THAILAND CARBON PROGRAM OF RICE-FIELD FOR ALTERNATIVE WET AND DRY IN THE AREAS OF THE CENTRAL AND NORTHERN

Project title	Thailand Carbon Program of Rice-Field for Alternative Wet and Dry in Areas of the Central and Northern
Project ID	5814
Crediting period	01/11/2025 to 31/10/2032
Original date of issue	03/11/2025
Most recent date of issue	12/11/2025
Version	1
VCS Standard Version	4.7
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1 PROJECT DETAILS

1.1 Summary Description of the Project

Rice cultivation is highly vulnerable to climate change, and it is also a significant source of greenhouse gas (GHG) emissions, particularly methane. In Thailand, conventional practices especially the continuous flooding of rice fields intensify methane production. Reducing these emissions is crucial to protecting the environment and building more resilient agricultural systems.

This program introduces water-efficient rice farming methods such as Alternate Wetting and Drying (AWD). These approaches reduce methane emissions by minimizing prolonged waterlogged conditions while also improving crop productivity. In addition, the program promotes sustainable rice production techniques, including conservation tillage, appropriate fertilizer use, and managing agricultural waste without burning.

To support farmers in adopting these sustainable practices, Charoen Pokphand Produce Co., Ltd. will engage FarmPro as facilitators and mentors. FarmPro, a fully integrated agricultural service provider in Thailand, offers farmers inputs, machinery, market connections, and technical guidance. They will also deliver essential services throughout the rice production cycle covering land preparation, planting, pest and fertilizer management, harvesting, grain purchasing, and irrigation assistance such as tube-well construction. The FarmPro team will be responsible for farmer on-boarding, training, and monitoring to ensure improved water management practices that reduce GHG emissions. The project will be implemented in seven clusters across northern and central Thailand: Phayao, Chiang Rai, Chiang Mai, Kamphaeng Phet, Phitsanulok, Phichit, and Nakhon Sawan. Training activities will focus on target areas such as water management for methane reduction, proper fertilizer application, and sustainable agricultural waste management practices that avoid burning.

The program seeks to build a more sustainable and environmentally conscious agricultural framework by providing farmers with practical, ready-to-use techniques for better water and crop management. Through formal training sessions, hands-on field guidance, and continuous progress tracking, the initiative is projected to cut greenhouse gas (GHG) emissions while strengthening Thailand's rice industry, paving the way for a more prosperous and climate-resilient future for farming communities. In line with SDG 13 (Climate Action), the project is expected to achieve approximately 58,219 tCO_2e in annual emission reductions, amounting to a cumulative total of around 407,535 tCO_2e across the entire 7-year program duration.

1.2 Audit History

This draft document for pipeline listing, not validation yet.

For projects undergoing crediting period renewal, include the audit history of the project using the table below. For the project validation, state the validation date in the Period column. This table should include all monitoring periods, including the period of this report.

Audit type	Period	Program	Validation/verification body name	Number of years
Validation/ verification	*(DD-Month-YYYY-- DD-Month-YYYY)*	*VCS*	*Control Union/* *verification body name*	

1.3 Sectoral Scope and Project Type

Complete the table below with information relevant for AFOLU projects:

Sectoral scope	14. Agriculture, forestry and other land use (AFOLU)
AFOLU project category[1]	Agricultural Land Management (ALM)
Project activity type	Improved Management in Rice Production Systems (AWD), reduces agricultural inputs (fertilizer or fuel) and avoids open burning in rice fields

1.4 Project Eligibility

1.4.1 General eligibility

Based on the requirements of the VCS Standard v4.7 and the VM0051 v1.0 methodology, this project satisfies all eligibility criteria for registration under the VCS Program. The project falls under the Agricultural Land Management (ALM) category and is not included in the excluded activities listed in Table 2.1 of the VCS Standard. The key eligibility considerations are as follows:

Requirements	Justifications
Projects shall meet all applicable rules and requirements set out under the VCS Program, including this document. Projects shall be guided by the principles set out in Section 2.2.1.	The project will be implemented in accordance with all applicable VCS Program rules and requirements. Based on the VCS Standard v4.7 and methodology VM0051 v1.0, the project meets the applicable eligibility requirements for inclusion under the VCS Program. Conformance will be demonstrated through the application of the approved methodology, documented project and monitoring procedures, QA/QC measures,

	supporting legal and contractual documentation, and validation and verification under the VCS Program, consistent with the principles of relevance, completeness, consistency, accuracy, transparency, and conservativeness.
Projects shall apply methodologies eligible under the VCS Program. Methodologies shall be applied in full, including the full application of any tools or modules referred to by a methodology, noting the exception set out in Section 3.14.1. The list of methodologies and their validity periods is available on the Verra website.	The project applies VM0051, an eligible VCS methodology approved under the VCS Program, and will apply it in full, including all applicable referred tools and modules, subject to Section 3.14.1 of the VCS Standard. The project falls within the Agricultural Land Management (ALM) category under AFOLU, is not listed as an excluded activity under Table 1 of the VCS Standard, and is therefore within the scope of the VCS Program. The project activity comprises improved rice cultivation practices that reduce net CH_4, N_2O, and/or CO_2 emissions through improved irrigation and crop management, Alternate Wetting and Drying (AWD), as applicable under VM0051.
Projects shall apply the latest version of the applicable methodology in all cases unless a grace period applies to the project as set out in 3.22 below. Projects shall update to the latest version of the methodology when reassessing the baseline or renewing a crediting period.	The project will apply the latest applicable version of VM0051, unless a grace period under Section 3.22 applies. At baseline reassessment or crediting period renewal, the project will update to the latest approved methodology version, as required under the VCS Program.
Projects and the implementation of project activities shall not lead to the violation of any applicable law, regardless of whether or not the law is enforced	The project will be implemented in accordance with all applicable laws and regulations of the host country, including those related to land use, water management, agriculture, and contractual arrangements with participating farmers. As outlined in Section 1.15 of this document, compliance will be supported by relevant legal, regulatory, land tenure, and project implementation documentation.
Where projects apply methodologies that permit the project proponent its own choice of model (see the VCS Program Definitions for the definition of model), the model shall meet the requirements set out in the VCS Methodology Requirements, and it shall be demonstrated at	Not applicable. The project does not use a project-proponent-selected model. Instead, the project applies VM0051 QA3 (Default Emission Factors) for quantification of GHG emission reductions, and will follow the corresponding methodology requirements for QA3.

validation that the model is appropriate to the project circumstances (i.e., use of the model will lead to an appropriate quantification of GHG emission reductions or carbon dioxide removals).	
Where projects apply methodologies that permit the project proponent to choose a third-party default factor or standard to ascertain GHG emission data and any supporting data for establishing baseline scenarios and demonstrating additionality, such default factor or standard shall meet the requirements set out in the VCS Methodology Requirements.	The project applies VM0051 Quantification Approach 3 (QA3), under which GHG emission reductions are quantified using default equations and emission factors in accordance with the methodology. Where any third-party default factor or standard is applied under the methodology, the project will ensure that such factor or standard meets the applicable requirements of the VCS Methodology Requirements and will document the source and justification accordingly.
Where the rules and requirements under an approved GHG program conflict with the rules and requirements of the VCS Program, the rules and requirements of the VCS Program shall take precedence.	The project will conform with the applicable VCS Program rules and requirements. In the event of any inconsistency between the VCS Program and any approved GHG program rules relevant to the project, the VCS Program requirements shall take precedence.
Where projects apply methodologies from approved GHG programs, they shall conform with any specified capacity limits (see the VCS Program Definitions for the definition of capacity limit) and any other relevant requirements set out with respect to the application of the methodology and/or tools referenced by the methodology under those programs.	The project applies VM0051 under the VCS Program rather than a methodology from another approved GHG program. Therefore, no external capacity limit applies. The project will comply with all applicable requirements of VM0051 and any referenced VCS tools or modules.
Where Verra issues new VCS Program rules, the effective dates of these requirements are set out in Appendix 3 Document History and Effective Dates or equivalent for other program documents, and are listed in a companion Summary of Effective Dates document which corresponds with each update.	The project will comply with the effective dates of any new or updated VCS Program requirements, as set out in the applicable document history and effective date sections of the relevant VCS Program documents and the corresponding Verra Summary of Effective Dates. The project proponent will apply the version and effective date requirements in force at the time of project validation, verification, baseline reassessment, and crediting period renewal, as applicable.

1.4.2 AFOLU project eligibility

Furthermore, the project is classified under the Agricultural Land Management (ALM) category of AFOLU in accordance with the VCS Standard, based on the following considerations:

Requirements	Justification
There are currently six AFOLU project categories eligible under the VCS Program, as defined in Appendix 1 Eligible AFOLU Project Categories below: afforestation, reforestation and revegetation (ARR), agricultural land management (ALM), improved forest management (IFM), reduced emissions from deforestation and degradation (REDD), avoided conversion of grasslands and shrublands (ACoGS), and wetland restoration and conservation (WRC). Further specification with respect to eligible activities which may be included within methodologies approved under the VCS Program can be found in the VCS Methodology Requirements.	The project is classified as an Agricultural Land Management (ALM) project under the VCS Program because it is implemented on existing rice croplands and applies improved water and crop management practices under VM0051 to reduce greenhouse gas emissions. The project does not involve forest activities, avoided land conversion, or wetland restoration; therefore, ALM is the applicable AFOLU project category.
Where projects are located within a jurisdiction covered by a jurisdictional REDD+ program, project proponents shall follow the requirements in this document and the requirements related to nested projects set out in the Jurisdictional and Nested REDD+ Requirements.	Not applicable, as the project is an ALM rice project under VM0051 and not a REDD+ or nested REDD+ project.
Where an implementation partner is acting in partnership with the project proponent, the implementation partner shall be identified in the project description. The implementation partner shall identify its roles and responsibilities with respect to the project, including but not limited to implementation, management, and monitoring of the project, over the project crediting period.	Charoen Pokphand Produce Co., Ltd. and Rajamangala University of Technology Lanna are identified in the project description as an implementation partner to the project proponent. Their roles and responsibilities over the project crediting period are clearly defined in Section 1.12.4 and include support for project implementation, project management, monitoring, and other assigned technical and operational functions, as applicable.
The project proponent shall demonstrate that project activities that lead to the intended GHG benefit have been implemented during each verification period in accordance with the project	The project proponent will demonstrate for each verification period that the implemented improved rice management practices were applied in accordance with the project design, or,

design. Where no new project activities have been implemented during a verification period, project proponents shall demonstrate that previously implemented project activities continued to be implemented during the verification period (e.g., forest patrols or improved agricultural practices of community members).	where no new activities were introduced, that the previously implemented practices continued during the verification period.
For all IFM, Avoiding Planned Deforestation (APD) (except where the agent is unknown), Restoring Wetland Ecosystems (RWE), Avoiding Planned Wetland Degradation (APWD), Avoiding Planned Conversion (APC), and ALM project types, the project proponent shall, for the duration of the project, reassess the baseline every ten years. For all Avoiding Unplanned Deforestation and Degradation (AUDD) (where the baseline is not allocated from jurisdictional level data), APD (where the agent is unknown), Avoiding Unplanned Conversion (AUC), and Avoiding Unplanned Wetland Degradation (AUWD) project types, the project proponent shall, for the duration of the project, reassess the baseline every six years. For Avoiding Unplanned Deforestation projects where the baseline is allocated from jurisdictional level data, the initial project baseline validity period may be as little as one year but no more than seven years. The second and subsequent project baseline validity periods shall be no more than six years. The project proponent shall reassess the baseline at the end of each baseline validity period.	For this VM0051 project, which focuses exclusively on reducing CH_4 emissions and, where applicable, N_2O and/or fossil-derived CO_2 emissions and does not include soil organic carbon stocks, the 10-year ALM baseline reassessment requirement does not apply pursuant to Section 3.2.7(3) of the VCS Standard. However, at each crediting period renewal, the validity of the original baseline scenario shall be reassessed, or, where invalid, a new baseline scenario shall be established in accordance with Section 3.9.8 of the VCS Standard and Section 6 of VM0051.
The following shall apply with respect to the baseline reassessment: 1) The latest version of the VCS Program rules (including the latest version of the VCS Standard) and applied methodology or its replacement shall be applied at the time of baseline reassessment. The grace periods for using the previous version of a methodology are	Not applicable as a 10-year baseline reassessment requirement, since the project is a CH_4/N_2O-only ALM project without soil organic carbon stocks. Baseline validity will instead be reassessed at each crediting period renewal, using the latest VCS rules and applicable methodology, with the project description updated and revalidated as required.

set out in Section 3.22 and in the document history section of each VCS Program document. 2) The baseline shall be reassessed in accordance with the timelines in Section 3.2.5 above and shall be validated at the same time as the subsequent verification. 3) The reassessment will capture changes in the drivers and/or behavior of agents that cause the change in land use, hydrology, sediment supply and/or land or water management practices and changes in carbon stocks, all of which shall then be incorporated into revised estimates of the rates and patterns of land-use change and estimates of baseline emissions. 4) The validity of the original baseline scenario shall be reassessed. Such assessment shall include an evaluation of the impact of new relevant national and/or sectoral policies and circumstances on the validity of the baseline scenario. If still valid, the GHG emissions associated with the original baseline scenario shall be reassessed for the new baseline validity period following the provisions of the applied methodology. If no longer valid, the current baseline scenario shall be established in accordance with the VCS Program rules. 5) Ex-ante baseline projections beyond the baseline reassessment period specified in Section 3.2.5 above are not required. 6) Sections 1.14, 3.1-3.4, Section 4 and Section 54 of the project description shall be updated to reflect any changes as described in Section 3.2.6(3) and any updates to the baseline emissions quantifications.	
The following shall apply with respect to ALM baseline reassessment: 1) For projects that set their baseline using historical management data specific to the project lands at validation, the historical baseline shall be compared to published data on current	Not applicable, as the project is a CH_4/N_2O-only ALM project without soil organic carbon stocks and is therefore exempt from the 10-year ALM baseline reassessment requirement. Baseline validity will be reassessed at crediting period renewal.

common practice in the project region. If there is a significant difference between the historical baseline and current common practice, the project baseline shall be updated to reflect current common practice in the project region at each baseline reassessment event. 2) For projects that set their baseline using regional data on common practice (i.e., data not specific to the project lands), the baseline shall be updated to reflect current practices at each baseline reassessment event using similar datasets (e.g., agricultural census data) as those used to establish the baseline at validation. 3) ALM projects focusing exclusively on reducing N_2O, CH_4 and/or fossil-derived CO2 emissions (i.e., those that do not include soil organic carbon stocks) are exempted from the 10-year baseline reassessment requirement.	
Where ARR, ALM, IFM or REDD project activities occur on wetlands, the project shall adhere to both the respective project category requirements and the WRC requirements, unless the expected emissions from the soil organic carbon pool or change in the soil organic carbon pool in the project scenario is deemed below de minimis or can be conservatively excluded as set out in the VCS Methodology Requirements, in which case the project shall not be subject to the WRC requirements.	Not applicable under the current project design. The project is an ALM rice project under VM0051, not a WRC project; however, if any project activity occurs on wetlands, the project will apply the relevant WRC requirements unless soil organic carbon pool effects are below de minimis or can be conservatively excluded.
The project boundary for a WRC project shall include CH_4 emissions sources for all WRC activities and N_2O emissions sources for RWE activities, unless deemed de minimis or evidence is provided that it is conservative to exclude these sources.	Not applicable, as the project is an ALM rice project under VM0051 and not a WRC project.

1.4.3 Transfer project eligibility

This is not a transfer project.

1.5 Project Design

Indicate if the project has been designed as:

☐ Single location or installation

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

☐ Grouped project

1.5.1 Grouped project design

The project is an example of a single project activity that was produced as a single project rather than as a group effort and took place in different places.

1.6 Project Proponent

Organization name	Charoen Pokphand Produce Co., Ltd.
Contact person	Dr. Sadudee Supanpai
Title	Project President
Address	C.P. Tower 2 (Fortune Town), 23rd Floor, Ratchadapisek Rd., Din Daeng, Bangkok, Thailand, 10400.
Telephone	+6681467XXXX
Email	carboncredit@cppcrop.com

1.7 Other Entities Involved in the Project

Organization name	Charoen Pokphand Produce Co., Ltd.
Role in the project	Project Owner
Contact person	Mr. Worasit Sittivichai
Title	Chief Operating Officer

Address	C.P. Tower 2 (Fortune Town), 23rd Floor, Ratchadapisek Rd., Din Daeng, Bangkok, Thailand, 10400.
Telephone	+6681450XXXX
Email	worasit@cppcrop.com

Organization name	Rajamangala University of Technology Lanna, Lampang
Role in the project	Consultant
Contact person	Assistance Professor Dr. Suraphon Chaiwongsar
Title	Project Consultant
Address	200, Moo 17, Phahonyothin Road, Phichai, Mueang Lampang District, Lampang 52000
Telephone	+6686051XXXX
Email	suraphon.c@rmutl.ac.th

1.8 Ownership

Participating farmers have entered into Carbon Rights Agreements with Charoen Pokphand Produce Co., Ltd. granting the company exclusive ownership of all carbon credits generated, in accordance with Section 3.7.1 of the VCS Standard. Following successful implementation, the project will produce Verified Emission Reductions (VERs).

Through Carbon Rights Agreements, project beneficiaries formally transfer the rights to these emission reductions to Charoen Pokphand Produce Co., Ltd., ensuring complete and undisputed ownership. Importantly, land ownership remains with the farmers, as confirmed by official government land documentation.

1.9 Project Start Date

Project start date	01/11/2025
Justification	Under the VCS Standard, the project start date is defined as the point at which activities that directly lead to GHG emission

	reductions or removals begin such as land preparation, planting, or changes in management practices. For this project, the start date is identified as the moment when the first participating farmer submits a cultivation plan through the project's internal control system. This submission signals the farmer's commitment to adopt improved water management practices, transition from continuous flooding to controlled irrigation, and begin land preparation. This date represents the first documented land preparation activity, verified through the farmer's cultivation plan and corresponding logbook entries provided as supporting evidence.

1.10 Project Crediting Period

Crediting period	☒ *Seven years, twice renewable* ☐ *Ten years, fixed* ☐ *Other (state the selected crediting period and justify how it conforms with the VCS Program requirements)*
Start and end date of first or fixed crediting period	01/11/2025 to 31/10/2032

1.11 Project Scale and Estimated GHG Emission Reductions or Removals

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

☒ < 300,000 tCO2e/year (project)

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

Complete the table below for the first (if renewable) or fixed crediting period:

Calendar year of crediting period	Estimated GHG emission reductions or removals (tCO_2e)
01/11/2025 to 31/10/2026	55,660
01/11/2026 to 31/10/2027	58,646
01/11/2027 to 31/10/2028	58,646
01/11/2028 to 31/10/2029	58,646

01/11/2029 to 31/10/2030	58,646
01/11/2030 to 31/10/2031	58,646
01/11/2031 to 31/10/2032	58,646
Total estimated ERRs during the first or fixed crediting period	407,535
Total number of years	7
Average annual ERRs	58,219

1.12 Description of the Project Activity

The Thailand Carbon Program of Rice-Field for Alternative Wet and Dry in Areas of the Central and Northern is an Agricultural Land Management (ALM) project under the AFOLU category of the VCS Program v4.7, utilizing the VM0051: Improved Management in Rice Production Systems (v1.0) methodology. The project is implemented and managed by Charoen Pokphand Produce Co., Ltd., with technical assistance from FarmPro Thailand, and spans approximately 8,848 hectares of irrigated rice fields located across Phayao, Chiang Rai, Chiang Mai, Kamphaeng Phet, Phitsanulok, Phichit, and Nakhon Sawan.

The project aims to reduce methane (CH_4) emissions produced in continuously flooded rice systems by introducing enhanced water management and sustainable cultivation practices. In traditional rice production, methane is generated under anaerobic (waterlogged) soil conditions due to methanogenic microbial processes. To mitigate these emissions, the project promotes the following GHG reduction strategies:

1.12.1 Main Project Activities and Technologies Employed

Alternate Wetting and Drying (AWD):

Alternate Wetting and Drying (AWD) is a climate-smart water management technique for rice farming that shifts away from traditional continuous flooding by introducing intentional cycles of irrigation and drainage. The approach involves embedding a perforated tube, typically made of PVC into the paddy field to track groundwater levels beneath the surface. During the tillering phase, farmers begin regulating water flow by letting the field drain until the water level drops to 10 cm below the soil surface, while ensuring it does not fall beyond that threshold to avoid stressing the crop. The field is then re-flooded to a shallow depth of approximately 5 cm. This wetting-drying cycle is paused during the flowering stage, as adequate water supply at this point is essential for pollination and embryo formation, helping to safeguard yields. The drying intervals play a vital role by introducing oxygen into the soil, fostering aerobic conditions that inhibit methane-generating microbes and promote deeper root development, ultimately strengthening plant vigor. From an environmental standpoint, AWD substantially reduces methane output from rice paddies, one of the leading agricultural sources of greenhouse gas emissions. That said, effective implementation depends on farmers having access to dependable irrigation infrastructure and adequate drainage systems, as well as proper training to prevent over-drying, which could negatively impact crop performance. In summary, AWD is an affordable, easy-to-implement, and scalable irrigation strategy that conserves water, maintains crop productivity, and supports efforts to combat climate change.

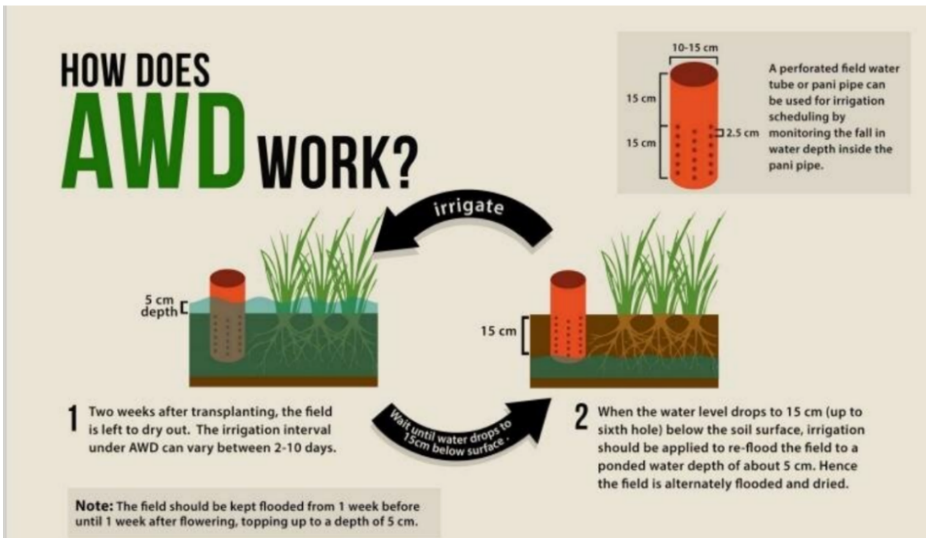

Figure 1: Working principle of AWD technique[1]

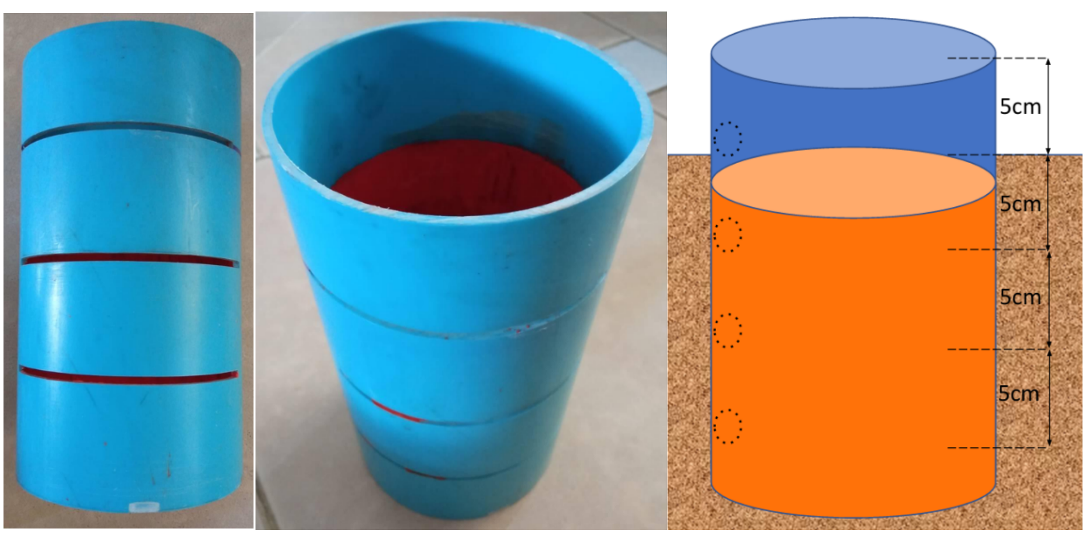

Figure 2: Perforated PVC pipe for monitoring the subsurface water level

Figure 3: Installing a perforated PVC pipe into the field to monitor the subsurface water level

1.12.2 Mechanism of Methane (CH_4) Reduction

By transitioning from traditional continuous flooding to AWD, the project shortens the periods of oxygen-deprived soil conditions that drive methane generation. The measurable decline in CH_4 emissions results from fewer waterlogged days and enhanced oxygen penetration into the soil. Complementary practices including the elimination of crop residue burning, optimized fertilizer application, and lower fossil fuel consumption contribute to additional reductions in other greenhouse gas emissions.

Emission reductions are tracked and quantified following VM0051 methodology guidelines, drawing on default regional emission factors specific to Southeast Asia. These calculations are supported by periodic records maintained by farmers, which are validated through on-site field inspections and incorporated into the project's Internal Control System (ICS).

1.12.3 Sustainable Agricultural Practices

According to the applicability conditions of VM0051, participating farmers are encouraged to adopt sustainable agricultural practices. The project seeks to eliminate the open burning of rice straw and crop residues a major source of GHG emissions in Thailand by promoting alternative, sustainable residue management methods. Through training, farmers learn to incorporate residues into the soil, compost them, use them as mulch, or repurpose them as livestock feed. These practices improve soil health, reduce dependence on chemical fertilizers, and generate additional value from crop residues. Farmers are also encouraged to reduce their overall use of agricultural inputs, including fertilizers and fuel. Training in site-specific nutrient management enables them to apply fertilizers more efficiently, based on crop requirements, soil characteristics, and seasonal conditions. The project further promotes the use of enhanced-efficiency fertilizers and split applications to minimize nitrogen losses and improve nutrient uptake. To ensure effective implementation, farmers receive practical guidance and ongoing support through FarmPro extension services, farmer field schools, and demonstration plots. Participants are free to adopt the practices most suitable for their farming conditions; however, their cultivation outcomes must remain consistent with the applicability requirements outlined in VM0051.

1.12.4 Organizational Roles and Community Involvement

- Charoen Pokphand Produce Co., Ltd. serves as the Project Proponent, responsible for the overall project management, strategic oversight, monitoring, and reporting under the VCS Program. The company will engage the FarmPro team in Thailand as the implementing partner, responsible for field-level implementation, farmer coordination, technical extension, training delivery, and routine follow-up to support adoption of the project activities.
- Rajamangala University of Technology Lanna (RMUTL) serves as an academic and technical support partner, contributing research-based knowledge, methodological interpretation, and technical advisory support for project design and implementation. RMUTL may support the project through activities such as baseline and regional data analysis, development and review of technical materials, stratification support, quality assurance/quality control (QA/QC) of field data, MRV system strengthening, and capacity-building for field staff and farmer groups. This role is consistent with RMUTL’s institutional focus on technology, innovation, community engagement, and knowledge transfer for sustainable communities.
- Farmer groups participate in the project under Carbon Rights Agreements, whereby they retain ownership and control over their land while transferring the rights to the resulting emission reductions to the Project Proponent, in accordance with the agreed contractual framework.

- Local government agencies, including the Department of Agricultural Extension (DOAE), Department of Rice, and Royal Irrigation Department (RID), support the project through coordination, technical guidance, access to relevant agricultural and irrigation data, and facilitation of alignment with applicable government programs and regulatory requirements.

Community engagement is central to the success and long-term sustainability of the project. Participating farmers benefit from continuous capacity-building activities, including field demonstrations, on-farm coaching, seasonal follow-up visits, and practical training tailored to local farming conditions. These activities are designed not only to improve technical understanding, but also to strengthen confidence and consistency in the implementation of climate-smart rice cultivation practices.

In addition, the project establishes Smart Farmer Networks, led by trained farmer leaders who act as local champions within their communities. These leaders facilitate peer-to-peer learning, provide practical support to fellow farmers, help reinforce proper implementation of project practices, and serve as a communication bridge between farmers and the project team. Through this participatory structure, the project promotes local ownership, strengthens collective learning, and enhances the likelihood of sustained practice adoption beyond the immediate project cycle.

1.12.5 Jurisdictional Context

The project is implemented across Phayao, Chiang Rai, Chiang Mai, Kamphaeng Phet, Phitsanulok, Phichit, and Nakhon Sawan provinces in Thailand. These areas are not currently part of any jurisdictional REDD+ or other carbon credit programs, ensuring n overlap in GHG accounting frameworks. The project aligns with Thailand's Nationally Determined Contribution (NDC) and contributes to the country's national climate strategy by reducing agricultural emissions and promoting more efficient water use.

1.13 Project Location

The project located in Thailand, rice producing regions, divided into seven provinces, which are Phayao, Chiang Rai, Chiang Mai, Kamphaeng Phet, Phitsanulok, Phichit, and Nakhon Sawan provinces (Figure 4).

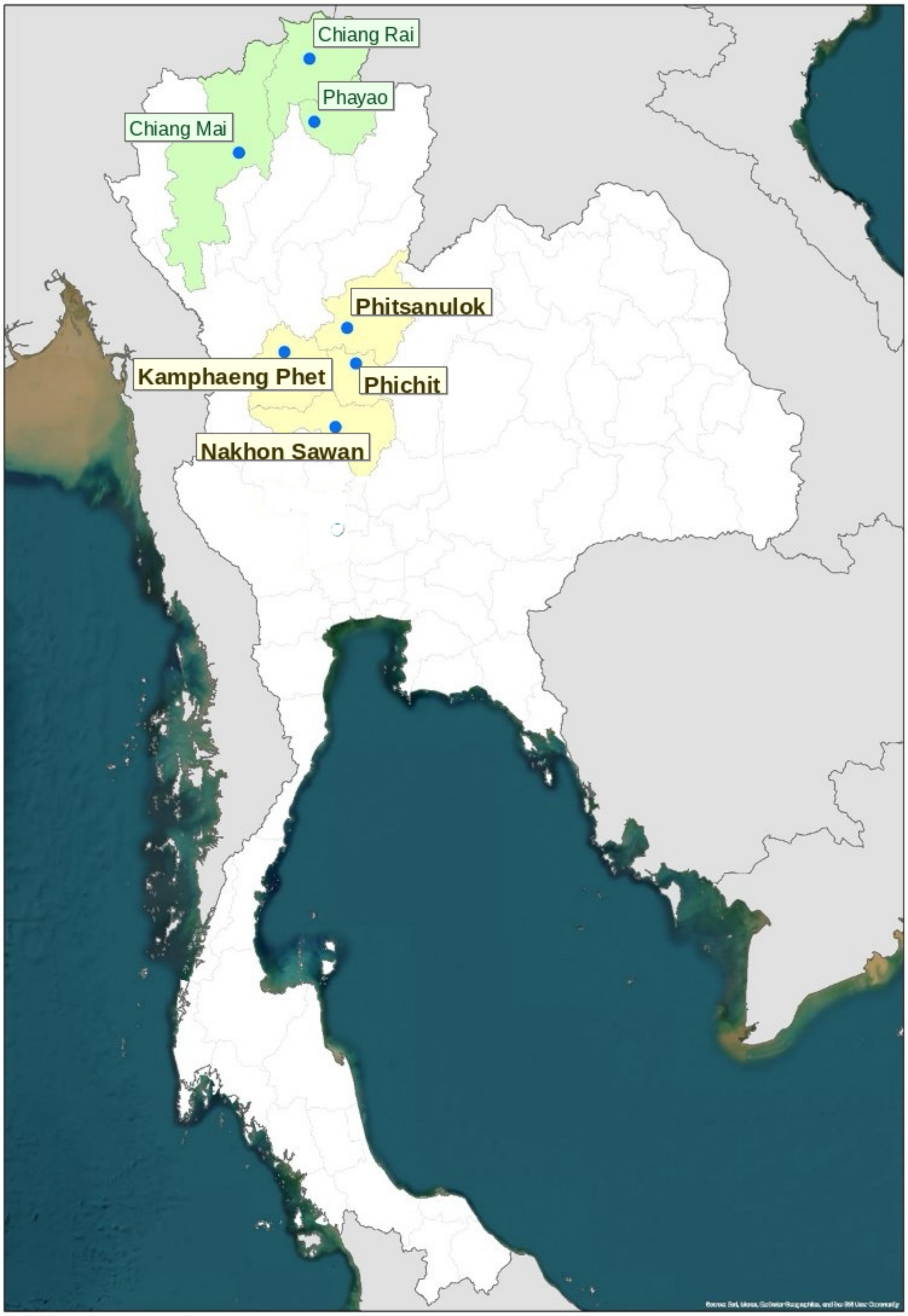

Figure 4: The Overview of the project area which is divided into 2 Zones (which are Zone 1 include Phayao, Chiang Rai, Chiang Mai, Kamphaeng Phet, Phitsanulok, Phichit, and Nakhon Sawan provinces)

Table 1 Project Boundary Coordinates (GPS Coordinates) for Each Zones

Zone	Provinces	Latitude	Longitude
1	Phayao	19.1486	99.9633
	Chiang Rai	19.8648	100.2873
	Chiang Mai	18.9414	98.8867
2	Khamphaeng Phet	16.1832	99.5507
		15.9864	99.6787
		16.3285	99.7857
	Phitsanulok	16.7184	100.0422
		16.8591	100.1683
	Phichit	16.517	100.3895
	Nakhon Sawan	15.8819	100.3211
		15.7376	100.1143

1.14 Conditions Prior to Project Initiation

Prior to project initiation, rice cultivation in the project area followed prevailing farmer practices in established rice-growing provinces of Thailand, namely Phayao, Chiang Rai, Chiang Mai, Kamphaeng Phet, Phitsanulok, Phichit, and Nakhon Sawan. These pre-project conditions are the same as the baseline scenario described in Section 3.4 (Baseline Scenario). Accordingly, the detailed description of pre-project crop establishment, water management, fertilizer application, residue management, and other agronomic practices is not repeated here, and the reader is referred to Section 3.4 and the associated baseline assessment documentation, consistent with the VCS Standard.

The project has not been implemented to generate GHG emissions for the purpose of their subsequent reduction, removal, or destruction. Prior to the project start date, the project proponent did not introduce, intensify, or encourage any emissions-intensive practice in order to create an artificially inflated baseline. In particular, the project proponent did not increase the duration or depth of flooding, promote unnecessary burning of rice residues, increase fertilizer inputs beyond ordinary farmer practice, or otherwise alter cultivation conditions for the purpose of later claiming emission reductions. Instead, pre-project conditions reflected ordinary rice cultivation practices in existing agricultural landscapes, and the project applies improved rice management within those landscapes rather than creating a temporary or artificial high-emissions condition prior to crediting. This statement should be supported at validation by baseline survey records, farmer enrollment documents, historical field-management evidence, and dated project-start documentation, in line with the VCS Standard.

Ecosystem type

The project area is located within predominantly human-managed agricultural ecosystems consisting mainly of irrigated and rainfed lowland rice agroecosystems in northern and central

Thailand. Thailand's rice production systems are commonly described in terms of irrigated and rainfed lowland environments, which are the dominant rice ecosystems relevant to the provinces included in this project (Varinruk, 2017[1], Wang et al., 2022[2]). The project area is therefore characterized as a cultivated rice-based agroecosystem with associated irrigation and drainage infrastructure where available, rather than a natural or undisturbed ecosystem.

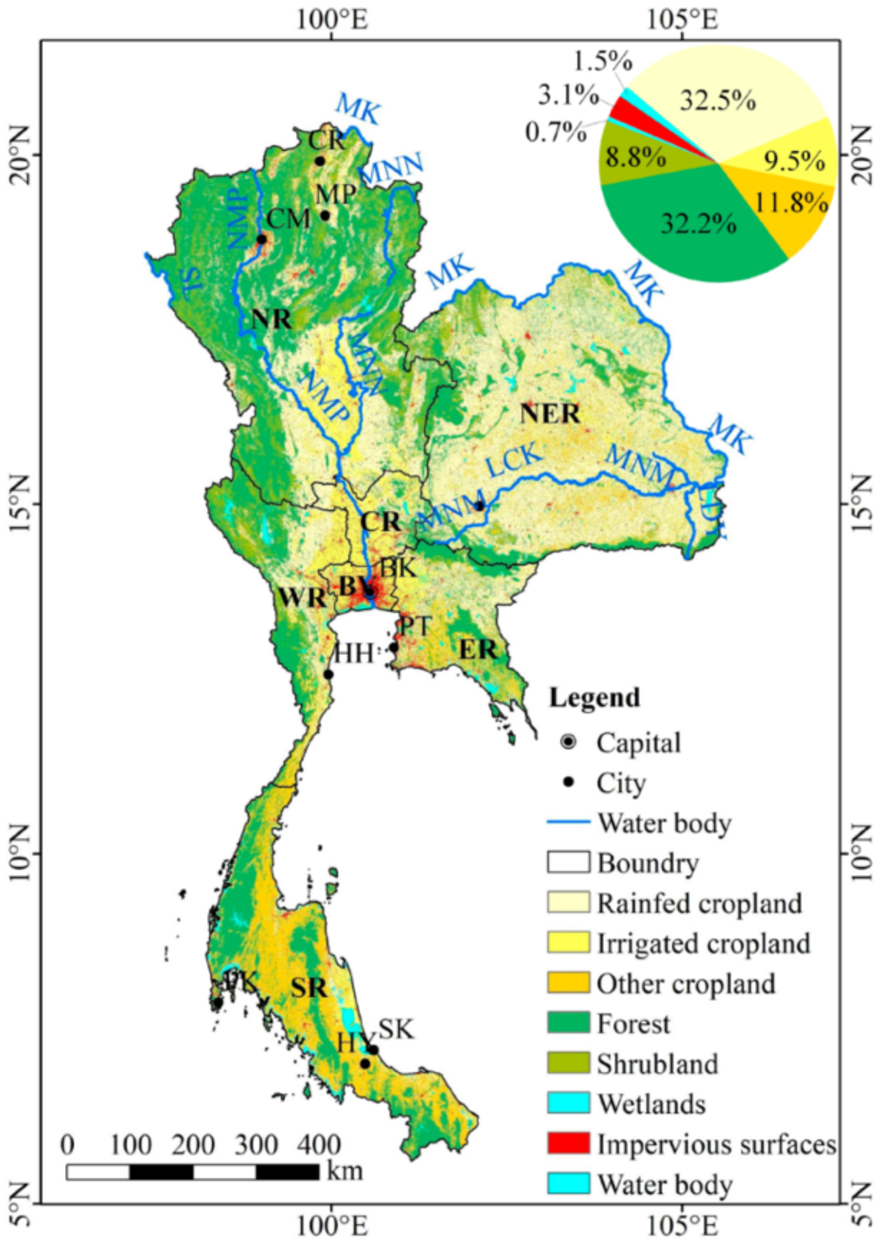

Figure 5: Land use change (LUC) map of Thailand in 2020[1]

[1] Varinruk, B. (2017). Thailand rice production and rice research and development on climate change. APEC . https://mddb.apec.org/Documents/2017/PPFS/WKSP1/17_ppfs_wksp1_008.pdf

[2] Wang, Y.; Hu, Y.; Niu, X.; Yan, H.; Zhen, L. Land Use/Cover Change and Its Driving Mechanism in Thailand from 2000 to 2020. Land **2022**, 11, 2253. https://doi.org/10.3390/land11122253

Current and historical land use

The current land use of the project area is predominantly agricultural, with rice cultivation as the principal land use in the enrolled project fields. Official provincial statistics continue to report major rice cultivation and second-rice cultivation across the project provinces, confirming that these provinces form part of Thailand's established rice-producing landscape (National Statistical Office, 2025)[1]. Historically, the project is intended to be implemented only on lands demonstrated through project screening, farmer field-history records, and other validation evidence to have already been under agricultural use prior to project initiation, rather than on land newly converted for the purpose of the project.

Present and prior environmental conditions of the project area

The project area spans provinces in Northern and Central Thailand, characterized by a tropical monsoonal climate. According to the Thai Meteorological Department (2021)[2], the region experiences a distinct rainy season driven by the southwest monsoon (mid-May to mid-October) and a cooler dry season influenced by the northeast monsoon. Meteorological data indicates that rainfall variability in Upper Thailand is significantly dictated by monsoon troughs and seasonal circulation patterns. These climatic factors are the primary drivers of rice cultivation calendars, seasonal water availability, and field-level water management strategies across the project boundary.

Hydrologically, the project area comprises a mix of irrigated and rainfed lowland paddy fields. Water dynamics are influenced by a combination of natural precipitation, irrigation infrastructure, and farm-level drainage systems. As noted by FAO (2022)[3], water control levels vary by province, reflecting Thailand's dual system of irrigated and rainfed rice production. In irrigated zones, water management is more active, aligned with official guidance from the Rice Department (2020)[4], which emphasizes that effective paddy management is contingent upon the capacity to regulate water levels through established irrigation networks.

The topography consists predominantly of low-lying alluvial plains and gently sloping agricultural lands ideal for rice cultivation. While the Central region is characterized by flat plains, certain Northern provinces feature more varied terrain, with cultivation primarily occurring in valley systems. Soil conditions are representative of long-established agricultural systems. The Land Development Department (LDD, n.d.)[5] identifies these as typically heavy-textured soils with high water-holding capacity, common in flood-prone or lowland areas with shallow water tables, making them highly suitable for anaerobic rice cultivation. The landscape is a human-modified rural production environment, dominated by rice monoculture and associated vegetation along field bunds and canals.

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[1] National Statistical Office. (2025). *Statistical yearbook Thailand 2025*. Available: https://www.nso.go.th/public/e-book/Statistical-Yearbook/SYB-2025/36/

[2] Thai Meteorological Department. (2021). *The Climate of Thailand*. [Online]. Available: tmd.go.th

[3] FAO. (2022). *AQUASTAT Country Profile – Thailand*. Food and Agriculture Organization of the United Nations.

[4] Rice Department. (2020). *Rice Knowledge Bank: Good Agricultural Practices for Rice*. Ministry of Agriculture and Cooperatives.

[5] Land Development Department (LDD). (n.d.). *Soil Resources of Thailand*. Ministry of Agriculture and Cooperatives.

Environmental conditions prior to project initiation are consistent with historical rice-based land use and seasonal monsoonal regimes. Enrolled fields followed Business-as-Usual (BAU) practices, shaped by traditional rainfall patterns, irrigation access, and local farmer decision-making. There is no evidence of artificial conditions introduced prior to the project to inflate baseline emissions. Consequently, the project represents a transition from conventional rice cultivation to monitored, high-integrity management under the VCS Program, adhering to the requirements of Methodology VM0051 regarding the demonstration of historical management consistency

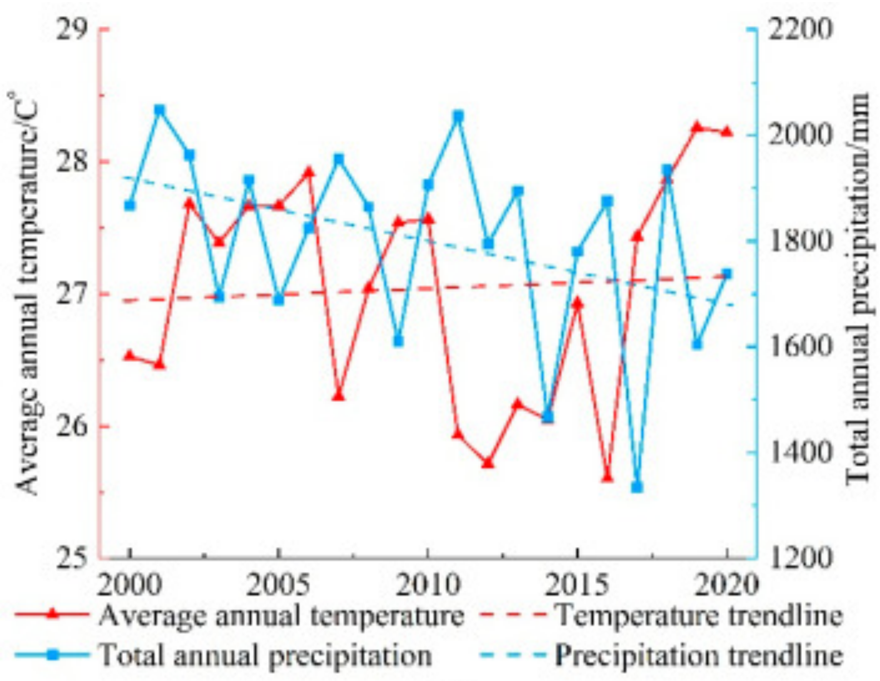

Figure 6: Climate factors status in Thailand from 2000 to 2020[1]

[1] Wang, Y.; Hu, Y.; Niu, X.; Yan, H.; Zhen, L. Land Use/Cover Change and Its Driving Mechanism in Thailand from 2000 to 2020. Land **2022**, 11, 2253. https://doi.org/10.3390/land11122253

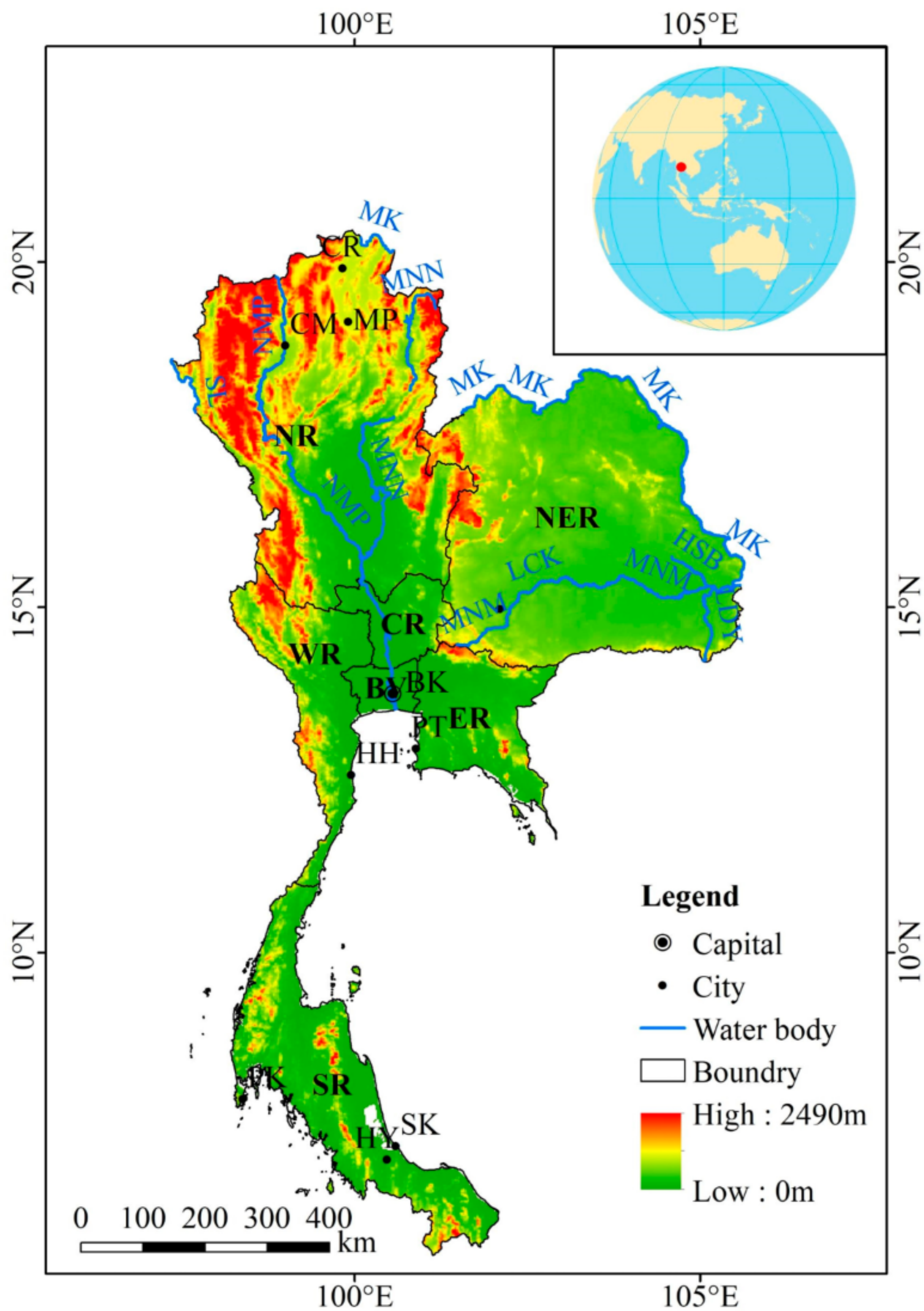

Figure 7: Location and topography map of Thailand. Region: NR: northern region; NER: northeastern region; CR: central region; WR: western region; ER: eastern region; BV: Bangkok and its vicinity; SR: southern region. Capital and city: BK: Bangkok; CM: Chiang Mai; CR: Chiang Rai; HH: Hua Hin; HY: Hat Yai; MP: Muang Phayao; NP: Nakhon Potchasima; PK: Phuket; PT: Phattaya; SK: Songkhala. River: HSB: Huai Se Bok; LCK: Lam Chiang Krai; LDY: Lam Dom Yai; MK: Mekong; MNM: Mae Nam Mun; MNN: Mae Nam Nan; NMP: Nam Mae Ping; SL: Salween[1].

[1] Wang, Y.; Hu, Y.; Niu, X.; Yan, H.; Zhen, L. Land Use/Cover Change and Its Driving Mechanism in Thailand from 2000 to 2020. Land 2022, 11, 2253. https://doi.org/10.3390/land11122253

1.15 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project is designed and implemented in strict adherence to the statutory and regulatory frameworks of the Kingdom of Thailand. Beyond environmental and land-use mandates, the project integrates compliance with regulations governing agricultural chemicals, labor rights, and data privacy to ensure comprehensive project integrity.

Environmental and Water Management

- Enhancement and Conservation of National Environmental Quality Act (B.E. 2535 and amended B.E. 2561): Provides the overarching legal basis for environmental protection. The project aligns with national objectives regarding pollution control and sustainable resource management, ensuring that AWD practices do not adversely affect local ecosystems.
- Water Resources Act (B.E. 2561): Governs the equitable and efficient distribution of water. The project's water management protocols, including Alternate Wetting and Drying (AWD), operate within the rights granted to agricultural users and support the national strategy for climate-resilient water usage managed by the Office of the National Water Resources (ONWR).

Land Use and Tenure Security

- Land Code Act (B.E. 2497) and Amendments: Ensures that all project activities occur on lands legally designated for agriculture. This prevents project leakage into protected forests or restricted areas.
- Agricultural Land Reform Act (B.E. 2518): Validates the rights of farmers in reformed land areas (Sor.Por.Kor). The project verifies that participating farmers have legitimate land-use rights, ensuring that carbon credit ownership is legally grounded.

Agricultural Inputs and Chemical Management

- Hazardous Substances Act (B.E. 2535 and Amendments): Regulates the use of pesticides and herbicides. The project strictly prohibits the use of substances banned by the Department of Agriculture (DOA), such as Paraquat and Chlorpyrifos. Project monitoring includes training farmers on Integrated Pest Management (IPM) to ensure compliance with national safety and environmental standards.
- Fertilizer Act (B.E. 2518 and Amended B.E. 2562): Controls the quality and application of fertilizers. The project promotes nutrient management that adheres to these standards to prevent nitrogen leaching and soil degradation.

Social, Labor, and Data Compliance

- Labor Protection Act (B.E. 2541 and Amendments): The project maintains a zero-tolerance policy towards forced and child labor in all field operations. All implementation activities carried out by the Proponent and Partners comply with national occupational health and safety standards.

- Personal Data Protection Act (PDPA) (B.E. 2562): As the project involves extensive data collection from thousands of farmers, it strictly follows PDPA requirements. Informed consent is obtained for all personal data processed for VCS monitoring, reporting, and verification (MRV) purposes.

1.16 Double Counting and Participation under Other GHG Programs

1.16.1 No Double Issuance

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

☐ Yes ☒ No

If yes, provide required evidence of no double issuance as outlined by the VCS Standard.

1.16.2 Registration in Other GHG Programs

Has the project registered under any other GHG programs?

☐ Yes ☒ No

If yes, provide the registration number and the date of project inactivity under the other GHG program.

Is the project active under the other program?

☐ Yes ☒ No

Project proponents, or their authorized representative, must attest that the project is no longer active in the other GHG program in the Registration Representation.

1.16.3 Projects Rejected by Other GHG Programs

Has the project been rejected by any other GHG programs?

☐ Yes ☒ No

If yes, provide the program name(s), reason(s) and date for the rejection, justification of eligibility under the VCS Program, and any other relevant information.

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

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

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit? See the *VCS Program Definitions* for definitions of emissions trading program and binding emission limit.

☐ Yes ☒ No

If yes, provide all required evidence of no double claiming as outlined by the VCS Standard.

1.17.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system? See the *VCS Program Definitions* for definition of GHG-related environmental credit system.

☐ Yes ☒ No

If yes, provide all required evidence of no double claiming as outlined by the VCS Standard*.*

1.17.3 Supply Chain (Scope 3) Emissions

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

☐ Yes ☒ No

1.18 Sustainable Development Contributions

The project contributes to multiple Sustainable Development Goals (SDGs) by adopting sustainable agricultural practices and promoting inclusive community engagement. The following summarizes the project's contributions and associated monitoring approaches:

- **SDG 2 (Zero Hunger)**

Target 2.4. By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality

Impact Indicator Number of farmers reporting increased yields as a result of the project's activities.

Detail: The project promotes sustainable agriculture through the adoption of Alternate Wetting and Drying (AWD), which is expected to enhance crop yields compared to traditional continuous flooding methods. Yield improvements will be monitored using farmer questionnaires and reports submitted through local authorities, ensuring consistent, accurate, and verifiable data collection.

Monitoring: To ensure data integrity and verifiability, the project employs a multi-tiered monitoring framework. Primary data is captured via a dedicated mobile application directly from farmers at the conclusion of each harvest, ensuring timely and accurate reporting. For large-scale operations, a stratified random sampling strategy is implemented to conduct rigorous on-ground audits, cross-referencing self-reported data with physical records such as sales receipts. Furthermore, the project maintains high QA/QC standards by validating field data against official benchmarks from the Department of Agricultural Extension (DOAE) and conducting unannounced spot-checks during harvests. All records are consolidated into a centralized digital database, providing a transparent and comprehensive audit trail for the Validation and Verification Body (VVB).

- SDG 3 (Good Health and Well Being)

Target 3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination

Impact Indicators: - Area under reduced/avoided open burning of biomass, crop residue

Detail: Baseline data indicate that some farmers still engage in open burning of crop residues. The project aims to achieve a complete (100%) elimination of open burning among participating farmers. Through awareness campaigns and training sessions, farmers are educated on the health and environmental hazards of burning and are encouraged to adopt safe and sustainable residue management practices, contributing to improved local air quality.

Monitoring: To ensure data integrity and verifiability, the project employs a multi-tiered monitoring framework. Primary data is captured via a dedicated mobile application directly from farmers at the conclusion of each harvest, ensuring timely and accurate reporting. For large-scale operations, a stratified random sampling strategy is implemented to conduct rigorous on-ground audits, cross-referencing self-reported data with physical records such as sales receipts. Furthermore, the project maintains high QA/QC standards by validating field data against official benchmarks from the Department of Agricultural Extension (DOAE) and conducting unannounced spot-checks during harvests. All records are consolidated into a centralized digital database, providing a transparent and comprehensive audit trail for the Validation and Verification Body (VVB).

- **SDG 4 (Quality Education)**

Target 4.4 By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship

Impact Indicator: Number of employees provided skill development training

Detail: The project enhances the essential knowledge and technical capacity for participating farmers, project's employees, and FarmPro officers through structured training sessions on sustainable agriculture and carbon-smart farming at Kamphaeng Phet demonstration farm. It will track the number of participants, disaggregated by gender, to ensure inclusiveness and equal access to educational opportunities for all farmers and the project's workers.

Monitoring: Educational outcomes are verified through a systematic monitoring framework that maintains comprehensive dossiers for all sessions, including curricula, training materials, and trainer qualifications. Participant engagement is meticulously tracked via digital check-ins and signed registries—disaggregated by gender to ensure inclusive access and equity. To validate the effectiveness of knowledge transfer, the project utilizes pre- and post-training assessments, providing objective evidence of competency gains. All records are digitized and consolidated within a centralized database, ensuring a transparent and verifiable audit trail for the Validation and Verification Body (VVB) to evaluate during periodic verification events.

Target 4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development

Impact Indicator: Number of individuals who received skill training at Kamphaeng Phet demonstration farms

Detail: The project supports Target 4.7 by utilizing the Kamphaeng Phet demonstration farm as a living learning center, where farmers, youth, and women acquire practical skills and knowledge in sustainable agriculture, carbon management, and climate resilience. The farm fosters education for sustainable development, promoting sustainable lifestyles, gender equality, respect for human rights and cultural diversity, and a culture of peace and global citizenship through inclusive and participatory learning approaches.

Monitoring: The project's educational impact under Target 4.7 is monitored through a structured framework centered on the Kamphaeng Phet. These facilities serve as experiential learning hubs where technical knowledge transfer is verified via comprehensive event dossiers, including geotagged attendance registries disaggregated by gender and age. To ensure the quality of 'living laboratory' activities, the project maintains a centralized digital database containing training agendas, photographic evidence of hands-on sessions, and participant competency evaluations. This systematic approach ensures a transparent and verifiable audit trail, enabling the Validation and Verification Body (VVB) to confirm that all learners gain the practical skills essential for promoting sustainable development and climate-resilient lifestyles

- **SDG 6 (Clean Water and Sanitation)**

Target 6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

Impact Indicator: Number of farmers applying water management practices

Detail: As outlined in Section 1.12, the adoption of AWD is expected to reduce water consumption and improve overall irrigation efficiency. This approach directly supports Thailand's water conservation objectives by optimizing the use of limited freshwater resources in rice cultivation.

Monitoring: The project's contribution to Target 6.4 is verified through a robust monitoring framework focused on the widespread adoption of AWD. Water-use efficiency is documented using Field Water Pipes (Pani Pipes) and farmer logs, which capture on-field-level water management cycles. To ensure the integrity of the reported water savings, the project cross-references field data with official irrigation schedules and conducts periodic, geotagged spot-checks by field officers. All records are digitized in a centralized database, maintaining a comprehensive audit trail that enables the Validation and Verification Body (VVB) to objectively evaluate the reduction in freshwater withdrawals and the enhancement of irrigation efficiency within the project boundary.

- **SDG 8 (Decent Work and Economic Growth)**

Target 8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value

Impact Indicator: Number of working hours created through direct in-field labor

Detail: The project generates local employment opportunities through field implementation, training, and monitoring activities. It is expected to account for 20,000 field labor hours, categorized by type of work (paid, unpaid, permanent, or occasional). These activities contribute to rural economic development and support improved livelihoods for participating communities.

Monitoring: The project's contribution to Target 8.5 is monitored through a robust labor tracking framework that documents direct field employment generated by project activities. To ensure the integrity of the reported 20,000 field labor hours, the project utilizes digital timesheets and verified payroll records, disaggregated by gender and employment type (permanent, occasional, and paid). This systematic data collection provides a transparent audit trail for the Validation and Verification Body (VVB), enabling the assessment of the project's impact on local livelihoods and its adherence to fair labor practices. Furthermore, periodic internal audits of field logs ensure that employment data is accurately captured and aligned with the physical implementation of the VCS program.

- **SDG 12 (Responsible Consumption and Production)**

Target 12.2 By 2030, achieve the sustainable management and efficient use of natural resources

Impact Indicator: Average percentage reduction in water use per hectare

Detail: The project contributes to Target 12.2 by promoting efficient water use through AWD practices among participating farmers. These practices reduce water consumption per hectare while maintaining crop yields, lower energy requirements and methane emissions, and improve overall resource efficiency, thereby supporting responsible consumption and production in rice farming.

Monitoring: Resource efficiency under Target 12.2 is verified through a structured monitoring framework that quantifies the reduction in water and energy consumption. The project utilizes Pani Pipe observations and digital irrigation logs to capture real-time field-level water management data, which is then cross-referenced against regional baseline consumption standards. To ensure the integrity of reported resource savings, field officers conduct randomized geotagged audits to verify the consistent application of AWD practices. All data is managed through a centralized digital platform, providing a transparent audit trail that enables the Validation and Verification Body (VVB) to evaluate the project's success in promoting sustainable resource management and reducing the overall environmental footprint of rice production.

Target 12.8 By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature

Impact Indicator: Number of people who received information and awareness training on sustainable development

Detail: At baseline, no formal capacity-building programs on sustainable farming or waste management existed. Through this project, at least 300 participants—including farmers and students—will receive training on sustainable consumption, climate change, and environmental stewardship at the Kamphaeng Phet training center and demonstration farms, which serve as outdoor classrooms for hands-on, practical learning.

Monitoring: The achievement of Target 12.8 is monitored through a systematic documentation framework focused on the project's Training Center and demonstration farms. The project tracks the reach of its awareness programs by maintaining comprehensive training dossiers and geotagged participant registries, ensuring that at least 300 individuals gain relevant knowledge for sustainable lifestyles. To verify the impact of these 'outdoor classrooms,' the project utilizes pre- and post-activity assessments and photographic evidence of hands-on learning sessions. All records are consolidated into a centralized digital database, providing a transparent and verifiable audit trail for the Validation and Verification Body (VVB) to confirm the successful transfer of information regarding sustainable development and environmental stewardship

- **SDG 13 (Climate Action)**

Target 13.2 Integrate climate change measures into national policies, strategies and planning
Impact Indicator: Amount of GHGs emissions avoided or sequestered
Detail: By adopting Alternate Wetting and Drying (AWD), farmers are expected to achieve significant reductions in methane (CH_4) emissions from rice fields. Ongoing training and field support ensure consistent implementation of these practices, directly contributing to Thailand's Nationally Determined Contribution (NDC) targets under the Paris Agreement.
Monitoring : The project's impact on Target 13.2 is verified through a stringent MRV framework aligned with VCS Methodology VM0051. GHG emission reductions, specifically the avoidance of methane (CH_4), are quantified using field-level data from Pani Pipes and farmer logs, which are then cross-referenced with satellite-based remote sensing to ensure accuracy. To maintain high environmental integrity, the project provides a comprehensive digital audit trail—comprising geotagged field evidence and monitored water-level cycles—enabling the Validation and Verification Body (VVB) to objectively confirm the total tCO_2e avoided. This systematic approach ensures that the project delivers high-quality carbon credits while directly supporting Thailand's NDC targets and national climate action strategies.

1.19 Additional Information Relevant to the Project

1.19.1 Leakage Management

The project will not introduce any new use of organic amendments, and biomass residues previously used for biochar production will remain excluded from project activities. Throughout implementation, rice yields will be continuously recorded and monitored for each cultivation season to ensure that no yield reduction occurs as a result of project interventions. Therefore, no leakage is expected from project activities. To maintain transparency and ensure the integrity of results, monitoring will specifically address potential leakage risks, including: (1) the introduction of organic amendments sourced from outside the project area that were not historically applied, (2) any reduction in rice yields, and (3) diversion of biomass residues previously used for bioenergy applications in the baseline scenario.

1.19.2 Commercially Sensitive Information

The public version of this project description does not exclude any commercially sensitive information. It includes all relevant details regarding the establishment of the baseline scenario, evidence of additionality, and the estimation and tracking of GHG emission reductions and removals, including both capital and operational expenditures.

1.19.3 Further Information

As of right now, there is no new information that could influence project eligibility, GHG emission reductions, or the project's effect estimation. Any new information that becomes available will be incorporated into the draft PDD for verification.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Stakeholder Identification	Stakeholders were identified through a structured and inclusive process comprising baseline surveys, community meetings, field-level engagement, and coordination with relevant local, provincial, and national institutions. This process was designed to identify all parties who may be directly affected by the project, may influence project implementation, or may hold relevant technical, regulatory, environmental, or social interests. Invitations to consultation meetings were communicated through formal letters, public announcements, and coordination with village leaders and local networks. Identified stakeholders include local rice farmers, village leaders, community groups and cooperatives, the Department of Agricultural Extension (DOAE), Department of Rice, Royal Irrigation Department (RID), Ministry of Natural Resources and Environment (MNRE), Geo-Informatics and Space Technology Development Agency (GISTDA), Rajamangala University of Technology Lanna (RMUTL), Cooperative Promotion Department (CPD), National Farmers Council of Thailand, Phayao Development Foundation, Foundation for Sustainable Development (Northern Thailand), and Chiang Mai Clean Air Network. Local rice farmers are the primary project participants and are directly affected by changes in cultivation practices, water management, labor, production costs, yields, and potential project benefits. Village leaders, community groups, and cooperatives are relevant due to their role in local coordination, communication, farmer mobilization, and possible benefit-sharing arrangements. DOAE, the Department of Rice, and RID are key technical and operational stakeholders because they are relevant to extension support, improved rice management practices, and irrigation- and drainage-related implementation conditions. MNRE, GISTDA, and RMUTL are relevant in relation to environmental management,

	spatial information, research, baseline analysis, and technical support. CPD, the National Farmers Council of Thailand, and the identified civil society organizations are relevant because they support farmer representation, community development, sustainable agriculture, and broader environmental interests. Stakeholder identification was therefore based on the extent to which each party may influence project implementation, support delivery, represent affected groups, or experience direct or indirect project impacts.
Legal or customary tenure/access rights	During stakeholder consultation, the project proponent identified legal and customary tenure/access rights as an important consideration for any future project enrollment. Potential project parcels are limited to existing agricultural land for which legal tenure or lawful access/use rights can be demonstrated, including NS4, NS3K, NS3, and ALRO.4-01 in agricultural land reform areas. Relevant rights may include individual ownership, lawful use rights, tenancy, inheritance, family succession, and locally recognized access arrangements, including rights relating to associated resources such as irrigation water, canals, drainage channels, bunds, and farm access routes. The consultation process also recognized that collective, shared, or potentially conflicting rights may exist, particularly where the cultivator is not the formal document holder or where multiple parties claim access or use rights. Stakeholders were informed that land with unresolved disputes or unclear rights would not be considered eligible. The consultation process did not involve land acquisition, involuntary relocation, compulsory transfer of rights, or restriction of lawful or customary access. In Addition, the target area does not include indigenous territories, community forests, or lands subject to customary or collective tenure claims. Farmers voluntarily enroll their lands, and no displacement, land conversion, or resettlement has occurred within or adjacent to the project boundary.
Stakeholder diversity and changes over time	The stakeholder groups represent a diverse cross-section of Thailand’s agricultural communities, including male and female smallholders, farmer leaders, local authorities, and private sector partners. Socioeconomic diversity is evident in variations in farm size, income levels, and production capacity across the project clusters. The project fosters inclusive participation, with a

	particular focus on gender equity and youth engagement. Over time, the composition of stakeholders may expand as awareness grows and more farmers participate through ongoing outreach and training activities.
Expected changes in well-being	Compared to the baseline scenario, stakeholders are expected to experience positive impacts on well-being through increased agricultural productivity, reduced input costs, and greater resilience to climate variability. Farmers benefit from training in sustainable practices, participation in carbon-credit revenue sharing, and additional on agricultural inputs provided through project partners. Communities are expected to gain from improved air quality, reduced crop residue burning, and strengthened local capacity for sustainable resource management. No adverse social or economic impacts are anticipated.
Location of stakeholders	Stakeholders are located within the main project clusters in Phayao, Chiang Rai, Chiang Mai, Kamphaeng Phet, Phitsanulok, Phichit, and Nakhon Sawan provinces of Thailand. These provinces represent the primary rice-producing areas targeted by the project. Local government agencies, academic institutions, and project partners are based in regional administrative centers and provide technical support, training, and oversight. No stakeholders outside the defined project area are expected to experience negative impacts.
Location of resources	The project makes use of existing agricultural lands and irrigation infrastructure, including canals, drainage systems, and on-farm water management facilities, all lawfully managed by participating farmers in coordination with local authorities. No protected areas, community forests, or ecologically sensitive zones are located within or adjacent to the project boundary. All resources are accessed and managed in accordance with national regulations and established local governance frameworks.

2.1.2 Stakeholder Consultation and Ongoing Communication

Use the table below to describe the process for and the outcomes from the stakeholder consultation conducted prior to project initiation.

Date of stakeholder consultation	25/02/2025 – 20/03/2025 Multiple meetings, 11 locations
Stakeholder engagement process	Stakeholder consultations were conducted in a culturally appropriate and inclusive manner across the project's eight provinces: Phayao, Chiang Rai, Chiang Mai, Kamphaeng Phet, Phitsanulok, Phichit, and Nakhon Sawan. Invitations were issued more than 30 days in advance through village leaders, formal letters, and public announcements, ensuring that all relevant groups were informed and able to participate. Meetings were conducted in Thai to ensure accessibility, with particular attention to gender inclusion, encouraging participation from both male and female farmers. The consultation process complied with Verra's AFOLU project guidelines. Outcomes and attendance were documented through signed participant lists, photographs, and meeting minutes collected by the FarmPro and Carbon Credit Program coordination teams.
Consultation outcome	Stakeholders expressed broad support and provided consent for the project's objectives and design. Discussions addressed the anticipated benefits, including improved water management, reduced methane emissions, farmer training, and increased crop productivity. Potential risks, such as initial adjustment challenges during technology adoption, were considered minor and manageable. Stakeholders were informed about national environmental and labor regulations, the VCS validation and verification process, and the principles of Free, Prior, and Informed Consent (FPIC). All participants acknowledged that project participation is voluntary and that land ownership remains with the farmers.
Ongoing communication	A continuous engagement and feedback system has been established to maintain communication with stakeholders throughout project implementation. FarmPro extension officers act as focal points at the township level, supported by a grievance mechanism accessible via telephone, email, or in-person submission at local offices. Project updates and training information are disseminated through community meetings, village notice boards, and digital QR codes. Annual stakeholder review meetings will be held to present progress, gather feedback, and address any emerging issues.

Stakeholder input	All feedback from consultations was recorded and evaluated by the project proponent. Stakeholders provided positive comments, emphasizing environmental and livelihood benefits, and suggested expanding farmer participation and training coverage. In response, the project design was refined to include broader farmer outreach and an additional discount on agricultural inputs for all participating farmers. No major design changes were required, as the project already aligned with community expectations. All inputs and corresponding responses are documented in the Stakeholder Consultation Report.

2.1.3 Free Prior and Informed Consent

Use the table below to describe the outcome of the FPIC process as part of the stakeholder consultation process.

Obtaining consent	The FPIC process was carried out in a transparent and inclusive manner, in line with Verra's AFOLU standards. Prior to project implementation, consultations were held with stakeholders across Phayao, Chiang Rai, Chiang Mai, Kamphaeng Phet, Phitsanulok, Phichit, and Nakhon Sawan provinces to ensure that farmers, village leaders, and local authorities were fully informed about the project's goals, scope, and potential impacts. All sessions were conducted in Thai, using visual aids and printed materials to facilitate participants' understanding. All farmers voluntarily agreed to participate in the project after receiving comprehensive information about their rights and responsibilities. The consent process addressed two main areas: • Land ownership and use rights: Farmers maintain their full rights over their land; participation does not change their tenure status. For those without formal deeds, their land-use certificates (e.g., NS4, NS3K, ALRO 4-01 or other relevant titles) are verified. The village head compiles a list of participants, which is then submitted to the local Land Office and the Department of Agriculture for confirmation, ensuring that all participating plots are officially recognized under Thai land-right frameworks. • Carbon credit agreements: Each participating farmer signs a Carbon Rights Agreement, transferring the rights to verified emission reductions to Charoen Pokphand Produce Co., Ltd., the project proponent. This agreement clearly sets out

	benefit-sharing mechanisms and the obligations related to carbon credit issuance. No disputes or conflicts were identified during the FPIC process. Participation is entirely voluntary, and the project has not influenced or exacerbated any pre-existing land or community issues.
Outcome of FPIC	The Free, Prior, and Informed Consent (FPIC) process received widespread community endorsement and obtained official approval from all participating farmers and local government representatives. Stakeholders verified that the project would be carried out exclusively on land already under agricultural use, with no land-use conversion, relocation, or physical displacement of communities taking place. Participants showed a clear understanding of the project's goals, which include lowering methane emissions, optimizing water-use efficiency, and improving rural livelihoods. They also recognized the project's supplementary benefits, such as skills development and training programs, job creation within local communities, and reduced costs on agricultural inputs for enrolled farmers. The FPIC process is fully aligned with Thailand's national regulations and Verra's social and environmental safeguards, ensuring that: • No land has been encroached upon or converted • No individuals or communities have been relocated without consent • No physical or economic displacement has occurred Signed consent forms, attendance records, and meeting documentation are securely maintained by the project proponent and will be available for verification during the validation process.

2.1.4 Grievance Redress Procedure

Development process	The project's Grievance Redress Mechanism (GRM) was created through a structured, collaborative process to ensure that concerns are resolved quickly, openly, and in a culturally relevant way, while remaining safe and reachable for all stakeholders. The design of the GRM meets Verra's AFOLU safeguard standards and is based on traditional community-based dispute resolution methods in Thailand.

(a) Co-design through stakeholder consultation

The GRM was co-designed through consultations with local stakeholders during meetings held from February 25th to March 20th, 2025. In these sessions, the project developer presented proposed grievance channels and timelines to gather feedback on culturally appropriate communication, trusted local representatives, confidentiality, and specific access barriers for women, youth, and vulnerable groups. This input was integrated into the final GRM procedures, which now allow for submissions through various trusted channels, such as FarmPro offices, village leaders, and specific grievance officers.

(b) Definition of scope and principles

The GRM covers all feedback and complaints regarding project design and implementation, such as (but not limited to) participation and consent issues, benefit sharing, field impacts, data privacy, staff conduct, and social or environmental issues. The mechanism is guided by these core principles:

- Accessibility: offers various ways to submit concerns (verbal, written, or digital) in local languages.
- Confidentiality and anonymity: protects personal data and allows for anonymous submissions.
- Non-retaliation: protects stakeholders from reprisals, treating any form of intimidation as a serious violation.
- Transparency and fairness: employs clear procedures, specific timelines, and documented decision-making.
- Right to appeal: provides a process for escalating concerns if they remain unresolved.

(c) Institutional roles and capacity building

To operate the GRM, the project established a clear institutional structure:

- Grievance Receiving Points: Local FarmPro offices, village leaders, and designated grievance officers.
- GRM Focal Person: Tasked with receiving, registering, acknowledging, and tracking all entries.
- Investigation and Resolution Team: Responsible for fact-finding, proposing corrective measures, and ensuring their execution.

- Escalation/Appeal Level: Offers an independent review process, such as a project-level grievance committee separate from the daily implementation team.

All assigned personnel were trained on GRM procedures, documentation requirements, confidentiality, non-retaliation, and culturally appropriate engagement.

(d) Procedures, timelines, and documentation

The GRM establishes clear, time-bound procedures for receiving, hearing, and resolving grievances:

1. Intake and logging: Complaints can be submitted verbally, in writing, or digitally. Each is recorded in a log with a unique reference number and basic details (type, location, stakeholder group, and urgency).
2. Acknowledgement: The complainant is sent an acknowledgement within seven (7) working days.
3. Assessment and investigation: The project performs a proportionate investigation including site visits and interviews as needed to identify root causes and propose solutions.
4. Resolution and corrective action: Grievances are resolved within thirty (30) working days through documented actions and follow-up verification.
5. Extension for complex cases: If a resolution requires more time, the deadline may be extended with a written justification, a new timeline, and interim updates for the complainant.
6. Escalation and appeal: If the complainant remains unsatisfied, the case may be moved to the appeal level for review, with information provided on external channels where applicable.

(e) Communication and accessibility measures

The GRM is shared with stakeholders through various channels, including consultation meetings, village announcements, and postings at FarmPro offices and community hubs. This information covers how to file a grievance, expected timelines, options for confidentiality or anonymity, and the non-retaliation principle. The project ensures the mechanism stays accessible to women, youth, and vulnerable households by using female focal points where appropriate and offering confidential submission options.

	(f) Monitoring, reporting, and continuous improvement The effectiveness and inclusiveness of the GRM are reviewed annually as part of the project's management system. The review evaluates the number and types of grievances, resolution times, recurrence patterns, stakeholder satisfaction (where feasible), and accessibility for vulnerable groups. Lessons learned are used to update GRM procedures, training, and communications. A summary of GRM performance aggregated and anonymized is included in internal monitoring and provided to relevant stakeholders upon request.
Grievance redress procedure	**Scope and eligibility.** The GRM is available to all stakeholders, including participating and non-participating farmers, community members, local leaders, service providers, and any other affected or interested parties. Grievances may involve (i) participation and consent, (ii) benefit sharing and inclusion, (iii) field implementation impacts (such as water access, drainage, crop impacts, or weed/pest management issues related to practice changes), (iv) the conduct of project staff or contractors, (v) data collection and privacy, and (vi) any other environmental or social concerns linked to project activities. **Confidentiality, anonymity, and non-retaliation.** Complainants can submit grievances anonymously and request that their identity remains confidential. All grievances are managed under a non-retaliation policy; any intimidation, harassment, or retaliation against complainants is considered a serious violation that triggers immediate escalation to senior project management and corrective action. **Case classification and prioritization** Upon receipt, each grievance is classified to ensure proportionate handling and timely resolution: - **Category A (Information/Minor):** Requests for clarification, minor administrative issues, or simple corrections. - **Category B (Moderate):** Repeated issues, disputes requiring investigation, service delivery gaps, or implementation concerns affecting multiple households. - **Category C (Serious):** Allegations of misconduct, corruption, discrimination, threats, significant harm, or

sensitive disputes requiring an urgent response. These urgent cases are acknowledged and assessed on an accelerated timeline ideally within 48 hours while still following all procedural steps.

Procedure steps (expanded operational details)

1. Submission (Intake and registration).

- Stakeholders submit grievances via phone, email, written letter, QR-code form, or in person at the nearest FarmPro office.
- The grievance officer records: the date, location (village/cluster/zone), type of grievance, parties involved, preferred contact method, and whether anonymity or confidentiality is requested.
- Each case is assigned a unique reference number and entered into the Grievance Register.

2. Acknowledgement (within seven (7) working days).

- The grievance officer provides written or verbal acknowledgement within seven (7) working days, including the case number, next steps, and expected timeline.
- For anonymous cases, acknowledgement is issued through the complainant's chosen channel (if provided) or through community notice mechanisms while maintaining their anonymity.

3. Assessment and Resolution (within thirty (30) working days).

- A Grievance Review Committee, comprising representatives from Charon Pokphand Produce Co., Ltd., Rajamangala University of Technology Lanna , and relevant local authorities, reviews and investigates the case.
- The investigation is proportionate to the grievance category and may involve interviews with the parties involved, a review of project records (such as training logs, participation lists, service notes, or MRV entries), and site visits when necessary.
- The committee proposes a resolution and, if needed, a Corrective Action Plan (CAP) that outlines specific actions, responsible parties, deadlines, and monitoring steps.
- If a resolution exceeds 30 working days due to complexity, the complainant is provided with a written justification and a revised timeline, along with interim updates at least every 15 working days until the case is closed..

4. Feedback, implementation, and documentation (closure verification).

- The final decision and corrective actions are communicated to the complainant in a clear way, using the local language where necessary.
- The project verifies the completion of corrective actions such as through follow-up visits, record reviews, or confirmation from community focal points before closing the case.
- All submission details, investigation notes, decisions, CAP actions, and verification evidence are kept in the Grievance Register for transparency and audit purposes. Aggregated and anonymized summaries may be reported internally for management review and continuous improvement.

5. Appeal and escalation.

- If the complainant is unsatisfied with the resolution, the case can be escalated to senior project management for a formal review (First Appeal).
- If the issue remains unresolved, the complainant may request a referral to relevant government departments or independent mediation (Second Appeal). The project provides clear information on accessing these external channels.
- Appeal decisions are documented and recorded in the Grievance Register.

Accessibility and awareness

All stakeholders are informed of the GRM through:

- Training sessions (including a dedicated segment briefing them on the GRM).
- Printed materials (flyers and posters in villages and FarmPro offices).
- QR-code access and contact listings displayed on community notice boards.

Annual review and continuous improvement

The GRM undergoes an **annual** review to evaluate its effectiveness and inclusiveness, focusing on the volume and types of grievances, resolution times, recurring issues, and accessibility for

	women, youth, and vulnerable households. The review also assesses the adequacy of confidentiality and non-retaliation protections. These findings are then used to update procedures, committee training, and communication materials.

2.1.5 Public Comments

Comments received	Actions taken
There are concerns that different areas have varying conditions, making water management difficult, which may affect yield and production costs. Some areas may have challenges in fully managing water.	The project provides flexible implementation support tailored to local conditions. Site-specific technical assistance — including field water tube monitoring, land leveling guidance, and sub-paddy zoning — will be provided to help farmers manage water effectively regardless of soil type or topography. Farmers are not required to implement all measures at once; the project supports a phased approach aligned with each farmer's readiness and field conditions.
More project information is needed to help make informed decisions; ongoing education and clear manuals are important.	Detailed information materials, regular workshops, and practical manuals will be developed and distributed to keep farmers well-informed and supported throughout the project. Resources will cover the core Alternate Wetting and Drying (AWD) technique — including the use of the field water tube (pani pipe) to monitor soil water levels — as well as guidelines on carbon credit registration, monitoring procedures, and payment processes.
Participants expressed concern about weed management under AWD conditions and requested guidance on weed prevention, control strategies, and fertilizer scheduling compatible with the AWD approach.	A weed management manual tailored to AWD rice cultivation will be produced and distributed to all participating farmers. The manual will cover: (1) preventive cultural practices such as certified seed selection and stale seedbed technique; (2) water management strategies that suppress weed germination; (3) appropriate herbicide application timing during dry periods; and (4) a fertilizer scheduling guide aligned with key rice growth stages — basal application, active tillering, panicle initiation, and heading —

	to ensure the crop out-competes weeds at each stage.
There is widespread support for the project; however, since AWD is a new practice for many farmers, some are hesitant to change their existing methods. Demonstration and model plots were requested to build farmer confidence before full adoption.	Demonstration plots and farmer learning centers have been established in every participating province, including the project's research and development farm in Kamphaeng Phet Province. Both AWD test plots and conventional flooding control plots are maintained side-by-side to transparently demonstrate behavioral changes and real-world outcomes. Additional climate-friendly rice cultivation approaches — such as Direct Seeded Rice (DSR) or Aerobic Rice cultivation— will be introduced to broaden participation options and ease the transition for hesitant farmers.
The success of the project will depend on how well it is adapted to local conditions and on genuine farmer participation. Several stakeholders expressed interest in joining for an initial one-year period to evaluate results before making a longer-term commitment.	Collaboration with local government agencies — including the Department of Agricultural Extension (DOAE) and provincial cooperative offices — will ensure the project is locally adapted and builds on existing farmer networks. Pilot participation for a single growing season is encouraged and fully supported. Within one crop cycle, farmers can observe measurable outcomes including changes in water pumping costs, fertilizer expenditure, yield performance, and soil health indicators. Expert field officers will provide on-site support throughout the trial period to ensure farmers receive timely, practical guidance.
One stakeholder expressed a specific interest in trialling project participation for one year to observe rice growth performance and evaluate overall results before deciding on continued engagement.	The project team welcomes one-year trial participation and will arrange field visits by trained agricultural officers to provide hands-on knowledge and site-specific recommendations on AWD rice farming practices. During the trial year, farmers will be supported in monitoring key performance indicators: (1) rice growth and root system development; (2) yield outcomes relative to the baseline flooding method; (3) reductions in water pumping and fertilizer costs; and (4) soil health indicators. Many Thai

	farmers in AWD pilot programmes have reported yield increases of 10–40% alongside significant reductions in input costs, primarily due to improved water management and stronger root development under intermittent drying conditions.

2.2 Risks to Stakeholders and the Environment

2.2.1 Management Experience

Description	Details
Overview	The project is led by the Carbon Program of Charoen Pokphand Produce Co., Ltd. and implemented in collaboration with the FarmPro team, which has extensive experience in agricultural development and community engagement throughout Thailand. The project management team brings strong technical expertise in sustainable rice production, carbon project implementation, and greenhouse gas (GHG) reduction initiatives.
Experience in Similar Projects	The FarmPro team has implemented several sustainable agriculture initiatives promoting Alternate Wetting and Drying (AWD). These programs have introduced improved water-management techniques and enhanced fertilizer efficiency, fully aligning with the Verra VM0051 methodology for Improved Management in Rice Production Systems.
Community Engagement and Training	FarmPro has conducted extensive stakeholder consultations and farmer-training activities across the eight project provinces Phayao, Chiang Rai, Chiang Mai, Kamphaeng Phet, Phitsanulok, Phichit, and Nakhon Sawan, covering more than 7,376 hectares. Farmer leaders are selected and trained to serve as focal points for peer-to-peer learning, feedback collection, and ongoing capacity building within their communities.
Partnerships and Technical Support	To enhance technical and scientific capacity, the project collaborates with Rajamangala University of Technology Lanna (RMUTL),Department of Agriculture Extension (DOAE), and Department of Rice in Thailand. These partners provide expert guidance in agronomy, water management, and data validation to support monitoring and verification activities. In addition, external

	specialists are engaged to deliver training in digital MRV systems and greenhouse gas (GHG) quantification.
Capacity Building and Recruitment Strategy	The project incorporates a structured recruitment and training program for field staff and farmer representatives. Regular workshops are conducted to strengthen competencies in sustainable agricultural practices, data recording, safety procedures, and gender-inclusive facilitation. When specific capacity gaps are identified, qualified consultants are engaged to deliver targeted technical support and training.
Environmental and Risk Management	The management team has carried out comprehensive Risk and Capacity Assessments. Potential risks associated with natural disturbances, climate variability, and stakeholder welfare are continuously monitored, and corresponding mitigation measures are integrated into the project's operational plan.
Governance and Transparency	Charoen Pokphand Produce Co., Ltd. maintains a well-defined governance structure supported by an Internal Control System (ICS), ensuring accountability and compliance with Verra's AFOLU Safeguard requirements. The project implements a formal Free, Prior, and Informed Consent (FPIC) process and an established Grievance Redress Mechanism to safeguard stakeholder rights and ensure transparent, fair resolution of any concerns or conflicts.

The management team of Charoen Pokphand Produce Co., Ltd., working through FarmPro, has demonstrated strong capacity to implement large-scale sustainable rice initiatives and effectively manage environmental and social risks. Its long-standing engagement in Thailand's agricultural sector provides extensive local networks, while collaborations with research institutions and government agencies ensure solid scientific and technical support. By integrating practical field experience, institutional partnerships, and active community participation, the project team ensures the successful delivery of emission-reduction outcomes and long-term benefits for both stakeholders and the environment.

2.2.2 Risk Assessment

	Risks identified	Mitigation or preventative measure(s) taken
Natural and human-induced risks to stakeholders' wellbeing	Potential exposure of farmers to climate hazards such as droughts, floods, or heat stress during project implementation.	Training sessions on safe work practices and Adaptive Water Management (AWD) are regularly conducted for participating

		farmers. Seasonal climate advisories and early warning information are also disseminated through FarmPro field officers to support timely decision-making and reduce climate-related risks.
Risks to stakeholder participation	Limited participation of vulnerable farmers due to a lack of awareness or mobility constraints.	Continuous engagement through local farmer leaders helps ensure inclusive participation across all groups. Regular consultations, mobile communication, and accessible feedback channels including a hotline and QR-code feedback forms are used to maintain open communication and ensure that all stakeholders can easily express concerns or suggestions.
Working conditions	Risk of unsafe field conditions during equipment operation, fertilizer handling, or monitoring activities.	Safety guidelines are incorporated into all training sessions, and personal protective equipment (PPE), including boots, gloves, and masks, is provided to both staff and participating farmers. Regular supervision and monitoring are conducted to ensure compliance with occupational safety standards.
Safety of women and girls	Risk of exclusion of women in training or decision-making processes due to cultural norms.	A gender-inclusive participation policy is implemented to ensure equal access for all stakeholders. Invitations explicitly encourage female participation, and female staff are engaged to facilitate discussions, creating a safe and comfortable environment for women to contribute fully.
Safety of minority and marginalized groups, including children	Potential marginalization of ethnic minority farmers or child labor risk during planting/harvest seasons.	Farmer contracts explicitly prohibit the use of child labor. Awareness training is provided to promote the inclusion of minority

		and marginalized communities, and ongoing monitoring ensures compliance with labor and inclusion standards.
Pollutants (air, noise, discharges to water, generation of waste, and release of hazardous materials and chemical pesticides and fertilizers)	Improper use or disposal of chemical fertilizers and agricultural waste could cause contamination of water or soil.	Farmers receive training on correct fertilizer application rates and non-burning waste management practices. The promotion of organic alternatives and Integrated Nutrient Management (INM) helps reduce reliance on chemical inputs. Waste is managed using designated covered bins and safely disposed of in approved areas.

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

	Risks identified[2]	Mitigation or preventative measure(s) taken
Discrimination	Potential discrimination in recruitment or task assignment based on gender or ethnicity.	All project positions are filled through a transparent recruitment process based on qualifications and merit. The FarmPro HR policy strictly prohibits discrimination, ensuring equal opportunity and inclusive participation across all ethnic and social groups.
Sexual harassment	Risk of inappropriate behavior in mixed-gender work environments during training or field activities.	A zero-tolerance policy on harassment is strictly enforced. Awareness sessions and accessible grievance mechanisms allow for anonymous reporting, while supervisors are trained to

[2] The identified risks and commensurate mitigation or preventative measure(s) for forced labor, child labor, and human trafficking, must be inclusive of staff and contracted workers employed by third parties.

		promptly identify and address any misconduct.
Equal pay for equal work	Potential wage disparity between male and female laborers or local contractors.	The project complies with Thai labor laws and ILO principles, ensuring equal pay for equal work. Regular audits are conducted to verify fair wages for all employees and third-party contractors.
Gender equity in labor and work	Risk of unequal participation or limited leadership roles for women in project implementation.	Women are actively encouraged to assume decision-making roles as farmer leaders or field officers. Gender mainstreaming is integrated into all training programs, and participation data are systematically disaggregated by gender.
Forced labor	No risk identified.	All project contracts include clauses ensuring voluntary participation. Partner organizations and contractors are required to comply with Verra AFOLU safeguard standards as well as Thailand's labor laws.
Child labor	Potential risk during planting or harvesting periods, where family labor is customary.	All farmer and staff agreements include a strict prohibition on child labor. Awareness campaigns educate communities about the legal working age and the importance of school attendance, while monitoring visits are conducted to ensure compliance.
Human trafficking	No risk identified.	Project activities are implemented locally and are community-based. Workers are recruited directly through transparent procedures,

		with proper identity verification and documented contracts to prevent any form of labor exploitation.

2.3.2 Human Rights

Risks identified	Mitigation or preventative measure(s) taken
Recognition of land tenure and customary rights: Potential misunderstanding regarding land-use rights among farmers, particularly in areas with informal or customary land tenure systems.	The project does not change or transfer land ownership. Participation is entirely voluntary and based on documented consent. Land-use rights are verified in coordination with local authorities and village leaders prior to project implementation.
Rights of Indigenous Peoples (IPs) and Local Communities (LCs): No risk identified. The project areas are located in established agricultural zones and not within recognized indigenous or tribal territories.	Continuous verification with local administrative offices ensures that project sites do not overlap with indigenous or community lands. Should new communities be identified during project expansion, FPIC will be obtained before any engagement.
Free, Prior, and Informed Consent (FPIC): Risk of inadequate understanding of project activities among participating farmers and community members.	FPIC was obtained during stakeholder consultations, ensuring that communities received comprehensive information on the project's objectives, benefits, and grievance mechanisms before participation. All meetings were documented, including attendance records and summaries of feedback received.
Respect for human rights and non-discrimination: Possible social exclusion of marginalized groups due to local socio-economic hierarchies.	The project adheres to Verra's AFOLU safeguard principles and the UN Guiding Principles on Business and Human Rights. Community engagement is conducted inclusively, ensuring active participation of women, youth, and other vulnerable groups.
Access to grievance mechanisms: Risk of delayed response to grievances or lack of awareness of complaint procedures.	A grievance redress procedure has been established and communicated during stakeholder consultations. Complaints can be

	submitted through local FarmPro officers, by telephone, or via QR-code feedback forms, with responses provided within 14 days.
Cultural heritage and traditional practices: No risk identified. Project activities do not affect local cultural or spiritual sites.	Site screening was carried out prior to project implementation. If any cultural or sacred areas are identified, project boundaries will be adjusted in consultation with the affected local communities.

2.3.3 Indigenous Peoples and Cultural Heritage

Risks identified	Mitigation(s) or preventative measure taken
No risk identified. The project area is situated within existing agricultural zones and does not overlap with any recognized Indigenous territories or customary lands.	The project boundary was verified using local administrative records and through community consultations. If Indigenous or customary communities are identified in future expansion areas, FPIC will be obtained prior to any implementation.
No risk identified. Project activities occur only in active rice fields with no known cultural or spiritual heritage sites.	Site verification and stakeholder consultations confirmed that project areas do not overlap with cultural or sacred sites. Should any such areas be identified in the future, project activities will be adjusted to ensure full protection and respect for cultural heritage.

2.3.4 Property Rights

Risks identified	Mitigation or preventative measure(s) taken
No risk identified. The project operates solely on existing agricultural lands managed by registered farmers under recognized land-use arrangements. The project does not alter or transfer land ownership, and all activities are	Land tenure verification was carried out through local authorities and community consultations prior to project implementation. All land-use agreements are documented and signed by both farmers and FarmPro representatives to ensure full transparency and voluntary consent.

implemented voluntarily with the consent of landholders.	
No risk identified. The project does not restrict community access to farmland, water, or natural resources, and all participating farmers retain full control over their land and production decisions.	Participation in the project is entirely voluntary and based on clear, written agreements. In the event of any land-related disputes or claims, the established grievance redress mechanism will be activated to ensure timely resolution in coordination with the relevant local authorities.

2.3.5 Benefit Sharing

Process used to design the benefit sharing plan	The benefit-sharing plan was created through a participatory consultation process involving farmer representatives, village leaders, and local authorities across the project provinces (Phayao, Chiang Rai, Chiang Mai, Kamphaeng Phet, Phitsanulok, Phichit, and Nakhon Sawan). During stakeholder meetings, the project presented proposed benefit options and constraints including carbon revenue timing and program/MRV costs while stakeholders provided input on fair allocation rules for farmer incentives and community development support. All feedback was documented and integrated into the final framework, which is disclosed to communities and linked to the project's grievance mechanism to ensure transparency and equity.
Summary of the benefit-sharing plan	The benefit-sharing plan ensures that participating farmers receive both financial and non-financial rewards from project implementation and carbon credit revenues. Benefits are distributed proportionally based on verified land area and confirmed compliance with project activities. Beyond direct monetary returns, the plan provides practical support to enhance farm performance and minimize production risks. The benefit package for participating farmers includes: - Increased productivity through improved cultivation practices and field support. - Lowered cultivation costs resulting from more efficient farm management. - Training and development in agricultural knowledge and technology, including capacity-building and technical coaching. - A 50% share of net profits from carbon credit sales after deducting eligible program and transaction expenses

	distributed to participants who remain in the project for at least three consecutive years.
Approval and dissemination of benefit sharing plan	The final benefit-sharing plan was formally approved by the FarmPro project team and endorsed in the presence of farmer representatives, who witnessed the agreed terms. To ensure clarity and accessibility, the plan and its supporting agreement were distributed in both Thai and English. Copies of the signed plan are kept at FarmPro offices in each project cluster and are available to stakeholders upon request. Additionally, the project held community awareness sessions and briefings during training to ensure that participating farmers and other stakeholders clearly understand eligibility criteria, allocation procedures, timelines, and the process for raising questions or grievances regarding benefit distribution.

2.4 Ecosystem Health

	Risks identified	Mitigation or preventative measure(s) taken
Impacts on biodiversity and ecosystems	No risk identified. The project operates exclusively in existing cultivated rice fields and does not convert natural habitats or forested areas.	Field boundaries were verified using satellite imagery and local land-use maps to ensure that no natural ecosystems are encroached upon. The project promotes sustainable agricultural practices, including no-burning, integrated pest management, and reduced chemical fertilizer use, contributing to enhanced biodiversity in surrounding landscapes.
Soil degradation and soil erosion	Potential risk of soil nutrient loss due to improper water or fertilizer management.	The project implements Alternate Wetting and Drying (AWD) techniques, which improve soil structure, reduce compaction, and enhance organic matter retention. Farmers receive regular training on proper fertilizer application and residue management to maintain soil fertility and minimize erosion.

Water consumption and stress	Risk of increased irrigation water demand during prolonged dry periods.	Alternate Wetting and Drying (AWD) technology is applied to optimize water use, reducing irrigation demand by approximately 25–30%. Farmers are trained in field-level water monitoring and irrigation scheduling to ensure sustainable water consumption without impacting neighboring users or surrounding ecosystems.

2.4.1 Rare, Threatened, and Endangered Species

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

☐ Yes ☒ No

Species and habitat	NA
Areas needed for habitat connectivity	NA

Use the table below to identify and summarize any risks related to habitats for rare, threatened, and endangered species, and for areas for habitat connectivity. Describe the commensurate mitigation or preventative measure(s) in place to prevent or mitigate the risk. Where no risk is identified, write "No risk identified" in the first column, and provide justification in the second column. Add rows as needed.

	Risks identified	Mitigation or preventative measure(s) taken
Habitats for rare, threatened, and endangered species	No risk identified	The project area does not contain any known populations of rare, threatened, or endangered (RTE) species, as defined by the IUCN Red List or Thailand's national biodiversity inventory. The site consists primarily of long-established agricultural lands that have been under rice cultivation for decades, with no remaining natural habitats such as wetlands, forests, or conservation zones.
Areas for habitat connectivity	No risk identified	

		All project activities, including sustainable rice cultivation and improved water management, are conducted entirely within these existing agricultural areas and do not involve land conversion, deforestation, or disturbance to wildlife habitats. As such, the project poses no risk to rare, threatened, or endangered species and is fully compliant with biodiversity conservation requirements.

2.4.2 Introduction of Species

N/A

2.4.3 Ecosystem Conversion

ARR, ALM, WRC or ACoGS projects shall provide evidence that the project area was not cleared or drained of existing natural ecosystems, unless such clearing took place at least 10 years prior, or the dominant land cover was invasive.

Use the table below to identify and summarize any risks related to ecosystem conversion. Describe the commensurate mitigation or preventative measure(s) in place to prevent or mitigate the risk. Where no risk is identified, write "No risk identified" in the first column, and provide justification in the second column. Add rows as needed.

	Risks identified	Mitigation or preventative measure(s) taken
Ecosystem conversion	No risk identified	The project area has been under continuous rice cultivation for more than ten years prior to the project start date and contains no natural ecosystems such as forests, wetlands, or grasslands. Historical land-use records and satellite imagery confirm that the land had already been converted to agricultural use well before project implementation.

		No clearing, draining, or conversion of natural habitats has occurred as part of project activities. The project focuses on improving existing agricultural practices such as water-efficient irrigation through AWD, soil health management, and sustainable residue utilization to enhance productivity and environmental performance within established farmland boundaries. Therefore, the project involves no ecosystem conversion and fully complies with the requirement that no natural ecosystems have been cleared or drained within the past ten years.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Provide the title, reference and version number of the following information for the methodology(s), tools, and modules applied to the project (where applicable).

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	VM0051	VM0051 Improved Management in Rice Production Systems	v1.0
VCS Tool	VT0008	Additionality Assessment	v1.0

3.2 Applicability of Methodology

The following table demonstrates and justifies how the project activity meets each of the applicability conditions of the methodology VM0051, v1.0.

Methodology	Applicability condition	Justification of compliance
VM0051	1) Projects implement improved irrigation management practices that result in CH_4 emission reductions from methanogenesis (i.e., “main project activities”), including at least one of the following: a) Single drainage and/or a shortened period of flooded condition b) Alternate wetting and drying (AWD) c) Use of direct seeded rice (DSR)	The project seeks to transition irrigation practices on project plots from continuous flooding to intermittent flooding during the cultivation season using Alternate Wetting and Drying (AWD) techniques. Multiple drainage events are applied to reduce CH_4 emissions resulting from methanogenesis.
	2) Projects introducing or implementing quantitative adjustments (e.g., decrease in fertilizer application rate or fossil fuel use) exceed 5% of the pre-	The project includes a quantitative adjustment through a reduction in fertilizer application rate. In accordance with VM0051, the project proponent will

	existing value calculated as the average value over the historical look-back period, developed for the baseline schedule of activities (see Section 6).	demonstrate that the planned fertilizer reduction is greater than 5% of the pre-existing fertilizer application rate, calculated as the average value over the historical look-back period and incorporated into the baseline schedule of activities. Only fertilizer reductions that satisfy this threshold will be included under the project.
	3) The project rice fields are equipped with controlled irrigation and drainage facilities, such that appropriate flooded/non-flooded soil conditions can be established and desired emission reductions can be achieved.	The project applies only to rice fields with controlled irrigation and drainage facilities that allow the project proponent and participating farmers to establish the required flooded and non-flooded soil conditions under the credited management practice. Accordingly, only fields with sufficient water-control capacity to achieve the intended project water regime and emission reductions will be included, while fields lacking such control will be excluded. This is consistent with the applicability requirements of VM0051.
	4) The introduced project activities are not subject to any local regulatory restrictions as per the most recent requirements of the VCS Standard.	The project proponent confirms that the introduced project activities are not subject to any local regulatory restrictions under the most recent applicable requirements of the VCS Standard. Accordingly, only activities and project areas that are not prohibited, restricted, or mandated by applicable local regulations will be eligible for inclusion in the project.

	5) The project area has not been cleared of native ecosystems within the 10 years immediately preceding the project start date.	The project applies only to existing agricultural land that has not been cleared of native ecosystems within the 10 years immediately preceding the project start date. Any parcel identified as having been converted from native ecosystems during that period will not be eligible for project inclusion.
	6) The project fields maintain the same number of rice cultivation periods per year as in the historical look-back period (e.g., no shift from three to two growing seasons).	The project applies only to fields that maintain the same number of rice cultivation periods per year as in the historical look-back period. Fields involving a change in cropping frequency from the baseline scenario will not be eligible for inclusion.
	7) Practices are introduced that result in material declines in SOC stocks due to declines in the carbon input rate to soils (e.g., increased rice straw removal, decreased application rate of manure or compost, and introduction of new cultivars known to have a materially smaller root system than the cultivar(s) used in the baseline) [2]	The project does not introduce practices that reduce carbon inputs to soil and lead to material declines in SOC stocks. Activities such as increased rice straw removal, reduced manure or compost application, or introduction of cultivars with materially smaller root systems are not included in the project.
	8) Rice is grown under upland, [3] rainfed or deep-water, [4] or non-irrigated lowland rice production systems.	The project does not include rice grown under upland, rainfed, deep-water, or non-irrigated lowland rice production systems. The project applies only to irrigated rice fields with controlled irrigation and drainage facilities, consistent with the applicability requirements of VM0051. Any field falling under upland, rainfed,

		deep-water, or non-irrigated lowland rice systems will be excluded from the project.
	9) Projects change off-season (i.e., outside of the rice cultivation period) management practices (e.g., fertilizer application rates, tillage, crop rotations and crop types, and/or deviation of livestock management from historical off-season management practices). The following exceptions apply: a) Avoided crop residue burning after harvest (during the off-season) b) Reducing the flooding period prior to the start of the cultivation period only on fields that have no crop rotations (i.e., fields exclusively dedicated to flooded rice production)	The project does not introduce changes to off-season management practices that would render the methodology inapplicable, such as changes in off-season fertilizer application rates, tillage, crop rotations, crop types, or livestock management relative to the historical off-season management practices. Where relevant, the project may include only the exceptions expressly allowed under VM0051, namely: (i) avoided crop residue burning after harvest during the off-season; and/or (ii) reduction of the flooding period prior to the start of the cultivation period, but only on fields with no crop rotations and exclusively dedicated to flooded rice production. Any field involving other off-season management changes will not be eligible for inclusion.
	10) Projects seek to credit CO_2 removals due to the use of biochar	The project does not seek to credit CO_2 removals due to the use of biochar. Accordingly, biochar application and any associated CO_2 removal claims are not included in the project boundary or in the credited project activity. This is consistent with VM0051, which is not applicable to projects seeking to credit CO_2 removals from biochar use.

3.3 Project Boundary

According to the methods used, the rice fields when the water regime and cultivation technique are altered are included in the geographic border. All fields that alter the cultivation technique within the framework of the project activity are included in the project boundary's spatial extent.

Source		Gas	Included?	Justification/Explanation
Baseline	Fossil fuels	CO_2	Yes	Sources of fossil fuel emissions are vehicles (mobile sources, such as trucks, tractors) and mechanical equipment required by the rice cultivation activity
	Use of nitrogen fertilizers	N_2O	Yes	N_2O emissions from nitrogen fertilizers
	Biomass burning	CH_4	Yes	Traditional burning activities are part of the baseline scenario of areas
		N_2O	Yes	
	Soil methanogenesis	CH_4	Yes	Major source of emissions due to anaerobic condition
Project	Fossil fuels	CO_2	Yes	Sources of fossil fuel emissions are vehicles (mobile sources, such as trucks, tractors) and mechanical equipment required by the rice cultivation activity
	Use of nitrogen fertilizers	N_2O	Yes	N_2O emissions from nitrogen fertilizers
	Biomass burning	CH_4	Yes	Emissions from biomass burning. No events or decreasing events are expected in the project boundary
		N_2O	Yes	
	Soil methanogenesis	CH_4	Yes	Major source of emissions

Growers who enroll in the project submit shapefiles of their fields, indicating the areas where they will adopt project-relevant practices. These shapefiles are submitted separately to the registry upon validation. The project targets rice-producing regions in Thailand, covering eight provinces divided into two zones: Zone 1 - Phayao, Chiang Rai, Chiang Mai; and Zone 2 - Kamphaeng Phet, Phitsanulok, Phichit and Nakhon Sawan.

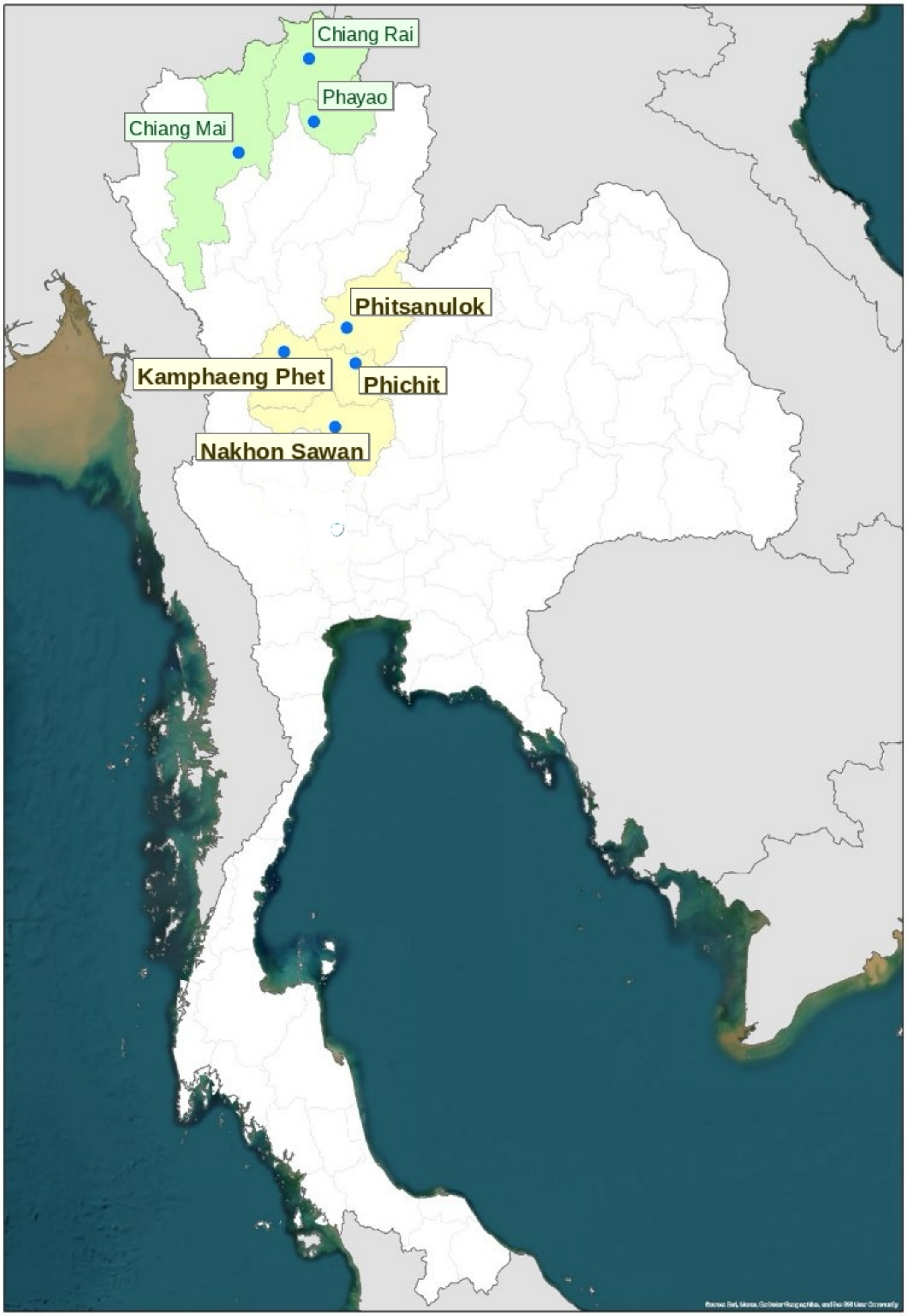

Figure 8: The Overview of the project area which is divided into 2 Zones (which are Zone 1 include Phayao, Chiang Rai, and Chiang Mai and Zone 2 include Kamphaeng Phet, Phitsanulok, Phichit, and Nakhon Sawan provinces

3.4 Baseline Scenario

The baseline scenario is defined as the continuation of pre-project rice cultivation practices within the project boundary, in accordance with VM0051 Improved Management in Rice Production Systems v1.0. The baseline was established ex ante using a historical look-back period of at least three years prior to the project start date, and the resulting historical management patterns were organized into a baseline schedule of activities for each quantification unit and stratum. On this basis, the baseline reflects observed pre-project farmer practice rather than assumed management conditions.

To ensure the baseline is grounded in empirical regional evidence, the project developer commissioned Rajamangala University of Technology Lanna (RMUTL) to conduct a regional baseline survey in the target area before the project began. RMUTL collected farmer-level data through structured questionnaires and field interviews across all project clusters, consolidating the results by region. This survey documented the key VM0051 baseline parameters summarized below:

	Parameter	Type	Value/Category	Code	Source
1	Water regime – On season	Dynamic	Continuously flooded	W1	Farmer Information from Survey
			Single drainage	W2	
			Multiple Drainage	W3	
2	Water regime – Pre season	Dynamic	Flooded	P1	Farmer Information from Survey
			Short Drainage (< 180 days)	P2	
			Long Drainage (> 180 days)	P3	
3	Organic amendment (application rate)*	Dynamic	No	R1	Farmer Information from Survey
			Low	R2	
			Medium	R3	
			High	R4	
4	Organic amendment	Dynamic	Straw on-season	O1	Farmer Information from Survey
			Straw off-season	O2	
			Green manure	O3	

Parameter		Type	Value/Category	Code	Source
			Farmyard manure	O4	
			Compost	O5	
5	Nitrogen fertilizer application	Dynamic	<100 kg N/ha	N1	Farmer Information from Survey
			100–200 kg N/ha	N2	
			200–300 kg N/ha	N3	
			>300 kg N/ha	N4	
6	Climate	Static	Northern Region	C1	Land Development Department**
			Northeastern Region	C2	
			Central Plain	C3	
			Western Region	C4	
			Eastern Region	C5	
			Southern Region	C6	
7	Cultivation period	Dynamic	High duration (>120 days)	T1	Farmer Information from Survey
			Medium duration	T2	
			Short duration (< 100 days)	T3	

* Organic amendment application rates are stratified into four categories (No/Low/Medium/High) as required by VM0051. The application rate (ROA) is recorded in t/ha per season, using dry weight for straw and fresh weight for other organic amendments, in accordance with IPCC guidance. For straw, the Low/Medium/High thresholds are established based on the VM0051 baseline straw assumption of 5 t/ha; for other amendments, the thresholds reflect standard agronomic practice ranges found in published guidance.

** Reference: Land Development Department. (n.d.). Agro-ecological zones of Thailand and land suitability for rice. Ministry of Agriculture and Cooperatives. Bangkok, Thailand.

For baseline quantification, the project relies on both dynamic and static parameters. The dynamic parameters are derived primarily from farmer information collected through the baseline survey and historical look-back assessment, while the climate-related parameter is derived from authoritative national zoning data. The resulting stratification outputs, including stratum codes, areas, number of farms, and parameter distributions, are summarized and will be used for emission calculation. The baseline was screened to ensure full consistency with the applicability conditions and requirements of VM0051, and only farms and fields meeting the methodology criteria were retained for baseline establishment and subsequent project eligibility screening.

For each stratum, the baseline scenario represents the continuation of existing cultivation patterns as confirmed through the baseline survey and historical practice assessment. In the absence of the project, farmers would continue prevailing water management, fertilizer and organic amendment practices, and associated field operations broadly consistent with their historical management patterns. This continuation scenario is considered the most plausible baseline because no structured mechanism currently exists to systematically implement, monitor, and sustain improved low-emission practices such as AWD beyond existing baseline behavior.

The baseline scenario is characterized primarily by conventional flooded rice cultivation. Baseline survey results show that continuous flooding is the dominant on-season water regime across the target clusters, averaging approximately 99.8% of surveyed fields. As a result, baseline cultivation is associated with prolonged anaerobic soil conditions during the cropping season, which are conducive to methane (CH_4) formation. Although some fields may experience isolated drainage events, these events are not planned, repeated, or managed as systematic wetting-and-drying cycles and therefore do not constitute project-like improved irrigation management under VM0051.

Pre-season water conditions vary across provinces depending on local cropping calendars and water availability, with fields exhibiting flooded conditions, short drainage periods of less than 180 days, or long drainage periods of more than 180 days prior to cultivation. Residue management and organic amendment practices likewise follow prevailing farmer behavior as documented in the baseline survey, including the type and rate of amendments historically applied. No application of biochar or methane-oxidizing biological agents occurs under baseline conditions. More broadly, the baseline does not include any structured intervention to improve resource-use efficiency or reduce greenhouse gas emissions at scale.

Accordingly, the baseline scenario assumes the continuation of business-as-usual rice production practices within the project boundary. Under this scenario, farmers would continue conventional flooded water management, farmer-specific residue and amendment practices, and existing input management approaches without standardized technical support, field coaching, water-level monitoring, or project-based recordkeeping. The baseline therefore represents a credible and conservative continuation of pre-project conditions rather than a transitional or partially improved scenario.

Under the project scenario, eligible irrigated lowland rice fields that have been confirmed to meet the applicability conditions of VM0051 are shifted from baseline management to a structured package of lower-emission interventions. The principal intervention is the introduction of Alternate Wetting and Drying (AWD), which reduces the duration of anaerobic soil conditions and thereby lowers methane formation during the cultivation period. The project also strengthens fertilizer and organic amendment management through targeted training, field coaching, and standardized MRV procedures, including water-level monitoring and recordkeeping, to support sustained implementation and quantification. Project emissions are calculated on the basis of monitored project practices, while baseline emissions represent the continuation of pre-project management patterns; the difference between the two constitutes the net greenhouse gas emission reductions attributable to the project.

Overall, the baseline has been established ex ante on the basis of historical field practice, survey-based evidence, and methodology-consistent stratification, and it provides a robust reference scenario against which project-induced emission reductions can be assessed.

3.5 Additionality

This project applies VM0051 Improved Management in Rice Production Systems, v1.0, which uses a project method for demonstrating additionality. Under Section 7 of VM0051, project proponents must demonstrate: (i) regulatory surplus in accordance with the VCS Standard, (ii) barrier analysis and/or investment analysis using VT0008, and (iii) common practice analysis for each proposed project activity. VM0051 further requires that methodologies be applied in full, including all referenced tools, while the VCS Standard defines additionality as reductions beyond business as usual that would not have occurred in the absence of the incentive provided by carbon markets.

For this project, the principal main project activity is improved irrigation management through Alternate Wetting and Drying (AWD) in eligible irrigated lowland rice fields. The project also includes an optional project activity involving improved nitrogen fertilizer management through a monitored reduction in fertilizer application relative to the baseline schedule of activities, consistent with the >5% quantitative-adjustment requirement under VM0051. Because VM0051 already contains procedures to identify the baseline scenario through the historical look-back period and baseline schedule of activities, Step 1 of VT0008 is not applied separately; instead, the project applies Step 2 (Barrier Analysis) and Step 4 (Common Practice Analysis) as required by the methodology.

3.5.1 Regulatory Surplus

Is the project located in an UNFCCC Annex 1 or Non-Annex 1 country?

☐ Annex 1 country ☒ Non-Annex 1 country

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

☐ Yes ☒ No

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

☐ Yes ☐ No

If no, describe which mandated laws, statutes, or other regulatory frameworks require project activities and provide evidence of systematic non-enforcement to demonstrate regulatory surplus.

Thailand is a Non-Annex I country. The project activities specifically the implementation of Alternate Wetting and Drying (AWD) within flooded rice systems as defined under VM0051 are not mandated by any applicable law, statute, or other binding regulatory framework in Thailand.

- National Context: While Thailand's Nationally Determined Contribution (NDC) and the National Strategy (2018–2037) aim for a transition to low-carbon agriculture, these are high-level policy goals and do not impose mandatory requirements on individual farmers or private entities to adopt AWD.
- The Rice Act (B.E. 2562): This primary legislation focuses on seed quality, price support, and farmer welfare but contains no provisions requiring specific methane-mitigation water management practices.

While relevant national frameworks, such as environmental conservation and water resources laws, establish general requirements for environmental protection and water management, they do not require farm-level adoption of AWD or specific methane-mitigation practices in rice cultivation. Therefore, the project exceeds all current regulatory requirements and satisfies the criteria for regulatory surplus.

3.5.2 Additionality Methods

Step 1: Identify Alternatives to the Project Activity

In accordance with VT0008 (v1.0), Step 1 is not applied because VM0051 provides specific procedures to identify the baseline scenario defined as the continuation of pre-project rice cultivation practices using a historical look-back period to establish an annual schedule of activities.

Consequently, baseline scenario identification follows VM0051 requirements, and additionality is demonstrated through regulatory surplus, Step 2 (Barrier Analysis) and/or Step 3 (Investment Analysis), and the common practice test, as mandated by the methodology.

Step 2: Barrier Analysis

In accordance with Section 7.2 of VM0051, the project applies Step 2 (Barrier Analysis) of VT0008. VT0008 requires the project to identify realistic and credible barriers, demonstrate that at least one barrier would prevent implementation of the project activity without carbon credit revenues, demonstrate that at least one alternative does not face the barriers to the same degree, and demonstrate that carbon credit revenues are the decisive element in overcoming the barriers. VT0008 also specifies that evidence must be transparent, conservative, relevant, and verifiable.

Step 2a: Identify Realistic and Credible Barriers

The barrier categories recognized by VT0008 include financial, information, and institutional barriers.

- Financial barrier

The transition from the baseline scenario (Continuous Flooding) to the project activity (AWD and improved nutrient management) is hindered by substantial financial barriers. Implementation at scale requires significant expenditures that do not arise under business-as-usual (BAU) practices. These include costs for farmer mobilization, intensive technical training, continuous field support, the establishment of robust monitoring systems, data management, QA/QC protocols, and the statutory costs for third-party validation and verification under the VCS Program.

Public evidence from Thailand reinforces the conclusion that such low-emission rice interventions are not commercially viable without structured technical and financial intervention. Specifically, the Thai-German Cooperation (2025) reports that successful mitigation packages in Thailand, including AWD and nutrient management, have historically required substantial technical training and financial assistance, including subsidies of up to 50% for farmers, alongside specialized green-credit arrangements to stimulate investment. Furthermore, the Green Climate Fund (2023) funding proposal for climate-smart rice in Thailand emphasizes the necessity of incentive grants and climate-smart loan mechanisms to overcome the financial inertia of traditional farming and to strengthen stable farmer relationships.

These institutional findings are corroborated by farmer-survey evidence (e.g., Villanueva et al., 2025), which concludes that the scaling of low-emission practices in Thailand is not driven by ordinary financial conditions but instead requires targeted incentives and practical, long-term training. Without the projected revenue from Verified Carbon Units (VCUs) to serve as this carbon-linked support, the project would be unable to absorb the high transaction costs of MRV or provide the necessary incentives to bridge the Incentive Gap caused by perceived yield risks and increased labor. Consequently, carbon finance is the decisive factor that enables the project to overcome these documented financial barriers and achieve long-term sustainability.

The project also faces a distinct access-to-finance and risk barrier. The approved GCF funding proposal for Thai rice explains that climate-smart rice farming requires coordinated financial mechanisms because farmer adoption is uncertain, implementation risks are significant, and access to ordinary finance is constrained. The same proposal describes the use of a Climate-Smart Loan Scheme, incentive grants, and de-risking arrangements to strengthen farmer relationships and support implementation, reflecting the fact that the transition to climate-smart practices is not readily financed under ordinary market conditions (Green Climate Fund, 2023). Likewise, Thai farmer-survey evidence indicates that scaling low-emission rice practices depends on targeted incentives and not merely on farmer awareness or willingness, which further supports the conclusion that the project faces a real access-to-finance barrier in the absence of carbon-linked support (Villanueva et al., 2025). This barrier is relevant to the present project because AWD and improved fertilizer management require farmers to accept short-term operational risk and adapt long-established practices before benefits are fully realized.

- **Technical and information barrier**

The project activity faces a material technical and information barrier, as Alternate Wetting and Drying (AWD) and precision nutrient management are not self-executing practices. They require sophisticated, plot-level decision-making and season-specific implementation knowledge that significantly exceed ordinary baseline farming routines. In the Thai context, AWD is not merely a reduction in water usage; it is a precision-based irrigation regime that demands constant monitoring of field water levels and the identification of critical operational thresholds to balance methane reduction with crop health. Evidence from the Thai Rice project's mid-term evaluation underscores this complexity, noting that even simple AWD implementation relies heavily on specialized tools, such as field water tubes and color-coded irrigation guides, to steer farmer decisions (Thai Rice Project, 2024). This illustrates that the transition from a flooded baseline to a managed AWD system is a technology-dependent shift rather than a minor adjustment to routine practice.

The inherent complexity of these climate-smart interventions is further validated by the existence of a specialized multi-module training curriculum established by the Thai Rice Department. This comprehensive framework includes distinct modules on rice varieties suitable for AWD, modified fertilizer application protocols, precise water-management procedures, and specialized pest, disease, and grain-quality management under non-flooded conditions (Rice Department, 2023). The necessity of such a multi-disciplinary curriculum confirms that successful AWD implementation at a commercial scale requires the mastery of interrelated technical components that are absent in the business-as-usual (BAU) scenario. This is consistent with findings from the International Rice Research Institute (IRRI), which report that while many Thai farmers are aware of low-emission concepts, they regard them as technically demanding and unfeasible without practical, sustained training and improved water infrastructure (IRRI, 2025).

Furthermore, the scale of capacity building required to overcome these barriers is unprecedented in conventional agriculture. The Thai Rice project demonstrated that scaling these practices necessitated a massive institutional effort, including the training of 99,094 farmers, 4,599 Smart Farmers, and 144 governmental institutions (Thai Rice Project, 2024). This level of organized technical support and MRV-related capacity building is a core component of successful implementation rather than an optional addition. Consequently, the barrier is not a lack of awareness, but the absence of the field-level support, practical decision tools, and institutional coordination required for the correct, consistent, and auditable implementation of the methodology. In the absence of carbon-linked project funding to provide this structured guidance, the proposed project activity would not be implemented reliably at the scale and integrity required by the VCS Program.

- Institutional and coordination barrier

The project faces a material institutional and coordination barrier because implementation of AWD and improved fertilizer management at scale requires a coordinated support system that does not exist under business-as-usual rice cultivation. In the Thai context, low-emission rice practices have not been disseminated as isolated farmer actions; rather, they have depended on organized collaboration among farmers, service providers, extension personnel, and public institutions. The Thai Rice project results factsheet reports that implementation required direct and indirect training for 99,094 farmers, the development of 4,599 smart farmers as local multipliers, capacity building for 144 governmental institutions, and technical training for 276 service-provider members. This indicates that scaling low-emission rice practices in Thailand has required a structured institutional platform for training, service delivery, and implementation support rather than spontaneous adoption by individual farmers alone (Thai Rice Project, 2024).

This barrier is further illustrated by the institutional design of Thailand's current climate-smart rice transition. The approved GCF proposal for Thai rice describes a need to strengthen farmer-support services, organize climate-smart service providers, and create financial and implementation mechanisms that link farmers with technical assistance and approved service delivery. Recent implementation updates likewise show that the program has been assembling a register of quality-approved climate-smart service providers and integrating support systems needed to deliver promoted practices consistently. These are not features of ordinary baseline cultivation; they are additional institutional arrangements required to make low-emission rice practices operational at scale (Green Climate Fund, 2023).

Thailand-specific farmer evidence also supports this conclusion. An IRRI policy brief based on farmer surveys in irrigated rice provinces found that successful scaling of low-emission rice practices depends not only on incentives and training, but also on implementation pathways that are trusted, practical, and institutionally supported. In other words, even where farmers are aware of AWD and related practices, adoption at scale still depends on a functioning coordination structure that can connect farmers to knowledge, implementation support, and market or carbon-program opportunities (IRRI, 2025).

Accordingly, the institutional barrier is not merely the absence of awareness; it is the absence, under the baseline scenario, of an organized mechanism capable of aggregating farmers, standardizing implementation protocols, supporting field-level practice, maintaining data integrity, and producing MRV-ready records. The proposed project must perform all of these functions in order to implement AWD and fertilizer-related mitigation measures consistently and credibly. These functions are not provided under prevailing farmer practice and therefore constitute a real institutional and coordination barrier to project implementation in the absence of carbon-linked project support.

Step 2b: Demonstrate That Barriers Would Prevent Implementation of the Project Activity

In accordance with VT0008, the Project Proponent demonstrates that the identified financial, technical, and institutional barriers are material and insurmountable under the Business-as-Usual (BAU) scenario. These barriers, individually and collectively, prevent the implementation of the project activity at the precision and scale required by VM0051 and the VCS Program.

- **The Financial Barrier: Prohibitive Transaction and Operational Costs**

The project activity is not merely a behavioral shift but a high-integrity management system requiring significant capital and operational expenditures that do not exist in the baseline scenario. These expenditures include farmer mobilization, specialized technical training, continuous field monitoring, and the establishment of a robust Internal Control System (ICS) for data management.

Public evidence from Thailand confirms that low-emission rice interventions are not self-sustaining on purely commercial terms. The Thai Rice project (Thai-German Cooperation, 2025) demonstrated that even with a 50% financial subsidy and national green credit programs, adoption remained dependent on external structured support. Without the anticipated revenue from Verified Carbon Units (VCUs), the current project lacks the financial mechanism to internalize these additional costs—specifically the high costs of third-party validation and annual verification—making the project financially unfeasible at the proposed scale.

- The Technical and Information Barrier: Complexity beyond Routine Practice

Alternate Wetting and Drying (AWD) and site-specific nutrient management are not self-executing" or intuitive practices; they require high-precision, plot-level decision-making that deviates significantly from traditional routines. Recent survey evidence (Villanueva et al., 2025) highlights that Thai farmers perceive AWD as "technically demanding" and risky without professional guidance.

The technical gap is further evidenced by the Thai Rice project's extensive capacity-building efforts, which required training 99,094 farmers, 4,599 Smart Farmers, and 144 governmental institutions to ensure correct implementation (Thai-German Cooperation, 2025). This massive investment in knowledge infrastructure confirms that successful AWD requires mastery of interrelated technical components (e.g., water-table monitoring at and threshold-based irrigation). In the absence of the carbon project's technical support, implementation would be inconsistent, incorrect, and ultimately non-auditable under the rigorous standards of VM0051.

- The Institutional and Coordination Barrier: Fragmentation of Smallholder Systems

The project requires a sophisticated organizational structure to coordinate thousands of independent smallholders—a structure that is absent in the BAU scenario. The project's baseline survey reveals a stark reality: 99.8% of the target population continues to practice continuous flooding, confirming that systematic water management has zero autonomous diffusion in the region.

Scaling low-emission rice depends on coordinated institutional "anchors." The Thai Rice project had to organize 2,544 village farmer groups and develop the GAP++ voluntary standard to differentiate low-emission rice from conventional output (Thai-German Cooperation, 2025). Without a centralized project entity—funded by carbon finance—to aggregate these fragmented farmers, standardize protocols, and maintain Verification-Ready records, coordinated action would collapse into isolated, unmonitored traditional farming.

- Conclusion

The identified barriers are not general sector challenges; they are definitive project-killers. As designed, the project activity satisfies Step 2b of VT0008 because:

- Financial: Carbon finance is the only source covering the MRV and implementation premium.
- Technical: Project-led coaching is the only bridge for the high-precision knowledge gap.
- Institutional: The project's ICS is the only structure capable of maintaining an auditable chain of evidence.

But for the carbon-market support, the baseline of continuous flooding and high-methane emissions would persist indefinitely.

Step 2c: Demonstrate That the Identified Barriers Would Not Prevent the Implementation of at Least One Alternative

In accordance with VT0008, the Project Proponent demonstrates that at least one realistic and credible alternative—the continuation of prevailing rice cultivation practices (Baseline Scenario)—is not prevented by the identified barriers to the same degree as the proposed project activity. This alternative involves the maintenance of conventional flooded water management and traditional nutrient application practices, which represent the established historical norm in the project area.

- Absence of Financial Barriers for the Baseline Alternative

The baseline alternative does not face the prohibitive financial barriers identified for the project activity because it requires no additional capital or operational expenditures beyond ordinary farming costs. Under the baseline, farmers operate within existing market structures without the need for project-wide mobilization, structured technical support, or the high transaction costs associated with Monitoring, Reporting, and Verification (MRV).

By contrast, evidence from Thailand indicates that low-emission interventions are financially more demanding; the Thai Rice project required an organized support framework, including a 50% financial subsidy, to achieve AWD and site-specific nutrient management at scale (Thai-German Cooperation, 2025). Since the baseline scenario relies on internalized, conventional costs already supported by local agricultural credit lines, it is not prevented by the lack of carbon-linked revenue.

- Absence of Technical and Information Barriers for the Baseline Alternative

The continuation of prevailing practices does not require farmers to adopt new decision-making tools, install monitoring infrastructure (e.g., Pani pipes), or adhere to complex irrigation schedules defined by a methodology. While AWD is perceived by Thai farmers as technically demanding and risky without sustained training (Villanueva et al., 2025), the baseline practice of continuous flooding is intuitive, traditional, and self-executing.

The Thai Rice project demonstrated that large-scale implementation of improved practices required intensive capacity building for over 99,000 farmers (Thai-German Cooperation, 2025), further highlighting that such technical transitions are not autonomous. The baseline alternative, being the default operational mode, remains entirely unhindered by these technical information gaps.

- Absence of Institutional and Coordination Barriers for the Baseline Alternative

Under BAU cultivation, farmers function as isolated economic units without the requirement for coordinated implementation, standardized protocols, or contribution to an integrated data system. In contrast, scaling low-emission practices requires a sophisticated institutional platform to coordinate farmer groups, service providers, and government agencies.

The Green Climate Fund (GCF, 2023) proposal for Thai rice explicitly frames climate-smart transformation as requiring coordinated service-delivery arrangements that are currently absent in the baseline environment. Because the baseline alternative does not depend on the aggregation of thousands of smallholders or the maintenance of "audit-ready" records, it is not restricted by the institutional fragmentation that characterizes the current agricultural sector in Thailand.

- Conclusion

The continuation of prevailing farmer practice constitutes a realistic and credible alternative that is not prevented by the identified barriers. While the project activity is stalled by the need for additional finance, specialized technical knowledge, and institutional coordination, the baseline alternative thrives under existing routines. Consequently, the project satisfies Step 2c of VT0008, as the identified barriers selectively prevent the climate-smart intervention while allowing high-emission practices to persist.

Step 2d: Demonstrate That Carbon Credit Revenues Are the Decisive Element in Overcoming Barriers

In accordance with VT0008, the Project Proponent demonstrates that carbon credit revenues serve as the decisive element enabling the project to overcome the financial, technical, and institutional barriers identified in Steps 2a–2c. Without the financial certainty provided by the VCS Program, the additional activities required to achieve CH_4 reductions would be neither commercially viable nor operationally sustainable.

- Overcoming the Financial Barrier through Performance-Based Revenue

Carbon credit revenues are decisive because they provide the necessary funding for specialized costs that do not arise under the baseline scenario. These include the long-term mobilization of farmers, deployment of technical training units, and the high-frequency Monitoring, Reporting, and Verification (MRV) activities required by VM0051.

Public evidence confirms that similar low-emission interventions in Thailand have historically depended on structured financial support rather than autonomous commercial diffusion. The Thai Rice project (Thai-German Cooperation, 2025)[1] relied on an extensive 50% subsidy and specialized green-credit arrangements to incentivize adoption. For the present project, carbon revenue functions as the primary economic engine that internalizes these implementation premiums, allowing the project to scale without relying on temporary government grants or unsustainable farmer debt.

- Overcoming Technical and Information Barriers via Sustained Capacity Building

The complexity of AWD management—requiring precise water-table monitoring demands a level of technical support that is absent in the BAU environment. Carbon credit revenues enable the project proponent to finance a permanent FarmPro extension service, providing the on-the-ground coaching necessary to de-risk the transition for farmers.

As noted by Villanueva et al. (2025), Thai farmers perceive AWD as technically demanding; thus, adoption is not driven by mere awareness but by sustained, practical training. The Thai Rice project demonstrated that scaling required training nearly 100,000 farmers and over 4,500 Smart Farmers (Thai-German Cooperation, 2025). Carbon revenues provide the long-term financial stability to maintain this intensive support infrastructure, ensuring that technical knowledge is not just transferred but consistently applied and monitored.

- Overcoming Institutional Barriers through the Internal Control System (ICS)

Carbon revenues allow the project proponent to act as a centralized aggregator, overcoming the institutional fragmentation of smallholder rice farming. This revenue funds the operation of a high-integrity Internal Control System (ICS) and digital platforms needed to manage data for thousands of plots—functions that the existing public extension system is not equipped to provide at this level of granularity.

The Thai Rice project outcomes show that implementation at scale required the coordination of over 2,500 village farmer groups and the development of new standards like GAP++ (Thai-German Cooperation, 2025)[1]. Carbon credit revenues are decisive here as they cover the operational costs of this coordination and the statutory fees for independent auditing, ensuring the project remains "audit-ready" throughout its crediting period.

- **Summary**

The weight of public evidence indicates that low-emission rice transformation in Thailand does not occur spontaneously. It requires a package of technical support, financial incentives, and coordinated institutional arrangements. For this project, carbon credit revenues are the only viable mechanism to finance this package.

Step 4: Common Practice Analysis

In accordance with VT0008 and VM0051, the common practice test for AWD must be conducted at the relevant regional level, and the activity is eligible only where its penetration rate does not exceed 20% during the historical look-back period. For this project, the primary evidence is the baseline stratification survey conducted by Rajamangala University of Technology Lanna (RMUTL) in 2025, based on farmer-level interviews and field survey information collected across the target provinces. The survey shows province-specific on-season water-regime data for Phayao, Chiang Rai, Chiang Mai, Kamphaeng Phet, Phitsanulok, Phichit, and Nakhon Sawan, and shows that continuous flooding (CF) averages 99.8%, while AWD averages only 0.2% across the surveyed project population. Province-specific AWD values are 0.3% in Phayao, 0.2% in Chiang Rai, 0.0% in Chiang Mai, 0.4% in Kamphaeng Phet, 0.2% in Phitsanulok, 0.1% in Phichit, and 0.3% in Nakhon Sawan. These values are far below the 20% common-practice threshold in VM0051 and therefore constitute strong direct evidence that AWD is not common practice in the surveyed target area.

Table 1: Province-Level Baseline Stratification of Cultivation Method and Water Regime Parameters under VM0051 (sample size = 502 farmers)

Province	Cultivation method (%)			Water regime on season (%)		Water regime pre-season (%)		
	Transplant	DSR	Transplant + DSR*	CF	AWD	Flooded	< 180d	> 180d
Phayao	34.0	35.5	30.5	99.7	0.3	1.5	88.5	10.0
Chiang Rai	31.5	39.0	29.5	99.8	0.2	1.2	90.0	8.8
Chiang Mai	33.2	36.8	30.0	100.0	0.0	1.4	89.5	9.1
Khamphaeng Phet	30.8	38.5	30.7	99.6	0.4	1.8	87.5	10.7
Phitsanulok	32.5	37.0	30.5	99.8	0.2	1.3	89.0	9.7
Phichit	33.8	36.2	30.0	99.9	0.1	1.0	90.4	8.6
Nakhon Sawan	31.0	38.0	31.0	99.7	0.3	1.6	88.8	9.6

Province	Cultivation method (%)			Water regime on season (%)		Water regime pre-season (%)		
	Transplant	DSR	Transplant + DSR*	CF	AWD	Flooded	< 180d	> 180d
Average	32.4	37.3	30.3	99.8	0.2	1.4	89.1	9.5

*Note: “Transplanting + DSR” refers to farms using both methods across multiple crops (2–3 per year). Transplanting is typically used in the wet season when water is abundant or for seed production, while DSR is used in subsequent dry-season crops to adapt to limited water availability.

The survey evidence is particularly robust because the same target population is already predominantly located in irrigated rice systems, averaging 90.6% irrigated area across the seven provinces. This is important for interpretation: the low AWD percentages cannot be attributed simply to a lack of irrigation suitability, because the surveyed population is already largely suitable for irrigation-based water management. Rather, the survey shows that even within a predominantly irrigated project population, farmers still overwhelmingly rely on conventional flooded cultivation. This interpretation is fully consistent with the project baseline description, which states that the baseline is dominated by continuous flooding and that improved water management remains limited and is not systematically implemented at scale.

Public evidence from Thailand does not contradict this conclusion. Instead, it shows that AWD is a known and promoted mitigation practice, but one that has expanded mainly through structured technical and financial support rather than through broad autonomous uptake. The Thai Rice project reports large-scale farmer training and support for low-emission rice practices, while Thailand-specific farmer survey evidence concludes that scaling AWD requires targeted incentives, practical training, improved water infrastructure, and clearer market pathways. Research from Chiang Mai further notes that AWD had been recommended for many years but had not been widely adopted by Thai farmers because of implementation constraints. Taken together, the public evidence supports a conservative interpretation: AWD is technically established in Thailand, but it has not become common practice in the surveyed project area (Thai-German Cooperation, 2025; Villanueva et al., 2025; Rattanarak et al., 2020).

Based on the RMUTL 2025 survey and the supporting public evidence, AWD is not common practice in the seven surveyed provinces of Phayao, Chiang Rai, Chiang Mai, Kamphaeng Phet, Phitsanulok, Phichit, and Nakhon Sawan during the relevant historical look-back period. The strongest evidence is the project’s own province-level survey, which directly measures on-season water-regime adoption in the candidate project population and shows AWD penetration of only 0.0%–0.4%, compared with the VM0051 threshold of 20%. This provides a clear and conservative basis for concluding that the AWD activity satisfies the common-practice requirement in these seven provinces.

Reference (for 3.5 Additionality)

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3.6 Methodology Deviations

There was no deviation in the methodology applied for the quantification of GHG emission reductions or removals.

4 QUANTIFICATION OF ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Determining baseline emissions is crucial for establishing emissions reduction targets, evaluating the effectiveness of mitigation strategies, and tracking progress in reducing emissions over time. Baseline emissions will be calculated using QA 3 (Default Factors) as described in section 8.1 of the Methodology. These quantifications will be based on the baseline assessment collected individually for participating farmers. The baseline emission will be calculated as follows:

GHGs	Sources/Inputs	Equation used*	Reference	Output
CO_2	Fossil fuel** - Gasoline (L) - Diesel (L)	1, 2	IPCC 2019 Refinement, Vol 2 Ch 3	CO_2_ff
	Liming - Calcitic limestone ($CaCO_3$) (t) - Dolomite ($CaMg(CO_3)_2$) (t)	3, 4	Methodology	CO_2_lime
CH_4	Soil methanogenesis - water regime during the cultivation period - water regime in the pre-season before the cultivation period - Application rate of organic amendment Cultivation period of rice (days)	5, 6, 7, 8	IPCC 2019 Refinement, Vol 4 Ch 5	CH_4_soil
	Biomass burning - Mass of rice straw burned (kg)	17	IPCC (2019), Refinement, Vol 4 Ch 2	CH_4_bb
N_2O	N fertilizer - Total nitrogen as synthetic fertilizer (t N) - Total nitrogen as organic fertilizer (t N)	19, 20, 21, 22	IPCC (2019), Refinement, Vol 4 Ch 11	N_2O_soil
	Crop residues - Total dry mass of rice straw returned to soils (t dry mass)	19, 22	IPCC (2019), Refinement, Vol 4 Ch 11	N_2O_soil

	- Nitrogen content in dry mass of crop residue (t N/t dry mass)			
	Biomass burning - Mass of rice straw burned (kg)	23	IPCC (2019), Refinement, Vol 4 Ch 2	N_2O_bb

* Equations are used in accordance with Section 8.2 Baseline Emission in the VM0051: Improved Agricultural Land Management (v1.2) methodology

** Fuel consumption for the AWD project is divided into two sources: (i) stationary fuel use (e.g., fuel for fixed equipment like the irrigation pumps vital for AWD water management) and (ii) mobile fuel use (e.g., fuel for machinery and vehicles handling Thai land preparation, planting, harvesting, and field transport).

The project applies emission factors in accordance with the VM0051: Improved Agricultural Land Management (v1.2) methodology, which specifies that default values from the IPCC 2006 Guidelines for National Greenhouse Gas Inventories or the 2019 Refinement shall be used in the absence of region-specific data. Calculations are to be found in the Excel spreadsheet.

4.2 Project Emissions

Project emissions in Thailand are calculated following the relevant methodology and the specific equations provided in Section 4.1. For the project scenario, monitored and verified practices such as Alternate Wetting and Drying (AWD) and related fuel-use parameters are substituted for historical baseline practices when determining emissions for each unit/stratum. Project emissions are measured over a 12-month monitoring cycle (data collection cycle) and are calculated using activity data from the monitoring system, including field records, surveys/logbooks, and QA/QC checks, alongside applicable default parameters.

All calculations, emission factors, and data inputs organized by stratum and monitoring period are documented in the project quantification Excel workbook, which is a core component of the Project Description and serves as auditable evidence for validation and verification.

4.3 Leakage Emissions

According to VM0051: Improved Management in Rice Production Systems, potential sources of leakage in improved rice management projects may arise from:

- The new application of organic amendments sourced from outside the project boundary that were not historically applied;
- Declines in rice yield as a result of project activities; and/or
- Diversion of biomass residues (e.g., rice straw or husk) that were previously used for bioenergy applications in the pre-project scenario.

In the case of this project, these leakage sources are considered unlikely for the following reasons:

- The project does not introduce new organic amendments from external sources. Organic inputs used under the project (e.g., composted straw or biochar) are produced locally within the project boundary from existing agricultural residues.
- Continuous monitoring and farmer training ensure that rice yields are maintained or improved under the new management practices, avoiding any displacement of production or economic activity.
- Biomass residues (mainly rice straw) previously not utilized for bioenergy will be either incorporated into the soil or processed into biochar within the same project area, ensuring no diversion of feedstock from existing bioenergy uses.

Therefore, leakage is not expected to occur under the Thailand Carbon Program.
However, should any of the above situations arise during implementation, the project will quantify leakage emissions in accordance with Section 8.3 of VM0051, following the applicable equations and parameters specified in the methodology. Specifically:

- If external organic amendments are introduced, emissions associated with their upstream production and transport will be quantified as per Equation 26 of VM0051;
- If a decline in rice yield is observed, the project will assess potential leakage through market substitution effects following Equation 27 or 28;
- If biomass residues are diverted from pre-project bioenergy uses, related leakage emissions will be calculated using the baseline for renewable fuel production ($LE_{BR,t}$) which is determined following procedures in CDM TOOL16 Project and Leakage Emissions from Biomass

All leakage calculations will use conservative assumptions and default emission factors as defined in VM0051 and IPCC 2019 Refinement. Monitoring data, yield records, and residue management logs will be maintained to demonstrate the absence or magnitude of any leakage throughout the crediting period.
Accordingly, the project complies with the requirements of the applied methodology and demonstrates that leakage risk is minimal and effectively managed.

4.4 Estimated GHG Emission Reductions and Carbon Dioxide Removals

The calculation of greenhouse gas (GHG) emission reductions for this project follows the VM0051: Improved Management in Rice Production Systems methodology. Ex-ante emission reductions are determined by applying VM0051 formulas and parameters to both baseline and project scenarios for every quantification unit and monitoring period. Baseline emissions represent the persistence of pre-project cultivation habits identified through historical assessments and surveys, whereas project emissions represent the monitored adoption of project practices (specifically AWD in eligible irrigated lowland fields), including required shifts in water management and input usage.

Net GHG benefits are calculated as the variance between baseline and project emissions for the sources and sinks specified under VM0051, following any necessary deductions like leakage. All ex-ante calculations, assumptions, and specific parameter values for the project are detailed in the project quantification Excel workbook, which is an integral part of this Project Description. The project focuses mainly on GHG emission reductions instead of CO_2 removals, and the anticipated calculation is as follows,

GHGs	Sources/Inputs	Equation used*	Reference	Output
ΔCO_2	Fossil fuel - Gasoline (L) - Diesel (L)	1, 2, 30	IPCC 2019 Refinement, Vol 2 Ch 3	ΔCO_2_ff
	Liming - Calcitic limestone ($CaCO_3$) (t) - Dolomite ($CaMg(CO_3)_2$) (t)	3, 4	Methodology	ΔCO_2_lime
ΔCH_4	Soil methanogenesis - water regime during the cultivation period - water regime in the pre-season before the cultivation period - Application rate of organic amendment Cultivation period of rice (days)	5, 6, 7, 8, 31	IPCC 2019 Refinement, Vol 4 Ch 5	ΔCH_4_soil
	Biomass burning - Mass of rice straw burned (kg)	17	IPCC (2019), Refinement, Vol 4 Ch 2	ΔCH_4_bb
ΔN_2O	N fertilizer - Total nitrogen as synthetic fertilizer (t N) - Total nitrogen as organic fertilizer (t N)	19, 20, 21, 22, 33	IPCC (2019), Refinement, Vol 4 Ch 11	ΔN_2O_soil
	Crop residues - Total dry mass of rice straw returned to soils (t dry mass) - Nitrogen content in dry mass of crop residue (t N/t dry mass)	19, 22, 33	IPCC (2019), Refinement, Vol 4 Ch 11	ΔN_2O_soil
	Biomass burning - Mass of rice straw burned (kg)	23	IPCC (2019), Refinement, Vol 4 Ch 2	ΔN_2O_bb

* Equations are used in accordance with Section 8 in the VM0051: Improved Agricultural Land Management (v1.2) methodology

** Fuel use under the project is categorized into two sources: (i) stationary fuel consumption (e.g., fuel used for fixed equipment such as irrigation pumps or generators) and (ii) mobile fuel consumption (e.g., fuel used by mobile machinery and vehicles for land preparation, planting, harvesting, and on-field transport)

According to the regional baseline assessment, the use of fuel-saving or conservation-tillage technologies is currently limited within the participating areas. As a result, the potential decrease in fossil-fuel usage is viewed as negligible and is not categorized as a primary project activity. Consequently, these emission reductions are omitted from the calculations to ensure a conservative accounting approach.

While managing crop residues and preventing open burning are central activities promoted by the project, their impact on greenhouse gas reduction is minimal compared to the mitigation of methane (CH_4) and nitrous oxide (N_2O) through improved AWD and nutrient management. Therefore, although the project maintains the "no-burn" practice as a vital sustainable intervention, this specific source is excluded from current GHG quantification to remain conservative in the estimations..

The assessment focuses on the primary emission pathways associated with paddy cultivation specifically:

- Reduction of CH_4 emissions through enhanced water-management practices, specifically AWD, and
- Reduction N_2O emissions by optimizing nitrogen management, mainly through lower synthetic fertilizer application rates.

Regarding N_2O emission quantification, only nitrogen from synthetic fertilizers is included, as it is the only factor projected to change in the project scenario. Nitrogen inputs from organic sources and crop residues are assumed to be identical in both baseline and project scenarios and do not impact net emission reductions. However, these factors will be tracked and documented to maintain transparency and facilitate recalculations if current assumptions change.

Emission reductions are determined by subtracting baseline emissions (bsl) from project emissions (wp). Net reductions are calculated using Equation (29) in VM0051 under Quantification Approach 3, with uncertainty deductions following the guidance in Section 8.6.4. Because this project utilizes Quantification Approach 3, which is capped at 60,000 t CO_2e annually, a 15% default uncertainty deduction for CH_4 and N_2O from soils must be applied..

The result of GHG emission reduction calculation is as follows:

Vintage period	Estimated baseline emissions (tCO_2e)	Estimated project emissions (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated reduction VCUs (tCO_2e)	Estimated removal VCUs (tCO_2e)	Estimated total VCUs (tCO_2e)
01/11/2025 to 31/10/2026	151,786	96,126	*0*	55,660	*0*	55,660
01/11/2026 to 31/10/2027	161,206	102,560	*0*	58,646	*0*	58,646
01/11/2027 to 31/10/2028	161,206	102,560	*0*	58,646	*0*	58,646
01/11/2028 to 31/10/2029	161,206	102,560	*0*	58,646	*0*	58,646
01/11/2029 to 31/10/2030	161,206	102,560	*0*	58,646	*0*	58,646
01/11/2030 to 31/10/2031	161,206	102,560	*0*	58,646	*0*	58,646
01/11/2031 to 31/10/2032	161,206	102,560	*0*	58,646	*0*	58,646
Total	**1,119,019**	**711,484**	0	407,535	0	407,535

In practice, if monitoring results indicate that there have been changes in other nitrogen sources (e.g., increased use of organic amendments or changes in residue incorporation practices) or significant change in fossil fuel uses, the emission calculations will be updated accordingly following the procedures and equations defined in the table shown above. This ensures that the quantification remains complete and accurate under any revised conditions.

For projects required to assess permanence risk:

i) Provide the requested information using the table below:

State the non-permanence risk rating (%)	*Example: 20%*
Has the non-permanence risk report been attached as either an appendix or a separate document?	☐ Yes ☐ No
For ARR and IFM projects with harvesting, state, in tCO_2e, the Long-term Average (LTA).	
Has the LTA been updated based on monitored data, if applicable?	☐ Yes ☐ No If no, provide justification.
State, in tCO_2e, the expected total GHG benefit to date.	
Is the number of GHG credits issued below the LTA?	☐ Yes ☐ No If no, provide justification.

ii) Complete the table below for the project crediting period. Note that the buffer pool allocation is split proportionally between the estimated reductions and removals. (For example, if a project is estimated to achieve 20,000 tCO_2e removals and 80,000 tCO_2e reductions and has a buffer contribution of 20%, or 20,000, the estimated removal VCUs would be 16,000 and reduction VCUs would be 64,000).

Vintage period	Estimated baseline emissions (tCO_2e)	Estimated project emissions (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated buffer pool allocation (tCO_2e)	Estimated reduction VCUs (tCO_2e)	Estimated removal VCUs (tCO_2e)	Estimated total VCU issuance (tCO_2e)
DD-MMM-YYYY to 31-Dec-YYYY	*Example:* *50,000*	*Example:* *20,000*	*Example:* *10,000*	*Example:* *4,000*	*Example:* *8,000*	*Example:* *8,000*	*Example:* *16,000*
01-Jan-YYYY to 31-Dec-YYYY							
01-Jan-YYYY to DD-MMM-YYYY							
Total							

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	$FFC_{bsl,i,j,t}$
Data unit	liters
Description	Consumption of fossil fuel type j for quantification unit i in year t in the baseline scenario
Source of data	The regional baseline assessment report was carried out by Rajamangala University of Technology Lanna prior to the project's commencement, complemented by farmer-level baseline data gathered by trained FarmPro field staff during onboarding and practice verification. This process ensures that the historical cultivation data and baseline practices are accurately confirmed and documented before the implementation of AWD protocols.
Value applied	As mentioned in the baseline assessment report
Justification of choice of data or description of measurement methods and procedures applied	Fuel usage is documented in liters according to fuel type (j) and categorized into two main groups: (i) stationary fuel consumption, such as for irrigation pumps and fixed machinery, and (ii) mobile fuel consumption, including tractors, tillers, harvesters, and other equipment utilized for land preparation, planting, harvesting, and field transport. This specific classification ensures comprehensive tracking and eliminates the risk of double counting. **Data collection:** Where available, baseline liter totals are gathered via structured interviews with farmers and/or their personal logbooks, backed by supporting documents like fuel receipts, farm ledgers, or invoices from service providers. FarmPro personnel document the specific timeframe, the associated equipment or task, and the total land area (ha) to maintain full traceability for the project. **Fallback estimation approach:** In cases where farmers cannot accurately provide liter measurements, field officers gather operational data to estimate fuel consumption via transparent proxies. These include (i) the type and rated power of the equipment, (ii) the age and condition of the machine as a proxy for fuel efficiency, (iii) total operating hours or frequency of tasks, and (iv) the specific area (ha) managed. For stationary machinery, fuel consumption is calculated by multiplying operating hours by the fuel consumption rate (L/hour) specific to the engine type; for mobile equipment, estimates are based on the frequency of

	operations and area-based factors (L/ha). Fuel efficiency values are obtained from peer-reviewed literature or IPCC guidance (2019 Refinement), using conservative assumptions to ensure baseline fuel usage is not overestimated. **QA/QC:** The project proponent implements QA/QC procedures to minimize recall bias and maintain auditability, which include (i) thorough completeness checks of all interview forms, (ii) cross-verification with available supporting documentation, (iii) internal consistency reviews of reported land areas, machinery types, and field operations, and (iv) statistical screening to identify outliers within cluster-level data. If irregular values are detected, FarmPro personnel perform follow-up verifications with farmers or service providers to validate or adjust the information. In cases where historical data from earlier cropping seasons exists, the reported fuel consumption is cross-referenced against past practice records to ensure the data remains plausible.
Purpose of data	Calculation of baseline emissions
Comments	Fuel efficiency may be obtained from peer-reviewed studies or the most recent version of the IPCC guidelines (Volume 2, Chapter 3).

Data / Parameter	$M_{limestone,bsl,i,t}$ $M_{dolomite,bsl,i,t}$
Data unit	tonnes
Description	Amount of calcitic limestone ($CaCO_3$) applied to quantification unit i in year t in the baseline scenario Amount of dolomite ($CaMg(CO_3)_2$) applied to quantification unit i in year t in the baseline scenario
Source of data	The regional baseline assessment report was executed by Rajamangala University of Technology Lanna before the project's official start date, potentially supplemented by farmer-specific baseline data gathered by qualified FarmPro field personnel during the onboarding process and the verification of baseline practices. This dual approach ensures that historical data and current agricultural methods are accurately documented before implementing AWD protocols.
Value applied	As mentioned in the baseline assessment report
Justification of choice of data or description of	The application of liming materials in the baseline scenario is documented as mass (t) based on the specific material type,

measurement methods and procedures applied	separated into: (i) calcitic limestone ($CaCO_3$) for $M_{limestone,bsl,i,t}$ and (ii) dolomite ($CaMg(CO_3)_2$) for $M_{dolomite,bsl,i,t}$. This classification ensures the accurate parameterization of baseline CO_2 emissions resulting from liming and avoids any double counting between the different types of lime materials. **Data collection:** Where available, baseline quantities of applied liming materials are gathered through structured interviews with farmers and/or their personal logbooks, supplemented by supporting documentation such as purchase receipts, supplier invoices, delivery notes, or farm ledgers. FarmPro personnel document the specific timeframe (season/year t), the timing of application events, the total treated area (ha), and the material specifications (including product names and, if available, $CaCO_3$-equivalent or label composition) to maintain full traceability at the quantification unit level. **Fallback estimation approach:** In cases where farmers cannot accurately report the applied mass, field officers gather transparent operational proxies to estimate the quantity of materials, including: (i) the total number of bags used, (ii) the weight per bag (kg), (iii) the frequency of application, and (iv) the specific area treated (ha). If the material composition is not formally documented, the project adopts a conservative approach by categorizing the material into the most likely group either calcitic limestone or dolomite based on product labels or supplier verification, while documenting the reasoning for this choice. Should liming not be practiced or if evidence is unavailable, the baseline value is conservatively set to zero for that specific period or quantification unit. **QA/QC:** The project proponent implements QA/QC procedures to maintain auditability, which include: (i) thorough completeness reviews of interview forms, (ii) cross-verification with available supporting documentation, (iii) internal consistency checks of reported land areas, bag counts, bag weights, and application schedules, and (iv) statistical screening to identify outliers within cluster-level data. If irregular values are detected, FarmPro personnel perform follow-up verifications with farmers or suppliers to validate or adjust the reported amounts. In cases where historical data from earlier cropping seasons exists, liming quantities are cross-referenced against past practice records to ensure the data remains plausible.
Purpose of data	Calculation of baseline and project emissions
Comments	For all equations, the subscript bsl must be substituted by wp where the relevant values are being quantified for the monitoring period.

Data / Parameter	GWP_{CH_4}
Data unit	$CO_2e/t\ CH_4$
Description	Global warming potential for methane
Source of data	IPCC Fifth Assessment Report (IPCC, 2014)
Value applied	28
Justification of choice of data or description of measurement methods and procedures applied	In accordance with VCS Standard v4.7, Section 3.15.4, all emission reductions and removals occurring on or after 1 January 2021 must be converted to CO_2e using GWP values from the IPCC Fifth Assessment Report (AR5) for both ex-ante (validation) and ex-post (verification) calculations. Therefore, the project applies GWP(CH_4) = 28 (100-year time horizon, AR5) as the required and consistent conversion factor throughout the Project Description and subsequent monitoring periods involving AWD.
Purpose of data	Calculation of baseline and project emissions
Comments	None

Data / Parameter	$EF_{bsl,c}$
Data unit	kg CH_4/ha/day
Description	Baseline methane emission factor for continuously flooded fields without organic amendments
Source of data	IPCC guidelines (2019), volume 4, chapter 5.5, Table 5.11
Value applied	Regional value of Southeast Asia – 1.22 kg CH_4/ha/day
Justification of choice of data or description of measurement methods and procedures applied	The baseline methane emission factor is utilized as the IPCC 2019 Refinement default for continuously flooded rice fields lacking organic amendments, as specified in Volume 4, Chapter 5 (Table 5.11). The project adopts the regional default for Southeast Asia (1.22 kg CH_4/ha/day) because (i) there is no verified Tier 2 emission factor applicable to the specific project conditions available at the time of validation, and (ii) the IPCC regional figure is the most reliable Tier 1 default that meets VM0051 requirements for baseline quantification. Following the IPCC hierarchy for defaults and the project's conservative strategy, regional defaults are applied consistently for both

	baseline and AWD project scenarios unless eligible, validated country-specific factors are officially adopted according to the methodology.
Purpose of data	Calculation of baseline and project emissions
Comments	Default values are to be considered at a country-specific, regional, and global level, listed here in descending order of preference.

Data / Parameter	$SC_{bsl,w}$
Data unit	unitless
Description	Baseline scaling factor of account for differences in water regime during the cultivation period
Source of data	Most recent version of IPCC guidelines (Table 5.12, Chapter 5, Volume 4)
Value applied	Value depends on water regime employed. Values from IPCC (2019) are: - Continuously flooded: 1 - Single drainage period: 0.71 - Multiple drainage periods: 0.55
Justification of choice of data or description of measurement methods and procedures applied	The baseline scaling factor $SC_{bsl,w}$ is applied using the IPCC 2019 Refinement default scaling factors that adjust methane emissions for variations in the water regime during the cultivation period, as specified in Volume 4, Chapter 5, Table 5.12. The project adopts these factors as they represent the most current, internationally accepted Tier 1 defaults for rice water management and align with the VM0051 quantification framework when country-specific scaling factors are unavailable at validation. Baseline water-regime categories such as continuously flooded, single drainage, or multiple drainage are identified through farmer baseline surveys and historical look-back assessments, with the corresponding IPCC scaling factor applied transparently for each stratum. This same IPCC-based scaling approach is utilized in the project scenario (wp) using monitored water-regime data, specifically for AWD, ensuring methodological consistency between baseline and project calculations.
Purpose of data	Calculation of baseline and project emissions

Comments	For all equations, the subscript *bsl* must be substituted by *wp* where the relevant values are being quantified for the monitoring period.

Data / Parameter	$SC_{bsl,p}$
Data unit	Unitless
Description	Baseline scaling factor to account for differences in water regime in the pre-season before the cultivation period
Source of data	Most recent version of IPCC guidelines (Table 5.13, Chapter 5, Volume 4)
Value applied	Value deepens on water regime employed. Values from IPCC (2019) are: - Non-flooded pre-season<180 days (indicating double cropping): 1.00 - Non flooded pre-season>180 days (indicating single cropping): 0.89
Justification of choice of data or description of measurement methods and procedures applied	The baseline pre-season scaling factor $SC_{bsl,p}$ is applied using the IPCC 2019 Refinement default scaling factors to adjust methane emissions based on water regime differences prior to the cultivation period, as specified in Volume 4, Chapter 5, Table 5.13. These IPCC factors represent the most current internationally accepted Tier 1 defaults and are utilized because no verified country-specific pre-season scaling factors for these project conditions are available at validation, aligning with VM0051 quantification principles. The pre-season water-regime category (either less than or more than 180 days non-flooded) is identified through farmer baseline surveys and historical look-back assessments for each stratum, with the corresponding IPCC scaling factor (1.00 or 0.89) applied transparently. This same methodology is utilized in the project scenario (wp) using monitored pre-season water-regime data, such as for AWD, ensuring methodological consistency between baseline and project calculations.
Purpose of data	Calculation of baseline and project emissions
Comments	For all equations, the subscript *bsl* must be substituted by *wp* where the relevant values are being quantified for the monitoring period.

Data / Parameter	$CFOA_a$
Data unit	Unitless
Description	Conversion factor for organic amendment type a
Source of data	Most recent version of IPCC guidelines (Table 5.14, Chapter 5, Volume 4)
Value applied	Value depends on organic amendment type applied (see Section 8.2.3)
Justification of choice of data or description of measurement methods and procedures applied	The conversion factor for organic amendment type $CFOA_a$ is applied using the IPCC 2019 Refinement default conversion factors for rice systems, as provided in Volume 4, Chapter 5, Table 5.14. These factors represent the most recent internationally accepted Tier 1 defaults and are utilized because no validated, project-applicable country-specific conversion factors are available at validation, which is consistent with the hierarchy of data sources under VM0051 and IPCC guidance. The project identifies the specific organic amendment type (a) through farmer baseline surveys and monitored project records such as on-season or off-season straw, green manure, farmyard manure, or compost and applies the relevant IPCC conversion factor as detailed in Section 8.2.3 of the quantification approach. This method ensures a transparent and consistent treatment of organic amendments for both baseline and AWD project scenarios.
Purpose of data	Calculation of baseline and project emissions
Comments	None

Data / Parameter	$MB_{bsl,i,t}$
Data unit	Kg
Description	Mass of rice straw burned of quantification unit *i* in year *t* in the baseline scenario
Source of data	Regional baseline assessment report conducted by Rajamangala University of Technology Lanna, Thailand, prior to the project start date and/or farmer-level baseline data collection conducted by trained FarmPro field staff during farmer onboarding and baseline practice confirmation.
Value applied	As mentioned in the baseline assessment report

Justification of choice of data or description of measurement methods and procedures applied	The baseline residue burning for $MB_{bsl,i,t}$ instruments specifically records (a) whether the practice of burning rice straw is utilized (Yes/No) and (b) the calculated portion of straw that is burned (burning fraction) for the specific season or year. This data collection allows for a transparent and field-specific measurement of burned residues within the context of AWD management. **Data collection:** The field officers gather data on residue management through structured interviews and baseline forms, documenting: (i) whether burning is practiced (Yes/No), (ii) the timing (e.g., post-harvest), and (iii) the specific burning fraction (percentage of straw burned) if burning occurs. When possible, these responses are validated using supporting evidence such as farmer records, confirmations of local practices, and field observations during baseline assessments for AWD implementation. **Quantification approach:** In cases where farmers do not directly report the mass of burned residues, $MB_{bsl,i,t}$ is estimated using documented proxies that align with IPCC concepts. This is achieved by combining: (i) the total amount of straw available in the field, calculated from the harvested area and biomass proxies like grain yield and straw-to-grain ratios, (ii) the portion of straw left in the field after any removal or alternate use, and (iii) the specific burning fraction identified in the baseline survey. The calculation parameters, including the use of dry versus fresh mass and any applied default ratios, are documented and consistently maintained for each stratum and quantification unit involved in the AWD project.. **QA/QC:** To reduce recall bias and ensure data integrity, the project implements rigorous QA/QC procedures, including completeness checks, internal consistency reviews, and outlier screening across all farms and clusters. Logical consistency rules are strictly enforced as follows: • If burning is reported as "No," the burning fraction is set to 0, and $MB_{bsl,i,t} = 0$. • If burning is reported as "Yes," the burning fraction must fall between 0-100%. Any inconsistencies such as a "Yes" response with 0% or a "No" response with a positive percentage trigger immediate follow-up verification. Where unusually high values are reported, FarmPro personnel conduct secondary verifications with the farmer or local focal points. To prevent the overestimation of baseline burning and

	subsequent over-crediting, burning is only accounted for when the baseline evidence is credible. Conservative assumptions, such as utilizing lower-bound fractions or conservative biomass proxies, are applied if uncertainty persists. All baseline survey instruments, forms, supporting evidence, and calculation sheets are maintained as auditable records for validation and verification. Furthermore, the project utilizes a GIS-based verification approach to corroborate reported residue burning. When feasible, the project screens for active fire detections or burn-scar indicators using publicly available satellite products over the project area during post-harvest periods. These signals are cross-checked against reported burning locations and dates. GIS outputs including maps, time-stamped screenshots, and spatial overlays with field boundaries are retained as supporting evidence. This GIS screening serves as a corroborative QA/QC tool and complements, rather than replaces, field- and farmer-based evidence; if discrepancies are identified, targeted follow-up verification is conducted to ensure the accuracy of the AWD project data.
Purpose of data	Calculation of baseline and project emissions
Comments	For all equations, the subscript *bsl* must be substituted by *wp* where the relevant values are being quantified for the monitoring period.

Data / Parameter	GWP_{N2O}
Data unit	tCO_2e/tN_2O
Description	Global warming potential for nitrous oxide
Source of data	IPCC Fifth Assessment Report (IPCC, 2014)
Value applied	265
Justification of choice of data or description of measurement methods and procedures applied	In accordance with VCS Standard v4.7, Section 3.15.4, all emission reductions and removals occurring on or after 1 January 2021 must be converted to CO_2e using GWP values from the IPCC Fifth Assessment Report (AR5) for both ex-ante (validation) and ex-post (verification) calculations. Therefore, the project applies GWP(N_2O) = 265 (100-year time horizon, AR5) as the required and consistent conversion factor throughout the Project Description and subsequent monitoring periods. This ensures that nitrous oxide reductions resulting from optimized

	nutrient management in AWD systems are accurately and conservatively reflected in the total carbon credit quantification.
Purpose of data	Calculation of baseline and project emissions
Comments	None

Data / Parameter	CF_{N2O}
Data unit	Kg N_2O/kg N-input
Description	N_2O correction factor for calculation N_2O emissions flux due to period of drying on rice fields
Source of data	The correction factor is derived from the emission factors (kgN_2O - N/t N) from the most recent version of Table 11.1 (Update) in Chapter 11, Volume 4 in the IPCC guidelines. The difference between the aggregated default value emission factors continuously flooded rice fields and rice fields with single or multiple drainage was converted from N_2O-N into N_2O emissions.
Value applied	0.00314 (IPCC 2019)
Justification of choice of data or description of measurement methods and procedures applied	The correction factor CF_{N2O} is derived from the IPCC 2019 Refinement default emission factors for direct N_2O emissions from managed soils, as presented in Volume 4, Chapter 11 (Table 11.1-Update). In the absence of validated, country-specific correction factors applicable to the project conditions at the time of validation, the project adopts this IPCC-based factor as the most recent internationally accepted Tier 1 default. The value is determined by calculating the difference between the aggregated default emission factors for continuously flooded rice and rice subjected to drainage (whether single or multiple drainage periods). This figure is then converted from N_2O–N to N_2O using the molecular weight conversion factor of 44/28. This approach provides a transparent representation of the incremental N_2O emissions associated with soil aeration during drying events and is applied consistently across both baseline and AWD project scenarios, in strict accordance with the methodology's quantification procedures.
Purpose of data	Calculation of baseline and project emissions
Comments	None

Data / Parameter	P_{bsl}
Data unit	Output/ha
Description	Average rice yield during the historical look-back period

Source of data	Regional baseline assessment report conducted by Rajamangala University of Technology Lanna, Thailand, prior to the project start date and/or farmer-level baseline data collection conducted by trained FarmPro field staff during farmer onboarding and baseline practice confirmation.
Value applied	As mentioned in the baseline assessment report
Justification of choice of data or description of measurement methods and procedures applied	Baseline rice yield P_{bsl} is derived from the Baseline Assessment Report prepared prior to the project start date, based on farmer practice information collected during the historical look-back assessment. In accordance with the methodology guidance (Section 8.4.2), the project determines average crop productivity using a minimum three-year look-back period, ensuring that the value represents typical baseline performance rather than an anomalous single year.Where available, yield information is supported by farmer records such as harvest notes, sales or warehouse receipts, or farm accounts and cross-checked for plausibility against local agronomic conditions and cluster-level distributions. Any outliers are reviewed and corrected through follow-up verification. The resulting average yield is applied consistently as the baseline productivity parameter for leakage calculations within the AWD framework.
Purpose of data	Calculation of leakage
Comments	For all equations, the subscript *bsl* must be substituted by *wp* where the relevant values are being quantified for the monitoring period.

Data / Parameter	RP_{bsl}
Data unit	Output/ha
Description	Average regional rice yield during the historical look-back period
Source of data	Baseline assessment report conducted by Rajamangala University of Technology Lanna, Thailand, prior to the project start date
Value applied	As mentioned in the baseline assessment report
Justification of choice of data or description of measurement methods and procedures applied	The regional baseline rice yield RP_{bsl} is derived from the Regional Baseline Assessment Report prepared prior to the project start date. It represents the average regional productivity over the historical look-back period, as required by the leakage guidance in Section 8.4.2 of the methodology. To reflect typical baseline conditions and reduce sensitivity to inter-annual variability, the regional yield is established using a minimum three-year look-back period. This is calculated as an area-weighted average for the applicable project region or cluster.

	Where available, these regional yield estimates are supported by aggregated survey results and cross-checked for plausibility against recognized regional statistics or market and warehouse records. Any anomalous values identified during this process are investigated and corrected through documented QA/QC procedures to ensure the integrity of the AWD project's leakage calculations.
Purpose of data	Calculation of leakage
Comments	It is anticipated that leakage will be both unlikely and negligible for this project. Nonetheless, adhering to a conservative approach, the project will consistently collect and maintain baseline and monitoring data regarding farm- and regional-level productivity, along with other relevant indicators, throughout the implementation phase. This proactive data management ensures that any potential leakage should it emerge from unforeseen shifts in management, land use, or production dynamics can be transparently identified, assessed, and quantified within the project framework.

5.2 Data and Parameters Monitored

Data / Parameter	Ai
Data unit	ha
Description	Area of quantification unit i
Source of data	Measurement of each quantification unit within the project area
Description of measurement methods and procedures to be applied	The quantification unit area is measured prior to verification.
Frequency of monitoring/recording	Monitoring must be conducted each season.
Value applied	7,376
Monitoring equipment	A Geographic Information System (GIS) is utilized to delineate and maintain the specific boundaries and surface areas of each quantification unit. This spatial framework is supported by: • Geo-registered Imagery: The use of satellite or aerial imagery time-stamped whenever available to provide a visual and chronological record of the project area. • Field Verification: Boundary accuracy is ensured through ground surveys using GPS-enabled mobile devices or high-precision GNSS receivers during site visits. • Project Reference Layers: Integration of administrative boundaries, irrigation infrastructure, and physical landmarks

	(such as roads or canals) to facilitate consistent georeferencing and robust change detection over time. This GIS infrastructure serves as the digital backbone for the AWD project, ensuring that emission reductions are attributed to precisely defined and verifiable land parcels.
QA/QC procedures to be applied	Quantification unit boundaries are delineated as GIS polygons in accordance with a documented boundary-mapping protocol. To ensure spatial accuracy, all imagery and GIS datasets are geo-registered and referenced to stable control features such as corner points, road or canal intersections, and permanent landmarks and processed using a consistent coordinate reference system. Where feasible, boundaries undergo cross-verification using multiple data sources, including satellite imagery and ground survey points. Any material discrepancies identified during this process are investigated and rectified through follow-up field visits and direct farmer confirmation. Boundaries are reviewed every season to capture any structural changes, such as field splitting/ merging, boundary shifts, land-use changes. All updates are documented with a clear audit trail that includes the date, the reason for the change, and supporting evidence like imagery screenshots or GPS records. Total land area is calculated directly from the polygon geometry and recorded in hectares (ha). If data is collected in alternative local units, it is converted to hectares using documented conversion factors and then cross-verified against the GIS-calculated area to ensure precision for project reporting.
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	Other units used to determine area (e.g., acres) must be converted to hectares.

Data / Parameter	$EF_{CO2,j}$
Data unit	t CO_2e/liter
Description	Emission factor for combustion of fossil fuel type j
Source of data	Most recent version of IPCC guidelines (Table 3.3.1 in Chapter 3, Volume 2)

Description of measurement methods and procedures to be applied	The emission factor $EF_{CO2,j}$ is not measured directly in the field; instead, it is a default value representing CO_2 emissions from the combustion of fossil fuel type j. This factor is applied in accordance with the IPCC 2019 Refinement (Volume 2, Chapter 3, Table 3.3.1). The project utilizes these IPCC default factors expressed on a per-liter basis to align with the activity data unit used for fuel consumption. These values are applied consistently to both baseline and project fuel usage covering both stationary and mobile sources to quantify total CO_2 emissions from combustion. Should more precise, project-applicable national factors be published by authoritative sources (such as government agencies using IPCC-consistent methodologies), the project will adopt them following the update requirements. Throughout any single monitoring period, the application of these factors remains consistent to ensure the integrity of the project emission reduction calculations.
Frequency of monitoring/recording	Source of data for emission factor must be monitored every five years and must be updated when more accurate data applicable to the project conditions become available.
Value applied	To be determine
Monitoring equipment	N/A
QA/QC procedures to be applied	The emission factors are sourced directly from the IPCC 2019 Refinement (Vol. 2, Ch. 3, Table 3.3.1) and are explicitly referenced within both the Project Description (PD) and the associated calculation workbook. To maintain a robust audit trail, the project archives the specific source document version, publication year, and the exact table utilized. The $EF_{CO2,j}$ values are applied consistently throughout each monitoring period to prevent any mathematical inconsistencies or fluctuations in reporting. A five-year review cycle is implemented to determine if updated IPCC values or more accurate, authoritative country-specific factors have been released. Should an update be adopted: • The change is fully documented, including the source, rationale, and effective date. • The new factors are applied prospectively, ensuring compliance with methodology requirements. The calculation workbook incorporates rigorous unit checks to verify that $EF_{CO2,j}$ (t CO_2/liter) is correctly applied to fuel consumption data (liters). Furthermore, the system is designed to prevent double counting between stationary and mobile fuel categories, ensuring a precise quantification of emissions within the project framework.

Purpose of data	Calculation of baseline and project emissions
Calculation method	The IPCC CO_2 emission factor on an energy basis (kg CO_2/TJ, NCV basis) is converted to a volume-based factor (**tCO_2/L**) consistent with fuel activity data recorded in liters by using IPCC net calorific values (NCV, TJ/Gg) and fuel density (ρ, kg/m³) from SEAI* (converted to kg/L). * Sustainable Energy Authority of Ireland. (n.d.). *Conversion factors*. https://www.seai.ie/data-and-insights/seai-statistics/conversion-factors
Comments	-

Data / Parameter	$EF_{limestone}$ $EF_{dolomlite}$
Data unit	t C/t limestone t C/t dolomite
Description	Emission factor for calcitic limestone ($CaCO_3$) Emission factor for dolomite ($CaMg(CO_3)_2$)
Source of data	Most recent version of IPCC guidelines (Section 11.3, Chapter 11,Volume 4)
Description of measurement methods and procedures to be applied	IPCC (2019) values: • $EF_{limestone}$ = 0.12 t C/t limestone • $EF_{dolomlite}$= 0.13 t C/t dolomite
Frequency of monitoring/recording	Source of data for emission factor must be monitored every five years and must be updated when more accurate data applicable to the project conditions become available.
Value applied	To be determined
Monitoring equipment	N/A
QA/QC procedures to be applied	The emission factors for liming are sourced directly from the IPCC 2019 Refinement (AFOLU, Volume 4, Chapter 11, Section 11.3). The specific source sections and tables used are explicitly referenced within the Project Description (PD) and the calculation workbook to ensure full transparency. The project maintains a rigorous record-keeping system that includes the publication year and version of the IPCC source, retaining a physical copy or stable link within the project documentation. To maintain accuracy:

	• Five-Year Review: Emission factors undergo a formal review at least every five years, or sooner if updated authoritative factors are released. • Prospective Application: Any updates to these factors are documented with a clear rationale and effective date, then applied prospectively in accordance with methodology requirements. The calculation workbook incorporates automated unit checks to ensure high data quality for AWD reporting. These checks verify that: (i) Material Quantities: Recorded accurately in tonnes (t) of limestone and tonnes (t) of dolomite. (ii) Emission Factors (EF): Applied correctly as t C/t of material. iii) Molecular Conversion: The conversion from tonnes of Carbon (t C) to tonnes of Carbon Dioxide (t CO_2) achieved by multiplying by 44/12 is applied correctly where emissions are reported in CO_2e. To avoid methodological inconsistencies, the same EF values are applied to both baseline and project periods within a single monitoring period. The specific material type (calcitic limestone vs. dolomite) is verified against baseline and monitoring records, such as product labels, supplier invoices, or farmer input logs. All references, parameter values, and unit conversion steps are locked within the calculation workbook. This setup features clear cell references and a comprehensive change log; any updates to parameters are flagged and documented in the monitoring/ verification package for VVB (Validation and Verification Body) review.
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	None

Data / Parameter	$f(CH_{4_{soil_{bsl,i,t}}})$
Data unit	t CH_4/ha
Description	N/A
Source of data	N/A

Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	N/A
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	N/A
Calculation method	N/A
Comments	Not applicable for Quantification 3 – Default Value

Data / Parameter	ROA_a
Data unit	t/ha
Description	Application rate of organic amendment type a, in dry weight of straw and fresh weight for others
Source of data	Management records from project area
Description of measurement methods and procedures to be applied	The application rate of organic amendment type a (ROA_a, in t/ha) is determined each season using management records within the project area. Organic amendments are categorized into defined types, such as on-season/off-season straw, green manure, farmyard manure, compost, or none. The project records ROA using the correct mass basis: dry weight for rice straw and fresh weight for non-straw amendments (e.g., green manure, farmyard manure, compost), maintaining consistency with the methodology requirements (Box 1). ROA is calculated by dividing the total mass of amendment applied or returned to the field by the treated area (ha) for each quantification unit or stratum. In cases where the baseline scenario requires an assumed straw incorporation rate (e.g., 5 t/ha) due to a lack of farmer-specific baseline data, this default is applied transparently.

	This baseline value is only updated if monitored project records provide evidence of a material change in biomass management between the baseline and project scenarios, such as an increase in the total biomass returned to the soils under project management.
Frequency of monitoring/recording	Monitoring must be conducted each season.
Value applied	To be determined
Monitoring equipment	The application rate of organic amendments ROA is monitored using farmer activity logbooks, which are supported by FarmPro field staff records and, where available, documentary evidence such as input purchase receipts, supplier invoices, transport/ delivery notes, and field verification checklists. To ensure area confirmation and correct linkage to each specific field or unit, ROA records are cross-referenced with the project's GIS field registry and unique field IDs. Where feasible, photo documentation of amendment delivery or application is utilized to further strengthen traceability within the project framework.
QA/QC procedures to be applied	All involved parties adhere to the methodology requirements outlined in Box 2, supported by project QA/QC procedures to ensure completeness, consistency, and auditability. These QA/QC measures include: • Systematic checks of farmer logbooks to verify amendment type, quantity, date, and specific field/area. • Rigorous unit checks to ensure the correct mass basis is applied dry weight for rice straw and fresh weight for all other organic amendments. • Verification of reported quantities against available supporting documents, such as purchase receipts, supplier invoices, and delivery records. • Validation across reported land area (ha), the number of bags or loads used, and established typical application ranges for the region. • Statistical screening across farmers and strata; any significant deviations trigger immediate follow-up verification by FarmPro staff. In cases where ROA cannot be reliably evidenced, a conservative treatment is applied for example, recording ROA as zero for that specific amendment type or using a lower-bound value consistent with documented local practices. Corrective data collection is then prioritized in subsequent monitoring cycles. All primary records, including logbooks, supporting documentation, and verification forms, are retained as

	permanent, auditable evidence for VVB validation and verification within the project framework.
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	In Box 1, in the baseline scenario, 5 t/ha of straw is assumed. This should be adjusted where material changes in biomass management occur in the project, such as increased biomass to soils.

Data / Parameter	L_t
Data unit	days
Description	Cultivation period of rice in year t
Source of data	Farm management records In circumstances where climatic conditions result in a monitoring period's cultivation period lasting longer than the baseline cultivation period, project proponents may set the baseline cultivation period duration as the actual number of days in the cultivation period during the monitoring period.
Description of measurement methods and procedures to be applied	The cultivation period L_t (days) is determined in accordance with the methodology requirements (Box 1). For each monitoring period and quantification unit/field, the cultivation period is defined as the total number of days from the initiation of land preparation through to the later of (i) harvest or (ii) post-season drainage, consistent with VM0051. The project records the specific event dates and calculates L_t as a simple date difference (end date – start date + 1 day). In circumstances where climatic conditions cause the cultivation duration during the monitoring period to exceed the baseline cultivation period, the project exercises the methodology option to set the baseline cultivation period equal to the actual cultivation period observed. This ensures a conservative and consistent quantification of emission reductions under the project framework.
Frequency of monitoring/recording	Monitoring must be conducted each season.
Value applied	To be determined
Monitoring equipment	The cultivation period L_t is monitored using farmer activity logbooks available in both paper and digital formats supported

	by FarmPro field monitoring tools. This comprehensive monitoring suite includes standardized field forms, checklists, and time-stamped notes from supervision visits. Where feasible, the project employs digital timestamping via mobile data capture to enhance accuracy. For each specific field or quantification unit, key milestone dates are meticulously recorded, including: • land preparation • crop establishment • harvest • post-season drainage. All recorded dates are directly linked to the project's central field registry using unique field IDs and GIS references where applicable. This systematic approach ensures that the duration of AWD management is precisely tracked and verifiable for each cultivation cycle.
QA/QC procedures to be applied	QA/QC procedures align with the requirements of Box 1 and include: (i) Completeness checks to verify that all critical event dates have been fully recorded; (ii) Logical consistency checks on the sequence of events (e.g., ensuring land preparation occurs before establishment, harvest follows establishment, and post-season drainage is correctly timed); (iii) Range checks against standard crop calendars for each cluster or zone, including outlier screening and follow-up verification for any reported durations that are unusually short or long; (iv) Cross-verification against available supporting evidence, such as service-provider receipts, field visit logs, and irrigation or drainage records; (v) Maturity cross-checks, where the reported cultivation period is compared against the expected maturity timeframe of the specific rice variety planted under local conditions. In instances where the recorded L_t falls outside the typical varietal range, the project performs follow-up verification—which may include reviewing logbook entries, interviewing farmers for clarification, or inspecting supporting documents like harvest receipts. All confirmed adjustments are documented to maintain a transparent audit trail for the final value.
Purpose of data	Calculation of baseline and project emissions

Calculation method	N/A
Comments	None

Data / Parameter	CF_r
Data unit	fraction
Description	Combustion factor for rice straw expressed as proportion of pre-fire fuel biomass consumed
Source of data	The combustion factor is sourced from the IPCC 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4 (AFOLU), Chapter 2, Table 2.6, which provides default combustion (fuel consumption) factors for biomass burning. This represents the most recent internationally accepted Tier 1 default for the proportion of pre-fire fuel biomass consumed during open burning of crop residues.
Description of measurement methods and procedures to be applied	CF_r is a default parameter and is not measured at field level.
Frequency of monitoring/recording	Source of data for the emission factor must be monitored every five years and updated when more accurate data applicable to project conditions become available.
Value applied	0.80
Monitoring equipment	N/A
QA/QC procedures to be applied	To ensure the accuracy and reliability of the combustion factor, the project implements the following QA/QC measures: (i) Confirm that the value utilized is sourced directly from the IPCC 2019 Refinement (Vol. 4, Ch. 2, Table 2.6) and has been accurately transcribed into the project's calculation workbook; (ii) Maintain a comprehensive record of the IPCC source version, including a copy or stable link within the permanent project files; (iii) Apply the same combustion factor uniformly across all calculations within a given monitoring period to prevent mathematical or reporting inconsistencies; (iv) Conduct a formal review of the parameter at least every five years or sooner if updated authoritative values are released documenting all changes (including source, rationale, and effective date) for prospective application.

	Furthermore, where supplemental quality checks are necessary for burning-related estimations, the project adheres to the IPCC Good Practice Guidance for emissions from biomass burning. This includes rigorous QA/QC oversight of input data and ensuring calculation consistency in alignment with established IPCC principles for the AWD framework.
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	None

Data / Parameter	EF_{CH4}
Data unit	g CH_4/kg dry matter burned
Description	Methane emission factor for the burning of rice straw
Source of data	The methane emission factor for rice straw burning is sourced from the IPCC 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4 (AFOLU), Chapter 2, Table 2.5, which provides default emission factors for open burning of biomass/crop residues. This represents the most recent internationally accepted Tier 1 default for CH_4 emissions per unit of dry matter burned.
Description of measurement methods and procedures to be applied	EF_{CH4} is a default parameter and is not measured at field level.
Frequency of monitoring/recording	Source of data for the emission factor must be monitored every five years and updated when more accurate data applicable to project conditions become available.
Value applied	2.7
Monitoring equipment	N/A
QA/QC procedures to be applied	The project ensures the accuracy of emission factors through the following QA/QC measures: (i) Source Verification: Confirm that the factor is sourced directly from the IPCC 2019 Refinement (Vol. 4, Ch. 2, Table 2.5) and has been accurately transcribed into the calculation workbook; (ii) Unit Consistency: Ensure the factor is applied strictly to dry matter burned (kg dry matter) and document any conversions from fresh mass to dry mass to maintain calculation integrity;

	(iii) Record Keeping: Maintain documentation of the specific IPCC source version and retain a copy or link within the project records; (iv) Periodic Review: Review the parameter at least every five years or sooner if updated authoritative values are released documenting any changes (source, rationale, and effective date) for prospective application. Additional QA/QC checks for burning estimates follow IPCC good practice principles, including input plausibility and calculation consistency checks, to ensure all results remain fully auditable within the AWD framework.
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	None

Data / Parameter	$f(N_2O_{soil_{bsl,i,t}})$
Data unit	t N_2O/ha
Description	Modeled nitrous oxide emissions from soil for quantification unit i in year t in the baseline scenario, calculated by modeling soil fluxes of nitrogen forms over the preceding year
Source of data	N/A
Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	N/A
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	N/A
Calculation method	N/A
Comments	Not applicable for Quantification 3 – Default value

Data / Parameter	EF_N
Data unit	(t N_2O-N/t N applied)
Description	Emission factor for nitrous oxide emissions from nitrogen additions from synthetic fertilizers, organic amendments, and crop residues in flooded rice
Source of data	The emission factor is sourced and applied in accordance with VM0051 (Quantification Approach 3, Section 8.2.6). Where project-applicable country-specific or peer-reviewed factors are not available at validation, the project applies an appropriate disaggregated Tier 1 default from IPCC 2019 Refinement (AFOLU, Volume 4, Chapter 11, Table 11.1 – Update) for flooded rice systems, consistent with the IPCC hierarchy of data sources and VM0051 requirements. If sufficient activity data and a defensible project-specific information source are available, emission factors may alternatively be derived following IPCC 2019 guidance (Vol. 4, Ch. 11, Sec. 11.2.1.1 and Ch. 2, Sec. 2.2.2), with documentation of assumptions and applicability to project conditions.
Description of measurement methods and procedures to be applied	EF_N is a default/derived methodological parameter and is not measured at field level.
Frequency of monitoring/recording	Source of data for emission factor must be monitored every five years and must be updated when more accurate data applicable to the project conditions become available.
Value applied	To be determined
Monitoring equipment	N/A
QA/QC procedures to be applied	To ensure the accurate quantification of N_2O emissions, the project implements the following QA/QC measures: (i) Source Verification: Confirm that the EF value is sourced from the IPCC 2019 Refinement (Vol. 4, Ch. 11, Table 11.1 – Update) and specifically corresponds to flooded rice conditions as required by the VM0051 Approach 3 methodology; (ii) Version Control: Maintain strict version control of the reference (including publication year and table used) and lock the selected value within the calculation workbook for the duration of each monitoring period; (iii) Unit & Conversion Accuracy: Verify unit consistency (tN_2O–N/t N applied) across all nitrogen input streams and ensure the

	44/28 molecular weight conversion is correctly applied when converting N_2O-N to N_2O; (iv) Methodological Consistency: Ensure EF_N is applied in conjunction with the project's specific drainage/drying adjustment parameters (e.g., CF_{N2O}) to maintain a cohesive quantification framework without mixing incompatible factors; (v) Periodic Review: Review the parameter at least every five years or sooner if more accurate, project-applicable factors are released documenting all updates (source, rationale, and effective date) for prospective application in the AWD project.
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	None

Data / Parameter	SF
Data unit	dimensionless
Description	Synthetic nitrogen fertilizer type
Source of data	The synthetic nitrogen fertilizer type (SF) is determined at the quantification unit or field level through farm management records. This process is primarily driven by farmer activity logbooks and supplementary FarmPro field staff records collected during seasonal monitoring. To ensure data accuracy, the fertilizer type is corroborated using the following documentary evidence such as purchase receipts, supplier invoices, packaging labels/photos, or input delivery notes, which allow for the precise identification of the product name and its specific nutrient formulation.
Description of measurement methods and procedures to be applied	In accordance with the methodology requirements (Box 1), SF is identified each season prior to verification by recording the specific synthetic fertilizer products applied such as urea, NPK blends, or ammonium-based fertilizers. The project tracks the nutrient composition of each product, prioritizing the nitrogen (N) content and, where relevant, the full N-P-K formulation as stated on the product label or invoice. To ensure an accurate calculation of total synthetic N input: • If various synthetic fertilizer types are used within a single season, the project records each product and its specific applied quantity separately.

	• In cases where a fertilizer type cannot be reliably identified for a specific event, the project applies a conservative classification. The basis for this such as farmer recall confirmed by local supplier norms is fully documented. • Any events recorded as "unknown" are flagged and resolved through targeted follow-up verification to maintain the integrity of the project data.
Frequency of monitoring/recording	Monitoring must be conducted each season.
Value applied	To be determined
Monitoring equipment	SF is monitored using farmer activity logbooks (available in both paper and digital formats) and is supported by FarmPro field monitoring tools, such as standardized seasonal input forms and checklists. Where feasible, photo documentation of fertilizer bags and labels is collected alongside physical or digital receipts and invoices. All records are directly linked to unique field or quantification unit IDs. These IDs are cross-referenced with the project's GIS registry to ensure that nitrogen application is accurately attributed to the correct geographic location.
QA/QC procedures to be applied	QA/QC procedures ensure the completeness, consistency, and auditability of fertilizer type identification, including: (i) Completeness checks to confirm that each fertilizer application entry includes the product name/type, date, quantity, and field ID; (ii) Verification against supporting documents, such as receipts, invoices, and labels or photos, where available; (iii) Internal consistency checks on nutrient formulation (e.g., urea ≈ 46% N; NPK blends match labeled content) along with plausibility screening against typical local fertilizer availability and usage rates; and (iv) Follow-up verification for any missing, ambiguous, or outlier entries through farmer re-contact or supplier confirmation. All records and supporting evidence are retained as auditable documentation for validation and verification within the project framework.
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	None

Data / Parameter	NC_{SF}
Data unit	t N/t fertilizer
Description	Nitrogen content of synthetic fertilizer type *SF*
Source of data	Nitrogen content of synthetic fertilizer NC_{SF} is determined based on manufacturer specifications, as evidenced by product labels, packaging, supplier invoices, and/or official specification sheets from the manufacturer or an authorized distributor. This process adheres to the methodology requirements of Box 1 and the Quantification Approach 3 (Section 8.2.6). Where available, the project maintains photographic evidence of labels and copies of specification documents as part of its permanent, auditable records.
Description of measurement methods and procedures to be applied	For each synthetic fertilizer product SF applied during a monitoring period, the project records the product name or type and the declared nitrogen content (%) from the manufacturer's specification or label. This nitrogen content is then converted to t N/t fertilizer. For blended products, such as NPK, the nitrogen fraction is derived directly from the labeled N value (e.g., a 15-15-15 blend has N = 15%). If the fertilizer product is changed or a new manufacturer specification is issued, NC_{SF} is updated accordingly for all subsequent monitoring periods. In cases where a product's N content cannot be verified, the project adopts a conservative approach. This requires obtaining follow-up documentation from the supplier or manufacturer; until confirmed, the product is flagged for correction and is not finalized for emission calculations within the project framework.
Frequency of monitoring/recording	Monitoring must be conducted each season. Parameter value must be updated when synthetic fertilizer product is changed or when new manufacturer specifications are issued.
Value applied	To be determined
Monitoring equipment	Nitrogen content is tracked using farmer activity logbooks and FarmPro field monitoring forms that document detailed fertilizer product information. This information is supported by photographic evidence of fertilizer bags and labels, supplier invoices or receipts, and digital or printed specification sheets. To ensure full traceability, all records are linked to the corresponding field or quantification unit ID, enabling a clear audit trail between nitrogen inputs and the specific project area.

QA/QC procedures to be applied	QA/QC procedures ensure the accuracy and auditability of NC_{SF} and include: (i) completeness checks to confirm that each fertilizer application record contains the product name/type and documented N content; (ii) verification against label photos, invoices, and/or manufacturer specification sheets; (iii) plausibility checks on N content (e.g., urea ~46% N; ammonium sulfate ~21% N; NPK blends consistent with labeled formulation) and consistency across farmers using the same product; and (iv) version control to ensure that any product changes or updated manufacturer specifications are recorded and applied prospectively. Any unclear entries trigger follow-up verification with the farmer and/or supplier before being accepted in the calculation workbook. All supporting documents and evidence are retained as auditable records for validation and verification.
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	None

Data / Parameter	$M_{bsl,SF,i,t}$
Data unit	tonnes
Description	Mass of nitrogen-containing synthetic fertilizer type SF applied to quantification unit i in year t in the baseline scenario
Source of data	Baseline synthetic fertilizer use for $M_{bsl,SF,i,t}$ is determined from farm management records and baseline practice data collected before the project start date, including: (i) results from the Regional Baseline Survey and (ii) farmer-level baseline data gathered by trained FarmPro field staff during onboarding and baseline practice confirmation. Where available, baseline quantities are validated using supporting documents such as purchase receipts, supplier invoices, input delivery notes, or farm records. The baseline fertilizer mass is documented by fertilizer product type (SF) and linked to the corresponding quantification unit or field (i) and year or season (t).
Description of measurement methods and procedures to be applied	In accordance with the methodology requirements (Box 1), the mass of each synthetic fertilizer type **SF** applied is determined for each quantification unit by recording the product name/type, application date(s), and quantity applied. Quantities are documented using the most direct available measure (e.g., total kilograms applied) and converted to tonnes for reporting and calculation. Where fertilizers are applied in bagged form, the mass is calculated as the number of bags x bag weight (kg),

	summed across application events and divided by 1,000 to convert to tonnes. Where farmers use custom blends or multiple synthetic fertilizers, each type is recorded separately to ensure accurate classification and calculation of nitrogen inputs.
Frequency of monitoring/recording	Monitoring must be conducted each season.
Value applied	To be determined
Monitoring equipment	Synthetic fertilizer mass is tracked and recorded using farmer activity logbooks (paper or digital), supported by FarmPro field monitoring forms or checklists. Where feasible, the project collects photographic evidence of fertilizer bags or labels and retains receipts, invoices, or service provider records to strengthen traceability. Records are linked to unique field or quantification unit identifiers (and the GIS registry, where applicable).
QA/QC procedures to be applied	QA/QC procedures ensure the completeness, consistency, and auditability of fertilizer quantity data and include: (i) completeness checks to confirm that each record includes fertilizer type (SF), date, quantity, and field or quantification unit ID; (ii) unit and conversion checks (kg to tonnes) and reconciliation of bag-count calculations with recorded totals; (iii) verification against supporting documents (receipts, invoices, or label photos) where available; (iv) internal consistency and plausibility checks against typical application ranges by crop stage and against cluster-level distributions; and (v) outlier screening with follow-up verification by FarmPro staff where unusually high or low values are identified. Any corrections are documented, and all records and supporting evidence are retained as auditable documentation for validation and verification.
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	For all equations, the subscript *bsl* must be substituted by *wp* where the relevant values are being quantified for the monitoring period.

Data / Parameter	OF
Data unit	dimensionless
Description	Organic nitrogen fertilizer type

Source of data	Organic nitrogen fertilizer type (OF) is identified at the quantification unit/field level from farm management records, primarily farmer activity logbooks and supporting records collected by FarmPro field staff during seasonal monitoring. Where available, the fertilizer type is verified using documentary evidence such as purchase receipts, supplier invoices, input delivery notes, and/or product labels or photos (including composition information where indicated).
Description of measurement methods and procedures to be applied	In accordance with the methodology requirements (Box 1), OF is identified each season prior to verification by recording the specific organic fertilizer product(s) applied and classifying them into defined organic N fertilizer types (e.g., farmyard manure, compost, green manure-based fertilizer products, manure slurry, or other locally used organic N fertilizers). The project records, at minimum, the product or type name, application date(s), and whether the material is primarily used as an organic N fertilizer (nutrient input) rather than as a general organic amendment. Where multiple organic fertilizer types are applied within a season, each type is recorded separately to support accurate calculation of organic N inputs. If the type cannot be reliably identified at the time of recording, the entry is flagged for follow-up verification, and the basis for any interim classification is documented.
Frequency of monitoring/recording	Monitoring must be conducted each season.
Value applied	To be determined
Monitoring equipment	OF is tracked using farmer activity logbooks (paper or digital), supported by FarmPro field monitoring forms or checklists. Where feasible, the project collects photo documentation of product bags or labels and retains receipts or invoices to strengthen traceability. Records are linked to the corresponding field or quantification unit ID (and the GIS registry, where applicable).
QA/QC procedures to be applied	QA/QC procedures ensure the completeness and auditability of OF identification and include: (i) completeness checks to confirm that entries include organic fertilizer type, date, quantity or event, and field ID; (ii) verification against supporting documents (receipts, invoices, or labels/photos) where available; (iii) consistency checks to ensure correct classification (e.g., distinguishing organic fertilizer inputs from organic amendment or residue categories recorded elsewhere), and plausibility checks against locally available organic fertilizer products; and (iv) outlier or ambiguity screening with follow-up verification by FarmPro staff where inconsistencies are identified. All supporting

	records and classification decisions are retained as auditable evidence for validation and verification.
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	None

Data / Parameter	NC_{OF}
Data unit	t N/t fertilizer
Description	Nitrogen content of organic fertilizer type *OF*
Source of data	The nitrogen content of organic fertilizer type NC_{OF} is determined using a documented hierarchy of sources to maximize applicability and auditability: (i) Product-specific documentation where available (e.g., manufacturer specification sheets, product labels, supplier certificates, or laboratory analysis reports for commercial organic fertilizers); (ii) Authoritative default datasets from recognized agencies and peer-reviewed compilations applicable to the organic fertilizer type and regional context (e.g., default manure N contents referenced in Edmonds et al. (2003) as cited by US EPA (2021), and/or regionally appropriate sources such as the European Environment Agency); and (iii) Where necessary, peer-reviewed literature values for the same organic fertilizer category (OF) under comparable conditions. The selected source, including its version or date, is documented and retained as auditable evidence.
Description of measurement methods and procedures to be applied	For each organic fertilizer type (OF) used in a given season, the project assigns NC_{OF} as t N per t fertilizer based on the best available eligible source described above. Where nitrogen content is reported as a percentage, it is converted to t N per t fertilizer. Where multiple organic fertilizer products fall under the same OF category (e.g., different manure sources or compost products), the project applies a documented representative value for that OF type, or a weighted value where sufficient product-specific information is available. The parameter is updated whenever the organic fertilizer product or type changes, or when a new, more accurate default value becomes available from an authoritative

	or peer-reviewed source, and updates are applied prospectively for the relevant monitoring periods.
Frequency of monitoring/recording	Monitoring must be conducted each season. Parameter value must be updated when organic fertilizer product is changed or as new default values become available in peer-reviewed publications or databases.
Value applied	To be determined
Monitoring equipment	N/A
QA/QC procedures to be applied	(i) Classification check: confirm that the recorded OF category corresponds to the material applied (e.g., compost vs farmyard manure vs manure-based products) and is consistent with logbooks and supporting documents. (ii) Source and version control: document the exact reference (dataset, publication, or database), version or date, and the value used; retain the supporting document (label, specification sheet, lab certificate, or literature/database citation). (iii) Unit and basis consistency: verify that NC_{OF} is applied in t N per t fertilizer on the same mass basis as the recorded application quantity (e.g., fresh mass where applicable), and that any conversions from %N are accurate. (iv) Plausibility screening: compare assigned N contents with typical ranges for the OF category; investigate and correct outliers or inconsistencies through follow-up verification with the supplier or manufacturer, or through additional documentation. (v) Conservative treatment: where multiple credible values exist or uncertainty remains, the project applies a conservative value selection approach that avoids underestimating N inputs and associated emissions, and documents the rationale. All QA/QC checks and supporting evidence are retained as auditable records for validation and verification.
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	None

Data / Parameter	$M_{bsl,OF,i,t}$
Data unit	tonnes

Description	Mass of nitrogen-containing organic fertilizer type *OF* applied to quantification unit *i* in year t in the baseline scenario
Source of data	Baseline organic fertilizer quantities for $M_{bsl,OF,i,t}$ are determined from farm management records and baseline practice data collected prior to the project start date, including: (i) the Regional Baseline Survey and (ii) farmer-level baseline data gathered by trained FarmPro field staff during farmer onboarding and baseline practice confirmation. Where available, quantities are verified using documentary evidence such as purchase receipts, supplier invoices, delivery notes, or farm records, and are linked to the corresponding quantification unit or field (i) and season or year (t).
Description of measurement methods and procedures to be applied	In accordance with the methodology requirements (Box 1), the mass of organic fertilizer type (OF) applied is determined for each quantification unit by recording the organic fertilizer type or category (OF), application date(s), and quantity applied. Quantities are recorded using the most direct available measure (e.g., total kilograms or tonnes applied). Where organic fertilizer is applied in bags, the mass is calculated as the number of bags multiplied by the bag weight (kg); where it is applied in loads or buckets, the project records the number of loads or containers multiplied by the estimated mass per load, with the basis for estimation documented. All quantities are converted to tonnes for reporting and calculation, and where multiple organic fertilizer types are used within a season, each type is recorded separately to ensure correct classification and linkage to $M_{bsl,OF,i,t}$ in the nitrogen input calculation.
Frequency of monitoring/recording	Monitoring must be conducted each season.
Value applied	To be determined
Monitoring equipment	Organic fertilizer mass is tracked using farmer activity logbooks (paper or digital), supported by FarmPro field monitoring forms or checklists. Where feasible, the project collects photo evidence of product or bag labels, or delivery loads, and retains receipts, invoices, or supplier confirmation records to strengthen traceability. Records are linked to unique field or quantification unit identifiers (and the GIS registry, where applicable).
QA/QC procedures to be applied	QA/QC procedures are applied to ensure the completeness, consistency, and auditability of organic fertilizer quantity data, including: (i) completeness checks to confirm that each record includes OF type, date, quantity, and field or quantification unit ID; (ii) unit and conversion checks (kg to tonnes) and reconciliation of bag or load calculations with recorded totals; (iii) verification against supporting documents (receipts, invoices, or

	label photos) where available; (iv) plausibility checks against typical application ranges for the OF category and screening for outliers against cluster-level distributions; and (v) follow-up verification by FarmPro staff where unusually high or low values, or inconsistencies, are identified. Any corrections are documented, and all records and supporting evidence are retained as auditable documentation for validation and verification.
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	For all equations, the subscript *bsl* is replaced with *wp* when the corresponding values are quantified for the monitoring period.

Data / Parameter	CR
Data unit	dimensionless
Description	Crop residue type
Source of data	Crop residue type (CR) is identified at the quantification unit or field level from farm management records, primarily farmer activity logbooks and supporting records collected by FarmPro field staff during seasonal monitoring. Where available, the residue type and handling practice are verified using supporting evidence such as harvest records, photos, or local verification during field visits.
Description of measurement methods and procedures to be applied	In accordance with the methodology requirements (Box 1), CR is identified each season prior to verification by recording the type of crop residue relevant to the rice production system and its management pathway. For this project, CR is expected to be mainly rice straw and associated aboveground residues generated from rice cultivation; where other residue streams are relevant (e.g., residues from a preceding crop within the same field and monitoring period), these are recorded and classified separately. The project records the residue type along with the associated residue management activity (e.g., returned to soil, removed, burned) to ensure that subsequent calculations apply the correct residue pathway and parameters.
Frequency of monitoring/recording	Monitoring must be conducted each season.
Value applied	To be determined

Monitoring equipment	CR is tracked using farmer activity logbooks (paper or digital), supported by FarmPro field monitoring forms or checklists. Where feasible, photo documentation from post-harvest visits and/or simple field observation records are used to verify the residue type and management pathway. Records are linked to unique field or quantification unit identifiers (and the GIS registry, where applicable).
QA/QC procedures to be applied	QA/QC procedures ensure the completeness, consistency, and auditability of CR classification and include: (i) completeness checks to confirm that residue type is recorded for each relevant field or season; (ii) consistency checks to ensure that CR aligns with the recorded crop type (rice) and the residue management pathway recorded elsewhere in the monitoring system (e.g., straw returned vs burned vs removed); (iii) plausibility checks against expected residue streams in the project area and screening for inconsistent entries; and (iv) follow-up verification by FarmPro staff where ambiguity is identified (e.g., unclear residue type or conflicting residue management records). All supporting records (logbooks, field checklists, and photos where available) are retained as auditable evidence for validation and verification.
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	None

Data / Parameter	NC_{CR}
Data unit	t N/t dry mass
Description	Nitrogen content in dry mass of crop residue type *CR* (above and belowground) before the rice season
Source of data	The nitrogen content in the dry mass of crop residue type NC_{CR} is determined using a documented hierarchy of peer-reviewed and authoritative sources applicable to the residue type and local conditions. Preferred sources include: (i) default residue nitrogen contents from the IPCC 2019 Refinement (AFOLU, Volume 4, Chapter 11), where applicable, and/or (ii) other peer-reviewed publications and recognized databases that report residue N content for the relevant crop or residue type. The selected source, along with its version or date and applicability to the residue type, is documented and retained as auditable evidence.

Description of measurement methods and procedures to be applied	NC_{CR} is a parameter value taken from published references and is not measured routinely at field level.
Frequency of monitoring/recording	Monitoring must be conducted each season. Parameter value must be updated as new default values become available in peer-reviewed publications or databases.
Value applied	To be determined
Monitoring equipment	N/A
QA/QC procedures to be applied	(i) Residue linkage check: confirm that the selected NC_{CR} value corresponds to the recorded residue type (CR) and is consistent with the project's residue accounting (e.g., rice straw dry mass returned to soil). (ii) Source and version control: document the exact reference (publication or database), year or version, and any relevant table or section; retain the citation and supporting excerpt where feasible. (iii) Unit and basis consistency: ensure the parameter is expressed and applied as t N per t dry mass, and that any conversions from %N are accurate. (iv) Plausibility screening: compare the selected value with typical ranges for the residue type; investigate any unusual values and document the justification for selection. (v) Conservative treatment: where multiple credible values exist, apply a conservative value that does not underestimate residue N inputs (and associated N_2O emissions), and document the rationale. All QA/QC checks and reference documentation are retained as auditable evidence for validation and verification.
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	None

Data / Parameter	$M_{bsl,CR,i,t}$
Data unit	tonnes

Description	Total dry mass of crop residue (aboveground and belowground) returned to soils prior to the rice season in quantification unit i in year t under the baseline scenario.
Source of data	Baseline crop residue return for $M_{bsl,CR,i,t}$ is determined from farm management records and baseline practice data collected prior to the project start date, including (i) the Regional Baseline Survey and (ii) farmer-level baseline data gathered by trained FarmPro field staff during onboarding and baseline practice confirmation. Residue management information is documented at the field or quantification unit level, including whether residues are returned to soil, removed, or burned, and the quantities or proxies needed for quantification. Where available, records are verified through farmer logbooks, field observations, and confirmation of local practices.
Description of measurement methods and procedures to be applied	In accordance with the methodology requirements (Box 1), the project determines the total dry mass of crop residues returned to soils (aboveground and belowground) for each quantification unit (i) and year or season (t). The residue type (CR) and management pathway are recorded first (returned, removed, or burned). Where farmers can directly report residue quantities (e.g., measured loads or recorded straw amounts), the reported mass is documented and converted to dry mass using documented moisture or dry matter assumptions where needed. Where direct residue mass is not available, $M_{bsl,CR,i,t}$ is estimated transparently using agronomic proxies consistent with IPCC concepts, such as harvested area and crop production indicators (e.g., grain yield) combined with an appropriate straw-to-grain relationship (or other documented residue production factors), adjusted by the fraction of residues returned to soil (net of removal and burning). The method used (direct measurement or proxy-based estimation), assumptions applied, and any conversions are documented and applied consistently within each stratum or quantification unit.
Frequency of monitoring/recording	Monitoring must be conducted each season.
Value applied	To be determined
Monitoring equipment	Residue return is tracked using farmer activity logbooks and FarmPro seasonal monitoring forms or checklists that record residue type and management pathway (returned, removed, or burned), supported where feasible by field verification checklists, photo documentation during post-harvest visits, and GIS-linked field identifiers. Records are maintained at the field or quantification unit level and consolidated for emission calculations.

QA/QC procedures to be applied	QA/QC procedures ensure the completeness, consistency, and auditability of $M_{bsl,CR,i,t}$ and include: (i) completeness checks to ensure that residue management is recorded for each field or season; (ii) consistency checks across residue pathway records (returned vs removed vs burned) to avoid double counting; (iii) unit checks to ensure final values are expressed in tonnes of dry mass and that any fresh-to-dry conversions are correctly applied and documented; (iv) plausibility checks against harvested area and typical residue production ranges (including cross-checks with yield or production proxies and cluster-level distributions); and (v) outlier screening with follow-up verification by FarmPro staff where unusually high or low values are identified. Any corrections are documented, and all underlying records (logbooks, field forms, photos where available, and calculation sheets for proxy-based estimates) are retained as auditable evidence for validation and verification.
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	For all equations, the subscript *bsl* is replaced with *wp* when the corresponding values are quantified for the monitoring period.

Data / Parameter	EF_{N2O}
Data unit	g N_2O/kg dry matter burned
Description	Nitrous oxide emission factor for the burning of rice straw
Source of data	The nitrous oxide emission factor for rice straw open burning, EF_{N2O}, is sourced from the IPCC 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4 (AFOLU), Chapter 2, Table 2.5, which provides default emission factors for open burning of biomass or crop residues. This represents the most recent internationally accepted Tier 1 default applied where project- or country-specific factors are not available at validation.
Description of measurement methods and procedures to be applied	EF_{N2O} is a default parameter and is not measured at the field level. The project applies the IPCC default value of 0.07 g N_2O per kg of dry matter burned for rice straw open burning, consistent with the IPCC approach for estimating emissions from biomass burning. The factor is applied consistently to all relevant burning events quantified in both baseline and project scenarios (i.e., where the mass of rice straw burned is determined on a dry matter basis), unless and until a more accurate, authoritative

	factor applicable to the project conditions becomes available and is adopted in accordance with the update procedure.
Frequency of monitoring/recording	Source of data for the emission factor is reviewed every five years and updated when more accurate data applicable to the project conditions become available.
Value applied	To be determined
Monitoring equipment	N/A
QA/QC procedures to be applied	(i) confirm that the factor is sourced directly from IPCC 2019 Refinement, Vol. 4, Ch. 2, Table 2.5 and accurately transcribed into the calculation workbook; (ii) ensure unit consistency by applying the factor only to dry matter burned (kg dry matter) and documenting any conversions from fresh mass to dry mass where applicable; (iii) maintain documentation of the IPCC source version and retain a copy or link in project records; and (iv) review the parameter at least every five years (or earlier if updated authoritative values become available), documenting any changes (source, rationale, and effective date) and applying updates prospectively. Additional QA/QC checks for burning-related estimates follow IPCC good practice principles to ensure consistent calculations and auditable results.
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	None

Data / Parameter	$EF_{eu,r}$
Data unit	kg CO_2e/t dry rice straw
Description	Emission factor for rice straw for off-farm end use category *r*
Source of data	Emission factors for off-farm end-use categories $EF_{eu,r}$ are determined using a documented hierarchy of evidence sources consistent with VM0051 Section 8.3.1. Preferred sources include, in order of priority: (i) facility-specific records from relevant off-farm end-use operators (e.g., production facility fuel or energy consumption records, throughput and process data, verified emission reports), (ii) government records or nationally recognized emission factor publications applicable to the specific end-use process, (iii) peer-reviewed literature and publicly available LCA databases that provide process-specific GHG

	intensities for the same straw end-use pathway, and (iv) survey data and industry association reports documenting typical processing energy use and emissions for the end-use category. The project documents the selected source(s), including year or version, geographic applicability, technology or process description, and key assumptions to ensure auditability.
Description of measurement methods and procedures to be applied	In accordance with Section 8.3.1, the project determines $EF_{eu,r}$ as the GHG emissions intensity associated with the relevant off-farm straw end-use pathway r, expressed per tonne of dry rice straw. Where facility-level data are available, the factor is calculated using the facility's documented activity data (e.g., energy and fuel use, and process emissions where relevant) normalized by the corresponding quantity of straw processed. Where facility-level data are not available, the project applies the most appropriate published factor from authoritative sources or peer-reviewed or LCA datasets, selecting values that match (i) the same end-use pathway, (ii) comparable technology and scale, and (iii) geographic context. All conversions to kg CO_2e per tonne of dry straw, and any assumptions (e.g., moisture content basis for dry straw, allocation rules where relevant), are documented in the quantification workbook and applied consistently.
Frequency of monitoring/recording	Monitoring must be conducted each season.
Value applied	To be determined
Monitoring equipment	N/A
QA/QC procedures to be applied	(i) Applicability screening: confirm that the selected factor corresponds to the same end-use category r and is applicable to the project context (technology, scale, geography, and system boundary). (ii) Source integrity and version control: document the exact source (title, author or issuer, year or version, table or section) and retain the reference or extract; apply the same factor consistently within a monitoring period. (iii) Unit and basis checks: verify that the factor is expressed in kg CO_2e per tonne of dry straw; document any moisture-basis conversions and ensure that dry mass definitions are consistent with the project's straw accounting. (iv) Cross-checks against facility or process data (where available): reconcile the implied emissions intensity with facility energy use or comparable benchmarks, and investigate any anomalies. (v) Update rule: review sources at least every five years (or when more accurate, project-applicable data become available) and

	document any updates (source, rationale, and effective date), applying changes prospectively.
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	None

Data / Parameter	$RS_{removed,r}$
Data unit	tonnes
Description	Mass of rice straw removed from field and sent to end use category *r*
Source of data	It is determined from project management and transaction records in line with the methodology guidance (Section 8.3.1). Primary sources include: (i) farmer activity logbooks documenting straw removal events and destination or end-use category, (ii) records collected by FarmPro field staff during seasonal monitoring, and where available, (iii) supporting transfer documentation such as straw sales receipts, buyer or collector records, transport or delivery notes, weighbridge tickets, or facility acceptance records that confirm quantities delivered and the end-use category.
Description of measurement methods and procedures to be applied	In accordance with Section 8.3.1, the project quantifies $RS_{removed,r}$ as the total dry mass of rice straw removed from each quantification unit or field and allocated to each end-use category r during the monitoring period. For each removal event, the project records: (i) date, (ii) field or quantification unit ID, (iii) end-use category *r* (e.g., feed, bedding, mushroom substrate, composting, bioenergy-based on the project's end-use classification list), and (iv) quantity removed. Where quantities are measured as fresh mass or volume (e.g., truckloads, bales, bags), they are converted to dry mass using documented conversion factors (e.g., bale weight, load capacity, and/or moisture content assumptions). Where weighbridge or buyer records are available, those values are prioritized. Quantities are aggregated by end-use category *r* for reporting and calculation.
Frequency of monitoring/recording	Monitoring must be conducted each season.
Value applied	To be determined

Monitoring equipment	Rice straw removal is tracked using farmer activity logbooks supported by FarmPro monitoring forms or checklists, and strengthened where feasible by transaction evidence (receipts or invoices), transport or delivery notes, weighbridge tickets, and/or facility acceptance records. Records are linked to field or quantification unit identifiers (and the GIS registry, where applicable) to ensure traceability and prevent double counting.
QA/QC procedures to be applied	(i) Completeness checks to ensure that each straw removal event includes field ID, end-use category r, date, and quantity; (ii) Classification checks to confirm that the end-use category r is consistent with the buyer or facility type, or the documented destination; (iii) Unit and basis checks to ensure quantities are reported as tonnes of dry matter, with documented and consistently applied conversions from fresh mass or volume where needed; (iv) Cross-checks against supporting documents (receipts, delivery notes, weighbridge or facility records) where available; (v) Reconciliation checks to avoid double counting across residue pathways by ensuring that removed straw is not simultaneously recorded as returned to soils or burned for the same field or period; and (vi) Outlier screening against typical removal rates by area and cluster, with follow-up verification by FarmPro staff where unusually high or low values are identified. All supporting records and calculation sheets are retained as auditable evidence for validation and verification.
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	None

Data / Parameter	$Q_{N,i}$
Data unit	Kg N/ha
Description	Application rate of nitrogen input for quantification unit *i* in the project scenario
Source of data	Nitrogen application rate is determined from project monitoring records for each quantification unit or field, primarily farmer fertilizer application logbooks supported by records collected by FarmPro field staff during seasonal monitoring. Where available, records are verified using purchase receipts or invoices, input

	delivery notes, and/or FarmPro consolidated input distribution records. Farmer surveys or interviews are used only as supporting information where logbooks are incomplete and are subject to follow-up verification.
Description of measurement methods and procedures to be applied	In accordance with the methodology requirements (Box 1), $Q_{N,i}$ is calculated for each quantification unit as the total nitrogen applied (kg N) divided by the cultivated area (ha) for the relevant season. Total nitrogen applied is determined by summing nitrogen inputs from recorded fertilizer products applied on the field, using the mass of each product applied and the documented nitrogen content for each product (e.g., NC_{SF} for synthetic fertilizers and NC_{OF} for organic fertilizers, where applicable). Where multiple application events occur, all events are recorded and aggregated for the season. The calculation is carried out transparently in the project quantification workbook and linked to the underlying field logbook entries and supporting documents.
Frequency of monitoring/recording	Monitoring must be conducted each season
Value applied	To be determined
Monitoring equipment	It is tracked using farmer activity logbooks (paper or digital) and FarmPro field monitoring forms or checklists. Where feasible, the project collects photo documentation of fertilizer bags or labels and retains receipts or invoices, or FarmPro input distribution records. Records are linked to unique field or quantification unit identifiers (and the GIS registry, where applicable) to ensure traceability.
QA/QC procedures to be applied	QA/QC procedures ensure the completeness, consistency, and auditability of $Q_{N,i}$, including: (i) completeness checks to confirm that fertilizer type or product, quantity, date, and field ID are recorded for each application; (ii) verification of quantities against supporting evidence where available (farmer receipts, FarmPro consolidated purchase or distribution records, supplier invoices); (iii) unit and conversion checks (kg product to kg N using documented N content values), and reconciliation of bag-count calculations with recorded totals; (iv) plausibility screening of seasonal N rates (kg N/ha) against typical ranges by cluster or zone, and outlier detection with follow-up verification; and (v) consistency checks to ensure that the same application is not double-counted across fertilizer categories. All supporting records and calculation sheets are retained as auditable evidence for validation and verification.
Purpose of data	Calculation of project emissions

Calculation method	N/A
Comments	None

Data / Parameter	$M\_OA_{wp,l,t}$
Data unit	tonnes
Description	Mass of organic amendment (from livestock type *l*) applied as fertilizer in the project area in year *t*
Source of data	The mass of livestock-derived organic amendment applied as fertilizer $M\_OA_{wp,l,t}$ is determined from project management records collected through seasonal monitoring, primarily farmer activity logbooks and records maintained by FarmPro field staff. Where available, quantities are verified using supporting evidence such as purchase receipts, supplier invoices, delivery notes, farm records, and/or records from manure suppliers or collectors. Data are recorded at the field or quantification unit level and aggregated to the project area for the relevant year or season t.
Description of measurement methods and procedures to be applied	For each monitoring period, the project records the quantity of manure or organic amendment applied and disaggregates it by livestock type (l) (e.g., cattle or buffalo, poultry, pig) in line with the methodology requirements. For each application event, the following are recorded: (i) livestock type or source, (ii) date, (iii) quantity applied, (iv) field or quantification unit ID, and (v) form of material (e.g., fresh manure, manure slurry, manure-based compost) where relevant. Quantities are recorded in the most direct unit available (kg, bags, loads) and converted to tonnes for reporting. Where direct weight is not available, quantity is estimated using transparent proxies (e.g., number of bags × bag weight; number of loads × standard load weight), with the basis for estimation documented. Values are aggregated across events and fields to obtain $M\_OA_{wp,l,t}$ for each livestock type and year or season.
Frequency of monitoring/recording	Monitoring must be conducted each season.
Value applied	To be determined
Monitoring equipment	Monitoring is carried out using farmer activity logbooks (paper or digital) supported by FarmPro seasonal monitoring forms or checklists. Where feasible, the project collects photo evidence of manure deliveries (bags or loads), retains receipts, invoices, or

	delivery notes, and links records to unique field or quantification unit identifiers (and the GIS registry, where applicable) to ensure traceability and prevent double counting.
QA/QC procedures to be applied	(i) Completeness checks to ensure each entry records livestock type (l), date, quantity, and field ID; (ii) Unit and conversion checks, including kg-to-tonne and bag/load conversions, with all assumptions clearly documented; (iii) Verification against supporting documents where available, such as receipts, invoices, delivery notes, and supplier confirmations; (iv) Plausibility screening of application rates by area and livestock type, including detection of outliers against cluster-level distributions, with follow-up verification for any deviations; and (v) Consistency checks to ensure that the same material is not double-counted across organic fertilizer or organic amendment categories within the monitoring system. All records, supporting evidence, and calculation sheets are retained as auditable documentation for validation and verification purposes.
Purpose of data	Calculation of leakage
Calculation method	N/A
Comments	None

Data / Parameter	$CC_{wp,l,t}$
Data unit	t C/t organic amendment
Description	Carbon content of organic amendment applied as fertilizer in the project area in year *t*, disaggregated by livestock type *l* for manure.
Source of data	The carbon content is determined in accordance with the methodology requirements (Box 1) using a documented hierarchy of sources. Preferred sources include: (i) Product-specific documentation, where available, such as manufacturer specification sheets, product labels, supplier certificates, or laboratory analysis reports for commercial organic fertilizers or composts. (ii) Peer-reviewed literature or authoritative default datasets, applicable to the specific organic amendment type and, for manure, the relevant livestock type (*l*).

	The selected source, including its year/version and relevance to project conditions, is documented and retained as auditable evidence.
Description of measurement methods and procedures to be applied	For each monitoring and verification cycle, the project assigns $CC_{wp,l,t}$ as t C per t of organic amendment for the organic amendment types applied in the project area. For manure applications, values are disaggregated by livestock type (l) (e.g., cattle/buffalo, poultry, pig) as required. Where carbon content is provided as a percentage of dry matter or as an organic carbon fraction, it is converted to t C per t of material using documented conversion steps and consistent mass basis assumptions (e.g., fresh vs. dry basis consistent with how amendment mass is recorded). If multiple manure products or sources exist within the same livestock type, the project applies either a documented representative value or a weighted value, when sufficient supporting data are available. Parameter values are updated at least every five years, or prior to each verification event if verification occurs more frequently, and updated earlier if more accurate, project-applicable values become available.
Frequency of monitoring/recording	Monitoring must be conducted every five years or prior to each verification event where verification occurs more frequently.
Value applied	To be determined
Monitoring equipment	N/A
QA/QC procedures to be applied	(i) Classification check: Confirm that the assigned carbon content corresponds to the recorded organic amendment type and, for manure, the correct livestock type (l). (ii) Source and version control: Record the exact reference (document, database, or publication), including year/version and any relevant table or section. Retain supporting evidence such as product labels, specification sheets, laboratory reports, or literature citations. (iii) Unit and basis consistency: Ensure values are expressed and applied as t C per t of organic amendment and are consistent with the mass basis used for recording amendment quantities (fresh vs. dry). Document and verify any conversions (e.g., %C to fraction). (iv) Plausibility and outlier screening: Compare assigned values against typical ranges for the amendment and livestock type; investigate anomalies and document the justification for any deviations.

	(v) Conservative treatment: Where multiple credible values exist or uncertainty remains, select a conservative value that does not underestimate leakage-related carbon inputs, and document the rationale. All QA/QC checks and supporting documentation are retained as auditable evidence for validation and verification.
Purpose of data	Calculation of leakage
Calculation method	N/A
Comments	None

Data / Parameter	P_{wp}
Data unit	Output (e.g., kg)/ha
Description	Average rice yield during the monitoring period
Source of data	Average rice yield during the monitoring period (P_{wp}) is derived from farm productivity records at the field/quantification unit level. Primary data sources include: • Farmer yield records or logbooks • FarmPro field staff monitoring forms • Where available, commercial-scale tickets, warehouse or mill receipts, and service-provider harvest records In addition, the project collects rice crop health and agronomic performance observations using the IRRI Standard Evaluation System (SES) scoring framework to support interpretation and plausibility checks of yield outcomes. Independent verification datasets are generated through: • Random crop-cutting measurements • Satellite-based yield assessment outputs Yield trends are further cross-checked against reference fields, including non-project or comparable baseline management fields, within the same agro-ecological context.
Description of measurement methods and procedures to be applied	P_{wp} is calculated as harvested paddy output per unit area (e.g., kg/ha) for each quantification unit and season, based on the recorded harvested quantity and corresponding harvested area (ha). Harvest quantity is determined using locally available measurement methods, including: • Mobile weighing devices

	• Commercial or fixed scales • Storage volume-to-weight conversions (where calibrated) • Scale tickets To strengthen data quality, the project implements the following measures: (i) Rice health monitoring using IRRI SES scales as a standardized field scoring approach for agronomic traits and stress symptoms, ensuring consistency of field observations across locations and seasons. (ii) Random crop cutting on a subset of fields each season, providing independent physical measurements of yield from predefined sampling plots to validate farmer-reported yields and quantify measurement bias. (iii) Satellite-based yield assessment, such as vegetation index/time-series estimation calibrated to field observations, as an additional plausibility check across the project area. Finally, results are compared with reference fields to confirm that project practices do not result in unintended yield declines relative to comparable local baseline management, while accounting for seasonal variability due to weather.
Frequency of monitoring/recording	Monitoring must be conducted each season.
Value applied	To be determined
Monitoring equipment	Monitoring of rice yield is supported by: (i) Farmer activity and yield records – logbooks (paper or digital) and FarmPro monitoring forms. (ii) Weighing equipment – portable/mobile scales, commercial/fixed scales, and/or scale tickets. (iii) Moisture measurement tools – where feasible, or standardized moisture assumptions applied consistently for yield reporting. (iv) IRRI SES field scoring sheets/forms – for monitoring crop health and agronomic performance. (v) Crop-cutting tools – sampling frames/quadrats, harvest bags, portable scales, and moisture measurement tools for independent yield measurement. (vi) GIS/remote sensing datasets and processing tools – to generate satellite-based yield assessment layers and overlays with field boundaries.

QA/QC procedures to be applied	(i) Completeness and traceability checks: Verify that each yield record includes field/quantification unit ID, harvested area, harvest date, and measurement method (e.g., scale ticket, portable scale, or volume conversion). (ii) Documentary cross-checks: Reconcile farmer-reported yields with scale tickets, receipts, warehouse, or mill records where available. Investigate discrepancies through follow-up verification. (iii) Crop-cutting verification: Implement random crop cutting each season as an independent check. Compare crop-cut yields with reported yields and apply corrective actions (data correction and/or retraining) where systematic bias is detected. (iv) SES-based plausibility screening: Use IRRI SES crop health and agronomic scores as supporting evidence to flag inconsistent yield results (e.g., low stress scores but unusually low yield, or severe stress scores with unusually high yield), triggering targeted re-checks. (v) Satellite-based plausibility screening: Compare reported yield patterns against satellite-derived yield indicators; investigate spatial or temporal outliers through targeted field verification. (vi) Reference field cross-check: Compare seasonal yield trends against designated reference fields to confirm no unintended yield decline attributable to project practices, while accounting for weather variability. (vii) Outlier screening and correction log: Perform statistical outlier detection by cluster or zone. Document all corrections with justification, supporting evidence, and approver details. All underlying records-including logbooks, scale tickets, crop-cut sheets, SES forms, and satellite outputs are retained as auditable evidence for verification.
Purpose of data	Calculation of leakage
Calculation method	N/A
Comments	*International Rice Research Institute. (2013). *Standard evaluation system (SES) for rice* (5th ed.). International Rice Research Institute. https://objectstorage.ap-dcc-gazipur-1.oraclecloud15.com/n/axvjbnqprylg/b/V2Ministry/o/office-sca/2024/12/27c7fd91c7a042dd947e3555a20c0850.pdf ** Reference fields are non-project rice fields selected within the same agro-ecological context as participating fields (i.e., similar soil type, climate zone, irrigation access, and cropping calendar)

	that continue baseline management practices. These fields are monitored at a limited level to provide a benchmark for comparison, enabling the project to (i) verify that project implementation does not cause unintended yield declines. (ii) distinguish project effects from seasonal weather variability. (iii) support QA/QC of reported agronomic performance and leakage-related indicators.

Data / Parameter	RP_{wp}
Data unit	Output (e.g., kg)/ha
Description	Average regional rice yield during the monitoring period
Source of data	Average regional rice yield during the monitoring period is obtained from authoritative, publicly available regional productivity statistics applicable to Thailand and the relevant project regions or clusters. Preferred sources are, in order of priority: (i) official Government of Thailand statistics (e.g., national statistical or agricultural datasets such as statistical yearbooks or agricultural reports), (ii) recognized international datasets that provide country or region-level yield estimates (e.g., FAOSTAT), and (iii) peer-reviewed academic publications or credible industry or sector reports where official data are unavailable or insufficiently disaggregated. The selected source(s), including year or version, geographic coverage, and any relevant definitions (paddy vs milled rice basis), are documented and retained as auditable evidence.
Description of measurement methods and procedures to be applied	It is determined as the average regional yield (output per hectare) for the relevant applicable region(s) during the monitoring period. Where regional yield data are available by administrative unit, the project calculates an area-weighted average for the applicable project region or cluster, using the corresponding paddy area as weights where available. Where yield is reported in units other than kg/ha, values are converted to kg/ha using documented conversion factors. Where sources report different yield bases (e.g., paddy vs milled rice), the project applies a consistent basis aligned with the project's yield definition (paddy yield) and documents any conversions or harmonization steps.
Frequency of monitoring/recording	Every 10 years
Value applied	To be determined
Monitoring equipment	N/A

QA/QC procedures to be applied	(i) Source integrity and version control (recording the exact publication or dataset name, issuer, year, and table or series used); (ii) definition consistency checks (confirming that the yield basis and geographic coverage match the intended regional boundary); (iii) unit conversion checks (ensuring conversion to kg/ha is accurate and documented); (iv) cross-checks across sources where feasible (e.g., comparing government statistics with FAOSTAT trends) to identify anomalies; and (v) documentation of any revisions to official datasets and their implications. Any updates are applied prospectively and recorded in the monitoring and verification package.
Purpose of data	Calculation of leakage
Calculation method	N/A
Comments	None

Data / Parameter	h
Data unit	Dimensionless
Description	Stratum identifier
Source of data	The stratum identifier h is determined from the project's baseline stratification framework and the field registry for the project area. Each field or quantification unit is assigned to a stratum based on the cultivation pattern parameters recorded for that field (e.g., water regime during the season and pre-season, organic amendment category or application characteristics, crop duration category, and climate zone), as documented in the baseline survey or historical look-back and confirmed through project monitoring records. Stratum assignments are maintained in the project database and linked to unique field identifiers (and GIS polygons, where applicable).
Description of measurement methods and procedures to be applied	Project fields are grouped into strata based on cultivation patterns. A stratum *h* includes all project fields that share the same defined cultivation pattern (i.e., the same combination of stratification parameters and codes as specified in the PD). Stratum assignment is carried out using a standardized classification rule set (lookup table) that maps each field's recorded parameter categories to a unique stratum code. Strata are reviewed annually (or prior to each verification event if more frequent) to reflect any confirmed changes in cultivation patterns (e.g., changes in water regime category, organic amendment practices, or crop duration classification). Any updates to stratum assignment are documented with the reason, effective season,

	and supporting evidence, and are applied consistently in the calculation workbook.
Frequency of monitoring/recording	Monitoring must be conducted annually or prior to each verification event where verification occurs more frequently.
Value applied	To be determined
Monitoring equipment	N/A
QA/QC procedures to be applied	(i) Completeness checks to confirm that all fields have the required parameter values for stratum assignment (or are flagged for follow-up or merging rules if data are missing); (ii) consistency checks to ensure that the stratum code matches the recorded parameter categories for each field; (iii) version control of the stratification lookup table and stratum definitions, with documented effective dates; (iv) periodic reconciliation between the field registry or GIS boundaries and the stratum assignment list to prevent missing or duplicate fields; and (v) review of any stratum changes with supporting evidence retained (e.g., updated practice records) to ensure transparent change management. All stratum assignment tables and change logs are retained as auditable evidence for validation and verification.
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	None

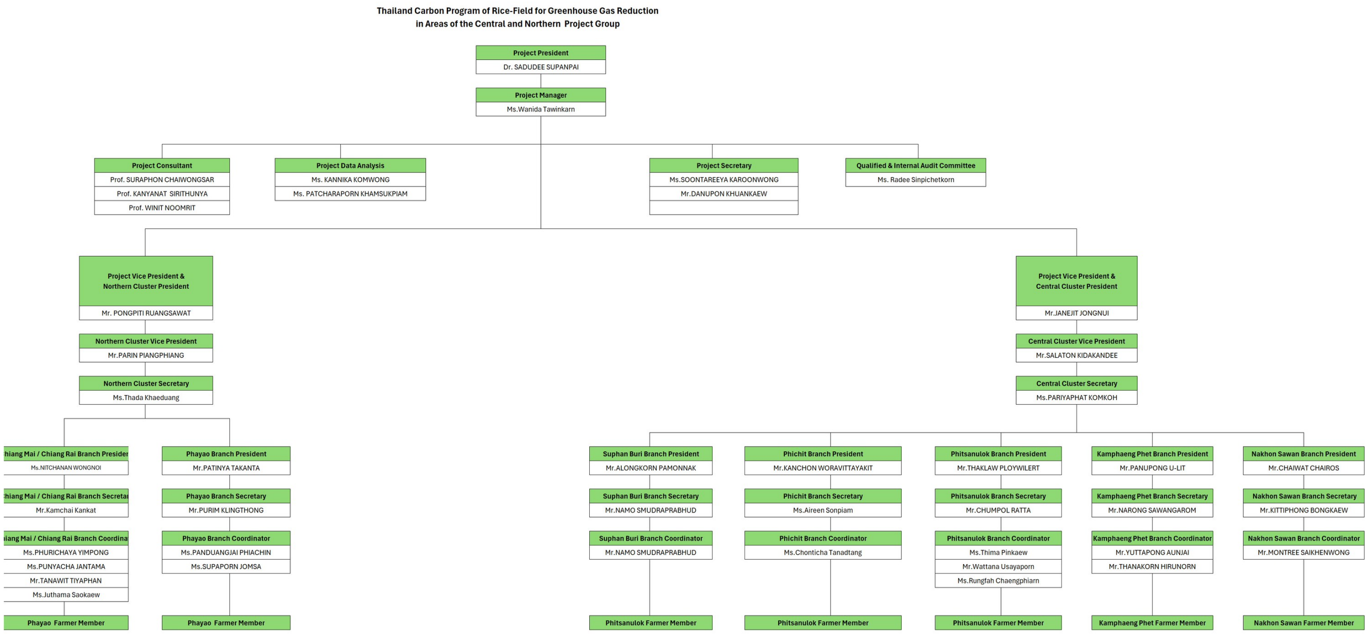
5.3 Monitoring Plan

5.3.1 Monitoring Plan

a) Overview

The Project Proponent develops and implements a program-level Management System or Internal Control System (ICS) to ensure complete, consistent, transparent, and verifiable monitoring of all parameters defined in Sections 5.1–5.2, and to support quantification under VM0051 Quantification Approach 3 (QA3). The ICS covers farmer onboarding and eligibility screening, field or plot identification, seasonal activity data collection, QA/QC, database management, reporting to the VVB, and continuous improvement. Monitoring is carried out across four project zones: Zone 1 includes Phayao, Chiang Rai, and Chiang Mai, and Zone 2 includes Kamphaeng Phet, Phitsanulok, Phichit, and Nakhon Sawan provinces, and is organized by stratum (h), where each stratum represents a distinct cultivation pattern used for quantification and verification.

b) Management structure and roles/responsibilities



The project is implemented through a structured management system to ensure clear accountability for VM0051 compliance, field operations, data integrity, QA/QC, and verification readiness. The management structure includes: (i) strategic oversight and governance, (ii) project administration and data management functions, and (iii) field operations organized by province/zone. Responsibilities are assigned to ensure separation of duties between implementation, data management, and internal audit.

(i) Strategic oversight and governance

Project Director

- Holds overall responsibility for project implementation and compliance with VM0051 and VCS requirements.
- Approves the Monitoring Plan or ICS, annual workplans, budget, and key program decisions (e.g., corrective actions affecting crediting).
- Ensures sufficient resources are allocated for MRV, safeguards, and verification preparation.

Project Consultant

- Provides independent technical and methodological support (VM0051 interpretation, VCS compliance, PDD or monitoring documentation).
- Advises on improvements to monitoring protocols, stratification logic, and parameter QA/QC.
- Supports readiness for validation or verification and responses to VVB findings.

Qualified & Internal Audit Committee

- Conducts periodic internal audits of the monitoring system and field implementation (ICS effectiveness, data integrity, and compliance checks).
- Reviews non-conformities, root cause analyses, and corrective or preventive actions (CAPA).
- Confirms that monitoring evidence is complete and traceable prior to submission for verification.

Project Lead

- Manages day-to-day coordination across administration, data teams, and field operations.
- Oversees implementation of the Monitoring Plan and ensures timely seasonal data collection.
- Consolidates operational issues and escalates decisions to the Project Director as required.

(ii) Project administration and data management (Project Admin)

Project Admin (Data & Documentation Control)

- Maintains document control (templates, SOPs, versioning of forms or lookup tables, and audit trails).
- Oversees the filing and retention of hard-copy and digital records in line with VCS requirements.
- Coordinates with field teams to ensure completeness of monitoring packages.

Data Collection Team (Data Collect)

- Receives and logs seasonal field records (logbooks, observation sheets, receipts, photos, and GIS outputs).
- Conducts initial completeness checks and flags missing or unclear entries for follow-up.
- Manages secure transfer of data from branches or clusters to the central database.

Data Analysis / MRV Team (Data Analysis)

- Maintains the project database and stratum assignment tables (h), linked to field IDs or GIS polygons.
- Performs data validation, outlier screening, and consistency checks (water regime codes, fertilizer rates, residue pathways, and yield).
- Aggregates monitored parameters by stratum and cluster and prepares inputs for the quantification workbook and monitoring reports.
- Maintains calculation files (Excel workbooks), ensuring traceability from parameter values to source evidence.

Data information flow ("Data information" link to Operations)

- Establishes a controlled feedback loop: data issues identified by the Data Analysis team are returned to the relevant cluster teams for clarification or correction; all corrections are documented with the date, reason, and approver.

(iii) Field operations ("Project Operation") and cluster implementation

Project Manager (Operations)

- Directly oversees field implementation across all clusters and ensures consistent application of monitoring SOPs.
- Assigns field staff, schedules seasonal visits, and ensures farmer training and onboarding are completed.

- Ensures timely delivery of verified seasonal datasets to the Project Administration or Data teams.

Cluster implementation structure (by zone/province)

Field operations are organized into clusters corresponding to the project geography and PDD zoning:

- Zone 1: Phayao, Chiang Rai, and Chiang Mai Province
- Zone 2: Kamphaeng Phet, Phitsanulok, Phichit, and Nakhon Sawan Province

Senior Field Manager (per province)

- Leads province-level implementation, supervises field managers, and ensures adherence to VM0051 practice definitions and monitoring requirements.
- Reviews seasonal monitoring outputs for completeness and addresses operational bottlenecks.
- Coordinates cluster-level corrective actions and refresher training.

Field Manager (per province)

- Manages field officer teams, farmer onboarding, training delivery, and seasonal monitoring activities.
- Ensures accurate recording of key monitored parameters (water regime on-season or pre-season, inputs, residues, yield, and fuel).
- Ensures collection of supporting evidence (receipts, photos, logbooks, GIS references) and timely submission.

Assistant Field Manager (per province)

- Supports field planning, spot checks, and follow-up verification.
- Conducts targeted re-visits for flagged records (outliers, missing documents, or inconsistent entries).
- Supports implementation of crop cutting and reference field monitoring activities.
- Coordinates branch-level field logistics, farmer communications, and record collection.
- Maintains local filing of hard-copy records and ensures readiness for field inspections by internal auditors and VVB.
- Supports GIS boundary confirmation and seasonal updates (field splitting/merging, area changes) under guidance from the central team.

(iv) Separation of duties and verification readiness

To ensure data integrity and auditability, the project applies separation of duties as follows: field teams collect primary data; the Data or MRV team performs independent validation, aggregation, and calculation; and the Internal Audit Committee conducts periodic compliance audits and reviews CAPA prior to verification. All monitoring outputs are linked to unique field IDs and GIS polygons, with documented version control and evidence retention to support VVB validation and verification.

a) Monitoring tasks and technical requirements

The project implements an Internal Control System (ICS) and a seasonal monitoring workflow to collect, verify, and archive all parameters listed in Section 9.2 (and PD Section 5.2). Key monitoring tasks include, at minimum:

- Farmer onboarding and eligibility screening (eligible irrigated lowland rice systems; confirmation of baseline practices and field identifiers).

- Field registry and GIS delineation of quantification units (field polygons, area, province or zone, and stratum assignment).
- Seasonal activity data collection (per field or quantification unit): water regime (on-season and pre-season), crop establishment method (transplant or DSR), cultivation period (L_t), organic amendment or residue management, fertilizer inputs (synthetic or organic), fuel use (stationary or mobile where applicable), and yield.
- Practice implementation verification for AWD, including field officer checks and evidence collection (logbooks, checklists, photos, receipts, and, where used, water-level indicators).
- Data consolidation and calculation: aggregation by province or zone and stratum (h), preparation of monitoring datasets and calculation workbooks, and compilation of the Monitoring Report package for the VVB..

b) Accounting boundary and delineation of differences

The accounting boundary includes all enrolled and eligible project fields within the project provinces or zones: Zone 1 includes Phayao, Chiang Rai, and Chiang Mai, and Zone 2 includes Kamphaeng Phet, Phitsanulok, Phichit, and Nakhon Sawan provinces, spatially delineated by GIS field polygons linked to unique field IDs. Any areas excluded for eligibility reasons (e.g., non-eligible water control conditions, non-rice land use, or fields not meeting enrollment requirements) are documented and excluded from the creditable area.

The project applies a consistent accounting boundary across clusters; any future differences in quantification approaches (e.g., if a subset of strata applies a different QA) will be spatially delineated and documented in an updated monitoring plan, in line with VM0051 requirements. At present, the project applies a single quantification approach (QA3) across all clusters and strata; therefore, no spatial differences in quantification approaches are applied.

c) Parameters to be measured

The project monitors and reports all parameters required under Section 9.2 for baseline and project emissions, as well as leakage, as applicable to the implemented practice changes and the selected quantification approach (QA3). Parameters include: water regime categories and scaling factors (cultivation or pre-season), organic amendment type and application rate (ROA), cultivation period (L_t), fertilizer types and nitrogen contents (synthetic or organic), residue pathways (returned, removed, or burned), fuel consumption (stationary or mobile), yield (Pwp), and regional yield (RPwp) for baseline re-evaluation or leakage where applicable.

d) Data to be collected, techniques, and sample designs

Management and activity data are collected per field primarily through farmer logbooks, FarmPro field observation sheets, receipts or invoices where available, and DMRV-enabled evidence (GIS layers and satellite imagery overlays).
Directly sampled parameters or verification sampling (where applied):

- Crop cutting is conducted on a random subset of fields each season to validate reported yields and assess potential reporting bias; sampling is designed to be representative across clusters and key strata. The crop-cutting sample design (sampling frame, randomization, minimum sample size per cluster or stratum, and field protocols) is documented in the Monitoring SOPs and aligned with the guidance referenced in VM0051 Appendices 1–2.
- Remote sensing checks (e.g., temporal vegetation indicators and spatial plausibility screening) are used to corroborate yield patterns and to support verification of field boundaries and residue burning signals where relevant.

Where guidance is required for sampling approaches, the project follows the methodology's referenced guidance (Appendices 1–2) and accepted sampling best practices.

e) Ten-year baseline re-evaluation plan

The project implements a 10-year baseline re-evaluation plan to reassess the continued validity of the baseline schedule of activities and regional or sub-national rice production conditions, and to revise the baseline schedule where required (including in connection with crediting period renewal).

The re-evaluation uses authoritative regional production data sources applicable to Thailand (e.g., Government of Thailand agricultural statistics and/or recognized international datasets such as FAOSTAT, supplemented by credible academic or industry sources where needed). Procedures and decision rules for revising baseline cultivation schedules (water regime patterns, residue handling, and fertilizer practices) are documented in the re-evaluation report and reflected prospectively in the monitoring and quantification systems. Baseline schedule revisions are triggered where re-evaluation evidence demonstrates material changes in common practice (e.g., sustained shifts in water regime, residue management, or input use) within the applicable geographic area.

f) QA/QC procedures

The monitoring system includes QA/QC procedures designed to ensure accurate data collection, identify and correct anomalous values, ensure completeness, perform independent checks on analysis results, and provide additional safeguards as appropriate.

Key QA/QC measures include:

- Completeness checks for each field or season (required parameters present and supporting evidence logged).
- Logical consistency checks (e.g., water regime codes consistent with practice claims; fertilizer type aligned with N content; residue pathways not double-counted across returned, removed, or burned).
- Outlier screening (rates of N input, ROA, yield, and fuel use) against cluster or stratum distributions; flagged records trigger follow-up verification and documented corrections.
- Independent internal checks by the Qualified and Internal Audit Committee (spot checks, internal audits of ICS effectiveness, and review of CAPA logs).

- Yield safeguard QA/QC: crop cutting verification, satellite-based plausibility screening, and comparison against reference fields to confirm that project yields do not show unintended decline relative to comparable baseline management (accounting for seasonal climate variability).

Independent checks on analysis results are conducted by the PMT QA/QC Lead and the Qualified and Internal Audit Committee through: (i) recalculation checks on a sample of strata, (ii) traceability checks from workbook outputs back to source evidence, and (iii) review of CAPA closure prior to verification submission.

g) Data archiving procedures

All monitoring data, including QA/QC data and correction logs, are archived electronically with secure access control and version management, and are retained for at least two years after the end of the last project crediting period, and longer where required by VCS record retention and verification needs.

The project also maintains procedures for anticipated updates to electronic file formats to preserve readability and auditability over time (e.g., periodic export to stable formats and controlled database backups). Hard copies (farmer logbooks and key evidentiary records) are retained at FarmPro branches and can be retrieved for verification. The project maintains scheduled database backups and exports key datasets and calculation workbooks to stable formats (e.g., PDF/A for signed records and non-proprietary CSV for core datasets) to mitigate risks associated with software or version changes. Any file format migration is documented with version history to preserve auditability.

h) Sampling error

Management data are expected to be collected across all project fields within quantification units following the hierarchy in Box 1; therefore, sampling error is not expected to contribute to uncertainty deductions. Where full coverage cannot be achieved, the project will justify the sampling approach and account for sampling error consistent with recognized sampling guidance referenced by VM0051.

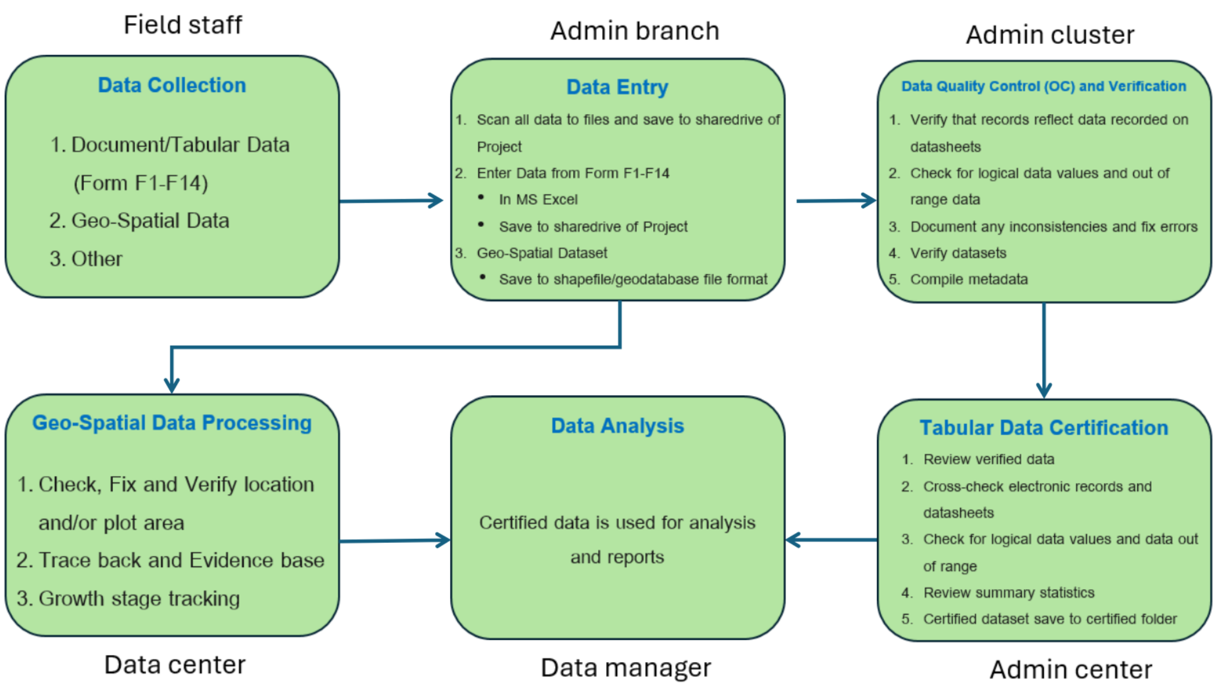


Figure 9: Support system to ensure robust MRV

5.3.2 Training and Technical Support

The Project Proponent, in coordination with FarmPro Thailand and supporting technical partners, provides structured training and ongoing technical support to participating farmers and project implementation staff to ensure correct and sustained implementation of the eligible VM0051 project activities (AWD). Training and technical support are designed to (i) deliver practical, field-ready guidance for the full cultivation cycle, (ii) reduce agronomic risks (particularly yield loss risk associated with altered water regimes), and (iii) ensure complete and accurate data collection required for monitoring and verification.

(a) Training scope and minimum content

Training is provided to both project staff (FarmPro field officers, cluster managers, and MRV or data staff) and farmers, and at a minimum covers the following areas relevant to project implementation and monitoring requirements:

1. **Field preparation and land development**
   - Land preparation steps for AWD, including land leveling practices where required to enable uniform wetting and drying.
   - Bund maintenance, drainage points, and field readiness checks for controlled irrigation and drainage.
2. **Irrigation and drainage management (water regime control)**

- AWD implementation requirements, including planned wet–dry cycles, safe dry-down practices, identification of critical growth stages, and the need for multiple drainage events (beyond end-of-season drainage) where applicable.
- Practical use of water-level indicators (e.g., AWD tubes or staff gauges where deployed), recording of drainage events, and coordination requirements in shared irrigation systems.

3. **Fertilizer and nutrient management**

- Correct identification of fertilizer types and nutrient contents (synthetic and organic), timing and split application, and practices to improve nitrogen-use efficiency under altered water regimes.
- Guidance on avoiding over-application and on making safe adjustments consistent with yield protection and local agronomic recommendations.

4. **Residue and organic amendment management**

- Straw management options (timing of incorporation, off-season versus in-season handling), classification of organic amendments, and implications for emissions and field performance.
- Restricted or discouraged practices under project rules (where applicable), and the recording of residue pathways (returned/removed/burned).

5. **Data collection and monitoring requirements (MRV/ICS)**

- Guidance on completing farmer logbooks or DMRV entries, including recording dates and quantities for fertilizer, organic amendments, fuel use (stationary or mobile), water regime status, and yield.
- Evidence requirements for verification (e.g., receipts, photos, service-provider records, and field visit checklists).
- Explanation of key parameters aligned with VM0051 definitions (e.g., water regime categories, cultivation period boundaries, and residue pathways) to minimize misclassification.

6. **Integrated agronomic guidance (holistic package)**
   Training is provided as an integrated cultivation system package rather than as separate interventions, covering crop establishment, weed management under reduced flooding, pest and disease considerations, and measures to maintain yield stability, with particular focus on constraints commonly associated with reduced flooding (e.g., weed pressure under intermittent irrigation).
7. **Variety-specific guidance (where applicable)**
   Where the project introduces or recommends specific cultivars as part of the improved cultivation package, training includes variety-specific requirements (e.g., maturity duration, water sensitivity, seeding rate, and optimal fertilizer timing) and how these influence irrigation scheduling and monitoring records.

(b) Technical support delivery mechanisms

Technical support is provided through multiple channels to ensure sustained adoption beyond one-off training sessions:

- On-site field coaching and seasonal visits: FarmPro field officers carry out scheduled and spot-check visits at key crop stages (land preparation, establishment, early vegetative stage, pre-flowering, harvest, and post-season drainage) to provide practical guidance and confirm proper implementation of practices.

- Demonstration plots and field days (where applicable): Demonstration fields are used to illustrate correct AWD implementation and to reduce perceived risk among farmers.
- Helpdesk or rapid-response support: Farmers can seek advice through local FarmPro offices and designated contact points, particularly during drainage decisions or unusual weather conditions.
- Refresher training: Refresher sessions are conducted where monitoring identifies recurring data quality issues or implementation challenges, and prior to each verification cycle.

(c) Documentation and verifiability (validation and verification readiness)

All training and technical support activities are documented in a verifiable manner and retained as auditable evidence, including:

- Training protocols or curricula and standard operating procedures (SOPs) aligned with VM0051 practice definitions and monitoring requirements;
- Attendance records (farmers and staff), training dates and locations, trainer names, and materials distributed;
- Records of on-site visits (visit logs, checklists, and photos where applicable), including guidance provided and any follow-up actions;
- Corrective and preventive action records (CAPA) where training or coaching is used to address non-compliance or data gaps; and
- Evidence of communication channels (posters, QR codes, or contact details) used to inform farmers of monitoring requirements and access to support.

(d) Competency assurance and continuous improvement

The project ensures competency of staff and farmers through periodic supervision, spot checks of field records, and review of monitoring performance indicators (e.g., completeness of logbooks, consistency of water regime classification, and yield safeguard outcomes). Training content and delivery are updated based on internal audit findings, VVB feedback, and seasonal learning to support continuous improvement and maintain implementation quality.

5.3.3 Implementation of Improved Water Management Practices (AWD)

The project implements eligible VM0051 rice practice changes in irrigated lowland rice systems, including Alternate Wetting and Drying (AWD), in line with VM0051 requirements. Practice implementation is guided by stratum-specific and, where relevant, variety-specific agronomic guidance developed and periodically updated by qualified experts. This guidance is intended to ensure correct implementation, maintain agronomic viability, and achieve the key safeguard objective that yield does not decline by more than 5% as a result of implementing the project activities.

(a) Engagement of qualified experts and development of stratum/variety criteria

The Project Proponent engages qualified agronomic experts with appropriate qualifications and/or demonstrated experience in rice agronomy and water management. These experts develop criteria specific to each stratum (h) and, where relevant, to rice variety groups (e.g., maturity duration classes), taking into account local soil conditions, climate zones, and irrigation or drainage constraints. The expert protocol defines, at minimum:

For AWD (irrigated lowland):

- Recommended drainage depth targets (cm below the soil surface) and acceptable ranges;
- Recommended drainage duration and re-flooding trigger conditions (e.g., field condition thresholds and water-level indicators where used);
- Growth stage restrictions (e.g., avoiding excessive drying during panicle initiation or flowering).

All criteria are documented in an AWD protocol (SOP), including decision rules, thresholds, and field instructions. The protocol is retained as auditable evidence.

(b) Yield safeguard (≤5% yield decline) and adaptive management

In developing and applying the stratum or variety guidance, the expert explicitly prioritizes yield protection. The project implements a yield safeguard package that includes:

- Stratum- or variety-specific guidance to prevent crop water stress during critical growth stages;
- Training and field coaching to ensure farmers correctly apply the cultivation system; and
- Seasonal yield monitoring (farmer records supported by cross-checks such as crop cutting, satellite-based plausibility screening, and reference field comparisons) to confirm that yield does not decline by more than 5% as a result of project activities.

If monitoring indicates a potential yield decline approaching the safeguard threshold, the project initiates corrective actions (e.g., adjusted thresholds, intensified coaching, targeted field visits, or temporary suspension or modification of practice requirements in the affected stratum), and documents these actions through the CAPA system.

(c) AWD drainage depth threshold and Quantification Approach implications

The project's current design applies QA3 across all strata; if strata with drainage depths of less than 10 cm are identified, the project will update the applicable quantification approach prospectively and document the change in the Monitoring Plan and calculation workbook. For AWD strata, the expert protocol specifies the recommended drainage depth. If the expert determines that any portion of the project area should implement AWD with a drainage depth of less than 10 cm below the soil surface, those areas will be spatially delineated (GIS-linked to field IDs or strata), and the project will apply Quantification Approach 2 (QA2) for those areas in accordance with VM0051. Farmers in QA2 areas remain subject to the same agronomic compliance requirements for drainage depth and duration, and compliance will be monitored and documented under the ICS.

(d) Timing and scheduling of AWD practices

The project supplies farmers with implementation schedules and decision-support guidance aligned with local crop calendars and irrigation practices.

For AWD, the project adheres to the VM0051 recommendation that the first drainage event takes place no earlier than 21 days after initial flooding, to minimize nutrient losses (e.g., pre-flood nitrogen) and support nutrient uptake. Subsequent AWD events are scheduled according to the expert protocol and field conditions.

(e) Compliance monitoring and documentation

Implementation and compliance are tracked each season through the project ICS using farmer logbooks or DMRV records, supported by verification from field officers. Records capture establishment method, dates, water regime status and transitions, drainage events (where applicable), and supporting evidence (photos, checklists, and water-level indicator readings where applied). Any deviations from the recommended depth, duration, or timing are recorded with justification and corresponding follow-up actions. Training records, expert protocols, and field verification logs are maintained as auditable evidence for validation and verification.

APPENDIX 1: COMMERCIALLY SENSITIVE INFORMATION

Use the table below to describe the commercially sensitive information included in the project description to be excluded in the public version.

Section	Information	Justification

APPENDIX X: <TITLE OF APPENDIX>

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