gas sampling and water monitoring.
Agricultural Technicians from MAO	Some inquired about the water management aspects of the project, such as how irrigation works with PVC pipes, the use of water pumps, and whether the field conditions, like dryness, affect weed growth or crop yield. They also asked about the daily water monitoring process and whether all farmers would be required to monitor the water levels every day. Finally, some questions addressed the project's goals and its sustainability.	All questions were addressed and Ats were informed about the direct communication channels and regular and weekly visits that local GC staff would do throughout the monitoring period, with UPLB. Green Carbon and UPLB explained in digestible detail about carbon credits generated and the overall benefits for the farmers participating in the initiative, including how AWD practices might impact crop yield and weed growth, as well as the long-term duration of the project.

F. References

[1] Sun, Huifeng, Sheng Zhou, Zishi Fu, Guifa Chen, Guoyan Zou, and Xiangfu Song. “A Two-Year Field Measurement of Methane and Nitrous Oxide Fluxes from Rice Paddies under Contrasting Climate Conditions.” *Scientific Reports* 6, no. 1 (June 20, 2016): 28255. https://doi.org/10.1038/srep28255.

[2] International Rice Research Institute. "Alternate Wetting and Drying." GHG Mitigation in Rice. Accessed March 3, 2025. https://ghgmitigation.irri.org/mitigation-technologies/alternate-wetting-and-drying.

[3] Gupta K, Kumar R, Baruah KK, Hazarika S, Karmakar S, Bordoloi N. Greenhouse gas emission from rice fields: a review from Indian context. *Environ Sci Pollut Res Int*. 2021 Jun;28(24):30551-30572. doi: 10.1007/s11356-021-13935-1. Epub 2021 Apr 27. PMID: 33905059.

[4] Reddy, V, and Dil Rahut. MULTIFUNCTIONALITY of RICE PRODUCTION SYSTEMS in ASIA a Synoptic Review ADBI Series on Asian and Pacific Sustainable Development *ASIAN DEVELOPMENT BANK INSTITUTE*. 2023.

[5] Bautista, Elmer Granadozo, and Masanori Saito. “Greenhouse Gas Emissions from Rice Production in the Philippines Based on Life-Cycle Inventory Analysis.” ResearchGate, 2016, www.researchgate.net/publication/273636139_Greenhouse_gas_emissions_from_rice_production_in_the_Philippines_based_on_life-cycle_inventory_analysis.

[6] Cheng, Haomiao, Kexin Shu, Tengyi Zhu, Liang Wang, Xiang Liu, Wei Cai, Zhiming Qi, and Shaoyuan Feng. “Effects of Alternate Wetting and Drying Irrigation on Yield, Water and Nitrogen Use, and Greenhouse Gas Emissions in Rice Paddy Fields.” *Journal of Cleaner Production* 349 (May 15, 2022): 131487. https://doi.org/10.1016/j.jclepro.2022.131487.

[7] Li, Jianling, et al. “Annual Greenhouse Gas Emissions from Rice Paddy with Different Water-Nitrogen Management Strategies in Central China.” *Soil & Tillage Research*, vol. 235, 1 Jan. 2024, pp. 105906‑105906, https://doi.org/10.1016/j.still.2023.105906. Accessed 10 Nov. 2023.

[8] Rola, Agnes, et al. “Challenges of Water Governance in the Philippines.” Philippine Journal of Science, vol. 144, no. 2, 2015, pp. 197–208, philjournalsci.dost.gov.ph/images/pdf/pjs_pdf/vol144no2/pdf/challenges_of_water_governance_in_the_Phils_FinalCopy_05_April_2016.pdf.

Reference lists to support descriptions in the PDD, if any.

Annex

Annex 1: **Estimated emissions reductions for 2031-2034**

Year	Estimated Reference emissions (tCO2e)	Estimated Project Emissions (tCO2e)	Estimated Emission Reductions (tCO2e)
2031	478,621.53	269,938.02	208,683.52
2032	478,621.53	269,938.02	208,683.52
2033	478,621.53	269,938.02	208,683.52
2034	478,621.53	269,938.02	208,683.52
Total (tCO2e)			834,734.08

Annex 2: **Estimated emissions reductions for the entire project lifetime**

Year	Estimated Reference emissions (tCO2e)	Estimated Project Emissions (tCO2e)	Estimated Emission Reductions (tCO2e)
2024	8,151.09	4,563.96	3,587.13
2025	35,350.29	19,848.74	15,501.55
2026	130,398.15	73,337.22	57,060.93
2027	289,938.66	163,316.56	126,622.10
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2030	478,621.53	269,938.02	208,683.52
2031	478,621.53	269,938.02	208,683.52
2032	478,621.53	269,938.02	208,683.52
2033	478,621.53	269,938.02	208,683.52
2034	478,621.53	269,938.02	208,683.52
Total (tCO2e)			1,403,397.68

Revision history of PDD

Version	Date	Contents revised
1.0	21/05/2025	First Version