THE WORLD BANK
IBRD • IDA | WORLD BANK GROUP

TRANSFORMATIVE CARBON
ASSET FACILITY · TCAF

WORLD BANK TECHNICAL SUPPORT

Monitoring, Reporting & Verification Package

One Million Hectares of High Quality and Low-Emission Rice Program — MRV Methodology & Implementation Manual for the Mekong Delta, Viet Nam.

Sustainable 1Mha Low-Emission Rice

Mekong Delta, Viet Nam

ISSUED

May 2026

ABOUT THIS DOCUMENT

A carbon-market-grade MRV system crafted for Viet Nam's national-scale rice program

This Executive Summary presents the MRV package developed with World Bank support for Viet Nam's 1 Million Hectares High-Quality Low-Emission Rice Program. The MRV package is designed to meet the rigor required for participation in international carbon markets, while remaining operationally feasible at the scale of one million hectares of household led rice sector. Its design is based on Viet Nam's existing institutional and regulatory framework for the rice sector, ensuring alignment with domestic institutional setting-up and long-term sustainability.

THE PACKAGE AT A GLANCE

Two interrelated documents — an **MRV Methodology** and an **MRV Implementation Manual** — jointly provide a complete end-to-end framework, including scientific rules, and field-level operations. The package was consulted domestically and internationally for peer validation purpose.

PREPARED IN SUPPORT OF

The Viet Nam Ministry of Agriculture and Environment (MAE), under the program "Sustainable Development of One Million Hectares of High-Quality, Low-Emission Rice Associated with Green Growth in the Mekong Delta," established by Prime Minister Decision No. 1490/QD-TTg.

CLIMATE FINANCE CONTEXT

Support is provided under the Transformative Carbon Asset Facility (TCAF), a World Bank–managed carbon fund — linking MRV rigor directly to climate finance delivery.

FRONT MATTER

Acknowledgements

This report was jointly prepared by the Institute for Agricultural Environment (IAE) and the World Bank under the guidance and direction of the Ministry of Agriculture and Environment (MAE) of Vietnam. The report was funded by the Transformative Carbon Asset Facility (TCAF) managed by the World Bank.

The report team gratefully acknowledges the leadership of the Department of Crop Production, the Department of Climate Change, and the Department of International Cooperation of MAE, as well as other relevant departments of the Government of Vietnam, during the preparation and consultation of the study.

The IAE team was led by Mai Van Trinh, Director of IAE. Technical inputs were provided by a World Bank team led by Zhuo Cheng (Senior Climate Finance Specialist) and Thuong Thuong Thi Nguyen (Climate Finance Specialist), Guo Li (Senior Agriculture Economist), Binh Thang Cao (Senior Agriculture Specialist), Hoa Thi Phuong Kieu (Program Assistant), and Hang Minh Dang (Consultant), under the guidance of Paavo Eliste (Practice Manager, Agriculture and Food, East Asia and Pacific), Olivier Mahul (Global Manager, Carbon Finance Solutions, One Climate Department), and Mariam J. Sherman (World Bank Division Director for Vietnam, Cambodia, and Lao PDR). The team also extends its sincere thanks to all the reviewers who generously provided comments and suggestions that helped strengthen this work.

The study was prepared with support from a UNIQUE land use GmbH team led by Andreas Wilkes, contracted by the World Bank Group. The team gratefully acknowledges the valuable guidance provided by the stakeholders consulted.

Rights and Permissions

Disclaimer

THE COMPLETE PACKAGE

Contents

EXECUTIVE SUMMARY

DOCUMENT ONE — MRV METHODOLOGY

DOCUMENT TWO — MRV IMPLEMENTATION MANUAL

01

PROGRAM CONTEXT

Background & Program Context

Viet Nam's "Sustainable Development of One Million Hectares of High-Quality, Low-Emission Rice Associated with Green Growth in the Mekong Delta" (the 1Mha Program) is one of the world's most ambitious national-scale climate-smart agriculture initiatives. Anchored in Prime Minister Decision No. 1490/QD-TTg, the program targets the transformation of rice cultivation across one million hectares of the Mekong Delta — by promoting practices such as Alternate Wetting and Drying (AWD) water management, reduced nitrogen application. The program simultaneously pursues climate mitigation, enhanced rice quality, farmer income, and alignment with Viet Nam's Nationally Determined Contribution (NDC) under the Paris Agreement.

A critical enabler of the program's success — and its connection to climate finance — is a rigorous Monitoring, Reporting, and Verification (MRV) system. Since October 2024, the World Bank has provided sustained technical support to the Viet Nam Ministry of Agriculture and Environment (MAE) to design, test, and institutionalize a comprehensive MRV package comprising two core documents: an MRV Methodology and an MRV Implementation Manual. This support is provided in the context of the Transformative Carbon Asset Facility (TCAF), a World Bank-managed carbon fund, creating a direct link between MRV rigor and climate finance delivery.

1 M ha

Target rice area transformed across the Mekong Delta

5 provinces

Pilot provinces: Cần Thơ, An Giang, Cà Mau, Vĩnh Long & Đồng Tháp

2030

Target year for full one-million-hectare scale

02

TWO COMPLEMENTARY DOCUMENTS

The MRV Package

The MRV package is explicitly designed to meet carbon market-grade standards, while remaining practical at the scale of one million hectares of smallholder rice farming. This dual ambition — international credibility and operational feasibility — defines every design choice in the package. It consists of two interrelated documents that together provide a complete, end-to-end framework — from scientific rules to field-level operations.

DOCUMENT 01

MRV Methodology

MRV Methodology establishes the scientific and procedural rules for quantifying greenhouse gas (GHG) emission reductions. It adopts IPCC 2019 Tier 2 approaches for emission factor application, with a structured Improvement Pathway that progresses towards Tier 3 process-based modelling as measurement capacity matures. The methodology is designed covers the core technical functions of MRV — what is monitored, additionally test, how baseline and project emissions are quantified, and how emission reductions are calculated under conservative, IPCC aligned principles, thus it does not cover a few standards specific methodology requirements, such as downward adjustment under Article 6.4. This design allows the same monitored data to support voluntary crediting, Paris Agreement Article 6.2 transactions, Article 6.4 activities, or future domestic Emissions Trading Scheme units, with the relevant pathway adjustments applied transparently through the carbon programme design document and the validation and verification process. The methodology aligns with major voluntary carbon standards. Baseline emissions are conservatively set relative to pre-program practices, ensuring that all credited reductions are real and conservatively quantified.

DOCUMENT 02

MRV Implementation Manual

The MRV Implementation Manual aims to operationalise the Monitoring, Reporting and Verification (MRV) Methodology for Viet Nam's One Million Hectare High-Quality Low-Emission Rice Cultivation Program (1Mha Program) in the Mekong River Delta. It sets out the step-by-step procedures through which the Methodology is applied in the field, covering Standard Plot (SPOT) mapping and stratification, baseline and monitoring data collection, quality assurance and quality control, data management (uncertainty analysis, sampling requirements, etc.), annual monitoring reporting, and the interface with validation and verification. The Manual translates the Methodology's principles into operational instruments that work at the scale of hundreds of cooperatives and millions of smallholder plots — defining roles and responsibilities across the Department of Crop Production and Plant Protection (DCPPP), the Central MRV Unit, and Provincial MRV Units. Together with companion materials planned for development (Training Manual; Database and Software Manual; Validation and Verification Manual), it will constitute the operational backbone of the Program's MRV system.

Together, these two documents constitute a complete, carbon-market-grade MRV package: the Methodology provides the scientific rules and the Implementation Manual provides the operational procedures. Each document serves a distinct function, but they are designed to work as an integrated system. The package was consulted domestically and internationally for peer validation purpose.

The six-step monitoring cycle

As specified in the Implementation Manual — applicable across every registered cooperative and field, season after season.

1 Preparation
Tools, templates & training of Province MRV Units

2 Registration
Cooperatives & SPOT areas enrolled

3 Baseline
Pre-program emissions established

4 Measurement
Sampling & photo-monitoring of drainage

5 Reporting
Seasonal data via national platform

6 Verification
Accredited third parties per respective standard requirements

03

FROM TECHNICAL REPORT TO SECTOR POLICY

Domestic Institutionalization

A distinguishing feature of the 1Mha Program's MRV package is that it has not remained a technical document — it has been integrated formally into existing implementation of the program by the Vietnamese government, by piloting the implementation of the MRV guidelines across several communities in the five pilot provinces.

> DECISION NO. 4801/QD-BNNMT · 14 NOVEMBER 2025
>
> On November 14, 2025, the Ministry of Agriculture and Environment (MAE) issued Decision No. 4801/QD-BNNMT, officially promulgating the "Pilot Process for Measurement, Reporting, and Verification (MRV) for High-Quality and Low-Emission Rice Cultivation in the Mekong Delta."

A sequenced, three-stage pilot process

Especially, Decision No. 4801/QD-BNNMT structures MRV piloting in a sequenced, three-stage process that sets out how the MRV package moves from design to full implementation:

01

Preparation & tool development

Stage 1 — Preparation and tool development: This stage includes finalization of the guidelines, use of tools and templates, and delivering training across the five pilot provinces (Cần Thơ, An Giang, Cà Mau, Vĩnh Long, and Đồng Tháp), among others.

02

Operational pilot 2025–2026 winter-spring

Stage 2 — Operational piloting during the 2025–2026 winter-spring cropping season: The pilot activities include establishing baselines and conducting monitoring, using offline-capable mobile applications for photo-based monitoring of drainage events across all registered SPOTs, and preparing a seasonal summary report, among others.

03

Review, learning & scaling 2026–2027

Stage 3 — Review, learning, and programmatic scaling (2026–2027): Building on the pilot experience, the Government continues to refine the guidance and processes to reflect lessons learned on the ground, supporting progressive expansion toward the program's full one-million-hectare scale by 2030.

04

FROM MINISTRY TO FARM GATE

Institutional Structure & NDC Alignment

The institutional structure envisioned under Decision No. 4801/QD-BNNMT sets out clear, multi-level, transparent data flows from central government to farm gate. At the national level, the Department of Crop Production and Plant Protection (DCPPP) under MAE serves as both the 1Mha Program's national focal point and the rice-sector focal point for NDC reporting. A dedicated MRV unit established under DCPPP could help with methodology governance, digital platform management, QA/QC oversight, and compilation of program-wide annual monitoring reports. At the provincial level, it would be important for the Departments of Agriculture and Environment (DAEs) in each pilot province to establish dedicated Province MRV Units and develop annual provincial monitoring plans consistent with the MRV Manual, with commune extension offices providing direct technical support to cooperatives. At the field level, cooperatives and agribusiness companies would register SPOT areas, submit seasonal monitoring data through the national digital platform, and maintain photographic and logbook evidence of AWD practice compliance. While these units are not yet formally established, this institutional arrangement was tested through the pilot implementation.

ALIGNMENT WITH THE NATIONAL GHG INVENTORY & NDC

A distinctive design feature of the 1Mha Program's MRV package is its deliberate alignment with Viet Nam's national GHG inventory framework and NDC reporting obligations. The methodology adopts the same regional and seasonal emission factors and activity data definitions used in Viet Nam's rice sector inventory submissions under the UNFCCC, ensuring that emission reductions verified under the 1Mha Program are coherent with — and do not conflict with — national accounting. This design choice directly addresses the double-counting risk that undermines many subnational carbon projects: credits issued through the 1Mha Program can be accounted for consistently whether they are used for Article 6.2 Internationally Transferred Mitigation Outcomes (ITMOs), domestic carbon market purposes, or as contributions to Viet Nam's NDC. The Central MRV Unit is positioned as the national focal point bridging project-level monitoring data and national inventory reporting, enabling a seamless flow of verified GHG information from field to national communications.

05

LARGE-SCALE RICE MRV IN THE CARBON MARKET

Addressing a Critical Gap

Rice is one of the largest single sources of agricultural methane globally, yet the past experience in implementing rice carbon crediting project at large scale is proven to be largely limited, with various challenges. Recent developments under voluntary carbon standards — including Verra's rice methodology (VM0051) and the Gold Standard rice methodologies — have substantially advanced the technical basis for rice-sector emission reductions and remain essential instruments for project-level crediting. Nevertheless translating this experience to a one-million-hectare programme across hundreds of cooperatives and millions of smallholder plots in the Mekong River Delta has raised a distinct set of gaps: how to keep Monitoring, Reporting and Verification (MRV) cost and operational intensity within reach of smallholder farmers which is key to ensure large scale project viable; how to ensure consistency between project outcomes and Viet Nam's national greenhouse gas (GHG) inventory and Nationally Determined Contribution (NDC) reporting; and how to align activity data and emission factors across multiple programmes operating in the same communes. These programmatic and institutional gaps sit alongside, rather than within, the scope of any single voluntary standard.

The 1Mha Program directly addresses these gaps. By combining a government-led institutional framework, a scientifically rigorous methodology, a digitally enabled implementation system, and a transparent international peer review process, the Program establishes a replicable model for national-scale rice carbon accounting. The use of SPOT-based stratification and statistical sampling addresses the "smallholder aggregation problem" that has long constrained rice carbon projects — enabling cost-effective, high-integrity data collection across millions of individual plots without requiring plot-by-plot monitoring. The phased improvement pathway provides a credible roadmap for methodological progression, building investor confidence that the system will strengthen over time rather than stagnate at a minimum standard. Within this framework, private-sector developers retain a central role: voluntary standards continue to provide the project-level mechanisms for credit generation, supported by the Program's common technical architecture and aligned with national reporting.

165 M ha

Rice cultivated globally — the scale of the replication opportunity

1 M ha

A single coordinated program across the Mekong Delta

06

A GLOBAL TEMPLATE FOR RICE PRODUCERS

Replication Potential for Global Rice Producers

The significance of the 1Mha Program extends well beyond Viet Nam. Rice is cultivated on approximately 165 million hectares globally, with major producing countries — including Thailand, Indonesia, India, Bangladesh, Myanmar, and the Philippines — facing similar pressures to reduce agricultural methane emissions under their NDCs while accessing climate finance to support the transition. The MRV package developed for the 1Mha Program offers a technically robust and institutionally tested template that other countries can adapt to their own agronomic, regulatory, and data environments.

Several features of the package are particularly well-suited to replication. The SPOT concept — grouping fields by homogeneous hydrology, soil, and elevation — is applicable to any irrigated rice landscape with organized irrigation infrastructure and can be adapted to different scales and geographic contexts. The tiered improvement pathway enables countries with limited initial technical capacity to launch an MRV-eligible program immediately while building toward higher precision over time. The cooperative-based reporting model, combined with offline-capable digital tools, is designed for the connectivity and institutional realities of rural agricultural landscapes in developing countries. The explicit alignment between project-level MRV and national GHG inventory methodology provides a blueprint for how other countries can design rice carbon programs without creating accounting inconsistencies at the national level.

World Bank engagement in the 1Mha Program — spanning methodology design, international consultation facilitation, and TCAF carbon finance — positions this initiative as a global knowledge product. The detailed documentation of methodological choices, consultation outcomes, and operational protocols developed for Viet Nam can inform the design of similar programs across Southeast Asia and beyond, accelerating the growth of a credible, large-scale rice carbon market that currently remains challenging to operationalize, given the difficulty of balancing data accuracy with the cost-effectiveness of running an MRV system at scale.

EXECUTIVE SUMMARY

Conclusion

The World Bank's technical and financial support to Viet Nam's 1Mha Low-Carbon Rice Program has yielded an MRV package that balances three interrelated objectives: it aligns with the credibility standards of international carbon markets; it remains operational and cost-effective across one million hectares of smallholder agriculture; and it is being institutionally anchored within Viet Nam's GHG-accounting architecture, building on the initial decision to pilot. The two-stage consultation process — domestic institutionalization through MAE Decision No. 4801 and international peer review generating 65 technical comments — provides a strong foundation of institutional ownership and technical credibility. The package's alignment with national inventory and NDC reporting ensures coherent climate accounting from field to government. And its modular, phased design offers a replicable model for rice-producing countries worldwide, addressing a long-standing gap in the global carbon market for practical, large-scale rice MRV. As the 1Mha Program moves from pilot to full-scale implementation, the MRV system developed with World Bank support will serve as both an operational instrument for Viet Nam and a global reference for the rapidly evolving field of low emission rice and carbon finance.

An MRV package that balances data quality and international carbon-market credibility with practical, cost-effective monitoring for smallholder farmers at large scale.

MRV PACKAGE · DOCUMENT ONE

MRV Methodology

Guiding methodological rules and principles for measurement, reporting and verification of greenhouse-gas benefits in the 1Mha rice carbon program.

SECTIONS IN THIS DOCUMENT

Abbreviations

1Mha	One Million Hectares of High-quality, Low-emission Rice
AWD	Alternate wetting and drying (see Definitions)
C-PDD	Carbon program design document
CF	Continuous flooding
CH_4	Methane
CO_2	Carbon dioxide
DAE	Provincial Departments of Agriculture and Environment
EF	Emission factor
GHG	Greenhouse gas
ha	Hectares
IPCC	Intergovernmental Panel on Climate Change
ITMOs	Internationally transferred mitigation outcomes
MAE	Ministry of Agriculture and Environment
MRV	Measurement, reporting and verification
MSD	Mid-season drainage (see Definitions)
N	Nitrogen
N_2O	Nitrous oxide
NDC	Nationally Determined Contribution
QA/QC	Quality assurance and quality control

Definitions

1Mha Project	Project on Sustainable development of one million hectares of low carbon and high-quality rice associated with green growth in the Mekong Delta until 2030, as approved in PM Decision No#:1490/QD-TTg, which encompasses activities outside the scope of the carbon program
1Mha carbon program	A set of activities within the 1Mha Project to generate mitigation outcomes
Alternate wetting and drying	Fields have more than one effective drainage event during the cropping season (plus end-season drainage).
Individual mitigation activity	The eligible mitigation activities conducted on groups of fields that are registered under one farmer organization or cooperative to participate in the program and that meet all the requirements in Section 2.2.
Mid-season drainage	Fields have a single effective drainage event during the cropping season at any growth stage (plus end-season drainage).
Mitigation measures	Agronomic practices (e.g. water and nutrient management practices) that affect GHG emissions. In this methodology, 'mitigation measures' refers to these practices in general, whereas 'mitigation activities' refers to their application as part of eligible mitigation activities.
Drainage event	Drainage is the natural or artificial removal of surface water and sub-surface water from a rice field area. For the purpose of MRV, an effective drainage event is when there is evidence that surface soil remained non-flooded with no standing water for 3 or more consecutive days after the day of drainage.

Introduction

1.1 Background

- The 'Project on Sustainable development of one million hectares of low carbon and high-quality rice associated with green growth in the Mekong Delta until 2030' (1Mha Project) sets out the objective to promote sustainable farming practices that reduce greenhouse gas (GHG) emissions. Some of the promoted practices can be eligible for crediting in carbon markets. Adoption of eligible practices and robust measurement, reporting and verification (MRV) of the activities and their effects on GHG emissions comprise the core activities of the 1Mha carbon program associated with the 1Mha Project.
- **Purpose of this methodology:** Quantifying the emission reductions achieved under the 1Mha carbon program requires a GHG quantification methodology suited to rice production conditions in the Mekong Delta Region — a key component of the MRV system. This methodology document sets out the principles, requirements and methods for determining eligible activities and geographic areas, quantifying baseline and project GHG emissions and calculating emission reductions, together with the data sources and monitoring activities needed to support them. Its central purpose is to give the Government of Viet Nam a common, standardized basis for accounting for the program's emission reductions — a single set of quantification principles that lets the central level compile, aggregate and report results consistently across many cooperatives and provinces, whichever crediting route an individual project ultimately follows. The value of a common methodology is therefore coherence and comparability across the whole program, and a reliable basis on which the Government can stand behind the emission reductions it reports.
- **Principles and general requirements:** The methodology is designed to generate high-integrity emission reductions (ERs) under the 1Mha carbon program, which may serve multiple purposes, including use in domestic emissions trading systems (ETSs), for voluntary carbon market transactions, or, if authorized, as Internationally Transferred Mitigation Outcomes (ITMOs) under Article 6.2 of the Paris Agreement. While not all ERs generated under the MRV system will be used as ITMOs, this methodology adopts the internationally agreed guidance for Article 6.2 transactions as the reference framework to ensure environmental integrity and broad usability of credits. Accordingly, it ensures that ERs:
  - Are real and verified;
  - Ensure environmental integrity, including through … baselines set in a conservative way and below 'business as usual' projections, taking into account all existing policies and addressing uncertainties in quantification and potential leakage;
  - Minimize and, where possible, avoid negative environmental, economic and social impacts; and
  - Be consistent with the host country's sustainable development objectives.

This document sets out how these principles and requirements are to be met in the 1Mha carbon program. The 1Mha Methodology is not designed to replace Verra, Gold Standard, or other established methodologies. Rather, it establishes the national-level scientific and procedural framework — the minimum technical standard — within which private-sector actors (aggregators, project developers, off-takers) can pursue specific crediting pathways. A cooperative's emission reductions verified under this Methodology can, in principle, support credit issuance under Verra VCS, Gold Standard, or a future domestic crediting mechanism, provided that the additional pathway-specific requirements of those standards (additionality tools, project design document formats, registry registration, buffer pool contributions) are also met. This "national floor with standard-specific ceiling" architecture avoids fragmentation of monitoring data across multiple incompatible methodological approaches, while preserving flexibility for private-sector actors and carbon buyers to select the crediting pathway best suited to their needs.

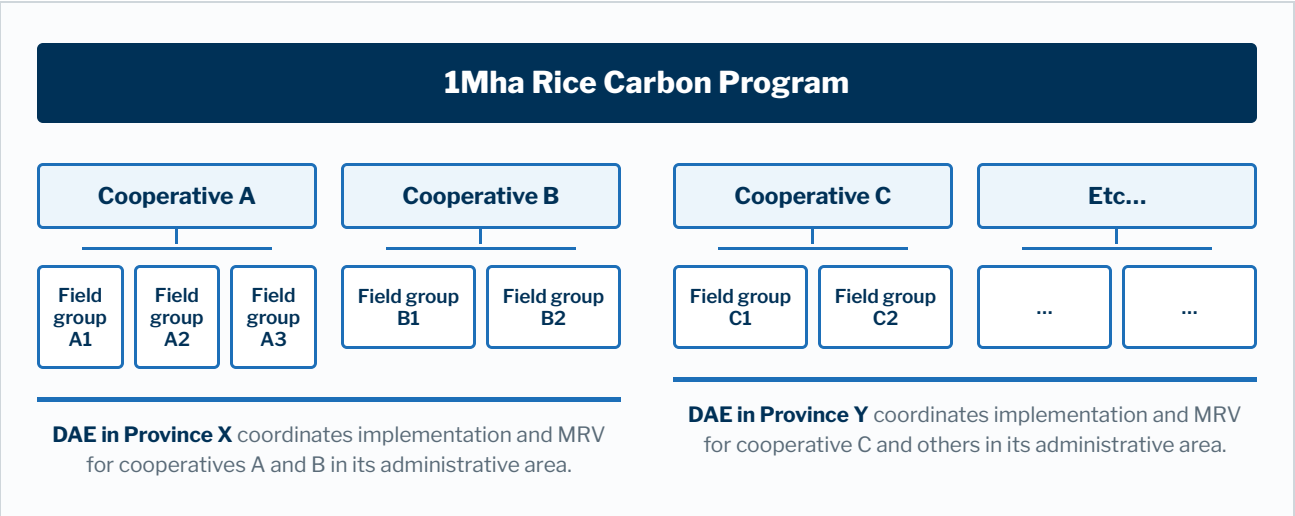
1.2 1M ha rice carbon program design

The 1Mha carbon program will be anchored by a single master document — the carbon program design document (C-PDD) — compiled and maintained by the Government at the central level as the program's common reference for monitoring, reporting and verification, rather than a project design document prepared under any individual carbon standard. Within the five participating provinces, farmer organizations or cooperatives (hereinafter ‘cooperatives’) can register to participate in the 1Mha carbon program if they meet the eligibility criteria in Section 2.2. Provincial Departments of Agriculture and Environment (DAE) and commune extension offices will be responsible for coordinating, implementing and supporting cooperatives to implement MRV tasks within their administrative area (see MRV Implementation Manual). Design, training and implementation of MRV activities will be led by a Central MRV Unit delegated by MAE. MRV activities will produce an annual monitoring report for the whole carbon program and annual monitoring reports for each province.

Cooperatives intending to register for participation in the carbon program will submit statements and documentation to confirm that the cooperative and its participating groups of rice fields conform to the eligibility criteria for participation. New cooperatives and new groups of rice fields may be added to the carbon program throughout the program lifetime until the end of 2030. Conformity with the eligibility criteria and registration procedures will be validated by an accredited third party. This validation will occur the first time a cooperative is included in the 1Mha carbon program. For cooperatives and groups of rice fields added to the carbon program after the initial validation of the C-PDD, a third party will check their compliance with the eligibility criteria at the next carbon program verification event. The purpose of this check is to ensure that the newly added mitigation activities are consistent with the C-PDD and the program eligibility criteria. Specific procedures to register and add new individual mitigation activities to the carbon program are set out in the MRV implementation manual.

For integration with national systems, the Central MRV Unit will compile an aggregated and verifiable monitoring and verification package, including QA/QC records and supporting documentation, and submit it to the Department of Crop Production and Plant Protection (DCPPP), which serves as the 1Mha focal point and as the focal point for NDC rice-sector reporting. Detailed procedures for data management, registry submission, and compliance with applicable national legal instruments (including evolving decrees and registry arrangements) will be addressed through separate Government processes and associated guidance, as these are finalized. The Methodology and MRV Implementation Manual are technical guidance documents and do not establish national registration, authorization, or international transfer processes.

Figure 1: Schematic diagram of the 1Mha rice program implementation and MRV arrangements



Scope and private-sector engagement. The MRV arrangements set out in this Methodology and the accompanying MRV Implementation Manual are intended to support national coordination, consistency, and oversight for the 1Mha carbon program. They define minimum requirements for data collection, QA/QC, aggregation, and reporting at the program scale, and do not seek to prescribe or replace the rulebooks of voluntary carbon standards. Within this framework, private-sector actors, including aggregators, project developers, and offtakers, play an important role and may pursue specific crediting pathways depending on buyer preference (for example, Gold Standard, Verra Verified Carbon Standard, or future Article 6 arrangements), subject to compliance with national rules and the validation, verification, and issuance requirements of the applicable standard.

2. Scope and eligibility of mitigation actions

2.1 Eligible mitigation measures

- This methodology covers the following mitigation measures/technologies:
  - Change in water regime of irrigated rice fields during the cultivation period in any season from continuously flooded to intermittent flooded conditions, including mid-season drainage (MSD) and alternate wetting and drying (AWD), or from MSD to AWD. See **Definitions**.
  - Change in irrigation management of irrigated rice fields that shortens the period of flooded conditions during or before any planting season, including applying short duration varieties; replacing transplanting with continuous flooding by direct seeded rice with a shortened flooding period; and changes in pre-season water management regime. Detailed criteria for classifying pre-season flooding regimes (consecutive versus total flooding days, and the 30-day threshold) are set out in Section 3.4.3.2 (item 14) of the MRV Implementation Manual.
  - Improved fertilizer management, including reduced nitrogen fertilizer application rates or change in fertilizer type leading to change in nitrogen application rates.

2.2 Eligible individual mitigation activities

- An individual mitigation activity is the eligible mitigation measures conducted on groups of fields that are registered under one farmer organization or cooperative to participate in the 1Mha carbon program. The criteria in this section apply to all individual mitigation activities, including ones that are added into the program after it starts:

- Eligible individual mitigation activities must be located in registered specialized rice cultivation areas in the five provinces of the Mekong River Delta under the current administrative structure: Cần Thơ, An Giang, Cà Mau, Vĩnh Long, and Đồng Tháp;
- The geographic locations of the participating rice fields must be clearly documented;
- Change in water regime, irrigation management, or fertilizer management occurred on or after 1 January 2021;
- The changes in water regime, irrigation management, or fertilizer management are implemented in a way that ensures they do not directly cause a reduction in rice yield;
- Participants in the individual mitigation activity have agreed to transfer ownership of emission reduction rights to the project entity;
- Participants in the individual mitigation activity confirm that emission reduction rights have not been transferred to any other party as part of domestic or international voluntary or other carbon market project;
- All applicable requirements relating to stakeholder consultation and safeguard requirements set out in the C-PDD have been met;
- The eligible mitigation measures applied are not required by local or national legislation in the project location;
- The province in which the individual mitigation activity is located has an approved annual MRV plan.
- Irrigation and drainage infrastructure adequacy shall be assessed at registration and documented in the cooperative or company registration application, against applicable national technical specifications (see MRV Implementation Manual, Appendix A4).

Contribution to sustainable development and safeguards

The consistency of the eligible mitigation measures with the sustainable development objectives of the 1Mha Project shall be justified in the respective carbon design documents prepared when registering with the respective standards.

The respective carbon design documents shall also set out a plan for monitoring the carbon program's contribution to sustainable development, including but not limited to relevant indicators reflecting the targets set out in PM Decision No. 1490/QD-TTg and any other monitoring indicators for the 1Mha Project required by MAE.

Potential negative social, economic and environmental impacts of eligible mitigation measures, including necessary enabling activities (e.g. infrastructure construction), and means to address them shall be described in the respective carbon design documents.

3. GHG sinks and sources included

The GHG emission sources included in or excluded from the project boundary when quantifying baseline and project emissions are listed in Table 1.

Table 1. Emissions sources included when calculating baseline and project emissions

Source	Gas	Included	Explanation
Emissions from rice cultivation	CH_4	Yes	Major source of emissions in both baseline and project scenarios
Emissions from synthetic nitrogen fertilizer use	N_2O	Yes	Emissions from nitrogen fertilizer use are quantified in both baseline and project scenarios. Change in emission factor due to change in irrigation method must also be included.
Emissions from fossil fuel use by land levelling machinery	CO_2	Yes	Land-levelling may be a direct, project-enabled activity required to implement AWD effectively in some areas. Associated CO2 emissions from land-levelling machinery are included only where a demonstrable, AWD-attributable change in fuel or energy use occurs; otherwise, such emissions are excluded. Routine farm operations not affected by AWD adoption (for example, harvesting) are out of scope and are not included in the project boundary.

Annex 1 sets out the general conditions and procedures for including additional mitigation measures and GHG sources in the program as data and methods improve over time.

4. Baseline setting

- The crediting baseline shall be set for the carbon program as a whole, and must be set such that baseline GHG emissions are lower than the 'business-as-usual' projections for GHG emissions from rice cultivation in the latest updated version of Viet Nam's NDC. Specific methods to determine and quantify the crediting baseline shall be described in the C-PDD.

- The baseline scenario must be determined for each group of fields in a registered individual mitigation activity.
  - For groups of fields in which mitigation measures will be adopted *after* a baseline survey has been conducted, baseline rice cultivation practices shall be determined for each cropping season on the basis of farmers' practices in the 1 year prior to the baseline survey.
  - If mitigation measures were adopted prior to the baseline survey, then the baseline rice cultivation practices in each season shall be the rice cultivation practices in each rice season in the 1 year before adoption verifiable evidence from earlier years can be provided (e.g. farmer logs, project monitoring records, documentation by extension agencies, irrigation and drainage schedules, photos with meta-data showing field conditions). If verifiable evidence is not available, then the baseline rice cultivation practices shall be the practices implemented in each season in the 1 year prior to the baseline survey.
  - If the year prior to the baseline survey in (a) above or the year before adoption in (b) above had an atypically long rice growing season, then the duration of the rice growing season in the baseline shall be set as the typical growth period for the baseline rice variety cultivated in that season.

5. Stratification of the program area

Stratification of the carbon program area is useful to increase the accuracy of emission estimates, and to match baseline and project data on rice cultivation practices with the parameters given in the IPCC equations for methane emissions from rice cultivation (IPCC 2019 Vol. 4 Ch. 5).

The 1Mha carbon program area will be divided into strata based on two static criteria, namely sub-region and soil type that are representative in Mekong Delta (see Table 2). Each stratum will then be subdivided into two sub-strata, namely continuous flooding (CF) or mid-season drainage (MSD), based on baseline survey data on water management practices. Strata with biophysical characteristics that make AWD adoption technically infeasible may be excluded from the carbon program area.

All other variables used in the IPCC equations for estimating methane emissions from rice cultivation, apart from water regime, sub-region and soil type, are considered "dynamic variables". These may vary between the baseline and the project scenario, and may also change from year to year during implementation. Dynamic variables will be determined for each stratum in the baseline scenario and will be monitored annually to quantify project emissions in each stratum. In the equations below, each stratum is denoted using the subscript *g*.

Table 2: Baseline stratification criteria

Sub-region	Soil type	Name of strata	Name of sub-strata

Sub-region	Soil type	Name of strata	Name of sub-strata
Upstream	Alluvial soils	1	1CF; 1MSD
	Acid sulphate soils	2	2CF; 2MSD
Mid-region	Alluvial soils	3	3CF; 3MSD
	Acid sulphate soils	4	4CF; 4MSD
	Medium and light saline soils	5	5CF; 5MSD
Coastal area	Alluvial soils	6	6CF; 6MSD
	Acid sulphate soils	7	7CF; 7MSD
	Medium and light saline soils	8	8CF; 8MSD
Ca Mau Peninsula	Acid sulphate soils	9	9CF; 9MSD
	Medium and light saline soils	10	10CF; 10MSD
Total number of strata		10	20

6. Baseline emissions

- Baseline emissions will be calculated using Equation 1:

$$BE_y = \sum_s^S (BER_S + BEN_S + BEF_S)$$ EQUATION 1

where:

BEy	= Baseline emissions per year (tCO_2e)
BERS	= Baseline emissions from rice cultivation in season *s* (tCO_2e)
BENS	= Baseline emissions from N fertilizer application in season *s* (tCO_2e)
BEFS	= Baseline emissions from fossil fuel use by machinery used in land preparation in season *s* (tCO_2e)
S	= index indicating rice cultivation season.

- Baseline emissions from rice cultivation in season (s) are calculated using Equation 2:

$$BER_S = \sum_g^G (EF_{BL,S,g} \times A_{S,g} \times 10^{-3} \times GWP_{CH4}) \quad \text{EQUATION 2}$$

where:

BERS	= Baseline emissions from rice cultivation in season *s* (tCO_2e)
EFBL,S,g	= Baseline methane emission factor from rice lands in stratum *g* in season *s* (kg CH_4 ha^{-1} $season^{-1}$)
AS,g	= Area of program rice fields in stratum *g* in season *s* (ha)
GWPCH4	= Global warming potential of CH_4 (t CO_2e/t CH_4; value of 28 to be used from IPCC AR5)
G	= Index for rice fields in the same stratum

In this methodology, the value of $EF_{BL,S,g}$ is calculated using the methods set out in the IPCC 2019 Refinement using sub-national Tier 2 emission factors for the Mekong Delta and IPCC default scaling factors applied in Equation 3:

$$EF_{BL,S,g} = EF_{c,g,s} \times SF_{w,g} \times SF_{p,g} \times SF_{o,g} \times days_{BL,s,g} \quad \text{EQUATION 3}$$

Where

EFBL,S,g	= Baseline methane emission factor from rice fields in stratum *g* in season *s* (kg CH_4 ha^{-1} $season^{-1}$)
EFc,g,s	= Baseline emission factor for continuously flooded fields without organic amendments in stratum *g* in season *s* ($kgCH_4$ ha^{-1} day^{-1}) (Table 3)
SFw,g	= Scaling factor to account for the differences in water regime during the cultivation period (either CF or MSD) in the stratum *g* (Table 4)
SFp,g	= Scaling factor to account for the differences in water regime in the pre-season before the cultivation period in stratum *g* (Table 4)
SFo,g	= Scaling factor to account for the differences in type and amount of organic amendment applied in stratum *g* (Equation 4)
daysBL,s,g	= Baseline cultivation period for rice crop in season *s* in stratum *g* (days)

Table 3. Emission factors for continuous flooding without organic amendments in the Mekong Delta Region

Cropping season	EF_c	Unit
Winter-spring	1.95	$kgCH_4$ ha^{-1} day^{-1}
Summer-autumn	1.83	$kgCH_4$ ha^{-1} day^{-1}
Autumn-winter	2.20	$kgCH_4$ ha^{-1} day^{-1}

Source: 2626/ QĐ-BTNMT

- The IPCC default scaling and conversion factors used in the national inventory shall be applied in Equation 3 (Table 4).
- For water regime during the cultivation period (SFw), an effective drainage event is when surface soil remained non-flooded with no standing water for 3 or more consecutive days after the day of drainage (see Definitions).

Table 4: Default scaling and conversion factors

Scaling and conversion factor	Management	Value
Water regime during the cultivation period (SF_w)	Continuously flooded (CF)	1

Scaling and conversion factor	Management	Value
	Mid-season drainage (MSD)	0.71
	Alternate wetting and drying (AWD)	0.55
Water regime before the cultivation period (SF_p)	Non flooded preseason < 180 days	1
	Non flooded preseason > 180 days	0.89
	Flooded pre-season >30 d	2.41
Conversion factor for type and timing of organic amendment (CFOA)	Straw incorporated < 30 days before cultivation	1
	Straw incorporated > 30 days before cultivation	0.19
	Compost	0.17
	Farm yard manure	0.21
	Green manure	0.45

Source: IPCC (2019) Vol 4 Ch 5

- The scaling factor for the type and amount of organic amendment (SF_o) is calculated using Equation 4:

$$SF_{o,g}=(1+\sum_i ROA_{BL,i,g,s}\times CFOA_{i,g,s}) \quad \text{EQUATION 4}$$

Where

SFo,g	= Scaling factor to account for the differences in type and amount of organic amendment applied in stratum *g* (Table 4)
ROABL,i,g,s	= amount of organic amendment of type *i* (in dry weight for straw, fresh weight for other amendments) applied to rice land in stratum *g* in season *s* in the baseline (t ha^{-1} $season^{-1}$)
CFOAi,g,s	= conversion factor for organic amendment of type *i* applied in stratum g in season *s* (shown in Table 4 above)
I	=index of organic amendment types and timings.

- General conditions and procedures for changing the default values in Tables 3 and 4 as new data or methods become available are set out in Annex 1. Requirements for direct measurements of emission factors (e.g. EF_c) or scaling factors (e.g. SF_w) are set out in Annex 2.
- Baseline emissions from nitrogen (N) fertilizer use will be calculated using Equations 5 and 6:

$$BEN_S = \sum_g^G BEN_{BL,S,g} \qquad \text{EQUATION 5}$$

where

$$BEN_{BL,S,g} = \sum_g^G (FN_{BL,S,g} \times A_{S,g} \times EF_{1FR} \times \frac{44}{28} \times 10^{-3} \times GWP_{N2O}) \qquad \text{EQUATION 6}$$

and

$BEN_{BL,S,g}$	= Baseline emissions from nitrogen fertilizer use in stratum *g* in season *s* (tCO_2e)
$FN_{BL,S,g}$	= Baseline quantity of nitrogen in fertilizer used in stratum *g* in season *s* (kg N)
EF_{1FR}	= Emission factor for nitrogen fertilizer application ([kg N_2O–N (kg N)$^{-1}$]; value to be taken from IPCC 2019 Table 11.1: Baseline continuous flooding: 0.00300 Baseline mid-season drainage: 0.00500
GWP_{N2O}	= Global warming potential of N_2O (tCO_2e/tN_2O; value of 265 to be used from IPCC AR5)
$A_{S,g}$	= Area of program rice fields in stratum *g* in season *s* (ha)

- Baseline emissions from fossil fuel use in land levelling are calculated using Equations 7 and 8:

$$BEF_S = \sum_g^G (A_{BL,S,L,g} \times FE_L) \qquad \text{EQUATION 7}$$

Where

$A_{BL,S,L,g}$	= Baseline area of rice fields in stratum *g* that are levelled in season *s* (ha)
EF_L	= Emission factor for fossil fuel consumption from machinery used in land levelling (t CO_2 per hectare levelled)

- Additional guidance on developing the emission factor per ha levelled is given in Annex 3.

7. Project emissions

- Project emissions shall include emissions from rice cultivation, N fertilizer application and emissions from fossil fuel use (Equation 8):

$$PE_y = \sum_s^S (PER_S + PEN_S + PEF_S) \quad \text{EQUATION 8}$$

Where

PEy =	Project emissions in year *y* (tCO_2e)
PERS =	Project emissions from rice cultivation in season *s* (tCO_2e)
PENS =	Project emissions from N fertilizer application in season *s* (t CO_2e)
PEFS =	Project emissions from fossil fuel use by machinery used in land preparation in season *s* (t CO_2e)

Project emissions from rice cultivation: Methane emissions from rice cultivation under project activities must be quantified using Equation 9, which is the same as the equation used for baseline rice cultivation emissions, but with the subscript BL substituted with the subscript P:

$$PER_S = \sum_g^G (EF_{P,S,g} \times A_{S,g} \times 10^{-3} \times GWP_{CH4}) \quad \text{EQUATION 9}$$

where $EF_{P,S,g}$ is the seasonal methane emission factor for rice cultivation in the project scenario, calculated by following the procedures outlined above for baseline emissions to reflect the project practices following Equations 10 and 11:

$$EF_{P,S,g}=EF_{c,g,s}\times SF_{w,P,g}\times SF_{p,g}\times SF_{o,g}\times days_{P,s,g}$$ EQUATION 10

EFP,S,g	= Methane emission factor for rice fields in stratum *g* in season *s* in the project scenario (kg CH_4 ha^{-1} $season^{-1}$)
EFc,g,s	= Emission factor for continuously flooded fields without organic amendments in stratum *g* in season *s* (kg CH_4 ha^{-1} day^{-1}) (Table 3)
SFw,P,g	= Scaling factor to account for the differences in water regime during the cultivation period (e.g. AWD) in stratum *g* (Table 4)
SFp,g	= Scaling factor to account for the differences in water regime in the pre-season before the cultivation period in stratum *g* (Table 4)
SFo,g	= Scaling factor to account for the differences in type and amount of organic amendment applied in stratum *g* (Equation 11)
daysP,s,g	= Cultivation period for rice crop in season *s* in stratum *g* in the project scenario (days)

$$SF_{o,g}=(1+\sum_{i} ROA_{P,i,g,s}\times CFOA_{i,g,s})$$ EQUATION 11

Where

ROAP,i,g,s	= amount of organic amendment of type *i* (in dry weight for straw, fresh weight for other amendments) applied to rice fields in stratum *g* in season *s* in the project scenario (t ha^{-1} $season^{-1}$)
CFOAi,g,s	= conversion factor for organic amendment of type *i* applied in stratum g in season *s* (shown in Table 4 above)
I	=index of organic amendment types and timings.

Consistent with improvements to baseline quantification, values of $EF_{c,g,s}$ and $SF_{w,g}$ used to quantify project emissions may be updated at the same time as values used for baseline quantification by following the procedures set out in Annex 1 and Annex 2.

Project emissions from N fertilizer application: N_2O emissions from N fertilizer application in the project scenario shall be quantified using Equations 12 and 13:

$$PEN_S = \sum_g^G PEN_{P,S,g} \quad \text{EQUATION 12}$$

where

$$PEN_{P,S,g} = \sum_g^G (FN_{P,S,g} \times A_{S,g} \times EF_{1FR} \times \frac{44}{28} \times 10^3 \times GWP_{N2O}) \quad \text{EQUATION 13}$$

and

PENS	= Project emissions from nitrogen fertilizer use in season s (tCO_2e)
FNP,S,g	= Quantity of nitrogen fertilizer used in the rice fields in stratum *g* in season *s* in the project scenario (kg N)
EF1FR	= Emission factor for nitrogen fertilizer application ([kg N_2O–N (kg N)$^{-1}$]; value to be chosen depending on the transition from the baseline situation: Baseline continuous flooding changes to AWD in the project scenario: 0.00314 Baseline mid-season drainage or AWD changes to AWD in the project scenario: 0.00500
GWPN2O	= Global warming potential of N_2O (tCO_2e/tN_2O; value of 265 to be used from IPCC AR5)

Project emissions from fossil fuel use by machinery used in land preparation: CO_2 emissions from fossil fuel use by machinery used in land levelling shall be quantified using Equation 14:

$$PEF_S = \sum_g^G (A_{P,S,L,g} \times EF_L) \quad \text{EQUATION 14}$$

Where

EF_L =	Emission factor for fossil fuel consumption from machinery used in land levelling (t CO_2 per hectare), which may use the same value as EF_L used for the baseline scenario.
$A_{P,S,L,g}$=	Area of rice fields in stratum *g* that are levelled in season *s* in the project scenario (ha)

8. Leakage

Rice straw management is not an eligible mitigation activity in this initial version of the methodology. Removal of rice straw from project fields may increase emissions outside the project area if alternative uses of straw have higher emissions than the baseline on-field uses of straw. Partial evidence indicates that some common off-field uses have lower emissions than both straw incorporation and burning, which is a common use in the Mekong Delta region. However, currently insufficient data is available to accurately quantify emissions from alternative uses. Leakage emissions should be assessed and included in future revisions of this methodology.

9. Calculation of emission reductions

How emission reductions are calculated

Verified emission reductions are the conservative difference between baseline and project emissions, net of any leakage — drawing the preceding sections together.

Baseline emissions — BE — emissions under continuous flooding (§6)

−

Project emissions — PE — emissions with AWD / MSD applied (§7)

−

Leakage — LE — emissions shifted outside the boundary (§8)

=

Emission reductions — ER — credited, conservative & uncertainty-adjusted (§9–10)

- Emission reductions in each year are calculated using Equation 15:

$$ER_y=(BE_y-PE_y)$$ EQUATION 15

Where

ER_y =	Emission reductions in year *y* (tCO_2e)

10. Uncertainty management

- Uncertainty must be quantified and managed. The uncertainty of emission reductions should be quantified using the methods set out below. In addition to applying quality control and quality assurance (QA/QC) to data and data management processes, measures should be taken to reduce uncertainties as far as is practicable, as outlined below.
- The uncertainty of emission reductions may be quantified using either error propagation methods or Monte Carlo simulation. Additional guidance includes
  - For default parameters taken from the IPCC guidelines, the 95% margins of error or uncertainty ranges given in the IPCC 2019 Refinement should be used.
  - For country-specific EFc, default uncertainty values are provided in the parameter table in Section 11.
  - For baseline and project activity data collected through census, sample surveys or observation, margins of error with 95% confidence must be estimated. These should reflect both inherent variability in each parameter, and error associated with sampling, data collection or measurement methods.
  - If new GHG quantification methods are adopted for use with this methodology (e.g. applying biogeochemical models), additional sources of uncertainty (e.g. model uncertainty) will also need to be considered.
- Methods to reduce uncertainties include (a) ensuring that conservative values are used, and (b) improving the accuracy of estimates for parameters that have significant impact on the uncertainty of emission reductions:

- **Conservativeness:** Data, methods and assumptions are conservative if they ensure that baseline emissions are not overestimated and project emissions are not underestimated. Default values from the IPCC Guidelines (Table 4) and national GHG inventory (Table 3) may be used without adjustment for conservativeness, but their uncertainty must be considered as per paragraph 37 above. For other parameters derived from measurement or surveys, monitoring reports should justify that the parameter values applied are conservative. Conservativeness may be applied as follows:
  - For activity data estimated using farmer reported data, the mean value may be considered conservative if comparisons of farmer reported values and directly measured values show that the mean of farmer reported values is within ±20% of the mean of measured values. If the difference between farmer reported and measured values is greater than ±20%, a conservative value is one standard deviation below the mean farmer-reported value for baseline parameters, and one standard deviation above the mean farmer-reported value for project scenario parameters.
  - The conservativeness of other parameters values used should be justified using peer-reviewed literature, field studies, expert judgment, or other credible and transparent sources.
- **Reducing uncertainties:** Uncertainty analysis should be used to identify the key parameters that contribute most to the overall uncertainty in estimated emission reductions. Efforts to improve data should prioritize these parameters, especially where practical and cost-effective options exist to reduce uncertainty, such as improving measurement accuracy, refining sampling approaches, increasing sample size, or switching to more reliable data sources or data collection methods. These improvements may be phased in over the program lifetime, taking into account the availability of methods, financial resources, technical capacity, and institutional readiness.

11. Data and parameters not monitored

The parameters listed in this section are not monitored during carbon program implementation. For individual mitigation activities included in the C-PDD, the values of each of these parameters shall be available at the initial validation of the C-PDD. For the baseline scenario of groups of fields added to the program area after the initial C-PDD validation, the values of these parameters shall be made available at the next verification event after they join the program.

DATA/PARAMETER	GWP_{CH4}
DATA UNIT	t CO2e/t CH4
DESCRIPTION	Global warming potential for methane
EQUATIONS	2, 9
SOURCE OF DATA	IPCC Fifth Assessment Report

VALUE APPLIED	28
JUSTIFICATION OF CHOICE OF DATA OR DESCRIPTION OF MEASUREMENT METHODS AND PROCEDURES APPLIED	-
PURPOSE OF DATA	Calculation of baseline and project emissions
COMMENTS	—

DATA/PARAMETER	$EF_{c,g,s}$
DATA UNIT	Kg CH_4 ha^{-1} day^{-1}
DESCRIPTION	Baseline emission factor for continuously flooded fields without organic amendments in stratum *g* in season *s*
EQUATIONS	3, 10
SOURCE OF DATA	This methodology Table 3
VALUE APPLIED	Value depends on the cropping season: winter-spring 1.95; summer-autumn 1.83; autumn-winter 2.20
JUSTIFICATION OF CHOICE OF DATA OR DESCRIPTION OF MEASUREMENT METHODS AND PROCEDURES APPLIED	Sub-national EF value approved for use in the national GHG inventory. Data source indicates the following 95% margins of error: winter-spring: ±15.5%, summer-autumn: ±10.7%, autumn-winter: ±15.5%.
PURPOSE OF DATA	Calculation of baseline and project emissions
COMMENTS	Guidance on updating the value of $EF_{c,g,s}$ for use in this methodology is given in Annex 1.

DATA/PARAMETER	$SF_{w,g}$
DATA UNIT	Unitless
DESCRIPTION	Scaling factor to account for the differences in water regime in stratum *g*
EQUATIONS	3, 10
SOURCE OF DATA	IPCC 2019 Vol 4 Ch 5, Table 5.12.
VALUE APPLIED	Value depends on water regime: continuously flooded: 1; mid-season drainage: 0.71; alternate wetting and drying: 0.55. See Table 3 in this methodology.

JUSTIFICATION OF CHOICE OF DATA OR DESCRIPTION OF MEASUREMENT METHODS AND PROCEDURES APPLIED	If fields within the same stratum have different water regimes, the value of $SF_{w,g}$ applied to that stratum must be calculated as the area-weighted average value. Default uncertainty ranges are provided in IPCC 2019, Volume 4, Chapter 5, Table 5.12.
PURPOSE OF DATA	Calculation of baseline and project emissions
COMMENTS	A drainage event is defined as successful if the fields have no standing water for at least 3 consecutive days. Guidance on updating the value of SF_w for use in this methodology is provided in Annex 1.

DATA/PARAMETER	$SF_{p,g}$
DATA UNIT	Unitless
DESCRIPTION	Scaling factor to account for the differences in pre-season water regime (i.e., before rice planting) in stratum *g*
EQUATIONS	3, 10
SOURCE OF DATA	IPCC 2019 Vol 4 Ch 5, Table 5.13.
VALUE APPLIED	Value depends on pre-season water regime: non-flooded < 180 d: 1; non-flooded > 180 d: 0.89; flooded > 30 d: 2.41
JUSTIFICATION OF CHOICE OF DATA OR DESCRIPTION OF MEASUREMENT METHODS AND PROCEDURES APPLIED	If fields within the same stratum have different pre-season water regimes, the value of $SF_{p,g}$ applied to that stratum must be calculated as the area-weighted average value. Default uncertainty ranges are given in IPCC 2019 Volume 4 Chapter 5 Table 5.13.
PURPOSE OF DATA	Calculation of baseline and project emissions
COMMENTS	When choosing the appropriate value of $SF_{p,g}$ for a group of fields, the duration of water management for different purposes should be considered (e.g., flooding to flush out acid or salt as part of land preparation prior to planting), but attention should be paid to the duration of actual field water conditions and the non-flooding or flooding durations specified in Table 4.

DATA/PARAMETER	$ROA_{BL,i,g,s}$
DATA UNIT	Tonnes per ha per season
DESCRIPTION	Amount of organic amendment of type *i* applied to rice land in stratum *g* in season *s* in the baseline
EQUATIONS	4

SOURCE OF DATA	Baseline documentation.
VALUE APPLIED	—
JUSTIFICATION OF CHOICE OF DATA OR DESCRIPTION OF MEASUREMENT METHODS AND PROCEDURES APPLIED	The mass of input is in dry weight for straw and fresh weight for other amendments (e.g., compost, farm yard manure, green manure). Baseline parameter values may be based on sampled field measurements or farmer-reported data. In line with para. 37(c) of this methodology, studies should be undertaken to estimate the margin of error associated with farmer-reported values. For the dry weight of straw, values may be estimated using grain yield, harvest index, dry matter content or other conversion factors. The values of these conversion factors should be drawn from peer reviewed studies in the Mekong Delta Region or official sources and reputable research institutions. Uncertainty values should be determined considering the data sources and other assumptions used. The values of $ROA_{BL,i,g,s}$ used should be calculated as the area-weighted average of values for each field or group of fields within each stratum.
PURPOSE OF DATA	Calculation of baseline emissions
COMMENTS	Values should be separately recorded for each type of organic amendment.

DATA/PARAMETER	$CFOA_{i,g,s}$
DATA UNIT	Unitless
DESCRIPTION	Conversion factor for organic amendment of type *i* applied in stratum *g* in season *s*
EQUATIONS	4, 11
SOURCE OF DATA	IPCC 2019 Volume 4 Chapter 5 Table 5.14
VALUE APPLIED	See Table 4 in this methodology.
JUSTIFICATION OF CHOICE OF DATA OR DESCRIPTION OF MEASUREMENT METHODS AND PROCEDURES APPLIED	Values of $CFOA_{i,g,s}$ shall be determined based on documentation of farmers' use and management of organic amendments in the baseline and project scenarios. Default uncertainty ranges are given in IPCC 2019 Volume 4 Chapter 5 Table 5.14. The values of $CFOA_{i,g,s}$ used must be calculated as the area-weighted average of values for each field or group of fields within each stratum
PURPOSE OF DATA	Calculation of baseline and project emissions
COMMENTS	—

DATA/PARAMETER	$days_{BL,s,g}$
DATA UNIT	Days
DESCRIPTION	Baseline cultivation period for rice crop in season *s* in stratum *g*
EQUATIONS	3

SOURCE OF DATA	Baseline documentation
VALUE APPLIED	—
JUSTIFICATION OF CHOICE OF DATA OR DESCRIPTION OF MEASUREMENT METHODS AND PROCEDURES APPLIED	Baseline values may be based on observations, farmer-reported documentation, or peer reviewed studies in the Mekong Delta Region, or information from official sources and reputable research institutions. Uncertainty values should be determined considering the data sources and other assumptions used.
PURPOSE OF DATA	Calculation of baseline emissions
COMMENTS	For the purpose of calculating baseline emissions used in emission-reduction calculations, the value of daysBL,s,g shall be set equal to daysP,s,g (the cultivation period observed in the project scenario in the same season). This climate-matched baseline ensures that the baseline season length reflects the same climatic conditions as the project season and provides a more accurate representation of the counterfactual situation, given that eligible measures are limited to changes in water regime and fertilizer management and do not include shorter-duration rice varieties. In addition, if the year prior to the baseline survey (or the year before adoption) experienced an atypically long rice growing season, the typical growth period of the rice variety cultivated in that season may be used as a reference for cross-checking the baseline season length.

DATA/PARAMETER	$FN_{BL,S,g}$
DATA UNIT	Kg N
DESCRIPTION	Baseline quantity of nitrogen in fertilizer used in stratum *g* in season *s*
EQUATIONS	6
SOURCE OF DATA	Baseline documentation
VALUE APPLIED	—
JUSTIFICATION OF CHOICE OF DATA OR DESCRIPTION OF MEASUREMENT METHODS AND PROCEDURES APPLIED	The mass of nitrogen (N) applied in fertilizer may be estimated using data on the mass of different fertilizer products used and N content of each product. The fertilizer mass data may be derived from field observations, farmer-reported data, peer reviewed studies in the Mekong Delta Region, information from official sources or reputable research institutions. The N content of fertilizer products may be based on product labels, or where unavailable, or a conservative interpretation of national standards (e.g. Appendix V of Decree 108/2017/NĐ-CP). Associated uncertainties should be determined considering the data sources and other assumptions used.
PURPOSE OF DATA	Calculation of baseline emissions
COMMENTS	—

DATA/PARAMETER	EF_{1FR}
DATA UNIT	kg N^2O–N (kg N)$^{-1}$
DESCRIPTION	Direct N_2O emission factor for rice fields
EQUATIONS	6, 13
SOURCE OF DATA	IPCC 2019 Volume 4 Chapter 11 Table 11.1
VALUE APPLIED	Value depends on water regime. For baseline continuous flooding: 0.003; for baseline mid-season drainage: 0.005 For project transition from continuous flooding to MSD or AWD: 0.00314; for project transition from MSD to AWD: 0.005
JUSTIFICATION OF CHOICE OF DATA OR DESCRIPTION OF MEASUREMENT METHODS AND PROCEDURES APPLIED	Values used must be consistent with the data used for baseline water regime and transitions of water regimes in the project scenario. Uncertainty ranges for EF_{1FR} are given in IPCC 2019 Volume 4 Chapter11 Table 11.1.
PURPOSE OF DATA	Calculation of baseline and project emissions
COMMENTS	—

DATA/PARAMETER	$A_{BL,S,L,g}$
DATA UNIT	Hectares
DESCRIPTION	Baseline area of rice fields in stratum *g* that are levelled in season *s*
EQUATIONS	7
SOURCE OF DATA	Baseline documentation
VALUE APPLIED	—
JUSTIFICATION OF CHOICE OF DATA OR DESCRIPTION OF MEASUREMENT METHODS AND PROCEDURES APPLIED	Baseline values may be based on peer reviewed studies in the Mekong Delta Region, information from official sources or reputable research institutions, and/or information provided by land levelling service providers and/or farmers. Associated uncertainty values should be determined considering the data sources and other assumptions used.
PURPOSE OF DATA	Calculation of baseline emissions
COMMENTS	—

DATA/PARAMETER	EF_L
DATA UNIT	t CO_2 per hectare levelled

DESCRIPTION	Emission factor for fossil fuel consumption from machinery used in land levelling
EQUATIONS	7, 14
SOURCE OF DATA	Study commissioned by the project entity
VALUE APPLIED	—
JUSTIFICATION OF CHOICE OF DATA OR DESCRIPTION OF MEASUREMENT METHODS AND PROCEDURES APPLIED	Guidance on estimation of EF_L is given in Annex 3.
PURPOSE OF DATA	Calculation of baseline and project emissions
COMMENTS	—

12. Data and parameters to be monitored

- Parameters in this section must be monitored for the project scenario.

DATA/PARAMETER	$A_{S,g}$
DATA UNIT	Hectares
DESCRIPTION	Area of program rice fields in stratum *g* in season *s*
EQUATIONS	9
SOURCE OF DATA	Project monitoring records.
DESCRIPTION OF MEASUREMENT METHODS AND PROCEDURES TO BE APPLIED	The location of all project groups of fields must be documented in a project database. The area of each group of fields may be recorded using GPS or using interpretation of remote sensing imagery. When cadastral maps or remote imagery are used, corner points and boundaries of groups of fields must be clearly marked.
FREQUENCY OF MONITORING/RECORDING	To be monitored once at registration for the project. If land is later consolidated during the project period, the area shall be remeasured, and the updated value shall be applied in the calculation of baseline and project emissions from the season in which consolidation occurred.

QA/QC PROCEDURES TO BE APPLIED	To ensure that no double counting of emission reductions occurs between this program and other crediting projects or programs, a database recording the locations of other crediting projects or programs shall be maintained by MAE and reviewed to identify any geographical overlaps. Any overlapping areas from which credits have already been issued must be excluded from the emission reduction calculations.
PURPOSE OF DATA	Calculation of baseline and project emissions
CALCULATION METHOD	The project database shall aggregate the areas of all field groups within each stratum (and sub-stratum) to calculate the total area of each stratum (and sub-stratum) in each season.
COMMENTS	If uncorrected GPS measurements are used, uncertainty may be estimated based on project-specific studies or relevant published studies from similar regions.

DATA/PARAMETER	$SF_{w,P,g}$
DATA UNIT	-
DESCRIPTION	The correct value of the scaling factor for differences in water regime during the cultivation period ($SF_{w,P,g}$) for the project scenario is determined by collecting monitoring data during each cropping season in the project period. This data records the water management practices applied to fields or groups of fields (i.e, continuous flooding, mid-season drainage or AWD).
EQUATIONS	10
SOURCE OF DATA	Project monitoring records.
DESCRIPTION OF MEASUREMENT METHODS AND PROCEDURES TO BE APPLIED	Monitoring may be conducted using either a census or sampling methods. Data sources may include water level tubes, water sensors, or photographic documentation demonstrating the number of successful drainages applied in each cropping season.
FREQUENCY OF MONITORING/RECORDING	In every rice cropping season.
QA/QC PROCEDURES TO BE APPLIED	Note the definition of successful drainage events in this methodology is when fields have no standing water for at least 3 consecutive days.
PURPOSE OF DATA	Calculation of project emissions
CALCULATION METHOD	The values of $SF_{w,P,g}$ used must be calculated as the area-weighted average of project fields within each stratum.
COMMENTS	Initial values to use are: CF=1, MSD=0.71, AWD=0.55. Guidance on updating these values for use in this methodology is given in Annex 1.

DATA/PARAMETER	$SF_{p,g}$

DATA UNIT	-
DESCRIPTION	The correct value of the scaling factor for pre-season water regime ($SF_{p,g}$) in the project scenario is determined by collecting monitoring data on pre-season water management practices.
EQUATIONS	10
SOURCE OF DATA	Project monitoring records.
DESCRIPTION OF MEASUREMENT METHODS AND PROCEDURES TO BE APPLIED	Monitoring may be conducted using either census or sampling methods. Data sources may include direct observations or farmer-reported values.
FREQUENCY OF MONITORING/RECORDING	For every rice cropping season.
QA/QC PROCEDURES TO BE APPLIED	Pre-season water management practices should be consistent with data on harvest dates in the previous rice cropping season
PURPOSE OF DATA	Calculation of project emissions
CALCULATION METHOD	The values of $SF_{p,g}$ used must be calculated as the area-weighted average of project fields within each stratum.
COMMENTS	The appropriate value to apply must be selected from Table 4 in this methodology

DATA/PARAMETER	$ROA_{p,I,g,s}$
DATA UNIT	Tonnes amendment applied
DESCRIPTION	Amount of organic amendment applied (dry matter for rice straw, fresh weight for others)
EQUATIONS	11
SOURCE OF DATA	Project monitoring records.
DESCRIPTION OF MEASUREMENT METHODS AND PROCEDURES TO BE APPLIED	Monitoring may be conducted using either census or sampling methods. Data may be collected through direct field measurements or estimated based on farmer-reported values. For dry weight of straw, estimates may be derived from grain yield, harvest index, dry matter content or other conversion factors. These conversion factors should be based on peer-reviewed studies in the Mekong Delta Region or drawn from official sources or reputable research institutions.
FREQUENCY OF MONITORING/RECORDING	Once per rice cropping season.
QA/QC PROCEDURES TO BE APPLIED	If farmer-reported values of straw or other organic amendments are used, verify the accuracy of farmer-reported estimates against measured values. Undertake spot-checks to ensure that estimates of $ROA_{p,I,g,s}$ do not underestimate with-project emissions.

PURPOSE OF DATA	Calculation of project emissions
CALCULATION METHOD	The values of $ROA_{P,i,g,s}$ used may be calculated as the area-weighted average of project fields within each stratum.
COMMENTS	Values should be separately recorded for each type of organic amendment.

DATA/PARAMETER	$days_{,p,s,g}$
DATA UNIT	Days
DESCRIPTION	duration of each rice cropping season
EQUATIONS	10
SOURCE OF DATA	Project monitoring records.
DESCRIPTION OF MEASUREMENT METHODS AND PROCEDURES TO BE APPLIED	Monitoring may be conducted using either census or sampling methods. Data may be collected through direct field observations or farmer-reported documentation.
FREQUENCY OF MONITORING/RECORDING	Once per rice cropping season.
QA/QC PROCEDURES TO BE APPLIED	If farmer-reported dates or durations are used, verify the accuracy of farmer-reported estimates against other data sources (e.g. local agriculture department records, varietal performance records). Undertake spot-checks to ensure that estimates of crop duration do not underestimate with-project emissions.
PURPOSE OF DATA	Calculation of project emissions
CALCULATION METHOD	The values of $Days_{P,s,g}$ used must be calculated as the area-weighted average of project fields within each stratum.
COMMENTS	—

DATA/PARAMETER	$FN_{,P,,s,g}$
DATA UNIT	kg N
DESCRIPTION	Quantity of nitrogen fertilizer applied in stratum *g* in season *s*
EQUATIONS	13
SOURCE OF DATA	Project monitoring records.

DESCRIPTION OF MEASUREMENT METHODS AND PROCEDURES TO BE APPLIED	Monitoring may be conducted using either census or sampling methods. The mass of nitrogen (N) in fertilizer applied may be estimated using data on the mass of different fertilizer products used and estimated N content of each product. The mass of fertilizer products used may be determined through field observations or farmer-reported documentation. The N content may be based on product labels or a conservative interpretation of national standards (e.g. Appendix V of Decree 108/2017/NĐ-CP).
FREQUENCY OF MONITORING/RECORDING	During or at the end of each rice cropping season.
QA/QC PROCEDURES TO BE APPLIED	If farmer-reported values of the mass of each type of fertilizer applied are used, verify the accuracy of farmer-reported estimates against measured values. Undertake spot-checks to ensure that reported values do not underestimate with-project emissions.
PURPOSE OF DATA	Calculation of project emissions
CALCULATION METHOD	The values of $F_{P,s,g}$ used may be calculated as the area-weighted average within each stratum.
COMMENTS	—

DATA/PARAMETER	$A_{,P,,s,L,g}$
DATA UNIT	Hectares
DESCRIPTION	Area of rice fields in stratum *g* that is levelled in season *s*
EQUATIONS	14
SOURCE OF DATA	Project monitoring records.
DESCRIPTION OF MEASUREMENT METHODS AND PROCEDURES TO BE APPLIED	Monitoring may be conducted using either census or sampling methods. Data may be collected based on farmer-reported values.
FREQUENCY OF MONITORING/RECORDING	Once per rice cropping season.
QA/QC PROCEDURES TO BE APPLIED	Cross-check farmer-reported data with documented records, e.g. service provider or local agriculture department records
PURPOSE OF DATA	Calculation of project emissions
CALCULATION METHOD	The values of $A_{P,s,L,g}$ used must be calculated as the area-weighted average of project fields within each stratum.
COMMENTS	—

13. Monitoring plan

- A carbon program monitoring plan for the whole 1Mha carbon program shall be submitted together with the C-PDD. The monitoring plan shall include all data, parameters and related information required by this methodology, including:
  - Methods for data collection or measurement and their frequency;
  - Calibration requirements of measurement equipment, with reference to the relevant national standards, where applicable;
  - Sampling procedures, where applicable;
  - Quality assurance and quality control (QA/QC) procedures;
  - A description of the monitoring management system, including
    - Institutional arrangements and management procedures to implement the monitoring plan across all project areas;
    - provisions for data archiving;
    - procedures for authorizing, approving and documenting changes to recorded data;
    - roles and responsibilities for data collection, data management and archiving.

Data stewardship and management arrangements consistent with the FAIR principles (Findable, Accessible, Interoperable, Reusable), to the extent feasible at this stage, including (i) assignment of persistent identifiers and searchable metadata for archived datasets and updated emission factors; (ii) use of standardized file formats and controlled vocabularies; (iii) tiered access provisions distinguishing publicly available aggregated or anonymized data from data requiring authorization; and (iv) version control and documentation of provenance, processing steps, and quality flags whenever emission factors, scaling parameters, or monitoring methods are updated. Detailed arrangements will be developed as the program data platform and institutional arrangements are finalized.

- Each province shall develop its own annual monitoring plan in accordance with the overall program MRV Implementation Manual and monitoring plan, to guide the planning and implementation of MRV activities within the province in each cropping season.
- When new project areas are added within a province, the provincial monitoring plan shall be updated in accordance with the procedures outlined in the MRV Implementation Manual. All provincial monitoring plans shall be made available at each verification event.
- Annual monitoring reports will be prepared as a single report for the 1Mha carbon program. Annual monitoring reports shall include the following, as relevant, per parameter:

- For each parameter:
  - Parameter name, units of measure and description;
  - Data sources;
  - Sampling procedures (if applicable) and data collection methods;
  - Monitoring frequency;
  - Value applied and its estimated uncertainty range or margin of error;

Annual monitoring reports shall transparently disclose the key parameters used in the calculation of emission reductions, including emission factor values applied, scaling factors, summary statistics for activity data, and any deduction rates applied (such as uncertainty deductions or buffer allocations), consistent with applicable data-protection requirements.

- Quality control and quality assurance (QA/QC) procedures applied
- Description of monitoring and data management arrangements, including:
  - Entity(ies) or person(s) responsible for monitoring activities and data management and archiving;
  - Methods for collecting, storing, and reporting data on monitored parameters
  - Description of databases, tools or software systems used for data collection and management;
  - Any deviations from the approved monitoring plan
- Transparent calculation of emission reductions and the associated uncertainty of emission reductions
- Planned measures to improve data quality and reduce uncertainty
- Measures taken to ensure there is no double counting of emission reductions.

14. Validation and verification

Scope of this section. Validation and verification procedures and requirements applicable to the generation and issuance of carbon credits, including verifier accreditation, validation and verification timelines, registry, and issuance steps, are pathway-specific. They are determined by the applicable crediting framework (for example, an international voluntary carbon standard, a future domestic crediting mechanism, or an Article 6 pathway) and any associated host-country arrangements, and they are implemented through the relevant carbon project cycle. This Methodology and the accompanying MRV Implementation Manual do not prescribe these pathway-specific procedures. They are designed to generate consistent, auditable monitoring data and a complete evidence package suitable for third-party review under any of the relevant pathways.

Where verification is conducted under or in support of a specific crediting pathway, it shall follow the requirements of that pathway's standard, which may include the requirements of ISO 14064-3, the requirements of the applicable voluntary carbon standard (for example, Verra Verified Carbon Standard, Gold Standard), and the national regulations under Decree No. 06/2022/NĐ-CP (as amended by Decree No. 119/2024/NĐ-CP, and subsequent amendments), as applicable. Where verification outputs are intended to be used within Viet Nam's national systems, they shall be consistent with applicable national rules and regulations, including those governing the recognition and accreditation of verification bodies. In the case of an international transaction (for example, ITMOs under Article 6.2), additional validation and verification standards and procedures requested by the applicable standard or by the buyer may be applied, provided they are mutually agreed upon in advance.

Verification frequency. Monitoring reports may be prepared annually. Verification may occur annually or at longer intervals, by covering one or more consecutive monitoring periods, consistent with the verification frequency and maximum interval permitted under the applicable crediting framework or standard, and any Government requirements where relevant.

- Validation shall assess the application of the methodology in the C-PDD following ISO 14064-3 (section 7.1.4) or other agreed guidance.
- Verification shall assess whether GHG emission reductions were monitored in accordance with the approved monitoring plan, the applied GHG methodology and the C-PDD to determine if the GHG emission reduction statements are materially correct and conform to the agreed criteria, procedures and requirements. Verification activities shall follow ISO 14064-3 or other agreed guidance.

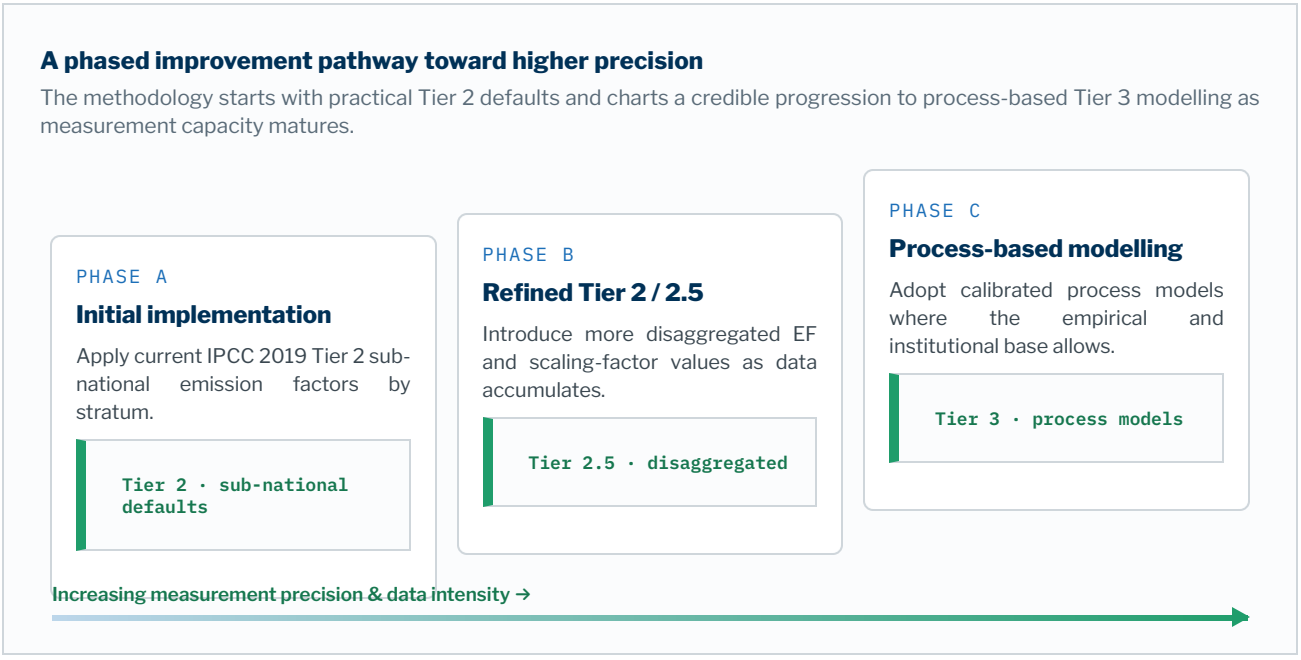
Annex 1: Improvement pathway for the 1Mha MRV system

Purpose

This Annex sets out the improvement pathway under which the parameter values, GHG quantification methods, activity data monitoring methods, and the scope of eligible mitigation measures of this Methodology are expected to evolve over the lifetime of the 1Mha carbon program. The pathway is designed to maintain consistency with national inventory practice and conservative baseline setting, while progressively strengthening the empirical basis, scientific rigor, and accuracy of the program estimates as data, capacity, financing, and institutional conditions allow.

The Annex addresses five elements: A1.1 Sequencing of methodological improvements; A1.2 Conditions and procedures for changing parameter values or estimation methods; A1.3 Cross-cutting principles (uniform application, central approval, version control); A1.4 Governance for review and approval of updates; and A1.5 Indicative criteria for advancing through the pathway.

A1.1 Sequencing of methodological improvements



The current Methodology applies the IPCC 2019 Tier 2 approach with Viet Nam sub-national emission factors (per MoNRE Decision 2626/QĐ-BTNMT, 2022) disaggregated by Mekong Delta sub-region and by cropping season, together with IPCC default scaling factors. This is consistent with the national GHG inventory and is explicitly accepted as a valid quantification approach under major voluntary carbon standards, including Verra VM0051 and Gold Standard rice methodologies.

The improvement pathway envisions three indicative phases.

PHASE A · TIER 2

Initial implementation — sub-national defaults

Apply current sub-national EFc by season together with IPCC default SFw and SFp values. Apply photo-based and survey-based monitoring. This phase prioritizes consistency with national inventory practice, scalability to the 1-million-hectare program area, and verifiability through third-party audits.

PHASE B · TIER 2.5

Refined Tier 2 / Tier 2.5

Progressively introduce more disaggregated EFc and SFw values supported by targeted field measurements undertaken under the program measurement plan (Annex 2 of the Methodology). Refinements may include: (i) further disaggregation by stratum and season; (ii) revised SFw values that better capture drainage quality (depth, duration, redox dynamics), in particular through the relationship between non-flooded duration and CH4 emissions, with a view, subject to the development of revised factors, to using non-flooded duration as a practical proxy for CH4 outcomes; (iii) integration of organic-amendment management refinements through the CFOA parameter; and (iv) introduction of Tier 2.5-style emission factors that combine targeted field measurements with calibrated modelling to capture inter-annual variability.

PHASE C · TIER 3

Process-based modelling

Where the empirical base, modelling capacity, institutional capacity, and financing allow, transition to process-based or biogeochemical modelling for CH4 and N2O quantification. This will require the additional management and environmental parameters (planting method, seeding rate or transplanting time and plant density; number, timing, rate, and method of nitrogen fertilizer applications; typical water depth in cm under flooded and non-flooded conditions; tillage timing, method, and depth) that are not required for the Tier 2 approach but become inputs to process-based models. Soil-specific and cultivar-specific scaling factors may be introduced under Tier 3 only where credible, QA/QC-compliant country-specific evidence is available.

Cross-cutting all phases:

Drainage definitions and thresholds. The current threshold of more than three consecutive days non-flooded (consistent with IPCC 2006 and 2019 inventory guidance for intermittently flooded regimes) is retained until and unless empirical evidence supports revised classification. Where the program field measurements confirm a consistent relationship between shorter non-flooded durations (for example, 1 to 2 days) and CH4 emissions, the improvement pathway may enable the development of revised EFc and SFw values, and a project-specific drainage definition that quantifies the mitigation effect of shorter drains.

Remote sensing. Ground-based observations remain the primary basis for verification in Phase A, with remote sensing (for example, L-band SAR and Sentinel-1) used complementarily for cross-checking and for targeting quality-control visits. Progressive integration of remote-sensing data into routine monitoring will be assessed as imagery quality, processing capacity, and access and licensing arrangements allow, and as remote sensing demonstrates the capacity to reliably detect short-duration drainage events and the additional management practices (organic amendments, fertilizer application, straw management) that affect emissions.

Rice straw management. Rice straw management is not currently treated as a standalone eligible mitigation measure. Two constraints limit current quantification of emissions from burning and from alternative straw uses: the absence of a robust monitoring system to track the fate of straw removed from fields, and the lack of robust emission factors for alternative straw uses. Progress on these constraints is a priority for future improvement. As an initial step, the MRV Implementation Manual already captures baseline straw-management information (Annex A9, item 16) to support future enhancement.

Open burning of rice straw is subject to Decree No. 45/2022/ND-CP on administrative sanctions for violations of environmental protection law, which classifies burning of crop residues in fields as an environmental violation subject to progressive penalties. This regulatory constraint is a material factor shaping straw management practices in the Mekong Delta and must be reflected in the improvement pathway in two ways. First, to the extent that Decree No. 45/2022/ND-CP progressively reduces the prevalence of open burning in the baseline scenario, the baseline emissions attributable to straw burning may decrease over time; this must be factored into baseline review and update processes under A1.2 to avoid overestimating baseline emissions and therefore crediting emission reductions that would have occurred independently of program activities. Second, the regulatory trend toward elimination of open burning creates an opportunity to recognize avoided burning as a creditable mitigation activity once adequate monitoring infrastructure is in place, consistent with the improvement pathway set out below and subject to further discussion.

Development of robust emission factors for alternative straw uses under Mekong Delta conditions, including residue burning (as a reference scenario baseline given the regulatory trajectory under Decree No. 45/2022/ND-CP), incorporation, off-field removal, composting, and use as animal feed or biomass energy; these factors shall be derived from peer-reviewed field measurement studies or official inventory guidance, and shall be subject to the conditions and approval procedures in A1.2;

Inclusion of emissions from burning crop residues in the project boundary, once robust emission factors are available;

Where evidence and monitoring infrastructure permit, recognition of avoided open burning and adoption of alternative straw uses (e.g., straw incorporation >30 days before cultivation, composting, or removal for non-combustion purposes) as eligible mitigation activities, with quantification methods aligned with applicable voluntary carbon standards (e.g., Verra VM0051 Appendix provisions for straw) and consistent with Decree No. 45/2022/ND-CP compliance obligations. In crediting avoided burning, only burning practices that are not already legally prohibited and are verifiably above the regulatory baseline shall be treated as additional.

A1.2 Conditions and procedures for changing parameter values or estimation methods

If improved estimates of specific parameter values set out in this Methodology become available (for example, CH4 emissions under continuous flooding, single drainage, or AWD), or new methods for GHG estimation (for example, process-based modelling) are developed, they may be used together with this Methodology under the following conditions.

New parameter values or estimation methods may be applied in the monitoring report without prior revision to this Methodology, provided that all of the following conditions are met:

(i) the definitions and units of the affected parameters remain consistent with those specified in this Methodology;

(ii) the scope of GHG sources and sinks included in the quantification is not altered;

(iii) there is no impact on the treatment of leakage or the eligibility of individual mitigation actions; and

(iv) the accuracy and completeness of monitored activity data are not adversely affected.

Where these conditions are met, the use of such updated values or methods shall be subject to assessment during the subsequent verification to confirm consistency with the requirements of this Methodology.

New parameter values or methods shall not be used until they have first been reviewed and approved if they result in any of the following:

(i) changes to the GHG quantification method;

(ii) changes to parameter definitions or units;

(iii) changes to the GHG sources included in the estimation;

(iv) impacts on the treatment of leakage;

(v) impacts on the eligibility of individual mitigation actions; or

(vi) reductions in the accuracy or completeness of monitored activity data.

In such cases, the Methodology, the 1Mha C-PDD, and the relevant monitoring plans must be revised, validated, and approved before the updated values or methods are applied.

Emission factor (EF) values used in this Methodology — in particular the sub-national baseline EFc values in Table 3 and the IPCC default scaling factors in Table 4 — shall be reviewed for potential update at intervals aligned with Viet Nam's National GHG Inventory cycle. Viet Nam currently produces National GHG Inventory reports on a biennial basis, consistent with its obligations under the UNFCCC Enhanced Transparency Framework (ETF). Accordingly:

(i) A systematic review of the current EF values used in this Methodology against the values adopted in the most recent approved National GHG Inventory shall be conducted by the Central MRV Unit no later than six months after each new National GHG Inventory report is officially published

(ii) Where the reviewed National GHG Inventory adopts materially different sub-national EFc values or revised IPCC default scaling factors, the Central MRV Unit shall initiate a methodology review under the procedures set out in A1.2 above and propose updated values to DCPPP for approval within the following review cycle.

(iii) Any update to EF values shall be applied prospectively from the monitoring period immediately following approval. Retroactive application of updated EF values to previously verified monitoring periods is not permitted, unless it can be demonstrated that retroactive application would result in a conservative (downward) adjustment to previously reported emission reductions.

(iv) Updated EF values shall be documented through the version-control procedures in A1.3 and communicated simultaneously to all program participants.

A1.3 Cross-cutting principles: uniform application, central approval, version control

Any updates to parameter values or estimation methods permitted under A1.2 shall:

(i) be applied only following centralized approval and version control;

(ii) be applied uniformly across all relevant strata or regions for a defined monitoring period;

(iii) be documented through clear records of the parameter and method version used, the approval date, and the monitoring period or periods to which the update applies; and

(iv) where the update affects the quantification method, parameter definitions or units, the scope of GHG sources or leakage, the eligibility of mitigation actions, or the completeness of monitored activity data, continue to require formal Methodology revision and approval before application (see A1.2).

If any of the changes referred to above are to be applied retroactively to monitored activity data, it must be demonstrated that the application of such changes is conservative and does not lead to overestimation of GHG emission reductions.

A1.4 Governance for review and approval of updates

Governance arrangements for the review and approval of revisions to parameter values, methods, or the Methodology, including roles and responsibilities, timelines, and procedures, will be determined by the relevant departments within the Ministry of Agriculture and Environment (MAE).

A1.5 Indicative criteria for advancing through the pathway

Decisions on whether and when to advance from one phase of the improvement pathway to the next will be informed by the following high-level criteria, taken together rather than individually:

(i) Data readiness: availability of sufficient empirical data of suitable quality and spatial and temporal coverage;

(ii) Accuracy gains: demonstrated reduction in uncertainty of emission-reduction estimates compared with the current approach;

(iii) Cost and feasibility: cost-effectiveness and operational feasibility at the 1-million-hectare program scale;

(iv) Verifiability: capacity to support independent third-party verification;

(v) System alignment: consistency with national inventory practice, NDC reporting, and the requirements of the relevant crediting framework; and

(vi) Financing and demand: availability of financing for the additional investment required, and confirmed buyer demand for credits generated under the more advanced approach.

Development and implementation of the detailed roadmap arising from these phases, including indicative milestones for integrating field measurements, remote sensing, and process-based modelling, will be taken forward under the program future workplans, subject to funding availability and Government agreement.

Annex 2: Requirements for direct measurements of methane emissions

A2.1 Rationale

The procedures for direct measurements are explained in the *Handbook Greenhouse Gases In Rice Cultivation - Emission Measurement Guide (IAE 2016),* as promulgated in MARD Decision No. 4831/QD-BNN-KHCN, dated 22 November 2016, titled *'Decision on promulgating a handbook on measuring greenhouse gas emissions in rice cultivation'*.

The purpose of this Annex is to specify the application of those procedures within the context of the 1Mha carbon program. While the Handbook provides generic guidance for field measurements, this Annex outlines specifics of their implementation in the 1Mha carbon program as well as an update on the available instrumentation for GHG analysis.

The purpose of direct measurement is to obtain estimates for each stratum in each season of CH_4 fluxes from paddy soil methanogenesis under 3 distinct water management treatments: (1) continuous flooding (CF) without organic amendment and non-flooded < 180 days pre-season ($EF_{c,g,s}$), and (2) mid-season drainage (MSD) and (3) AWD, under comparable organic amendment and pre-season practices. These measurements will be used to replace the default values of EF_c in Table 3. The emission rates of AWD or MSD as compared to CF or MSD are used to estimate stratum-specific values for the IPCC parameter SF_w, and will replace the default values in Table 4.

A2.2 Requirements and procedures

A2.2.1 General requirements

Site selection, setting up field measurement equipment, measurements, transport of gas samples, laboratory analysis and calculation of seasonal fluxes, emission factors and scaling factors must be done by personnel with appropriate qualifications and relevant experience. All procedures shall follow the requirements and guidelines set out in MARD decision No. 4831/QĐ-BNN-KHCN*, 'Decision on the issuance of a handbook on greenhouse gas emission measurement in rice cultivation',* dated 22 November 2016, unless otherwise specified in this Appendix.

A2.2.1.1 Site Selection and measurements

Field measurements shall be conducted at sites that are representative of each numbered stratum shown in Table 2 of this methodology, with a minimum of one site per stratum in each season. Soil characteristics (e.g., pH, sulfur content, clay and sand content) in each site shall be measured to demonstrate that site characteristics fall within the range defined for each soil stratum. For each measurement site in each rice cropping season, measurements for each treatment (i.e., CF, MSD, AWD) must be conducted with 3 independent replicates of each treatment in each season. Within each site, the locations for different water treatment should be established close to each other to ensure similar environmental conditions (e.g. soil type, rainfall). Meanwhile, each treatment plot shall be physically isolated to prevent lateral flows, such as from flooding plots to MSD or AWD plots. Management practices applied to all treatments at a given site shall include no organic amendments, in order to conform to the IPCC definitions for CF and to reflect the relative differences between CF, MSD and AWD treatments. The pre-season water regime at each site shall (i) reflect typical local practice at that site, and (ii) be consistent across all treatments within the same site, so that treatment comparisons are not confounded by differing antecedent water conditions. The default reference condition is no flooding for less than 180 days prior to rice cultivation; where typical local practice differs, this shall be documented and applied uniformly across all treatments at that site. Other management practices (e.g. rice variety, fertilizer application rates) must be typical of common practice at each site. If resources are sufficient for multiple sites per stratum or measurements in more than one year, the preference is to select sites representing a range of values in soil characteristics (e.g. clay content), as this is likely to strongly influence the relationships between water depth under drainage, duration of drainage and methane emissions.

In pilot phases that are not fully financed through carbon revenues, the final monitoring plan, including the number of measurement sites per stratum, will remain subject to budget and operational constraints. Where resources allow additional sites beyond the minimum, allocation shall follow a risk-based prioritization, with additional sites assigned to strata characterized by higher expected variability in soil or hydrological conditions, or to strata covering larger areas of the program. The rationale for the final allocation shall be documented in the C-PDD or in the annual program monitoring plan.

A2.2.1.2 Sampling equipment

Detailed specifications for design of chambers and base and other tools are given in 4831/QĐ-BNN-KHCN and summarized in Table A1.

Table A1 Summary of requirements for chamber design

Feature	Conditions
Field location	At least 2 m from field edge, installed 1 day before the first measurement
Chamber material	Glass, plastic or plastic-coated aluminum
Shape and size	Square, rectangular or cylindrical; minimum volume of about 125 liters, height of sampling box must be 10 cm higher than maximum height of rice plant
Base specifications and placement	Materials: Stainless steel, aluminum or plastic. Size: minimum volume 36 liters. Design: the base is equipped with a water circulation pipe between the inside and outside of the base (located about 1 - 2 cm from the ground), with rubber plugs for sealing during sampling. The top of the base has a groove filled with water so that when the air collection box is placed on top of the base, the water will create a seal that prevents air from circulating in and out. Base placement: the base is placed 7 – 10 cm below the soil surface
Other equipment	Thermometer to measure temperature inside the chamber; Fan for mixing air inside the chamber during sampling, connected to batteries outside the chamber; pressure valve; gas sampling tube connected to 3-way valve; sampling syringe; sample vials; clock to determine time of sampling.
Number of rice plants enclosed	Each replication and treatment shall enclose the same number of rice plants, with the exact number determined according to the size of the chamber. The number of plants enclosed shall be recorded for each measurement.

A2.2.1.3 Measurement procedures

Detailed procedures are given in 4831/QĐ-BNN-KHCN and summarized in Table A2.

Table A2 Summary of sampling procedure requirements

Feature	Conditions
Sampling frequency	Not less than 8 - 10 times per crop season
Sample timing	Sample between 8:00 – 10:00 am. Four consecutive samples to be taken at t0 (after placement of top chamber), t1 (10 minutes), t2 (20 minutes), t3 (30 minutes), with sampling times 10 minutes apart.
Sample storage until analysis	Transfer air samples into evacuated vial for storage and transport to the laboratory

Note: Standardized morning sampling between 08:00 and 10:00 is retained for operational feasibility. Available evidence from Viet Nam suggests that diurnal sampling does not materially change estimated fluxes relative to single morning measurements in comparable rice systems (Pandey et al., 2014, Agriculture, Ecosystems and Environment, 196:137 to 146, doi:10.1016/j.agee.2014.06.010).

A2.2.1.4 Gas analysis

Gas analysis may use gas chromatograph (GC) equipped with a flame ionization detector (FID) or a portable laser spectroscope. If GC is used, the procedures in 4831/QĐ-BNN-KHCN must be followed, as summarized in Table A3. Gas analysis must be conducted in a laboratory with a quality assurance and management system in place. If portable laser spectroscopes are used, the manufacturer's instructions must be followed, and the validity of the procedures to apply when using a laser spectroscope must be justified by a validation study.

Table A3 Summary of GC laboratory analysis requirements

Feature	condition
Method	Gas chromatograph with flame ionization detector (FID)
Injection	Direct injection or with multi-port valve and sample loop
Column	Packed (e.g. molecular sieve) or capillary column
Calibration	With certified standard gas each day of analysis before and after the analyses are done

A2.2.1.5 Calculation of seasonally-integrated emission factors and scaling factors

Data processing and quality control procedures must follow 4831/QĐ-BNN-KHCN. For calculation of CH_4 emission intensity in each treatment plot ($mg/m^2/h$):

$$F=(\frac{\Delta C}{\Delta t})*(\frac{v}{A})*(\frac{M}{V})*(\frac{P}{P_0})*(\frac{273}{T_{\text{Kelvin}}})$$

Where:

- ΔC is the change in CH_4 concentration during the time period Δt;

- v and A are the volume of the gas sampling box and the bottom area of the gas measuring box;

- M is the atomic mass of that gas;

- V is the volume occupied by 1 mol of gas at standard temperature and pressure (22.4 L);

- P is atmospheric pressure (mbar), P_0 is standard pressure (1013 mbar);

- $T_{Kelvin} = 273 + T_{Celsius}$

$T_{Celsius} = (T_{Celsius\_0min} + T_{Celsius\_1st\ sample} + T_{Celsius\_2nd\ sample} + T_{Celsius\_3rd\ sample}) / 4$

In practice, ΔC/Δt is determined by linear regression of the four concentration measurements (C0, C1, C2, C3) taken at t0, t1, t2 and t3, with the slope of the regression line representing the rate of concentration change. This is consistent with Decision 4831/QĐ-BNN-KHCN issued by the Ministry of Agriculture and Environment and with standard chamber flux protocols.

The seasonal cumulative emission of CH_4 per rice cropping season in each treatment plot is calculated using the formula:

$$=(n2-n1)*\frac{(F_{n1}+F_{n2})}{2}+(n3-n2)*\frac{F_{n2}+F_{n3}}{2}+\ldots+(nc-nx)*\frac{F_{nc}+F_{nx}}{2}$$

Where n1, n2, n3 are the dates of the 1st, 2nd and 3rd sampling; nx is the xth sampling day before the last sampling, nc is the day of the last sampling and Fn1, Fn2, Fn3, Fnx, Fnc are the average daily emissions of CH_4 (mg/m^2/day) corresponding to sampling days n1, n2, n3, nx and nc.

The average value for each stratum of seasonal CH_4 emission flux for each treatment in each rice cropping season is calculated as the arithmetic average of the replicates. Uncertainty (i.e., the margin of error expressed as a percentage of the mean) is calculated as:

$$Margin\ of\ error = [(1.96 \times \sigma) \div \bar{x}] \times 100$$

Where σ is the standard deviation, and $\bar{x}$ is the mean (IPCC 2019 Volume 1 Chapter 3).

Scaling factors for MSD and AWD may be represented as a fraction of seasonal CH_4 emissions under continuous flooding as in the IPCC Guidelines, or using equations fit to the data demonstrating acceptable relationships between CH_4 emission (or CH_4 emissions as a fraction of EFc) and other parameters (e.g. days of effective drainage) monitored using this methodology. Where regression equations are used to estimate scaling factors, uncertainty of the scaling factors can be expressed using root mean square error (RMSE) of the fit.

A2.2.2 N2O measurements

Where N2O measurements are conducted, the purpose is to assess whether the use of the IPCC default direct N2O emission factor for rice fields (EF1FR) is conservative under the program conditions, and whether adjustment is needed to reflect local conditions.

Where N2O measurements are conducted, samples shall be analyzed using gas chromatographs equipped with electron capture detectors (ECD).

Flux and N2O emission factor calculations shall follow recognized international chamber-method guidelines, including the Global Research Alliance N2O chamber methodology guidance, or other peer-reviewed methods.

Annex 3: General guidance on developing an emission factor for fossil fuel use emissions in land levelling.

$$EF_L = \sum_{a=1}^{n} \sum_{j=1}^{m} \sum_{k=1}^{o} O_{a,j,k} \times EF_k \qquad \text{EQUATION A3.1}$$

Where:

a indicates different specific land levelling activities;

j indicates different types of machine used;

k indicates fuel type (petrol or diesel);

O_{aj} indicates the amount of fuel used by machine type j used per ha in activity a (liters per ha);

EF_k indicates the CO_2 emission factor for fuel type k . This can be calculated using the IPCC 2006 default values (IPCC 2006 Vol 2 Ch 3):

EF_{petrol} = 0.002810 t CO_2e per liter

EF_{diesel} = 0.002886 t CO_2e per liter

Data on fuel types, machine types and fuel usage may be obtained from published studies and/or by interviewing land levelling service providers. If interviews with service providers are used, a sample frame should be developed by creating a list of all known service providers in the project region. Sampling should aim to estimate average fuel consumption per ha to a precision of ±10% with 95% confidence. Fuel consumption estimates should consider:

(a) fuel used for travel of machinery to and from sites for land levelling, and

(b) fuel used by machinery to complete land levelling operations.

Both (a) and (b) should consider the location of sites that are typical for the program region.

The uncertainty of the estimated emission factor must be quantified considering the variability in the data used to estimate the emission factor.

INTRODUCTION

Technical documents to guide implementation of MRV in the 1Mha carbon program will include the following 5 documents:

- Guiding methodological rules and principles for MRV (‘1Mha rice program methodology’)
- MRV implementation manual (this document)
- MRV training manual (to be developed under future Government guidance)
- MRV database and software operational manual (to be developed under future Government guidance)
- MRV validation and verification manual (to be developed under future Government guidance).

This document is the MRV Implementation Manual. The MRV methodology is provided as Document One; the MRV training manual, MRV database and software operational manual, and MRV validation and verification manual are to be developed under future Government guidance. The objective of the MRV Implementation Manual is to guide a step-wise process on how to monitor and report the required data for the MRV system, with roles and responsibilities of each implementation agency and stakeholder. The purpose of MRV is to enable the carbon program to demonstrate that emission reductions are real, transparent, conservative, and credible, in line with international good practice, using practical and cost-effective methods.

MRV PACKAGE · DOCUMENT TWO

MRV Implementation Manual

Operational procedures for delivering the MRV system across cooperatives and fields — the six-step cycle, data collection, quality control, reporting and verification.

IN THIS DOCUMENT

SUMMARY OF THE MANUAL

How the MRV system works — step by step

Before the detailed manual, this summary shows the whole MRV journey at a glance: who does what, and how each cropping season flows from preparation through to a verified emission-reduction report. The roles shown describe the system as designed and tested in the pilot; the MRV units referred to are being established progressively.

The four actors

NATIONAL

Central MRV Unit

Builds the tools & digital system, registers cooperatives, calculates emissions, and compiles reports (under DCPPP).

PROVINCIAL

Province MRV Unit / DAE

Plans the season, supports cooperatives, and runs quality-assurance spot-checks.

COMMUNE

Commune extension staff

Guides and supports cooperatives in mapping and collecting field data.

FIELD

Cooperatives & farmers

Register, map their SPOTs, apply AWD, and submit monitoring data & photos.

The annual cycle

Preparation — Central MRV Unit

Registration — Cooperatives

Baseline — Coops + Commune

Monitoring — Coops + Commune

QA / QC — Province MRV Unit

Reporting — Central MRV Unit

Verification — Third party

↻ Repeated each cropping season; independent third-party verification at longer intervals.

THE PROCESS · PART 1

Prepare → Register → Baseline

01 Preparation & planning

Tools and people are made ready before any field work.

Central MRV Unit
build tools, system & training
→
Province MRV Units
plan the season

02 Registration — before the season

Cooperatives enrol and are validated before each cropping season.

Cooperatives
submit application
→
Commune & Province
eligibility check
→
DCPPP
approve
→
Central MRV Unit
register

03 Establish the baseline

Each registered area is mapped and its pre-program practices recorded.

Cooperatives + Commune
map SPOTs & collect baseline
→
Province MRV
spot-check
→
Central MRV Unit
calculate baseline

THE PROCESS · PART 2

Monitor → Assure quality → Report & verify

04 Monitor farming practices

Through the season, drainage events are evidenced with photos.

Cooperatives + Commune — photo-monitor drainage & survey → **Province MRV** — spot-check → **Central MRV Unit** — calculate reductions

05 Quality assurance & control

Checks at every level keep the data reliable and credible.

Cooperatives — in-app QC checks → **Province MRV Units** — QA spot-checks & reviews → **Central MRV Unit** — QA/QC oversight

06 Reporting & verification

Field data becomes a verifiable annual report.

Central MRV Unit — seasonal + annual report → **DCPPP** — review & approve → **Provinces** — final reports → **Third-party verifier** — verification

IN THE PAGES THAT FOLLOW

The MRV Implementation Manual sets out each of these steps in full operational detail — roles & responsibilities, methods, forms and checklists.

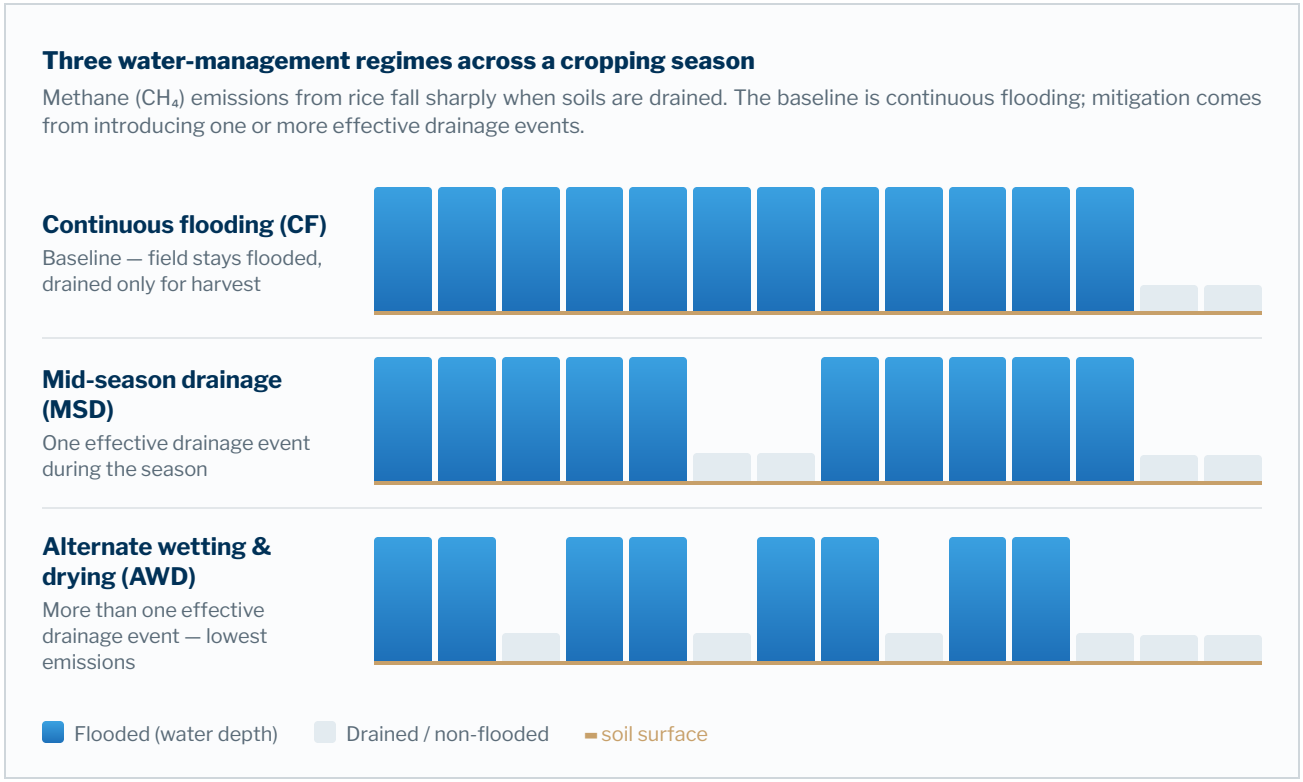
To ensure the quality of evidence supporting emission reductions claims, the 1Mha carbon program is designed to have a unified MRV system for the whole program managed at central level, with participation of other administrative levels and non-government actors in specific tasks as set out in this manual.

This manual describes the MRV system as designed and tested through the program's pilot phase. The institutional arrangements it refers to — including the Central MRV Unit and Province MRV Units — together with the roles and procedures set out below, are proposed for the program and are being put in place progressively; they are presented here as technical guidance rather than as standing regulatory requirements.

This MRV implementation manual provides guidance on

- Overall management of the MRV implementation;
- The annual MRV planning and review cycle;
- Registration of participating cooperatives and companies in the 1 Mha carbon program;
- How to map rice field areas participating in the program;
- How to collect baseline data;
- How to collect monitoring data;
- How to ensure the quality of the data;
- How to design and set up field measurements to collect emission factor data.

DEFINITIONS



- **MRV:** MRV stands for measurement, reporting and verification:

Measurement (M) refers to all the activities and procedures required to estimate GHG emissions and emission reductions. This includes direct physical measurement of GHG emissions and indirect measurement (estimation) of emissions or emissions reductions using activity data from surveys and existing emission factors.

Reporting (R): Information is provided that is sufficiently complete and transparent to demonstrate that emission reduction estimates are reliable and credible. This includes demonstrating that data quality control and quality assurance activities have been conducted.

Verification (V): The reported information is reviewed by a third party to establish whether the information provided is reliable and credible based on assessment of its accuracy, relevance, conservativeness, transparency, consistency and completeness.

- **Drainage event:** Drainage is the natural or artificial removal of surface water and sub-surface water from a rice field area. For the purpose of MRV, an "effective drainage event" is when there is evidence that surface soil remained non-flooded with no standing water for 3 or more consecutive days after the day of drainage.
- **Continuous flooding**: Fields have standing water throughout the rice growing season and only dry out for harvest (end-season drainage).
- **Mid-season drainage**: Fields have a single effective **drainage event** during the cropping season at any growth stage (plus end-season drainage)
- **Alternate Wetting and Drying**: Fields have more than one effective **drainage event** during the cropping season (plus end-season drainage)
- **SPOT**: A contiguous group of fields with the same elevation (i.e. an even field surface) and soil type that shares the same irrigation and drainage system. SPOTs are the unit for baseline data collection by participating cooperatives, and the unit for monitoring mitigation actions applied by cooperative members. The capitalized term ("SPOT") is used to refer to homogeneous groups of fields, which is different from the generic meaning of "spot-checks", which refer to field visits undertaken to ensure the quality of data.
- **Central MRV unit:** A unit delegated by the Ministry of Agriculture and Environment (MAE), responsible for developing MRV methodology, guiding MRV activities, calculating GHG emission reductions, data management and reporting.
- **Province MRV unit:** A unit under the Provincial Department of Agriculture and Environment (DAE), responsible for guiding and supporting MRV implementation in the province.

I. BACKGROUND: 1 MILLION HA PROGRAM AND MRV IMPLEMENTATION BOUNDARY

The 1Mha carbon program is a national umbrella program to be implemented by one single entity, the Ministry of Agriculture and Environment (MAE), with participation by 6 provinces in the Mekong Delta Region. Participating provinces are the five Mekong River Delta provinces under the current administrative structure: Cần Thơ, An Giang, Cà Mau, Vĩnh Long, and Đồng Tháp.

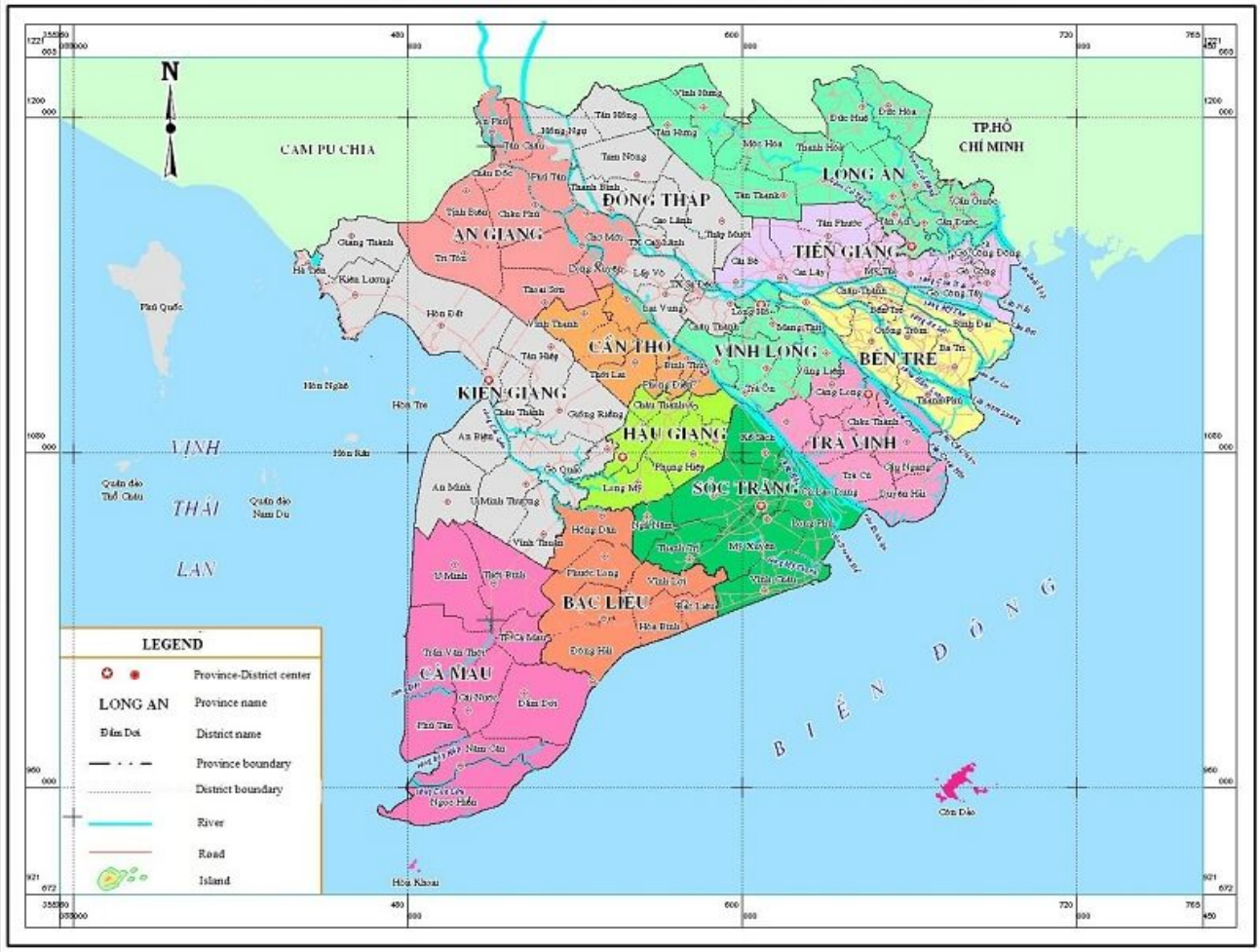


Figure 1 Administrative map of the Mekong Delta

II. OVERALL MRV SYSTEM MANAGEMENT

A multi-level accountability chain — ministry to farm gate

Decision No. 4801 assigns distinct MRV responsibilities at each level of government down to the individual cooperative.

LEVEL 01	**National**	**DCPPP & the Central MRV Unit — methodology governance, the digital platform, QA/QC oversight, baseline & emission calculations, and program-wide reporting.**
LEVEL 02	**Provincial**	**Departments of Agriculture & Environment (DAEs) / Province MRV Units — annual provincial monitoring plans, registration review, and data spot-checks.**
LEVEL 03	**Commune**	**Commune extension staff — direct technical support to cooperatives implementing AWD and the monitoring protocols.**
LEVEL 04	**Field**	**Cooperatives & companies — register SPOTs, collect baseline & monitoring data via the MRV app, and maintain photographic evidence of drainage.**

2.1 Overall coordination and supervision of MRV for the 1Mha carbon program is the responsibility of the **Department of Crop Production and Plant Protection** (DCPPP, MAE). DCPPP will be responsible for reviewing and approving the GHG quantification methodology and MRV manuals, procedures and guidelines, as well as review and approval of registration applications and monitoring reports, and other specific activities set out in this manual.

2.2 DCPPP will delegate responsibility for technical aspects of managing the MRV system to a **Central MRV Unit**, which will be responsible for:

- Drafting, reviewing and revising the GHG quantification methodology and MRV manuals, including templates, procedures and guidelines;
- Preparing MRV training materials and delivering training of trainers activities;
- Establishing a digital MRV data management system, including tools (e.g. smart phone apps) to enable cooperatives, communes and provinces to play their roles in MRV;
- Drafting annual program monitoring plans;
- Providing oversight and ongoing support to the implementation of MRV activities by province MRV units, including review and approval of provinces' annual MRV plans;

- Managing the MRV data management system, including quality assurance and quality control activities (QAQC);
- Drafting seasonal summary reports and annual monitoring reports;
- Coordinating with and supporting the activities of third-party validators and verifiers;
- Other specific activities as set out in this manual.

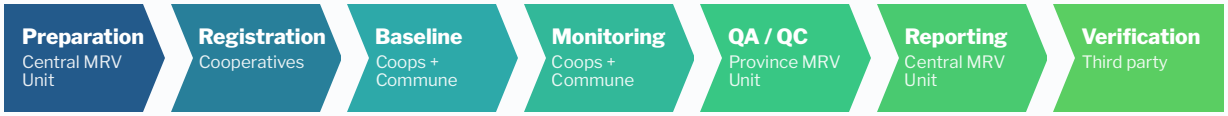
2.3 **Provincial DAEs** will establish province MRV units and allocate appropriate staff to that unit to be responsible for:

- Preparing annual monitoring plans for MRV activities in their province;
- Checking and confirming cooperative and company registration applications;
- Providing training, supervision and guidance to commune extension staff in mapping registered rice field areas, collecting and reporting baseline and monitoring data;
- Carrying out spot checks on MRV activities at the commune and cooperative and company levels during each season;
- Reviewing annual monitoring reports compiled by Central MRV Unit on behalf of each province and providing any required province-level clarifications.
- Other specific activities as set out in this manual.

III. STEPS FOR MRV IMPLEMENTATION

The MRV process at a glance

One end-to-end cycle, repeated each cropping season, with periodic third-party verification. The lead actor for each phase is shown beneath it.



↻ Annual MRV cycle — preparation through reporting each season; independent verification at longer intervals.

3.1 MRV overview

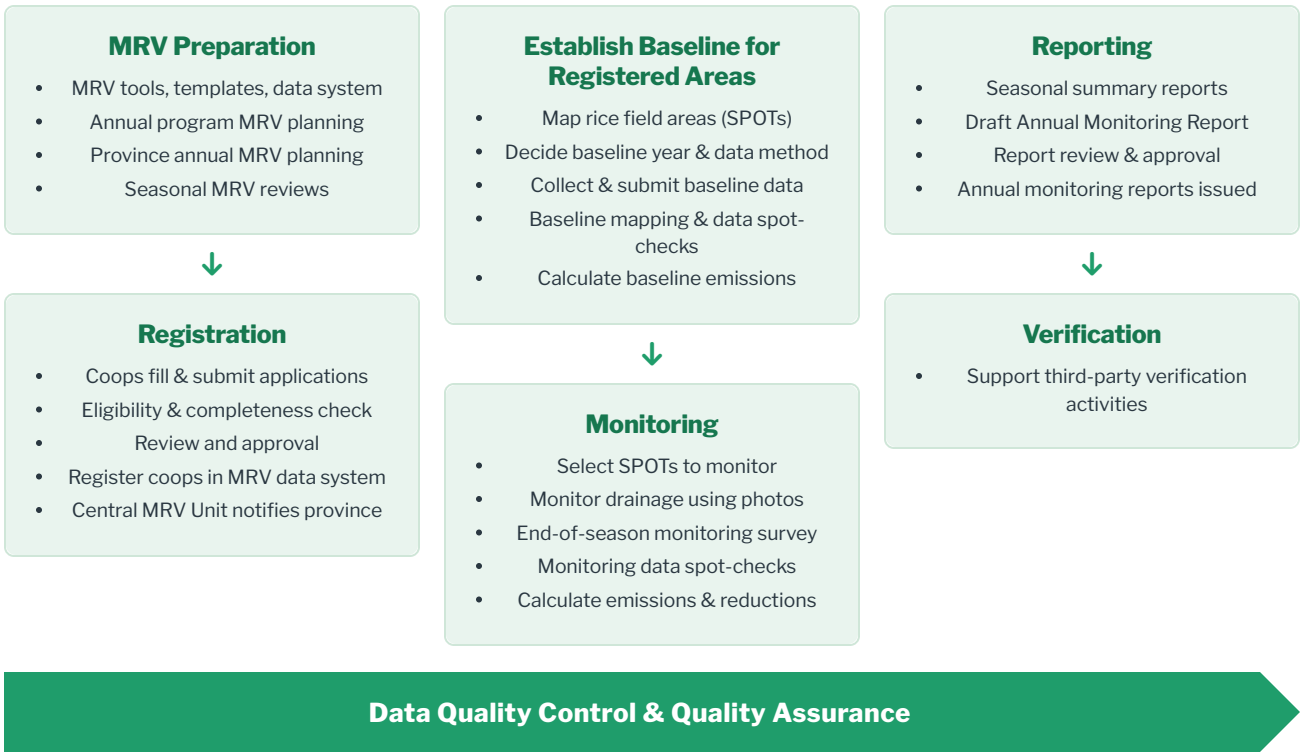


Figure 2 Overview of steps in MRV activities

Figure 2 gives an overview of the main stages of MRV and the key activities in each activity

When to do each set of activities?

A. Preparation: Central MRV Unit will prepare the tools and templates, and training materials for MRV activities, and provide technical support to establish a digital MRV system. Each province must have an approved annual monitoring plan before cooperatives or companies in that province can be registered. Monitoring plans must be reviewed and updated annually before the winter-spring rice season.

B. Registration: After a province monitoring plan has been approved, cooperatives and companies in that province may apply to register their participation in the 1Mha carbon program. Because the carbon program will expand gradually until 2030, cooperatives and companies may submit their registration applications [at any time, to begin official participation in the next rice cropping season OR in MONTH of any year, to begin official participation in SEASON of that year].

C. Establish baseline for registered areas: After a cooperative or company has been registered in the MRV data management system, participating rice field areas are mapped and baseline data collected. Baseline data and mapping should be completed and submitted into the MRV data management system *before the beginning of the first rice cropping season that will be monitored*. Field mapping and baseline data collection in each cooperative or company area will be done only once, but this will be an ongoing activity as new cooperatives and companies are approved to participate in the carbon program.

D. Monitor farming practices: Monitoring shall be done in every rice cropping season after baseline data has been submitted. Rice field drainage activities (e.g. single mid-season drainage or multiple drainage events, AWD) are monitored *during* each rice cropping season, and other rice cultivation practices are monitored *at the end* of each rice cropping season. Monitoring is an ongoing activity during program implementation. In addition, registered cooperatives and companies must confirm their continued participation before the beginning of each rice cropping season.

E. Quality control and quality assurance (QAQC): Quality control (i.e. checking if data provided is complete and correct) and quality assurance (i.e. verifying the submitted data and checking that data management procedures were followed) is an ongoing activity conducted as part of each MRV activity. Uncertainty management is also a QAQC activity.

F. Reporting: The carbon program will produce seasonal summary reports with basic data on progress of MRV implementation, and annual monitoring reports including emission reductions achieved.

G. Verification: Verification of program results by independent third parties may be done annually or at longer intervals.

Who is responsible for and who is involved in which activities? Roles and responsibilities in each of the main steps are summarized in Table 1.

Table 1 Overview of roles and responsibilities in MRV activities

MRV activity	Roles and responsibilities	Manual section
MRV preparation		3.2. MRV preparation and planning
Prepare MRV tools, templates, data management systems	Central MRV Unit to lead technical preparation; DCPPP to review and approve.	3.2.1 MRV Preparation
Annual Program MRV plan	Central MRV Unit	3.2.2.1 Annual Program MRV Planning

MRV activity	Roles and responsibilities	Manual section
Province Annual MRV planning	Province DAE and Province MRV Units draft annual plans Central MRV Unit reviews and approves Province MRV plans	3.2.2.2 Province Annual MRV Planning
Seasonal MRV review	Province MRV units, cc'd to Central MRV unit If needed, province MRV units make requests for deviation from annual plan. Central MRV Unit reviews and approves	3.2.2.3 Province annual monitoring cycle
Registration		3.3. Registration of Cooperatives and Companies in the MRV System
Fill in cooperative registration form	Cooperatives and companies	3.3.1 Cooperative and company registration
Submit registration application	Cooperatives and companies submit to province DAE and MRV unit	3.3.2 Submission of registration application
Eligibility and completeness checks	Province MRV unit	3.3.3 Eligibility and completeness check
Review and approval	Province DAE submits to DCPPP; DCPPP reviews and approves	3.3.4 Review and approval
Registration in MRV system	Central MRV Unit registers coops and companies in MRV system, notifies province.	3.3.5 Registration in the MRV system
Establish baseline for registered areas		3.4 Establish Baseline for Registered Areas
Mapping registered field areas	Cooperatives and companies with support from commune extension agencies using MRV app tools; province MRV unit provides guidance and support	3.4.1 Mapping homogenous groups of fields (SPOTs)
Decide baseline year and data collection method	Cooperatives and companies with support from commune extension agencies	3.4.2 Decide the baseline year and data collection method

MRV activity	Roles and responsibilities	Manual section
Baseline activity data collection	Cooperatives and companies with support from commune extension agencies using MRV app tools; province MRV unit provides guidance and support	3.4.3 Baseline activity data collection
Baseline data spot-checks	Province MRV Units	3.4.3.3 Quality control and quality assurance for baseline data
Baseline emission calculations	Central MRV Unit	3.4.4 Baseline emission calculations
Monitoring		3.5 Monitor Farming Practices
Confirm participation before each season	Cooperatives and companies indicate participation in the coming cropping season	3.5.1 Decide the number and location of SPOTs to monitor
Decide the number and location of monitoring	Central MRV Unit calculates and notifies provinces.	3.5.1 Decide the number and location of SPOTs to monitor
Photo-monitoring of drainage during the season	Cooperatives and companies with support from communes, photos submitted using MRV tool; Province MRV provides overall guidance and support	3.5.2.1 Photo-monitoring of drainage activities during each cropping season
End of season activity data survey	Cooperatives and companies with support from communes, data submitted using MRV tool; Province MRV provides overall guidance and support	3.5.2.2 Monitoring other rice cultivation practices
Monitoring data spot-checks	Province MRV Units, findings submitted using MRV tool	3.5.2.3 Quality control and quality assurance for monitoring data
Calculating emissions and emission reductions	Central MRV Unit	3.5.3 Calculating project emissions and emission reductions
3.6 Quality Assurance and Quality Control (QA/QC). See detailed activities in Table 9		

MRV activity	Roles and responsibilities	Manual section
3.7 Reporting		
Report seasonal monitoring data	Cooperatives submit data (e.g. photo-monitoring during drain periods, end-of-season survey) into the MRV system using approved tools; communes provide support.	3.7.1. Report Seasonal Monitoring Data
Draft seasonal summary and annual monitoring report preparation and checks for errors	Central MRV Unit	3.7.1. Report Seasonal Monitoring Data Cooperatives are responsible for submitting all required monitoring data into the digital MRV system using the approved tools and templates. This includes, for example, photo-monitoring records during drainage events and survey data collected at the end of the season. Commune staff shall provide technical support to cooperatives as needed to ensure accurate and timely data submission. 3.7.2 Preparation of Seasonal and Annual Monitoring Reports
Share seasonal summary reports	Central MRV Unit sends to DCPPP and each province	3.7.3 Seasonal Summary Reports
Annual monitoring report preparation	Central MRV Unit	3.7.1. Report Seasonal Monitoring Data Cooperatives are responsible for submitting all required monitoring data into the digital MRV system using the approved tools and templates. This includes, for example, photo-monitoring records during drainage events and survey data collected at the end of the season. Commune staff shall provide technical support to cooperatives as needed to ensure accurate and timely data submission. 3.7.2 Preparation of Seasonal and Annual Monitoring Reports
Annual report review and approval	DCPPP and provinces review draft reports; Central MRV Unit revises and finalizes reports.	3.7.4 Review and Approval of Annual Monitoring Reports
Share final annual monitoring report with provinces	DCPPP communicates annual monitoring reports to each province.	3.7.5 Communication of Final Annual Monitoring Reports
Verification		3.8 Verification

MRV activity	Roles and responsibilities	Manual section
3.8.2 Verification	Verification activities are conducted by a third-party. Central MRV Unit liaises with third party verifier and coordinates cooperation of provinces, cooperatives and companies All MRV actors will support their verification activities by providing the information requested.	

Detailed procedures and requirements for each step are set out in the following sections.

3.2. MRV preparation and planning

3.2.1 MRV Preparation

3.2.1.1 Preparation and Updating of MRV Tools and Templates

Central MRV Unit will lead technical preparation and updating of all tools, templates and data management systems required to implement this MRV Implementation Manual. These will be submitted to DCPPP for review and approval. The tools and templates include:

- All templates and forms outlined in draft form in Appendices A1-A5, A7, A9-A12 of this manual;
- Digital tools (e.g. apps) for SPOT mapping, baseline data collection and monitoring;
- Calculators to automate calculation of GHG emissions and emission reductions.

These tools and templates will be integrated into a digital data management system.

3.2.1.2 MRV Training by Central MRV Unit

Central MRV Unit will lead drafting of all training materials required to train staff at central, province and commune level on how to conduct MRV activities, and provide training to province MRV unit staff. The Central MRV Unit may also support commune-level training if requested.

3.2.1.3 Training by Province MRV Units

Province MRV units will train commune extension staff and cooperative leaders on how to conduct MRV activities, using the standardized training materials and guidance developed by the Central MRV Unit.

3.2.2 Annual MRV planning cycle

Table 2 gives an overview of the sequence of activities and responsibilities in the annual MRV planning cycle. Further details are given in the sections below.

Table 2 Roles and responsibilities in the annual MRV planning cycle

✓ Full responsibility

MRV activity	DCPPP	Central MRV Unit	Province MRV Units	Commune extension staff	Cooperatives
Prepare annual program MRV plan		✓			
Review & approve	✓				
Prepare province annual MRV plans			✓		
Review & approve		✓			
Implement MRV activities (see Sections 3.3 – 3.6)	✓	✓	✓	✓	✓
MRV review at end of each season			✓		
Request change to province annual MRV plan (if needed)			✓		
Review & approve change to annual MRV plan		✓			
Propose updates MRV tools, templates and data management systems based on implementation experience, if needed		✓			

3.2.2.1 Annual Program MRV Planning

Central MRV Unit will prepare an Annual Program MRV Plan for the whole carbon program and submit it to DCPPP for approval. Before drafting the annual plan, the Central MRV Unit should review issues identified by province MRV units in spot-checks on MRV activities, seasonal MRV reviews and requests to change annual monitoring plans, as well as findings of verification bodies. This plan must be finalized before the start of any field MRV activities, including cooperative registration, to provide the overall framework for the year.

The Annual Program MRV Plan shall set out program-wide objectives, schedules, procedures, monitoring requirements, QA/QC protocols, and reporting formats. The Central MRV Unit is responsible for defining the structure and template of the plan to ensure it meets operational needs and provides clear instructions for provinces. Province MRV Units will then prepare their own annual MRV plans within this framework, ensuring consistency across provinces. Ongoing communication and coordination between the Central MRV Unit and provinces is required throughout this process.

3.2.2.2 Province Annual MRV Planning

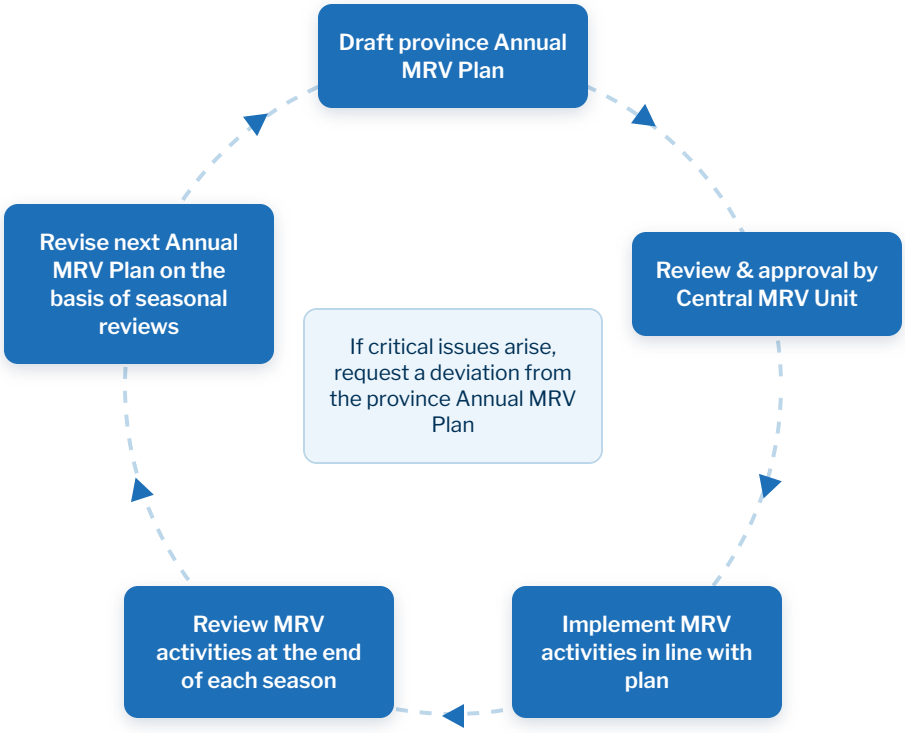
Each province must use the template approved by the Central MRV Unit to elaborate a Province Annual MRV Plan covering all MRV activities in the province (see draft in Appendix A1). Using the standard template, provinces will identify the agencies and staff at province and commune level responsible for each MRV activity. Any other adjustments to the specific MRV procedures that are required in light of province-specific circumstances may also be proposed in the Province Annual MRV Plan, provided they are clearly justified and do not compromise data quality, completeness, or consistency with the overall Program methodology.

Province Annual MRV Plans will be submitted by the Province MRV Unit to the Central MRV Unit. The Central MRV Unit will review and approve the Province Annual MRV Plans to ensure that they are complete and comply with the Program Annual MRV Plan. The Central MRV Unit will also define the timeline for submission and approval of Province Annual MRV Plans. This timeline should consider that submission should be completed sufficiently ahead of the winter–spring rice season (e.g., at least four weeks before the start of field activities) to allow for review and coordination.

3.2.2.3 Province annual monitoring cycle

The annual cycle of planning, monitoring and review is illustrated in 3. After monitoring data has been submitted at the end of every season, province MRV units must review implementation of MRV activities (Appendix A2). The review summary is sent to the Central MRV Unit for their information. The purpose of this review is to identify MRV activities that need to be improved, and to ensure that improvements are incorporated in MRV activities in the next rice cropping season and in the next Province Annual MRV Plan. If any issues identified in any season require changes to the approved Province Annual MRV Plan that need to be implemented in the next rice cropping season, a request to deviate from the approved Province Annual MRV Plan must be submitted by the Province MRV Unit to the Central MRV Unit for review and approval (Appendix A3). In principle, a request to deviate will not be approved if the change will lead to not all required data being collected or data collection methods changing to a method that is less accurate.

Documentation of each approved Province Annual MRV Plan, end of season reviews, and any approved deviations from annual plans must be archived by both province MRV units and the Central MRV Unit. These must be made available to third-party verifiers if requested.



3.3. Registration of Cooperatives and Companies in the MRV System

Table 3 gives an overview of the sequence of activities and responsibilities in registering cooperatives and companies in the MRV system. Further details are given in the sections below.

Table 3 Roles and responsibilities in registering coops and companies in the MRV system

✓ Full responsibility

MRV activity	DCPPP	Central MRV Unit	Province MRV Units	Commune extension staff	Cooperatives and companies
Fill in and submit cooperative / company registration application					✓
Check applications are eligible and complete			✓		

MRV activity	DCPPP	Central MRV Unit	Province MRV Units	Commune extension staff	Cooperatives and companies
Review and approve registration applications	✓				
Register cooperatives or companies in MRV system		✓			
Notify provinces of successful registrations		✓			

3.3.1 Cooperative and company registration

Cooperatives and companies may register for participation in the 1Mha carbon program [at any time, to begin official participation in the next rice cropping season OR in MONTH of any year, to begin official participation in SEASON of that year]. Registration must be approved, and recorded in the program MRV data management system before baseline and monitoring data can be uploaded.

3.3.2 Submission of registration application

A template for the cooperative and company registration application is shown in (Appendix A4). Cooperatives and companies will submit a registration application to the Province DAE [and province MRV unit].

3.3.3 Eligibility and completeness check

The [province DAE OR province MRV unit] will check the registration application to confirm the information provided is complete and meets the program eligibility criteria (see Registration Review Form in Appendix A5). If applications are ineligible or incomplete, province DEA unit will notify the applicant and may request further documentation or clarification. Ineligible and incomplete applications shall not be submitted for review and approval.

3.3.4 Review and approval

After confirming applications are eligible and complete, province DEA unit will submit the applications to DCPPP for review and approval. DCPPP will notify province DEA and both the province MRV unit and Central MRV Unit once approval is granted.

3.3.5 Registration in the MRV system

Upon receiving notification of approval, Central MRV Unit will register approved cooperatives and companies in the MRV data management system, and notify province MRV unit that registration is complete.

3.4 Establish Baseline for Registered Areas

Emission reductions are calculated as the difference between emissions under baseline rice cultivation practices and emissions from rice cultivation after adopting improved water and fertilizer management practices (or other eligible mitigation practices). **All** rice field areas approved for participation in the program must provide information on baseline rice cultivation practices. At the same time, the location of each rice field area will be digitally mapped. After checking on the completeness and quality of baseline data, it will be stored in the MRV data management system and used to calculate baseline emissions and emission reductions after monitoring data has been input into the MRV data management system.

The general procedure is:

- Map groups of fields (SPOTs) (see Section 3.4.1)
- Decide the baseline year and baseline data collection method (see Section 3.4.2)
- Collect baseline activity data (see Section 3.4.3)
- Calculate baseline emissions (see Section 3.4.4)

Table 4 gives an overview of the sequence of activities and responsibilities in establishing the baseline. Further details are given in the sections below.

Table 4 Roles and responsibilities in establishing the baseline

✓ Full responsibility

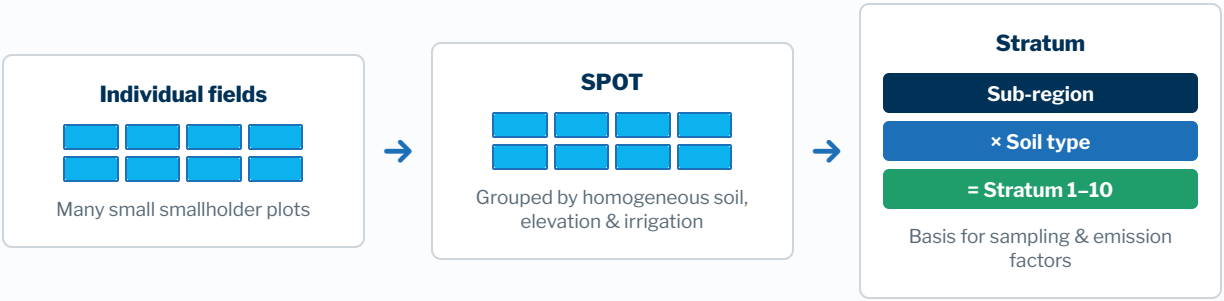
MRV activity	DCCP	Central MRV Unit	Province MRV Units	Commune extension staff	Cooperatives and companies
Mapping SPOTs			✓	✓	✓
Submit results of SPOT mapping					✓
Spot-checks for SPOT mapping quality assurance			✓		
Decide baseline year and data collection method			✓	✓	✓
Collect baseline data			✓	✓	✓
Submit baseline data					✓
Spot-checks for baseline data quality assurance			✓		

MRV activity	DCCP	Central MRV Unit	Province MRV Units	Commune extension staff	Cooperatives and companies
SPOT map & baseline data management		✓			
Calculate baseline emissions		✓			

3.4.1 Mapping homogenous groups of fields (SPOTs)

From fields to SPOTs to strata

Individual fields are grouped into a SPOT — a contiguous block sharing soil type, elevation and irrigation — which is then assigned to one of the program's baseline strata (sub-region × soil type).



Collecting data for every individual rice field plot would make MRV too complex. Therefore, the rice field area registered in each cooperative or company will be divided into groups of fields with similar characteristics called 'SPOTs'. Each SPOT may contain several or many individual farmer households' fields. These individual fields may be grouped into one SPOT if:

- All the fields have the same elevation (i.e. an even field surface), homogeneous soil type and soil characteristics; and
- All the fields share the same irrigation and drainage system, and apply the same water regime before and during the season (irrigation and drainage, especially draining practice like MSD or AWD).

SPOTs will be used as the unit for collecting baseline activity data on rice cultivation practices, and a sample of SPOTs will be monitored to collect data on rice cultivation practices after adoption of improved management practices.

The current draft does not define a required timeline for completing SPOT mapping. The Central MRV Unit shall set the standard timeline for SPOT mapping in alignment with registration and seasonal planning. The timeline may consider the need to complete, submit and check mapping before the first rice cropping season (e.g. at least 15–30 days) for which monitoring is planned, to allow sufficient time for data processing and quality checks.

3.4.1.1 Roles and responsibilities in field group mapping

Using the tools and training provided by Central MRV Unit (see Section 3.2.1 on MRV preparation),

- **Province MRV unit** will

- train commune extension staff on how to work with cooperative leaders and members (or company staff and contract farmers) to identify and map SPOTs.
- guide and support the mapping activities of each commune, and
- conduct quality assurance spot-checks of completed SPOT maps to verify accuracy and compliance with the grouping criteria.

  - **Commune extension staff** will work with cooperative leaders and members (or cooperative staff and contract farmers) to map SPOTs following all the required criteria and provide hands-on guidance throughout the mapping process.
  - **Cooperative leaders (or company managers)** are responsible for submitting the completed SPOT maps using the baseline MRV app or online interface.
  - **Central MRV unit** will

- integrate the submitted SPOT mapping data into the 1Mha MRV data management system;
- use GIS tools to allocate (digitize) each group of fields to a unique baseline stratum (see Appendix A8);
- implement and document quality control activities built-in to the data management system to validate completeness and spatial accuracy of submitted SPOT data; and
- liaise with province MRV units to resolve any issues with the submitted SPOT mapping data.

3.4.1.2 Method to identify SPOTs

- **Commune** extension staff will work with the cooperative leaders and members (or company staff and contract farmers) to identify and map SPOTs following the steps in sub-paragraphs (b) – (f).
- Using paper-based cadastral maps or Google maps, together with cooperative leaders and members (or company staff and contract farmers), map groups of fields that have an even field surface, share homogeneous soil characteristics and share the same irrigation and drainage system.
- Discuss with the cooperative members (or company contract farmers) owning plots in each group of fields to confirm that they agree the irrigation and drainage in these fields will be managed together (e.g. all applying AWD) and that all owners of field plots are willing participants in the carbon program, or adjust the grouping of fields until this is confirmed. Make sure that all farmer households with fields in each SPOT have signed the application to participate in the carbon program (see Annex 4.1).
- Follow the step-by-step guidance in Appendix A6 for how to map and record basic data for each SPOT.
- The SPOT size depends on the degree of homogeneity of the SPOT in field conditions (same soil type, same irrigation and drainage regimes, flat land with elevation difference less than 5 cm);

- Check each SPOT area: Together with cooperative members (or company staff and contract farmers), compare the total area of each SPOT estimated by mapping operation with the sum of single field areas; if there are differences, identify the reason and adjust the SPOT mapping if needed, or adopt the smaller of the two area values as the final area of the SPOT.
- SPOT mapping data and associated information will be submitted by cooperative leaders (or company managers) using digital tools designed by Central MRV Unit. Central MRV Unit will:
- process the data and integrate it into the MRV data management system;
- use GIS tools to allocate each group of fields to a unique baseline stratum (see Appendix A8);
- implement and document quality control activities built-in to the data management system to validate completeness and spatial accuracy of submitted SPOT data; and
- liaise with province MRV units to resolve any issues with the submitted SPOT mapping data.

3.4.1.3 Quality assurance for SPOT mapping

The key quality aspects to manage are ensuring that (a) information is complete; (b) homogenous irrigation/drainage within each SPOT, and (c) estimation of SPOT area with a reasonable degree of accuracy. Quality assurance will include the following:

- **Built-in functions of the digital MRV data management system:**

i. Completeness: The data management system should be designed with automated check for completeness: a cooperative's SPOT maps cannot be incorporated in the database unless the information uploaded is complete, i.e., SPOT shapefiles for every SPOT, information on 3 monitoring sites per SPOT, information on each cooperative member (or contract farmer) with fields in each SPOT.

ii. Conforming to SPOT definition: Baseline survey data on baseline water regime can be used to confirm that all SPOTs have homogeneous water regime.

- **Quality assurance spot-checks:** The Province MRV unit is responsible for:

- ensuring that commune extension staff make timely progress with field group mapping for cooperatives and companies whose registration has been approved;
- supporting commune extension staff and cooperative leaders and companies to resolve any issues arising in the mapping process;
- ensuring SPOT mapping is correctly implemented by (a) accompanying commune extension staff during the tasks to ensure that the skills and methods have been learned and are applied properly, and (b) spot-checks of a number of cooperatives or companies after SPOTs have been registered to check the results with the cooperatives and their members (or with companies and their contract farmers). These spot-checks may either be random or may be targeted to communes where more risks or issues have been identified. Central MRV Unit should develop further guidance on planning of spot-checks (e.g. how to determine the number of spot-checks per season, criteria for deciding locations etc.), and may revise this guidance as further information on data quality becomes available over time.
- A checklist for key issues to assess in these spot-checks is given in Appendix A7. Where possible, province MRV units should resolve any issues identified and record the actions taken in the spot-check documentation form (Appendix A7). If any issues cannot be immediately resolved, province MRV units should document recommendations to address the issue. If any of the quality criteria listed in the spot-check documentation form are not met, the province MRV unit may recommend to not approve the SPOT mapping until the issues are resolved.
- SPOT mapping spot-check documentation forms are submitted to Central MRV Unit through the digital MRV system. Central MRV Unit will take note of the findings and recommendations made by the province MRV units.

Where spot-checks or other quality-control activities identify inconsistencies, missing information, or potential errors that result in a recommended revision to data already submitted, the recommended revision shall be communicated to the cooperative or company through the digital MRV system. The revised value is accepted into the system only after the cooperative or company has reviewed and confirmed the revision through the system. All such revisions, together with the cooperative or company confirmation, are recorded in the system to ensure traceability and to provide a transparent basis for resolving any disputes regarding baseline or monitoring values.

To ensure that SPOTs are large enough to be operationally practical and representative, but small enough to maintain the homogeneity required for credible GHG quantification, the following area thresholds apply:

Threshold	Value	Rationale
Minimum SPOT area	5 hectares	==Below this threshold, the fixed costs of SPOT registration, mapping, and monitoring are disproportionate to the area credited. SPOTs smaller than 5 ha shall be merged with adjacent SPOTs meeting the homogeneity criteria, or excluded from the carbon program pending future consolidation.

Threshold	Value	Rationale
Maximum SPOT area	500 hectares	==Above this threshold, internal heterogeneity in soil type, elevation, and drainage behavior is likely to be material. SPOTs above this size must be subdivided to maintain the homogeneity required for the IPCC Tier 2 emission factor approach.
Recommended typical range	20–200 hectares	==SPOTs in this range generally balance operational practicality, irrigation system coherence, and statistical representativeness for sampling purposes.

Subject to further discussion, managing deviations from SPOT size thresholds are proposed as below:

(a) SPOTs below the 5 ha minimum: Where a cooperative's entire registered area is below 5 ha, the cooperative may be registered for participation in the carbon program but its fields must be assigned to a SPOT shared with an adjacent cooperative operating under the same provincial MRV unit. Shared SPOTs must meet all standard homogeneity criteria and the cooperatives involved must each separately confirm their participation and their agreement to share SPOT-level monitoring responsibilities. If no adjacent cooperative is available, the cooperative shall be registered as a "provisional participant" and excluded from emission reduction calculations until its area reaches the 5 ha threshold through expansion or merger.

(b) SPOTs above the 500 ha maximum: Where an initially mapped SPOT exceeds the 500 ha threshold, the Central MRV Unit shall require the Province MRV Unit to subdivide the SPOT before baseline data collection begins. Subdivision shall follow irrigation system boundaries or cadastral boundaries and shall be documented with a revised SPOT map submitted for review. Emission reductions generated by fields within an oversized, undivided SPOT shall not be credited until subdivision and re-mapping have been completed.

(c) Changes in SPOT area during program implementation: If a SPOT's area changes materially (by more than ±10%) due to land consolidation, land-use change, cooperative membership changes, or other causes, the cooperative or company must notify the Province MRV Unit within 30 days of the change. The Central MRV Unit will assess whether the change requires re-mapping, a new baseline survey for affected fields, or both. Changes of less than ±10% in area may be handled through a documented administrative update without requiring a new baseline.

(d) Statistical implications of SPOT size deviations: The sampling intensity required for monitoring (stratified random sampling targeting ±10% precision at 95% confidence intervals) is calculated relative to the total number and area of registered SPOTs. Significant changes in the number or area of SPOTs — whether due to new registrations, subdivisions, or exclusions — shall trigger a recalculation of the minimum monitoring sample by the Central MRV Unit, and provinces shall be notified before the next cropping season begins.

3.4.2 Decide the baseline year and data collection method

The most important characteristic of the baseline situation is the water regime used before AWD was adopted. Other information on rice cultivation practices before AWD was adopted is also required.

Commune extension staff will support cooperatives and companies to determine which year and seasons to select as the baseline year, and support them to put together any supporting evidence required. Commune extension staff should consult with province MRV units if any clarifications are needed to determine the correct baseline year for a particular SPOT or cooperative.

3.4.2.1 Definition of baseline water regimes

Baseline water regimes may either be continuous flooding or mid-season drainage with one effective drainage in the season. An effective drainage event is when surface soil remained non-flooded with no standing water for 3 or more consecutive days after the day of drainage (see Definitions). If baseline practices involved draining the fields but then re-wetting before 3 days have passed, then this will not be counted as an effective drainage event and the baseline practice will be defined as continuous flooding.

3.4.2.2 How to determine the baseline year and seasons

- **If AWD has not yet been adopted (i.e. baseline data is collected before switching practice)**:
  - Identify the current cropping season at the time of baseline data collection. *E.g. summer-autumn 2025*
  - For that season, take the same season 1 year earlier as the baseline. *E.g. summer-autumn 2024 is the season used to document baseline water regime and rice cultivation practices for the summer-autumn season.*
  - Similarly, for the other cropping seasons in the local rice season calendar, select the corresponding season one year earlier as the baseline for each remaining season in that calendar. *E.g. In triple cropping systems, the other baseline seasons are autumn-winter 2024 and winter-spring 2025. In double cropping systems, the other season will be winter-spring 2025.*
  - Collect baseline data (i.e. water regime and other rice cultivation practices) for each of these seasons by interviewing farmers using methods described in Section 3.4.3.2. No other written evidence is required if AWD has not yet been adopted.

- **If AWD has already been adopted before baseline data is collected:**
  - Identify the first cropping season and year AWD was adopted. *E.g. autumn-winter 2024*
  - Set the baseline water regime:
    - For that season identified above, take the same season 1 year before AWD adoption as the baseline for that season's water regime. *E.g. If AWD began in autumn–winter 2024, autumn-winter 2023 is the baseline season.*
    - Similarly, for the other cropping seasons in the local rice calendar, select the corresponding season one year earlier as the baseline for remaining season in that calendar. *E.g. In triple cropping systems, the other baseline seasons are summer-autumn 2023 and winter-spring 2023. In double cropping systems, the other season will be winter-spring 2023.*
  - **Evidence** of historical water regime: Additional evidence of the water regime used in each season shall be provided. The most preferred information that is available should be provided. The order of preferred information is:
    - Records of irrigation and drainage dates kept by the cooperative or company;
    - Irrigation schedules (plans) of cooperatives or companies;
    - Sluice gates operation records (opening/closing logs);
    - Field notes of extension/agricultural officers;
    - If none of the above are available, a signed statement from the cooperative leader or company technician describing the water regime in each season and confirming whether it meets the definition for continuous flooding or mid-season drainage.
  - **Evidence** of other rice cultivation practices: Other rice cultivation practices include straw management, fertilizer application, organic amendments, and sowing and harvest dates. For each of the baseline seasons and years, if supporting documentation is available, it shall be provided by the cooperative or company. This may include:
    - crop calendars
    - input purchase records
    - survey reports
    - other documentation from those baseline seasons.
    - If such documentation is unavailable or insufficient, other baseline rice cultivation practices for each season can be obtained by interviewing farmers about their practices during the year before baseline survey using the methods described in Section 3.4.3.2.

3.4.2.3 Ensuring a conservative baseline

If the weather in any baseline season was unusually abnormal, such as causing the growing season to be longer or shorter by one week or more, then the average season length for the same rice variety in the commune (as estimated by the extension officer) should be used as the length of the growing season.

3.4.3 Baseline activity data collection

What baseline data is collected (per SPOT)

For each SPOT, cooperatives collect data from a sample of farmers using the MRV app — grouped into these categories.

Identification	Farmer & field	Cultivation practices	
SPOT ID	Name, age, gender	Field levelling	Rice cultivar & seed
Baseline year & season	Field area (ha)	Sowing & harvest dates	Water regime (CF/MSD/AWD)
		Pre-season straw incorporation	N fertilizer (kg/ha)
		Organic amendments	Average yield

All cooperatives and companies participating in the program must provide baseline activity data for all SPOTs in their area. The Central MRV Unit shall set the standard timeline for baseline data collection in alignment with SPOT mapping and seasonal planning. The timeline may consider the need to complete, submit and check baseline before the first rice cropping season (e.g. at least 15–30 days) for which monitoring is planned, to allow sufficient time for data processing and quality checks. The data required to describe baseline rice cultivation practices are shown in Table 5. For each SPOT, data on rice cultivation practices are collected by interviewing a minimum of 3 households with field plots in that SPOT using a questionnaire survey (see Section 3.4.3.2). Typical rice cultivation practices will be calculated as the area-weighted average of the data provided by the farmers interviewed. The season and year for farmers to provide information about is decided using the procedures in Section 3.4.2 above.

Table 5 List of baseline activity data to collect for each baseline season

Parameter	Description and summary of methods
Area (ha)	**Description:** The area of rice fields (ha) registered to participate in the program owned by each farmer interviewed. **Method**: Farmer statement (see Section 3.4.3.2 method for data collection).
Water regime	**Description**: Whether continuous flooding, mid-season drainage or alternate wetting and drying was applied in the baseline season. **Method**: If improved water management has not yet been adopted, farmer statements of water management practices are used. If AWD was adopted before the baseline survey, see additional documentation should be provided (see Section 3.4.2.1)
Rice cultivar	**Description**: Name of the rice cultivar grown in the baseline season. **Method**: Farmer statement (see Section 3.4.3.2 method for data collection)
Duration of crop season (days)	**Description**: Duration in days of the cropping season between sowing and harvest in the baseline season. **Method**: Farmer statement (see Section 3.4.3.2 method for data collection)
Paddy yield (t/ha)	**Description:** Paddy rice yield (tonnes per ha) in the baseline season. Method: Farmer statement (see Section 3.4.3.2)
Type and amount of organic amendments applied (kg/ha)	**Description:** Type of organic amendments (e.g. animal manure, compost) applied to the rice field in the baseline season and the amount applied (kg per ha per season). **Method:** Farmer statement (see Section 3.4.3.2 method for data collection)
Crop residue management	**Description:** Percent of rice straw that is burned, incorporated in soils, or removed, and the uses of crop residues that are removed. **Method:** Farmer statement (see Section 3.4.3.2 method for data collection)
Fertilizer use (kg/ha)	**Description:** Amount of each type of nitrogen-containing fertilizer applied (kg fertilizer per ha) in the baseline season. **Method:** Farmer statement (see Section 3.4.3.2 method for data collection)

3.4.3.1 Roles and responsibilities in baseline data collection

Using the tools and training provided by Central MRV Unit (see Section 3.2.1 on MRV preparation),

- **Province** MRV unit will

  - train commune extension staff and cooperative leaders or company technicians on how to collect and submit baseline data;
  - guide and support the baseline data collection in each commune and
  - conduct quality assurance spot-checks.
- **Commune** extension staff will guide and support cooperative leaders and members (or company staff and contract farmers) to complete the baseline data collection.
- Cooperative leaders (or company managers) are responsible for submitting the baseline data using the baseline MRV app or online interface.
- **Central** MRV unit will
- integrate the submitted information into the 1Mha MRV data management system; and
- implement and document quality control activities built-in to the data management system.

3.4.3.2 Method for data collection

- For each SPOT, the cooperative or company shall collect data from a minimum of 3 farmer households with field plots in that SPOT. If there are only 3 farmer households with land in a SPOT, collect data from all 3 of them. If there are more than 3 farmer households in a SPOT, randomly choose at least 3 to interview, but if there are more than 30 farmer households, select 10% of them.
- The baseline data collection form is shown in Appendix A8. This survey form will be available in the baseline MRV app so that data can be automatically uploaded into the MRV data management system.
- Explanation of baseline parameters:

- **SPOT identification information:** This information is recorded so that the individual farmer interview information can be matched to a unique SPOT and the average value for all interviews in that SPOT can be calculated.
- **Baseline year and season:** See guidance in Section 3.4.2.
- **Farmer information: name, age and gender.** This information is recorded so that if the data reported need to be checked, the person who provided the information can be identified.
- **Area** of their field within the SPOT (ha): This information is used to calculate the area-weighted value of baseline activity data.
- **Field levelling:** If this field was levelled in the baseline year in any season, choose "yes" and select the method used for levelling. If not, choose "no".
- **Average yields:** Average yield is reported by farmers in fresh matter. This information is used by Central MRV Unit to estimate the mass of rice straw.
- **Rice cultivar and amount of seed:** Name of the rice cultivar grown and amount of seed (kg/ha) used in the baseline season.
- **Sowing and harvesting dates:** This information is used to calculate the duration (days) in the season.
- **Pre-season straw incorporation:** Is any straw left on the field surface incorporated into the soil (with or without microbials)? If yes, is this done > 30 days before sowing or <30 days before sowing.
- **Nitrogen fertilizer application:** kg/ha/season of fertilizer product applied. The fertilizer brand and product name will be used to estimate the nitrogen (N) content (%) of the kg fertilizer product applied.
- **Organic amendments:** This includes animal manure, compost, green manure or other organic amendments applied to fertilize the fields. Farmers report kg of fresh matter.
- **Water regime before the season:** This refers to whether in the 30 days before sowing, was the field completely flooded (choose 'Flooded pre-season > 30 days') or not? This includes flooding to wash out acid and salts. For example, if a paddy field is flooded for 1–2 months before transplanting to flush out salt, this practice meets the threshold, and the field would be considered to have a flooded pre-season water regime. But if farmer households undertake pre-planting flooding (for example, flushing fields to leach out salt or to ease tillage of heavy clay soil) for only 2-3 weeks then this would not meet the >30-day threshold to count as a "flooded pre-season". Overall, if there is multiple rice cropping with quick turnaround, i.e. short gap between cropping seasons, then there will be a short-drained pre-season and continuous flooding pre-season.
- **Water regime during the rice cropping season:** Water regime in-season includes continuous flooding or mid-season drainage or alternative wetting and drying. Mid-season drainage should only be selected if the drainage period equaled 3 or more consecutive days without standing water during the cropping season (plus final drainage). AWD should only be selected if there was more than one drainage period with 3 or more consecutive days without standing water after the day of drainage event during the cropping season (plus final drainage).
- **Rice straw management:** Estimate the % of total straw left after harvest that is used for different purposes.

Offline-first requirement. The baseline MRV data-collection tool shall be designed to operate offline at the field level. Survey forms (for example, KoboToolbox forms or equivalent functionality) shall be downloadable to the data-collector device, completed offline in the field, and uploaded to the central MRV system once connectivity is available. This ensures that intermittent or absent internet connectivity in remote rice-growing areas does not act as a barrier to data collection. The same offline-first requirement applies to the monitoring data-collection tool referenced in Section 3.5.2.

3.4.3.3 Quality control and quality assurance for baseline data

Data quality will be ensured through various means including:

- **Use of a standardized data collection tool.** The baseline data collection tool will be designed as a survey tool in a mobile phone app so that questions asked and data entered are standardized.
- **Training and support:** Training will be provided on how to collect, record and submit the baseline data. Commune extension staff will guide and support the cooperatives and companies to collect and report the baseline information required.
- **Built-in functions of the baseline MRV app:** The app and its interface with the MRV data management system will have automated functions to ensure that data collected is complete and does not contain unrealistic values ('outliers') before data can be uploaded. E.g. data for a season from one interview cannot be uploaded until that data sheet is complete; data that is above or below a pre-determined threshold will automatically be flagged and can only be uploaded after the user responds to a warning sign.
- **Quality assurance spot-checks:** The Province MRV unit will be responsible for:

- ensuring that commune extension staff support cooperatives and companies to make timely progress with submitting baseline data;
- supporting commune staff and cooperative leaders and company technicians to resolve any issues arising in the baseline data collection process;
- spot-checks of a number of cooperatives and companies after baseline data has been submitted to check that data were obtained from farmers and that the values reported are reliable. These spot checks may either be random or may be targeted to communes where more risks or issues have been identified.
- A checklist for key issues to assess in these spot-checks is given in Appendix A10. If any of the quality criteria listed in the spot-check documentation form are not met, the province MRV unit should recommend commune extension staff and cooperative (or company) staff to revise and re-submit the affected baseline data. All such recommendations shall be documented in the baseline activity data spot-check documentation form. The digital MRV system will track any baseline data revisions in the MRV system for transparency and future audits.

Where spot-checks or other quality-control activities identify inconsistencies, missing information, or potential errors that result in a recommended revision to data already submitted, the recommended revision shall be communicated to the cooperative or company through the digital MRV system. The revised value is accepted into the system only after the cooperative or company has reviewed and confirmed the revision through the system. All such revisions, together with the cooperative or company confirmation, are recorded in the system to ensure traceability and to provide a transparent basis for resolving any disputes regarding baseline or monitoring values.

3.4.4 Baseline emission calculations

Central MRV Unit will calculate baseline emissions. Only SPOTs with SPOT maps and baseline data that meets all quality criteria will be included in the baseline emission calculations. Baseline emissions in each SPOT will be calculated using the data on the area of each SPOT, together with baseline activity data provided and standard coefficients from the IPCC Guidelines or other sources described in this section. Total baseline emissions per stratum is the sum of emissions in each SPOT in that stratum. Total baseline emissions are the sum of total baseline emissions from all strata.

The baseline value for activity data in each SPOT will be calculated as the area-weighted average of all values provided. For example, farmer household A interviewed has 1 ha of field in the SPOT and farmer household B has 0.75 ha in the SPOT. The area-weighted average value of the parameter Y is $(1 * Y_A + 0.75 * Y_B)/ (1+0.75)$.

Following the equations in the methodology, Table 6 gives guidance on the data sources and methods to use in baseline emission calculations in each season.

Table 6 Guidance on calculation of parameters required to estimate baseline seasonal emissions in each SPOT

Methodology equation	Parameters	Data sources and methods
Eq. 3	$EF_{c,g,s}$ (emission factor for continuously flooded fields without organic amendment)	Values for each season taken from Document 2626 (see Table 3 in the methodology). These values shall be applied to the whole area of all SPOTs enrolled in the program. See also Appendix A15 on developing new EFc values.
Eq. 3	$SF_{w,g}$ (scaling factor for water regime)	Use IPCC 2019 values shown in Table 4 in the methodology. (see also Appendix A15 on developing new SF_w values). Values of the activity data used to calculate the area-weighted value of SF_w for each SPOT in the baseline are calculated from the baseline survey of on-season water regime in each SPOT.

Methodology equation	Parameters	Data sources and methods
Eq. 3	$SF_{p,g}$, (scaling factor for water regime before the cultivation period)	Use IPCC 2019 values shown in Table 4 in the methodology. Values of the activity data used to calculate the area-weighted value of SFp for each SPOT in the baseline are calculated from the baseline survey of on-season water regime in each SPOT.
Eq. 3, 4	$SF_{o,g}$, (scaling factor for organic amendments)	In the methodology Equation 4, SFo,g, is calculated as $SF_{o,g}=(1+\sum_i ROA_{BL,i,g,s} \times CFOA_{i,g,s})$ For each SPOT, *u*, rice straw incorporated in paddy soil, the value of ROA (rate of organic amendment) is to be calculated as follows: (1) Calculate total residue produced: (i) $Paddy\_yield_u = FRPY_u$ X 0.86 Where $Paddy\_yield_u$ is paddy yield, t DM/ha $FRPY_u$ is area-weighted average farmer-reported fresh matter paddy yield in SPOT *u*, t/ha. This is calculated from the baseline survey data. 0.86 is conversion of fresh to dry matter assuming 14% moisture content. (ii) $Res\_tot_u = (2.07$ X $Paddy\_yield_u) - 9.51$ in which Res_tot_u is the total biomass (stubble and straw) produced (t DM/ha) This equation was calculated from data in https://www.jstage.jst.go.jp/article/jsta/58/4/58_155/_pdf. However, to avoid negative values in the case of very low yields, the minimum value of Res_tot_u is set at 0.5 t DM/ha. E.g., if the equation is applied in EXCEL, to ensure a minimum of Res_tot_u = 0.5 t DM/ ha corresponding to $Paddy\_yield_u$ = 4.84 t DM/ ha:: =IF(A1>4.84,(2.07*A1-9.51),0.5) This formula assumes that $Paddy\_yield_u$ is given in cell A1.
		(2) Calculate amount of residues incorporated in soil (i) $Res\_incorp_u = Res\_tot_u$ X $Incorp\_pc_u/100$ in which Res_incorp_u = Amount of stubbles and straw incorporated into the soil in SPOT $_u$ (t DM/ ha) $Incorp\_pc_u$ = Percentage of residues incorporated into the soil (%) in SPOT *u* calculated as the area-weighted average from the baseline survey. . 3: Mass of other organic amendments applied (t fresh weight / ha): value to use is the area-weighted average per SPOT from the baseline survey 4. Calculate weighted average value of CFAO. CFAO uses IPCC 2019 values shown in Table 4 in the methodology. Weighted average is the sum-product of the dry weight of straw incorporated at different times and fresh weight of organic amendment and the default values of CFAO.
Eq. 3	$Days_{BSL,s,g}$ (duration of cropping season, days)	Calculate cropping season duration as the area-weighted harvest date – sowing date from the baseline survey.

Methodology equation	Parameters	Data sources and methods
Eq. 6	$FN_{BL,S.g}$ (kg N fertilizer applied/ha)	Central MRV unit will compile a library of all the common N fertilizer products used in rice cultivation in the region and their N contents as listed on product packaging. Kg N/ha applied is calculated as kg fertilizer product applied per ha (from baseline survey) * N content of the corresponding product. The average value per group of fields is calculated as the area-weighted average from the baseline data.
Eq. 7	$A_{BL,S,L,g}$ (area levelled in the baseline)	Calculated as the area-weighted average from the baseline survey data for each SPOT, or a conservative estimate after comparison with the sum of individual fields.

All the data used to calculate baseline emissions will be stored in the digital MRV system in a way that could enable a third party to trace all calculated results back to the raw data. Central MRV unit will implement quality control checks on the calculations made. Baseline emissions will be reported in the annual monitoring report (see Section 3.7 and Appendix A14).

3.5 Monitor Farming Practices

Whereas the baseline data must be provided by all participating cooperatives and companies for every SPOT, monitoring will be conducted on a sample basis. With a well-designed sampling scheme, this can provide equally representative monitoring data in each year, but with lower human resource and other inputs than the full baseline survey. The general procedure is:

- Before each rice cropping season, registered cooperatives and companies confirm whether they are participating in the coming cropping season (see Section 3.5.1)
- Decide the number of SPOTs that must be monitored and their location (see Section 3.5.1)
- Monitor implementation of mitigation activities (see Section 3.5.2)
- Quality assurance for monitoring data (see Section 3.5.3)
- Calculate project emissions and emission reductions (see Section 3.5.4).

Table 7 gives an overview of the sequence of activities and responsibilities in monitoring. Further details are given in the sections below.

Table 7 Roles and responsibilities in monitoring

✓ Full responsibility

MRV activity	DCPPP	Central MRV Unit	Province MRV Units	Commune extension staff	Cooperatives and companies

MRV activity	DCPPP	Central MRV Unit	Province MRV Units	Commune extension staff	Cooperatives and companies
Confirm participation in the coming cropping season		✓			✓
Calculate how many SPOTs need to be monitored and where they are located		✓			
Coordinating organization of monitoring in the selected SPOTs			✓		
Photo-monitoring of drainage activities during each season				✓	✓
Collect monitoring data on other rice cultivation practices after the harvest at the end of each season				✓	✓
Spot-checks for monitoring data quality assurance			✓		
Calculating project emissions and emission reductions		✓			

Central MRV Unit will be responsible for:

- sample size calculation and allocation of the sample to each commune and will notify the provinces of the SPOTs that have been selected for monitoring in each season
- integrating the submitted monitoring data into the 1Mha MRV data management system, and implementing and documenting quality control activities built-in to the data management system.
- Calculating project emissions and emission reductions.

Province MRV Units will be responsible for:

- Coordinating, organizing, guiding and supporting the monitoring activities of each commune, and
- conducting quality assurance spot-checks.

Commune extension staff will guide and support cooperative leaders and members (or company staff and contract farmers) to complete the monitoring activities.

Cooperative leaders and company staff are responsible for submitting the monitoring photos and survey data using the monitoring MRV app.

3.5.1 Decide the number and location of SPOTs to monitor

3.5.1.1 Seasonal Participation Confirmation

Registered cooperatives and companies must confirm through the digital MRV system before the start of the cropping season whether they are continuing to participate in the carbon program in the coming cropping season. The purpose of this is to create a list of all participating cooperatives and companies so that Central MRV Unit can then select which cooperatives or companies will be monitored in the coming season.

The Central MRV Unit shall define and communicate the deadline for confirmation each year, ensuring sufficient time (e.g., several weeks) before monitoring begins. Confirmation must be submitted through the MRV system. Cooperatives or companies that fail to confirm by the deadline will not be included in that season's monitoring sample. If they later indicate participation, they may still be included in the carbon program, but monitoring precision may be affected. Further guidance on handling late confirmations and engagement issues will be set out by the Central MRV Unit.

3.5.1.2 Calculation of SPOTs to be Monitored

Central MRV Unit will calculate the number of SPOTs that must be monitored in each season. This will be done [when drafting the Annual Program Monitoring Plan if there is only one registration deadline per year OR before the beginning of each season if cooperatives can join in any season of the year]. The objectives are to

- calculate the total number of SPOTs that must monitor drainage activities during the season and other rice cultivation data after harvest at the end of the season, and
- allocate this sample among the SPOTs in each stratum, when SPOTs with different size (ha) are located in different provinces and communes.

3.5.1.3 Sample size calculation method

- Calculation of sample size required will follow the stratified random sampling methods set out in the CDM sampling and survey guidelines, using a target precision of ±10% with a 95% confidence interval for each stratum.
- For drainage events monitored using photo-monitoring, the stratified random sampling method for sample proportions shall be used to determine what proportion of SPOTs are successfully drained in each stratum. The calculated result is called '$Sample_{drain}$'.
- For other rice cultivation data, the stratified random sampling method for sample means shall be used to calculate the sample size in each stratum. The sample size will be calculated for Days and ROA. The calculated results are called '$Sample_{days}$' and '$Sample_{ROA}$'.
- The sample size for each stratum will be selected as the largest among '$Sample_{drain}$', '$Sample_{days}$' and '$Sample_{ROA}$'.

3.5.1.4 Allocation of samples among SPOTs

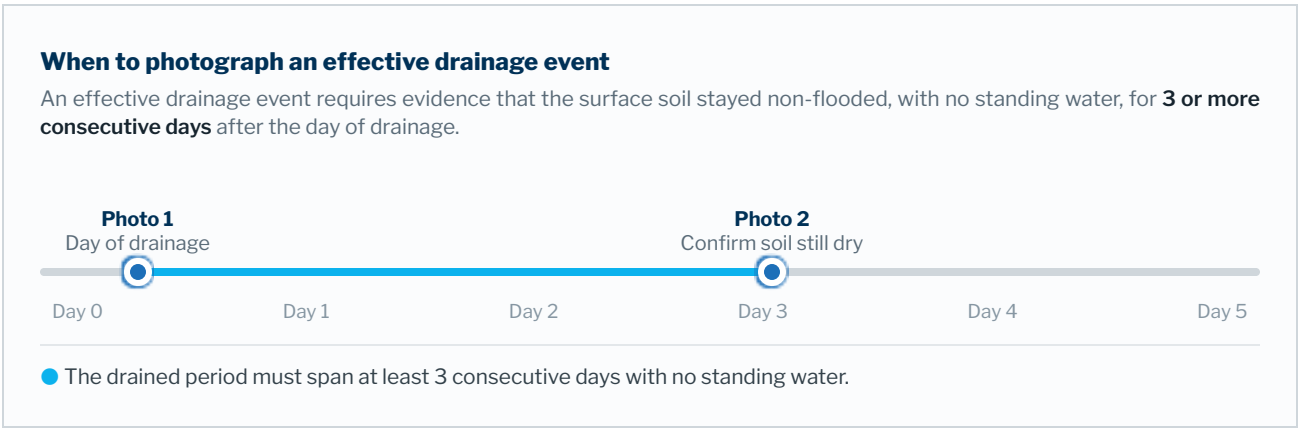
- The total monitoring sample will be allocated to each stratum in proportion to the total area of all registered SPOTs in each stratum. SPOTs in each stratum to be monitored will be randomly selected.
- Central MRV Unit will communicate the results of sample selection to each Province MRV Unit.
- Each Province MRV unit will communicate and coordinate monitoring tasks with the commune extension staff, who will inform cooperatives and companies that they will have monitoring tasks in the coming season.

3.5.2 Monitoring methods

Each Province MRV Unit is responsible for coordinating and supporting the implementation of monitoring activities in their province. Monitoring will be conducted by cooperative or company staff under the guidance and support of the commune extension staff.

The parameters that need to be monitored are the same as the parameters estimated in the baseline (Table 5). For monitoring drainage activities as part of MSD or AWD, photographic monitoring will be used (see Section 3.5.2.1 below). For other activity data, the MRV app will be used to collect data on other rice cultivation practices in a way similar to the baseline data collection (see Section 3.5.2.2 below).

3.5.2.1 Photo-monitoring of drainage activities during each cropping season



- **Purpose:** The purpose is to provide evidence that AWD was applied with effective drainage events. An effective drainage event is when there is evidence that surface soil remained non-flooded with no standing water for 3 or more consecutive days after the day of drainage (see Definitions).
- **Responsibilities**: Photo-monitoring is done by cooperative or company staff. Commune extension staff provide guidance and support to ensure that photos meet quality requirements, and monitoring tasks are done on time and completed in each season.

- **Method:** Evidence of this will be collected and reported using digital photographs.
- **Location to take monitoring photographs:** The procedures for SPOT mapping (Appendix A6, Step 4) set up signs marking 3 locations in each SPOT, one near the water inlet, one in the middle of the SPOT and one near the drainage end of the SPOT. These locations will be used for photo-monitoring.
- **Procedure to take photos:** Figure 4 shows an example of a photo of a drained field. Follow guidance produced by Central MRV Unit on how to take acceptable quality photos at each marker to demonstrate whether the location has achieved effective drainage.

Each photo shall include in the frame the physical marker indicating its geographic location (placed during SPOT mapping per Annex A6, Step 4). The Central MRV Unit may additionally require that GPS tagging of photos be enabled before photos are taken, where the data-collector device and field signal conditions permit. Where GPS tagging is not feasible, the physical marker remains the primary method for ensuring geographic traceability.

Figure 4 Photo of drained field in one monitoring location

- **Timing of photo monitoring**: When AWD is applied, there are normally two drainage events. For each drainage event, following these steps:
  - Step 1: Determine the first day of the field without standing water (Day 1)
  - Step 2: Go to inspect the field on the 4th day after Day 1 and take pictures of the field surface. If there is no water on the 4th day, take pictures of the soil surface. If the field remains dry on subsequent days, take one final photo on the last dry day before re-flooding (see Figure 5).

Figure 5: Illustration of when to take photographs to monitor an effective drainage event

Withdrawal date	First Dry Field Day (Day 1)	Day 2	Day 3	Day 4	Last day of withdrawal	The date of pumping water again
Drain water	Photograph	No Tracking	No Tracking	Photograph	Photograph	No Tracking

- **After taking each photo**, upload it immediately into the MRV data management system, preferably within 24 hours. Design of the digital MRV system may include reminder functions for cooperatives or companies if photos are missing. If uploads are not completed by the system deadline, automated notifications will be sent to commune extension staff for follow-up. Province MRV Units may also be notified if gaps persist..
- **Central MRV Unit will manage the uploaded photos in the MRV data management system,** including photo interpretation and quality checks on photo quality. Central MRV Unit will liaise with commune extension staff to flag and resolve any incomplete submissions and address any photo quality issues.

3.5.2.2 Monitoring other rice cultivation practices

- **Purpose**: The purpose is to monitor changes in other rice cultivation practices by farmer households.
- **Responsibilities:** Survey monitoring is done by cooperative staff. Commune extension staff provide guidance and support to ensure that monitoring tasks are done on time and completed in each season.
- **Method:** Use a survey form in the MRV app and interview a sample of farmers.
- **Timing:** The monitoring survey is be conducted after the end harvest in each rice cultivation season, preferably within **2–3 weeks** to ensure farmers can accurately recall practices. The exact deadline for survey completion will be set by the Central MRV Unit in coordination with provinces.
- **Sampling**: In each SPOT selected for monitoring in that season, a minimum of 3 farmer households with field plots in that SPOT should be interviewed. If there are only 3 farmer households with land in a SPOT, collect data from all 3 of them. If there are more than 3 farmer households in a SPOT, randomly choose at least 3 to interview, but if there are more than 30 farmer households, select 10% of them.
- **Data to collect:** The data required is the same as in Table 6 but without the water regime during the season, which is monitored using photos. The survey form in the MRV app will indicate the data required.

3.5.2.3 Quality control and quality assurance for monitoring data

Data quality for monitoring data will be ensured through various means including:

- **Use of a standardized data collection tool.** Monitoring data for both photos and rice cultivation data will be collected and reported using a mobile phone app, so that questions asked and data entered are standardized.
- **Training and support:** Training will be provided on how to collect, record and submit the monitoring data. Commune extension staff will guide and support the cooperatives and companies to collect and report the monitoring data.
- **Built-in functions of the MRV app:** The app and its interface with the MRV data management system will have automated functions to ensure that data collected is complete and does not contain unrealistic values ('outliers') before data can be uploaded.
  - For photos of field water condition, the main risks are incomplete submissions and photos of insufficient quality to interpret field water conditions. The MRV system should have functions to remind users to submit the photos on the required days, and to flag users whose submissions are late or missing. This can be used to send notifications to cooperative staff to submit a photo, and to instruct commune extension staff to follow-up with the flagged users. Similarly, the system could automatically flag photos that are insufficient quality and request users to re-take the photo and resubmit.
  - For end of season monitoring data, the system can have automated functions so that data for a season from one interview cannot be uploaded until that data sheet is complete; data that is more than a pre-determined threshold will automatically be flagged and can only be uploaded after the user responds to a warning sign etc., in order to ensure the completeness and quality of data submitted.
- **Quality assurance spot-checks:** The Province MRV unit will be responsible for:

- ensuring that commune extension staff support cooperatives and companies to make timely progress with collecting and submitting monitoring data;
- supporting commune staff and cooperative leaders and company staff to resolve any issues arising in the monitoring process;
- spot-checks of a number of cooperatives and companies after monitoring data has been submitted to check that data were obtained from farmers and that the values reported are reliable. These spot checks may either be random or may be targeted to communes where more risks or issues have been identified. A checklist for key issues to assess in these spot-checks is given in Appendix A10.

Where spot-checks or other quality-control activities identify inconsistencies, missing information, or potential errors that result in a recommended revision to data already submitted, the recommended revision shall be communicated to the cooperative or company through the digital MRV system. The revised value is accepted into the system only after the cooperative or company has reviewed and confirmed the revision through the system. All such revisions, together with the cooperative or company confirmation, are recorded in the system to ensure traceability and to provide a transparent basis for resolving any disputes regarding baseline or monitoring values.

3.5.3 Calculating project emissions and emission reductions

Project emissions in each SPOT will be calculated using the data on the area of each SPOT together with monitoring data provided and standard coefficients from the IPCC Guidelines or other sources (see Table 6). The monitoring data is representative of a sample of the total registered area in each season. The area-weighted average emissions per ha for each stratum calculated from the monitoring data will be taken to represent the average emissions per ha for that stratum in each season. Total project emissions in each season are the sum of total project emissions from all strata. **These calculations will be made by the Central MRV Unit after monitoring data submissions from each season are complete.**

Emission reductions in the project will be calculated following Equation 15 in the methodology. The uncertainty of calculated emission reductions must be quantified annually (see section 3.6.3.4). Project emissions, emission reductions and the uncertainty of annual emission reductions shall be reported in the annual monitoring report (see Section 3.7 and Appendix A14).

3.6 Quality Assurance and Quality Control (QA/QC)

Two layers of data quality

Quality is managed by those collecting the data (QC) and by independent reviewers (QA) — both documented.

Quality Control (QC)

By those collecting & reporting data

- Tasks done on time, data reported as specified
- Automated checks in the digital MRV system
- Cooperatives review & confirm their data in-app
- Checking calculations when drafting reports

Quality Assurance (QA)

By people not involved in data collection

- Spot-checks of submitted data (Province MRV Unit)
- Seasonal & annual reviews of MRV performance
- Confirming QC & QA activities were documented

3.6.1 Purposes of QAQC

The reliability and credibility of emission reduction estimates depends strongly on the quality of data collected and reported as well as the procedures implemented in the MRV data management system. Verification by independent third parties will establish the reliability and credibility of the emission reduction estimates by checking the accuracy, conservativeness, relevance, completeness, consistency and transparency of the information provided. To support this, quality control and QAQC activities must be implemented and documented throughout the MRV process. Many individual QAQC activities have been listed in the previous sections. This section summarizes these activities and the roles and responsibilities to show how QAQC operates as an integrated part of the MRV system.

3.6.2 Documentation of QAQC activities and findings

Records of QC and QA activities conducted, and their findings must be documented. Documenting the findings is useful not only to provide evidence to third parties that data quality was managed but is also useful to inform MRV planning for the next season or year.

3.6.3 QAQC methods and measures

3.6.3.1 Quality control (QC)

Quality control refers to activities conducted by the people involved in data collection to ensure data quality. These measures include:

- ensuring that monitoring tasks are done on time and that data is reported as soon as it is collected (e.g. monitoring soon after the harvest) to reduce inaccuracy as time passes;
- Building the digital MRV system with automated functions to ensure data quality (e.g. data can only be submitted when it is complete, 'outlier' values above a pre-determined threshold are flagged for data providers to check before resubmitting;
- designing functions in the MRV apps so that cooperatives review and confirm the accuracy of the data before its submission into the digital MRV data management system;
- checking for errors in calculations or reporting when drafting annual monitoring reports.
- quality control activities conducted and their findings should be documented.

3.6.3.2 Quality assurance (QA)

Quality assurance refers to activities by people not directly involved in data collection to ensure data quality, including checking that QC activities were conducted and that data quality is managed throughout the MRV system. These measures include:

- Spot-checks to confirm the accuracy and reliability of data provided (e.g. Province MRV Units spot-checks on SPOT mapping or baseline data);
- Seasonal and annual reviews of MRV performance to highlight issues arising and ensure that measures to address these issues are included in MRV and MRV training plans for the next year.
- Documenting and checking that quality control and quality assurance activities were conducted.

3.6.3.3 Roles and responsibilities in QAQC

Roles and responsibilities in these various QAQC activities are summarized in Table 8 while the specific tasks involved are listed in Table 9.

Table 8 Roles and responsibilities in QAQC

✓ Full responsibility

MRV activity	DCPPP	Central MRV Unit	Province MRV Units	Commune extension staff	Cooperatives and companies
Annual Province MRV Planning		✓			
Seasonal MRV reviews		✓	✓		
Deviation requests from annual plan		✓			
Cooperative registration eligibility and completeness checks			✓		
SPOT mapping				✓	✓
Spot-checks of SPOT mapping			✓		
Baseline activity data collection				✓	✓
Spot-checks of baseline data collection			✓		
Baseline emission calculations (incl. checks for correctness and data transcription)		✓			
Monitoring sample size calculation and allocation (incl. recalculation)		✓			
Photo-monitoring during the season		✓		✓	✓
End of season monitoring survey				✓	✓
Monitoring data spot-checks			✓		
Emission and emission reduction calculations (automated)		✓			
Drafting annual monitoring report		✓	✓		
Annual monitoring report review and approval	✓		✓		

MRV activity	DCPPP	Central MRV Unit	Province MRV Units	Commune extension staff	Cooperatives and companies
Support in verification	✓	✓	✓	✓	✓

Table 9 Specific tasks in QAQC

MRV activity	Tasks in QAQC	Automated checks & documentation
Annual Province MRV Planning	Central MRV Unit to review MRV issues before making annual plan	Review findings documented in province spot-check reports & seasonal MRV reviews, and verification reports
Seasonal MRV reviews	Province MRV Units review MRV performance, cc documentation to Central MRV Unit	Central MRV Unit checks that all provinces have submitted a review each season
Deviation requests from annual plan	Central MRV Unit reviews	Requests and review findings documented
Cooperative registration eligibility and completeness checks	Province MRV unit checks completeness of each application and eligibility	Results of completeness and eligibility checks are documented
SPOT mapping	Commune and cooperative or company staff check that mapped SPOT area is not larger than sum of field plot areas	Mapping data can only be uploaded if complete
Spot-checks of SPOT mapping	Province MRV unit assesses a sample of SPOT mapping activities	Spot-check findings documented
Baseline activity data collection		Data can only be uploaded if complete; unrealistic values are automatically flagged and data providers requested to review and resubmit
Spot-checks of baseline data collection	Province MRV unit assesses baseline data for a sample of SPOTs	Spot-check findings documented
Baseline emission calculations	Central MRV Unit checks that all results are correctly transcribed from databases into written reports	GHG calculations are automated.

MRV activity	Tasks in QAQC	Automated checks & documentation
Monitoring sample size calculation and allocation	Central MRV Unit checks the list of cooperatives/companies participating in each season (i.e. sample frame) and calculates sample size following sampling guidance	After data collection in each season, Central MRV Unit will recalculate the precision of the data obtained to ensure the sampling strategy maintains sufficient level of accuracy
Photo-monitoring during the season	Central MRV Unit will produce specific guidance on taking photographs. Central MRV Unit checks that photos are adequate quality and notifies communes and cooperatives if improvements are needed	Digital MRV data management system will have automated reminders to take photos once a drainage event has been reported, and flags missing submissions to commune extension staff to follow-up.
End of season monitoring survey		Data can only be uploaded if complete; unrealistic values are automatically flagged and data providers requested to review and resubmit
Monitoring data spot-checks	Province MRV unit makes sample spot-checks to confirm monitoring data provided	Spot-check findings documented
Emission and emission reduction calculations	Central MRV Unit checks that all results are correctly transcribed from databases into written reports and calculates uncertainty of emission reduction estimates	GHG calculations are automated
QAQC	Central MRV Unit will include QAQC activities in the annual plans, and monitor implementation of QAQC activities	QAQC activities and their results will be documented
Drafting annual monitoring report	Central MRV Unit staff check for errors and omissions	QC checks and results are documented
Annual monitoring report review and approval	DCPPP and province DAEs review draft annual monitoring reports to check that they are complete, transparent and accurate	Review feedback is documented.
Verification	Central MRV Unit liases with verifiers and coordinates support to verification activities from lower levels. All actors should be ready to support verification activities and corrective actions in response to any findings by the third-party verifier	Corrective action requests and responses made are documented and used to improve MRV in the next season and year.

3.6.3.4 Data collection accuracy

The methodology (Section 10) gives conditions under which conservative values of data collected should be used. To inform assessment of the conservativeness of activity data used, Central MRV Unit should commission or undertake targeted studies to compare the data sources and data collection methods proposed in this manual with directly measured values. Comparisons of the two datasets can enable assessment of whether the means of the two datasets vary by less than or greater than ±20%. The results can be used to inform selection of conservative values from the data collected and to inform calculation of uncertainty. These studies can be conducted only once, but should be repeated if data collection methods change. Variables to assess include:

a. Rice field group area: For a sample of field groups, compare area estimates based on GPS tracking of field boundaries with area estimates based on the mapping methods set out in this manual;

b. Straw management: For a sample of sites, compare estimates of the mass (kg DM) of straw produced with directly measured values;

c. Other organic amendments: For a sample of sites, compare farmer-reported estimates of fresh weight of other amendments applied with direct measurements.

d. N fertilizer application: For a sample of cooperatives or households with documented purchase records, compare farmer-reported values with documented values.

3.6.3.4 Uncertainty quantification

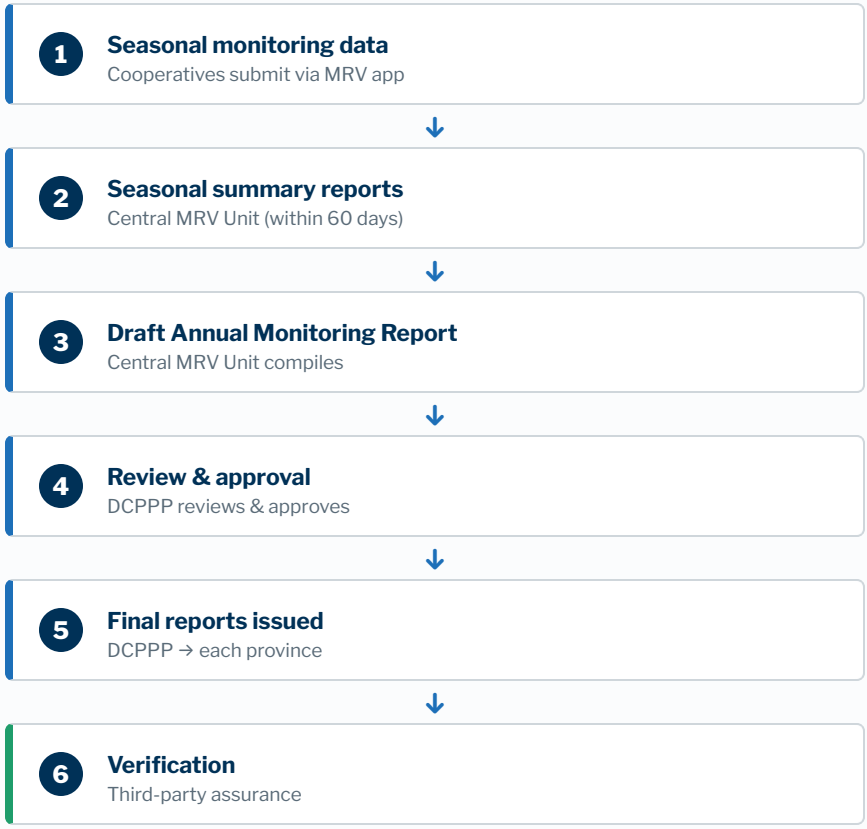
- Central MRV Unit is responsible for quantifying the uncertainty of emission reduction estimates and managing uncertainty as part of annual planning (see 'Guiding methodological rules' document, Section 10). Uncertainty must be calculated for each season, but the calculations can be made once per year after emission reductions from all seasons in the year have been calculated.
- To quantify the uncertainty of emission reductions, calculation of emission reductions per season and per year can be run in a Monte Carlo simulation model using the same activity data, coefficients and emission factors as in the emission reduction calculations. This can be accomplished using suitable software. Uncertainty ranges or margins of error for coefficients, scaling factors and emission factors are given in the parameter tables in the 1Mha GHG Quantification Methodology. Probability Density Functions should be selected based on the information provided in the IPCC Guidelines and the distributions of activity data. The outputs of Monte Carlo simulation are an estimate of the 95% confidence interval for emission reductions, and a quantified assessment of the contribution of each input parameter to the variance. See further guidance in Appendix A12. The resulting uncertainty at 95% confidence level should be reported in the annual monitoring report.

- Uncertainty management: The contribution of each input parameter to variance can be used to inform assessment of priorities and options for reducing uncertainty. Results of uncertainty analysis shall be presented in the annual monitoring report (Appendix A14).

3.7 Reporting

From seasonal data to verified annual report

Reporting moves from field data up to a verifiable annual monitoring report for the whole program and each province.



3.7.1. Report Seasonal Monitoring Data

Cooperatives are responsible for submitting all required monitoring data into the digital MRV system using the approved tools and templates. This includes, for example, photo-monitoring records during drainage events and survey data collected at the end of the season. Commune staff shall provide technical support to cooperatives as needed to ensure accurate and timely data submission.

3.7.2 Preparation of Seasonal and Annual Monitoring Reports

Central MRV Unit is responsible for drafting seasonal summary reports and annual monitoring reports for the whole program and for each province. The content of these reports is outlined in Appendix A13 and Appendix A14. The Central MRV Unit will prepare the draft reports, undertake checks for errors and omissions, and document the results of all the checks conducted. Specific dates and submission windows shall be set by the Central MRV Unit and published in the Annual Program MRV Plan each year. Province MRV Units shall align all activities with the timelines communicated by the Central MRV Unit via the digital MRV system.

3.7.3 Seasonal Summary Reports

Seasonal summary reports are provided for information only and do not need to be reviewed and approved. Central MRV Unit will send the seasonal summary reports to DCPPP and each province MRV unit.

3.7.4 Review and Approval of Annual Monitoring Reports

Central MRV Unit will send the draft annual program monitoring report to DCPPP. DCPPP will review the annual program monitoring reports and check that they are complete, transparent and accurate. Province DAEs will review the annual province monitoring reports and check that they are complete, transparent and accurate. Based on the feedback received, Central MRV Unit will prepare final draft reports. DCPPP will review and approve the final draft annual monitoring reports. All reviews and approvals shall follow the timelines set out in the Annual Program MRV Plan and subsequent notifications issued via the MRV system.

3.7.5 Communication of Final Annual Monitoring Reports

DCPPP will communicate the final draft annual monitoring reports to each province.

3.7.6 Verification of Annual Monitoring Reports

Annual monitoring reports will be made available as one of the main documents used in verification activities.

3.7.7 Data management and stewardship

Data stewardship for MRV data shall follow the FAIR principles (Findable, Accessible, Interoperable, Reusable) to the extent feasible at this stage. The Central MRV Unit shall maintain (i) a secure, backed-up repository for raw and processed data, metadata, and emission-factor updates; (ii) tiered access controls distinguishing cooperative-level, province-level, central-level, and verifier-level access rights; (iii) standardized file formats (for example, CSV, GeoTIFF, NetCDF) and controlled vocabularies; (iv) version control and provenance records for updates to emission factors, scaling parameters, and monitoring methods; and (v) documentation of all data-quality flags. A formal Data Management Plan elaborating these arrangements will be developed as the program data platform and institutional arrangements are finalized.

3.8 Verification

3.8.1 Verification of Emission Reductions

Emission reductions shall be verified. Verification will be conducted by independent third parties according to the requirements of the applicable standard or the requirements of each partner in a bilateral transaction. In general, verification shall follow the requirements of ISO 14064-3 and the applicable national regulations under Decree No. 06/2022/NĐ-CP (as amended), and the requirements of the crediting pathway selected, as applicable, unless otherwise agreed.

Verification frequency is determined by the applicable crediting framework. Monitoring reports may be prepared annually; verification may be conducted annually or at longer intervals by covering one or more consecutive monitoring periods, consistent with the maximum interval permitted under the applicable framework.

3.8.2 Coordination of Verification Activities

Central MRV Unit is responsible for liaising with third-party verifiers, coordinating verification activities and facilitating coordination in these activities with provinces. Central MRV Unit will be responsible for leading the response to any corrective action requests raised during verification. All parties engaged in MRV activities must support the verification activities, providing information as requested by the third-party verifier.

Appendices

A1. Draft template for Province Annual MRV Plan

Province X Annual MRV Plan for the year Y

  - **Overview**
- **MRV unit staffing:**

Province MRV unit responsible person: Name: _____ Tel./Zalo: _____

List the names of staff responsible for the following tasks and whether they have been sufficiently trained:

Task	Names	Trained [Yes/No]
Annual planning & seasonal MRV review		
Training of commune extension staff:		
Cooperative/company registration application checks:		
Guidance & supervision of SPOT mapping & baseline data collection:		
Spot-checks on mapping & baseline data collection		
Guidance & supervision of monitoring data collection:		
Spot-checks on monitoring data collection		
Review of seasonal summary and annual monitoring reports		
Document management & archiving		

1.2 Cooperative and company registration status

In the table, indicate the number of cooperatives and companies at each stage of participation in each commune:

	Number of cooperatives and companies
	Intending to submit registration Registration approved SPOT mapping & baseline data collected Mitigation monitoring begun
Commune A	—
Commune B	—
Etc	—

1.3 Commune preparation status

For each commune, name the responsible extension staff and whether the staff are sufficiently trained?

	Name	Contact	Basic training complete (Yes/No)	Additional training needed?
Commune A				
Commune B				
Etc				

2 Annual MRV task scheduling

	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Rice cropping season dates												
Summer-Autumn												
Autumn-winter												
Winter-spring												
MRV activities												
Province staff training												
Commune extension staff training												
Coop/company registration checks												
SPOT mapping & baseline data collection												
Spot-checks on mapping & baseline data												
In-season water regime monitoring												
End of season cultivation practice monitoring												
Quality checks on monitoring data collection												

	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Seasonal MRV reviews												
MRV report reviews												
Annual MRV planning												

2. MRV activity plan

2.1 MRV training plan

2.1.1 Province MRV Unit training

Training content	Month	Participating staff	Trainer
Annual planning & seasonal MRV review			
Training of trainers for support to commune extension staff			
Cooperative/company registration application checks:			
Guidance & supervision of SPOT mapping & baseline data collection:			
Spot-checks on mapping & baseline data collection			
Guidance & supervision of monitoring data collection:			
Spot-checks on monitoring data collection			
Review of seasonal summary and annual monitoring reports			
Document management & archiving			

2.1.2 Training for commune extension staff

Training content	Month	Participating communes	Trainer
Cooperative/company registration application			
SPOT mapping & baseline data collection:			
Monitoring data collection:			

3. MRV activity plan

3.1 Summer-autumn season

	Dates	Responsible staff
Annual planning & seasonal MRV review		
Coop/company registration application checks:		
Guidance & supervision of SPOT mapping & baseline data collection:		
Spot-checks on mapping & baseline data collection		
Guidance & supervision of monitoring data collection:		
Spot-checks on monitoring data collection		
Review of seasonal summary and annual monitoring reports		
Document management & archiving		

–

3.2 Autumn-winter season

	Dates	Responsible staff
Annual planning & seasonal MRV review		
Coop/company registration application checks:		
Guidance & supervision of SPOT mapping & baseline data collection:		
Spot-checks on mapping & baseline data collection		
Guidance & supervision of monitoring data collection:		
Spot-checks on monitoring data collection		
Review of seasonal summary and annual monitoring reports		
Document management & archiving		

3.3 Winter-spring season

	Dates	Responsible staff
Annual planning & seasonal MRV review		
Coop/company registration application checks:		
Guidance & supervision of SPOT mapping & baseline data collection:		
Spot-checks on mapping & baseline data collection		
Guidance & supervision of monitoring data collection:		
Spot-checks on monitoring data collection		
Review of seasonal summary and annual monitoring reports		
Document management & archiving		

Tools, templates and methods to use for each task will be those issued by the Central MRV Unit.

A2. Draft template for documenting seasonal MRV review

Province X MRV Review for the season _____ in Year ____

- MRV activity summary in the season
- MRV training activities:

Number of MRV training events held: ____

Numbers of province, commune, cooperative staff trained

	Coop / company registration		SPOT mapping & baseline data collection	Monitoring data collection	Quality checks in the field
Province					
Commune					
Cooperative & company leaders, members & staff					
	Brief summary of training results:				
	What needs to be improved in future?				

	Coop / company registration		SPOT mapping & baseline data collection	Monitoring data collection	Quality checks in the field
	Recommendations on how to improve these aspects of training:				

- MRV field activities:

Numbers of cooperatives or companies completing each type of activity this last season

	Coop/company registration submitted	SPOT mapping & baseline data collection	Monitoring data collection	Quality checks in the field
Cooperatives				
Companies				
Overall summary of MRV progress:				
What needs to be improved in future?				
Recommendations on how to improve MRV activities in the field: General recommendations for the program: Recommendations for specific communes, cooperatives or companies				

A3. Draft template to request a deviation from the annual monitoring plan

Province X Request for a change to the annual monitoring plan

Date of request:

Submitted by: NAME _____ tel./Zalo:_____

Indicate the type of proposed change with a	Change timing of existing planned activity	Change location of existing planned activity	Add new activity	Change MRV staffing	Change data collection method
1. What is the change to the annual monitoring plan requested?					
2. Reason for the change to the annual monitoring plan:					
3. Confirm whether the change will result in any of the following:					
				Yes	No
Allocation of staff to MRV activities they have not been trained in					
Not all of the baseline data required in the MRV manual will be collected					

Indicate the type of proposed change with a	Change timing of existing planned activity	Change location of existing planned activity	Add new activity	Change MRV staffing	Change data collection method
Not all of the monitoring data required in the MRV manual will be collected					
The method for mapping or baseline data collection will change					
The method for collecting monitoring data will change					

A4. Draft cooperative & company registration application form

Application to register for participation in the 1Mha carbon program

Cooperative or company name:

Address [Province/city, commune, ward]:_____

Contact person: Name: _____ Position: _____ Tel./Zalo: _____

On behalf of the cooperative members [company or company contract farmers] named and signing in Annex 4.1, I hereby submit this application to participate in the 1Mha carbon program. I confirm that:

- We have understood about the 1Mha carbon program, and voluntarily apply to participate
- We intend to implement the following new practices in our rice fields:

Changing to AWD

Changing to rice varieties with a shorter growing season

Use direct seeding with a shortened flooding period

Starting from the rice cropping season beginning in MM / YY

OR, if any of these changes have already been made, only those plots with changes made after 1/1/2021 are eligible for registration. Confirm which ones have been made, when, and whether there is documentation of when the changes were made (e.g. irrigation and drainage schedules, cooperative or company purchase records, other documents):

Farming practice	Season and year it began	Documentation (yes/no)
AWD		
Short season varieties		
Direct seeding		

- The total area (ha) being applied to enroll in the 1Mha program is _____ ha, and suitable irrigation and drainage infrastructure exists to adopt the proposed water management practices.
- Annex 4.2 includes a signed contractual agreement to transfer the rights over any GHG emission reductions resulting from the above actions to (MAE?) if our registration is approved, and to confirm that the emission reductions rights have not been transferred to other carbon project developers;
- Annex 4.3 gives a summary of water management and rice cultivation practices before making the above changes in farming practices, and our planned water management and rice cultivation practices after making these changes.

Signature: _____ Date: _____

Annex 4.1: List of cooperative members or company contract farmers applying to participate

By signing this form, I confirm that I understand the 1Mha carbon program and my rights and responsibilities in it; that I am voluntarily willing to participate; and that I delegate the cooperative [or company] representative named below this table to apply for participation on my behalf:

	Name	Address	Tel./Zalo	ID number	Plot size (ha)	Owner-cultivator, or tenant cultivator	Signature
1							
2							
3							
4							
Etc							
					Total____		

Name of cooperative or company representative submitting the application on behalf of the above: _____

Annex 4.2: Statement to confirm GHG emission reduction rights have not been transferred to other project entities and agreeing to transfer those rights to MAE if the registration application is approved.

Text to be elaborated by legal experts, and ensuring that it supports free and prior informed consent.

Note, in cases where the landowner is different from the farmers who will perform the project rice cultivation practices, a signed agreement between the two parties clarifying the carbon rights

Annex 4.3: Baseline and intended project water management and rice cultivation practices

The information provided here is indicative only. Formal data collection will take place after each cooperative's or company's application has been approved.

Note: Drainage for mid-season drainage or AWD is only considered effective if after the day of drainage, the field was not re-irrigated for at least 3 days.

Water management and rice cultivation practices before changing water management practices:

	Summer-autumn	Autumn-winter	Winter-spring
Variety planted			
Planting date			
Harvest date			
Water management method: (enter a) in the correct row			
Continuous flooding until end of season drainage			
One mid-season drainage			
More than one mid-season drainage (i.e. AWD)			
Fertilizer (kg / ha)			
N content (%)			
Other organic amendments (yes/no)			
Type and amount (kg/ha)			
Average paddy yield (kg)			

Intended water management and rice cultivation practices after changing water management practices:

	Summer-autumn	Autumn-winter	Winter-spring
Variety planted			
Planting date			
Harvest date			
Water management method: (enter a) in the correct row			
Continuous flooding until end of season drainage			
One mid-season drainage			
More than one mid-season drainage (i.e. AWD)			
Fertilizer (kg / ha)			

	Summer-autumn	Autumn-winter	Winter-spring
Other organic amendments (yes/no)			
Average paddy yield (kg)			

A5. Draft cooperative and company registration review form

The purpose of this form is to confirm that the registration application is complete and that the cooperative rior company and its proposed activities are eligible for the 1Mha program.

Cooperative or company name: _____

Date registration application received: _____

No.	Element to check	Confirm (enter)
1	Cooperative or company name, address, contact person & contact details are complete	
2	The cooperative or company rice field area is located in registered specialized rice land area in the province	
3	At least 1 eligible practice is indicated (and if it was already adopted, the form indicates the season, year and whether there is documentation)	
4	If the eligible practice was already adopted, the form states that adoption was after 1/1/2021	
5	Total ha proposed is indicated and matches with the total ha in Annex 4.1	
6	If AWD is proposed to be adopted, the form states that suitable irrigation and drainage infrastructure is in place	
7	Annex 4.1 has been signed by all listed cooperative members (or company contract farmers), and the cooperative or company representative is named below the table	
8	Annex 4.2 has been signed by the cooperative or company representative (and if involving other landowners, a separate agreement is also attached)	
9	Annex 4.3 baseline information is complete in both tables	
10	In Annex 4.3, the baseline and intended water management practices indicate that AWD was not practiced in the baseline, and at least one new eligible practice is shown in the intended practices table.	
11	As far as the reviewer is aware, the eligible practices proposed are not required by any compulsory national or provincial regulation law, regulation or decree	

No.	Element to check	Confirm (enter)
12	Item 12 is for information only, and is not a condition for an eligible application: Has adoption of improved water management in the past, or intended change in water management in the future benefited directly from international aid funding from NGOs, bilateral agencies or multilateral development banks? If yes, provide name of agency and/or project, and amount of funding received by the cooperative (if known):	Yes No

Assessment and recommendation:

1. After review, I confirm that the registration application is complete and eligible and that there are no known reasons why this cooperative or company should not be approved to participate in the 1Mha carbon program

OR

2. After review, I confirm that the registration application is complete and eligible, but DCPPP may wish to consider the following situation relevant to the application:_____

_____

Signed _____ date: _____

A6. Method for SPOT mapping

The SPOT mapping workflow

Four steps take a cooperative's fields from GPS corner coordinates to a coded SPOT map with monitoring points.

1 — Identify location & area

Capture GPS coordinates at the field corners; sketch field plots and farmer household IDs.

→

2 — Draw field diagram (GIS)

Enter coordinates in GIS, overlay satellite & elevation layers, digitize plots and canals, export Shapefile.

→

3 — Build the SPOT map

Calculate each SPOT's area, confirm a single water regime, and assign a unique SPOT ID.

→

4 — Identify monitoring points

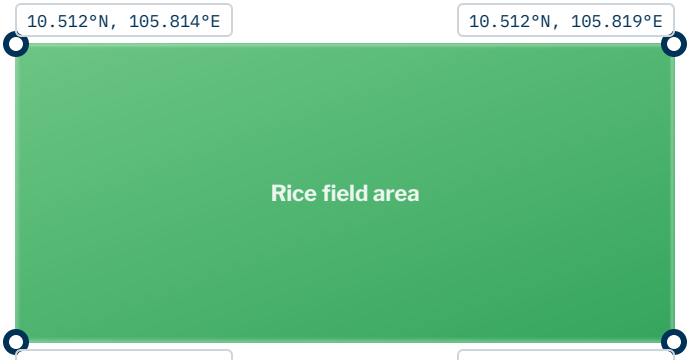
Place 3 monitoring points per SPOT (inflow, middle, outflow) with signs for photo-monitoring.

- **BUILD A SPOT MAP**

- SPOT concept: is a unit of rice area that is homogeneous in terms of elevation, flatness, and soil type; and irrigation systems, crop calendars and farming processes (varieties, irrigation regimes, fertilizers, straw management). Depending on the variability of the field, the model can be divided into SPOT with different characteristics.
- Each SPOT can be 1 or more farmer households' fields, as long as when practicing draining water to dry the fields, all points on the SPOT are equally dry within 24 hours.
- Each SPOT will be a unit that is coded and continuously monitored, measured, and reported throughout the farming process to calculate the emissions and emission reductions of registered mitigation activities.

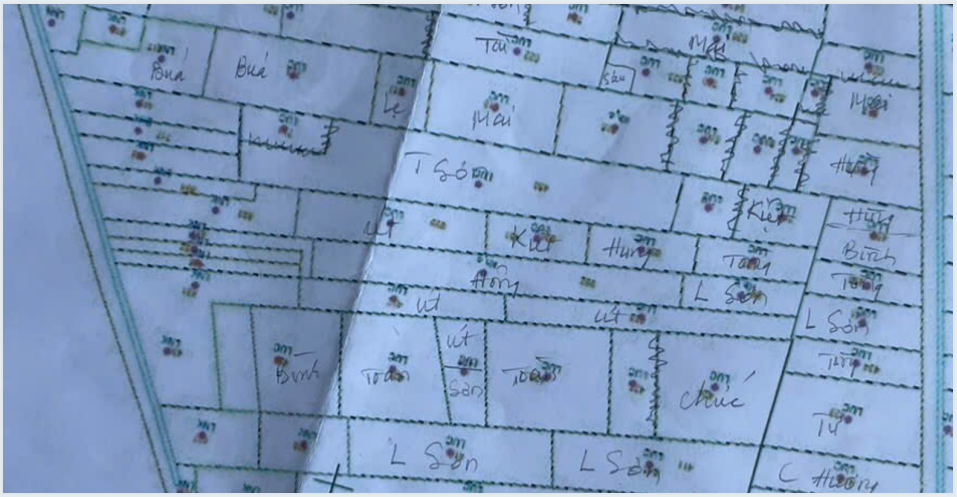
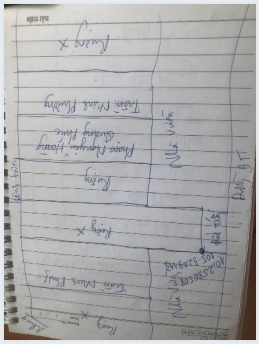
Step 1: Identify the location and area of the rice field

- Install Google maps on your smartphone



Illustrative ordinates at each corner martphone.

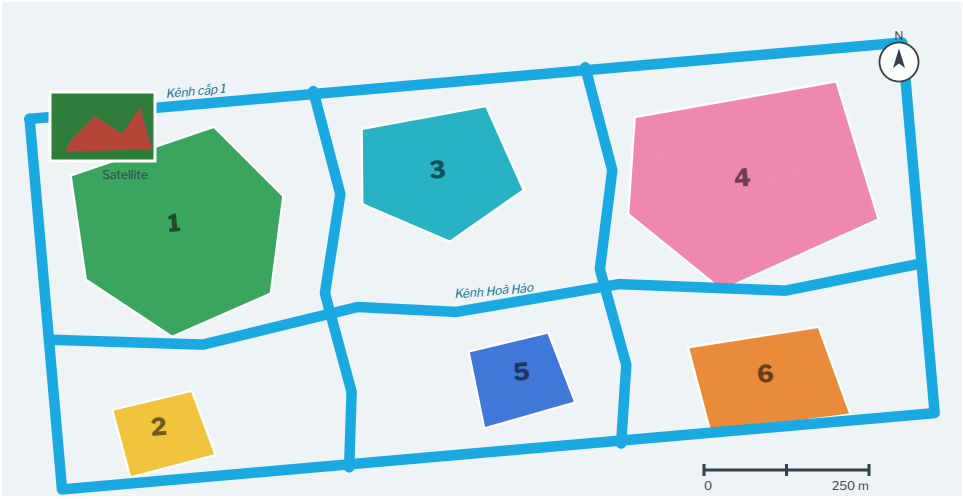
- Position the coordinates of the corners of the area where the MRV monitoring model is implemented (GCS_WGS_1984 coordinate system)
- Draw diagrams of field plots by hand on paper – clearly stating farmer household information

	
Identify again plot boundaries and information of rice farming households if there is a paper-based cadastral map	Redraw the plot diagram and identify the field information if there is no cadastral map

Step 2: Draw a diagram of the rice field

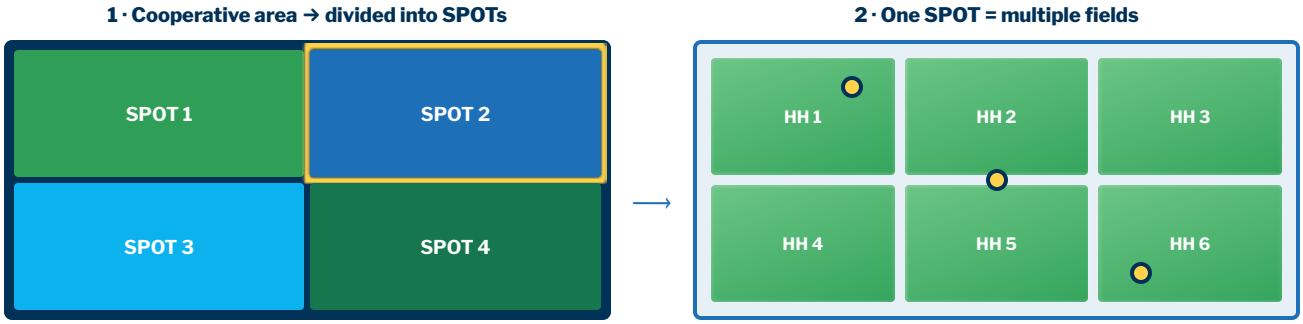
- Enter the identified coordinates at the corners of the area to be modeled using GIS geographic information software (Software such as QGIS, ARCGIS or MAPINFO can be used; however, QGIS is preferred because the background of satellite images running on QGIS is very stable and allows for quick operation)

QGIS Desktop 3.34.11	ArcMap 10.8.2	MapInfo Pro 15.0



Illustrative example — SPOTs vary in size and need not be adjacent; each is a homogeneous field group (in soil, elevation & water regime) bounded by irrigation canals, and contains many household parcels.

- Install Google map, google satellite, google earth engine in QGIS software
- Download the digital map of the altitude of the model area using google earth engine in QGIS software
- Based on the coordinates identified in the corners of the area, models and diagrams of hand-drawn field plots, digitize the boundaries of the SPOT on the background layer of Google satellite images



The whole registered area is split into SPOTs — each homogeneous in soil, elevation & water regime.

SPOT 2 groups several household fields (HH); 3 monitoring points are placed within it.

- Build farmer household information on the digitized SPOT map, including: Full name of farmer household, cooperative, commune/ward, province/city, coordinates of the SPOT.
- Allocate an ID number to each SPOT based on the abbreviations of provinces, communes and cooperatives, and SPOT number. E.g., TV.PH.PH.1 stand for Trà Vinh province, Phuoc Hao commune, Phuoc Hao cooperative, SPOT number 1.
- Digitize irrigation canals and inland roads in the area implementing the model
- Export the map to a Shapefile.

Step 3: Build a SPOT map

- Calculate the area of each SPOT (performed on GIS software)
- Determine the relative height of field plots at the extreme boundaries of the SPOT (based on the downloaded altitude map)
- Enter the water management regime of each SPOT
- Confirm that the SPOT contains only fields with the same water management regime and variation in field elevation not greater than 5 cm. Because elevation differences at this scale generally cannot be reliably resolved by digital elevation maps alone, this confirmation shall be made through field-based visual assessment, conducted with the participation of cooperative leaders and farmers familiar with the SPOT, and subsequently documented in the SPOT digital mapping records.
- Calculate the area of each SPOT (performed on GIS software)
- Number the order of the SPOTS in the cooperative.

Step 4: Identify monitoring points in the SPOT

- For each SPOT, identify 3 monitoring points at the following locations: the beginning of the water source (near the irrigation canal), near the middle of the SPOT and the end of the water source.
- Each monitoring point has a sign placed at that location for photo-monitoring.

- Edit and publish SPOT maps that show monitoring points
- Export Excel information table including: SPOT order number, monitoring point symbol, monitoring point coordinates, field area, farmer household name, location information (field, cooperative, commune/ward, province/city), SPOT average elevation, baseline water management regime.

A7. Checklist for undertaking and documenting spot-checks on mapped SPOTs

Guidance:

- The purpose of spot-checks on SPOT mapping is to ensure that the SPOTs identified meet the key requirements, and that the fields in SPOTs to be managed uniformly are clearly understood by farmers.
- Spot-checks should be conducted after SPOT maps and associated information have been uploaded into the digital MRV system.
- It is recommended that province MRV units conduct spot-checks on the SPOTs mapped in at least one cooperative or company per commune. This is because if the commune extension staff working with cooperative members or companies have mastered the SPOT mapping methods, it is more likely that the quality of SPOT mapping is similar in other cooperatives or companies mapped in the same commune. However, province MRV units may also use their knowledge of issues encountered in the mapping process to target spot-checks to communes or cooperatives or companies where more risks or issues have been identified. If necessary, spot-checks should be done in more than one cooperative or company per commune.

Checklist and spot-check documentation:

Province: _____ Commune: _____ Cooperative or company: _____

SPOT ID numbers checked: 1. _____ 2. 3. 4. 5.

Date of spot-check visit: DD/MM/YY

Name of person doing the spot-check: _____

	Requirement to check	Findings & comments
1	The location and boundaries of each SPOT are identifiable in the field	
2	The area of each SPOT calculated from SPOT mapping was compared with the sum of single field areas on cadastral maps or a list of field plot areas in the SPOT	
3	The area of each SPOT has not been overestimated as far as can be discerned	
4	All fields in each SPOT have an even field surface and similar soil characteristics	
5	All fields in each SPOT share the same irrigation and drainage system	

	Requirement to check	Findings & comments
6	Cooperative leaders and cooperative members (or company contract farmers where relevant) with fields in each SPOT were involved in the SPOT mapping	
7	Cooperative leaders (or company staff) and all farmers met with clearly understand that fields in each SPOT will apply the same water regime (MSD or AWD)	
8	All farmer households with fields in each SPOT signed Annex 4.1 of the cooperative or company registration application	
9.	All farmer households with fields in each SPOT are voluntarily participating in the 1Mha program and the planned changes in water and rice management	
Actions taken or specific recommendations for addressing any issues identified in the SPOTs that were checked:		
Recommendations for improving the quality of future SPOT mapping activities:		

A8. Baseline strata in the 1Mha carbon program

The overall process of stratification considers two static criteria (see Table 2 in the methodology) namely sub-region and soil type that can be overlaid to define strata numbered from 1 to 12 (see Figure A8.1 and Table A8.1 below). Note that a given soil type can occur in more than one sub-region, and strata may not be geographically contiguous, but can exist in 'patches'. Also, one stratum may be present in more than one province, and a province may include more than one stratum.

The stratification process also takes into account the baseline water regime which can be either Continuous Flooding (CF) or Mid-season Drainage (MSD). Therefore, each of the spatially explicit strata based on sub-region and soil type are subdivided into two sub-strata according to the respective baseline management (CF and MSD) using data from the baseline surveys. As can be seen in Table A8.1, emissions associated with the baseline water regime each sub-stratum will be calculated using a stratum-specific emission factor (EFc for rice cultivation under CF) and one scaling factor (for either CF or MSD). Strata with biophysical characteristics not suited to adoption of AWD may be excluded from the carbon program area.

Figure A8.1 Overlaying sub-region and soil type to determine the geographic location and area of strata defined based on 'static' criteria.

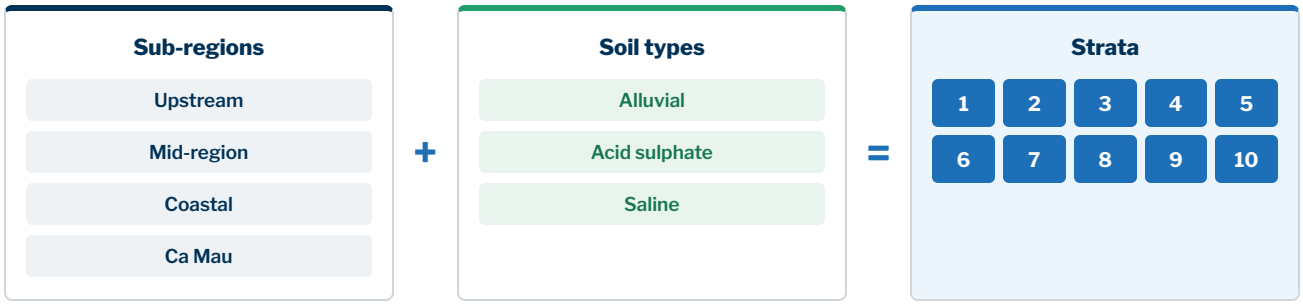


Table A8.1: Stratification scheme based on sub-region and soil type defining a given stratum that will be subdivided into two sub-strata based on the baseline water regimes (i.e. CF or MSD)

Sub-region	Soil type	Stratum	Baseline sub-strata	Emission factors	Scaling factors
Upstream	Alluvial soils	1	1CF; 1MSD	1CF_e; 1MSD_e	1CF_s; 1MSD_s
	Acid sulphate soils	2	2CF; 2MSD	2CF_e; 2MSD_e	2CF_s; 2MSD_s
Mid-region	Alluvial soils	3	3CF; 3MSD	3CF_e; 3MSD_e	3CF_s; 3MSD_s
	Acid sulphate soils	4	4CF; 4MSD	4CF_e; 4MSD_e	4CF_s; 4MSD_s
	Medium and light saline soils	5	5CF; 5MSD	5CF_e; 5MSD_e	5CF_s; 5MSD_s
Coastal area	Alluvial soils	6	6CF; 6MSD	6CF_e; 6MSD_e	6CF_s; 6MSD_s
	Acid sulphate soils	7	7CF; 7MSD	7CF_e; 7MSD_e	7CF_s; 7MSD_s
	Medium and light saline soils	8	8CF; 8MSD	8CF_e; 8MSD_e	8CF_s; 8MSD_s
Ca Mau Peninsula	Acid sulphate soils	9	9CF; 9MSD	9CF_e; 9MSD_e	9CF_s; 9MSD_s
	Medium and light saline soils	10	10CF; 10MSD	10CF_e; 10MSD_e	10CF_s; 10MSD_s
Total number of strata / sub-strata		10	20	20	20

[1] Note: area values in the table are hectares of land, not rice harvest area.

[2] The emission factors will be determined and named for both CH_4 (...e/C) and N_2O (..._e/N): 1CF_e/C; 1IF_e/N; 2CF_e/C; 2IF_e/N, 3CF_e/C ...

[3] The scaling factors will be determined and named for both CH_4 (...s/C) and N_2O (...s/N): 1CF_s/C; 1IF_s/N; 2CF_s/C; 2IF_s/N, 3CF_s/C ...

A9 Baseline data collection form

1. Basic information on the interview		
1.1 Cooperative or company name:.....		
1.2 Name of person recording the interview information:.....		
1.3 Date and time of interview: DD/MM/YY HH:MM		
SPOT identification code....		
Baseline year and season: YYYY Season (multiple choice dropdown list)		
Name of farmer interviewed:		
Area of rice fields in this SPOT: ..... (ha)		
Was this rice field area levelled by laser levelling or wet field levelling in the baseline year? Yes/No If yes, dry field laser levelling wet field levelling		
Average yield in this field in the baseline season: ..... (tonne / ha)		
Name of rice cultivar in the baseline year and season:_____		
Amount of seed (kg/ha)		
Sowing date: DD/MM/YY	Harvest date: DD/MM/YY	
In the baseline season, how many days before cultivation is stubble and any straw incorporated into the soil? < 30 days before cultivation > 30 days before cultivation		
Fertilizer application (total in the baseline season):	Kg/ha/season	Fertilizer brand and product name
Urea		
NPK		
DAP		
Organic amendments used: Yes/No. If yes:	Kg/ha/season	
Type of amendment # 1:		
Type of amendment # 1:		
Type of amendment # 1:		
14. Information on water regimes before the cultivation period:	Flooded pre-season > 30 ngày	Flooded pre-season < 30 ngày

15. Information on water regimes during the cultivation period: Continuously flooded Single drainage period Multiple drainage periods
16. Information on rice straw management:
% of rice straw burned
% of rice straw incorporated in soil
% of rice straw removed: Of which: % sold for use in mushroom growing: % sold for livestock feed: % used for other purposes (specify): % sold but use unknown:

A10. Checklist for undertaking and documenting spot-checks on baseline activity data

Guidance:

- The purpose of spot-checks on baseline activity data is to ensure that the baseline year and seasons were correctly defined, and the baseline data is accurate and reliable.
- Spot-checks should be conducted after baseline data (and any supporting evidence) have been uploaded into the digital MRV system.
- It is recommended that province MRV units conduct spot-checks in at least one cooperative or company per commune. This is because if the commune extension staff working with cooperative members or companies have mastered how to guide the cooperatives in baseline data collection, it is more likely that the quality of baseline data is similar in other cooperatives or companies mapped in the same commune. However, province MRV units may also use their knowledge of issues encountered in the baseline setting process to target spot-checks to communes or cooperatives or companies where more risks or issues have been identified. If necessary, spot-checks should be done in more than one cooperative or company per commune.
- If in a SPOT, the baseline selected was the seasons in the 1 year before the baseline survey and farmers were interviewed with no need for additional documentation, the focus of spot-checks is (a) ensure the procedures were followed; (b) ensure that the baseline water regime reported is an accurate description of water management practices and (c) ensure that data on sowing and harvest dates, crop yields and straw management are reliable.
- If in a SPOT, AWD was previously adopted, the focus of spot-checks is on (a) confirming the season and year of AWD adoption and (b) checking the additional documentation provided and the choice of other data sources used.

Checklist and spot-check documentation:

Province: _____ Commune: _____ Cooperative or company: _____

SPOT ID numbers checked: 1. _____ 2. 3. 4. 5.

Date of spot-check visit: DD/MM/YY

Name of person doing the spot-check: _____

(A) If the SPOT used only farmer interviews for a baseline in the 1 year before the survey:

	Requirement to check	Findings & comments
1	The number of farmers interviews is at least 3, or if there are more than 30 farmer households with fields in the SPOT at least 10% were interviewed	
2	The named farmers interviewed confirm that they were interviewed and involved in providing the baseline data	
3	After cross-checking with cooperative or company staff and farmers, the baseline water regime (continuous flooding or MSD) reported is correct.	
4	After cross-checking with cooperative or company staff and farmers, the baseline sowing and harvest dates, crop yields and straw management data are correct and do not overestimate crop duration, yields or the amount of straw returned to the fields	
Specific recommendations for addressing any issues identified in the SPOTs that were checked:		
Recommendations for improving the quality of future baseline data collection activities:		

(B) If the SPOT adopted AWD in the past and the baseline year and season is more than 1 year ago:

	Requirement to check	Findings & comments
1	After cross-checking with cooperative or company staff and farmers, the season and year AWD was first adopted is correct	
2	After discussing the availability of documentary evidence to show when AWD was first adopted, the choice of documentation provided followed the order of preference (actual irrigation & drainage records > plans > schedules > field notes > signed statement)	
3	After discussing the availability of documentary evidence for other rice cultivation practices, the choice of documentation or the choice to use farmer interviews followed the guidance in the MRV manual.	
4	After cross-checking with cooperative or company staff and farmers, the baseline water regime (continuous flooding or MSD) reported is correct.	

	Requirement to check	Findings & comments
5	After cross-checking with cooperative or company staff and farmers, the baseline sowing and harvest dates, crop yields and straw management data are correct and do not overestimate crop duration, yields or the amount of straw returned to the fields	
Specific recommendations for addressing any issues identified in the SPOTs that were checked:		
Recommendations for improving the quality of future baseline data collection activities:		

A11. Checklist for spot-checks on monitoring data

Guidance:

- The purpose of spot-checks is to ensure that the monitoring data is accurate and reliable.
- Spot-checks should be conducted both during the season (to check photo-monitoring) and after end of season monitoring data have been have been uploaded into the digital MRV system.
- It is recommended that province MRV units conduct spot-checks in at least one cooperative or company per commune. This is because if the commune extension staff working with cooperative members or companies have mastered how to guide the cooperatives or companies in monitoring data collection, it is more likely that the quality of monitoring data is similar in other cooperatives or companies mapped in the same commune. However, province MRV units may also use their knowledge of issues encountered with incomplete photo-monitoring uploads or other issues to target spot-checks to communes or cooperatives or companies where more risks or issues have been identified. If necessary, spot-checks should be done in more than one cooperative or company per commune.

Checklist and spot-check documentation:

Province: _____ Commune: _____ Cooperative or company: _____

SPOT ID numbers checked: 1. _____ 2. 3. 4. 5.

Date of spot-check visit: DD/MM/YY

Name of person doing the spot-check: _____

- Spot-checks during the season focusing on photo-monitoring

	Requirement to check	Findings & comments
1	3 locations in each SPOT for photo-monitoring are clearly marked	

	Requirement to check	Findings & comments
2	Cooperative or company staff responsible for photo-monitoring clearly understand when to take photos and how	
3	Photos have been taken and uploaded on time, and are complete for all drainages conducted so far this season	
4	Uploaded photos are of sufficient quality	
Specific recommendations for addressing any issues identified in the SPOTs that were checked:		
Recommendations for improving the quality of future photo-monitoring activities:		

- Spot-checks for end of season monitoring surveys

	Requirement to check	Findings & comments
1	After cross-checking with cooperative or company staff and farmers, the reported water regime implemented by farmer households (continuous flooding, MSD or AWD) is correct.	
2	After cross-checking with cooperative or company staff and farmers, the sowing and harvest dates, crop yields and straw management data are correct and do not underestimate crop duration, yields or the amount of straw returned to the fields	
3	Land levelling: (a) check whether the cooperative had any paddy that was levelled in the last cropping season, and if yes, whether that paddy is registered in the carbon program; (b) If there is paddy in the program that was levelled, cross check the area reported as levelled against documentation held by the cooperative, a service provider or the local agriculture department.	
Specific recommendations for addressing any issues identified in the SPOTs that were checked:		
Recommendations for improving the quality of future monitoring activities:		

A12. Inputs to uncertainty quantification

A12.1 Monte Carlo simulation

Uncertainty analysis using Monte Carlo simulation can be accomplished in a variety of softwares, each of which have their own specific requirements for input data and procedures to run the simulations. In general, the key inputs to any Monte Carlo simulation model are:

- **Parameter values**: The mean values of all activity data, coefficients and emission factors exactly as implemented in the program GHG calculations;

- **Margins of error**: Margins of error around the mean values for each input parameter (or uncertainty ranges for some default parameters given in the IPCC guidelines). Margins of error should be calculated with a 95% confidence interval using a z-score of 1.96:

> $$\textit{Margin of error} = [(1.96 \times \sigma) \div \bar{x}] \times 100$$

Where σ is the standard deviation and $\bar{x}$ is the mean. If only uncertainty ranges are available, then unless the IPCC Guidelines state otherwise, it may be assumed that the ranges contain 95% of possible parameter values (IPCC 2019 Vol 1 Ch 3 section 3.2).

- **Probability Density Functions (PDFs)**: For each parameter, PDFs essentially describe the distribution of parameter values (e.g. normal, lognormal etc.).
- **Model equations:** The equations use exactly as implemented in the program GHG calculations express the relationship between parameters.

In brief, the equations given in the methodology should be programmed, and parameterized using the values used in the program GHG calculations for all baseline and project parameters, and the calculation of emission reductions; each parameter is then associated with a particular uncertainty range (or margin of error) and distribution (pdf). Monte Carlo simulation then runs the model for the specified number of times randomly selecting parameter values from each parameter. This results in a simulated distribution for the estimate of emission reductions, which may also be expressed as a margin of error or uncertainty associated with the mean simulated value. Some software programs also have automated functions to quantify the percentage contribution of each input parameter to total uncertainty. This can be useful to identify which parameters to focus on for data quality improvement.

A12.2 Data sources and assumptions for uncertainties and their distributions

The table below gives some data sources and assumptions that can be used in parameterizing the simulation model.

Table A12.1 Data sources and assumptions for uncertainties and their distributions

Parameters	Uncertainty	Source	Distribution	Source
$EF_{c,g,s}$ (emission factor for continuously flooded fields without organic amendment)	winter-spring: ±8.9% summer-autumn: ±6.2% autumn-winter: ±8.9%	Data held by IAE		

Parameters	Uncertainty	Source	Distribution	Source
$SF_{w,g}$ (scaling factor for water regime)	CF: 0.73 – 1.27 MSD: 0.53 – 0.94 AWD: 0.41 – 0.72	IPCC 2019 Table 5.12	PERT (asymmetrical, only min, max and most likely known)	
$SF_{p,g}$, (scaling factor for water regime before the cultivation period)	Non-flooded < 180d: 0.88 – 1.12 Non-flooded > 180d: 0.80 – 0.99 Flooded pre-season > 30d: 2.13 – 2.73	IPCC 2019 Table 5.13	PERT (asymmetrical, only min, max and most likely known)	
CFOA (conversion factor for organic amendments)	Straw <30d: 0.85 – 1.17 Straw > 30d: 0.11 – 0.28 Compost: 0.09 – 0.29 FYM: 0.15 – 0.28 Green manure: 0.36 – 0.57	IPCC 2019 Table 5.14	PERT (asymmetrical, only min, max and most likely known)	
$A_{S,g}$ (area of SPOTs)	To be calculated from study in 3.6.3.4.a. If using unmodified GPS tracking, a default uncertainty of ±1.3% may be assumed.	ADB (2018)	Normal	
ROA (organic amendments applied)	To be calculated from studies in 3.6.3.4.b and c, and ex post analysis of the precision of survey data (see 'monitoring sample size calculation and allocation' in Table 9).		To be determined according to the distribution of the data collected	
Days (duration of cropping season)	To be calculated from the baseline and project activity data (see 'monitoring sample size calculation and allocation' in Table 9).		To be determined according to the distribution of the data collected	
kg N fertilizer applied/ha	To be calculated from the study in 3.6.3.4.d , and ex post analysis of the precision of survey data (see 'monitoring sample size calculation and allocation' in Table 9).		To be determined according to the distribution of the data collected	
Fertilizer N content	N deviation rate (%) from product labels may be assumed to be 3.2%	Kojin et al. (2022)	Normal	Kojin et al. (2022)
EF_{1FR}	CF: 0 – 0.010 MSD or AWD: 0 - 0.016	IPCC 2019 Table 11.1	PERT (asymmetrical, only min, max and most likely known)	

Parameters	Uncertainty	Source	Distribution	Source
EF_L (kgCO2/ha rice paddy levelled)	To be calculated from data in the study quantifying the emission factor , and ex post analysis of the precision of survey data (see 'monitoring sample size calculation and allocation' in Table 9).		To be determined from the study quantifying the emission factor	

A13. Draft seasonal summary report template

1Mha Carbon Program Seasonal Summary Report for the season

[summer-autumn / autumn/winter / winter-spring] YEAR

1. Province MRV preparation

1.1 Province A

1.1.1 Province annual monitoring plan approved [Yes/No]

1.1.2 Training activities (cumulative totals to date)	# of province training events	# of province staff trained	# of commune training events	# of commune and cooperative/ company staff trained
Registration methods				
SPOT mapping				
Baseline data collection				
Photo-monitoring				
Monitoring survey				
QAQC methods				

1.1.3 MRV implementation (cumulative totals to date)	Registration approved	SPOT mapping & baseline data registered in MRV system	Monitoring data registered in MRV system	QA spot-checks documented in MRV system
Number of cooperatives / companies				
Number of SPOTs	n/a			
Total area (ha)	n/a			

[repeat for each province]

A14. Draft annual monitoring report template

Note: specific buyers or investors may have other reporting requirements and mandatory templates.

1Mha Carbon Program Annual Monitoring Report	
Reporting Period covered in this report	
Applied methodology version & date	
Number of ERs quantified:	
Date of submission	

1 Implementation status of the carbon program

A short description (2-page maximum) of the implementation of the carbon program, including:

- *Progress on the actions and interventions (including key dates and milestones);*
- *Effectiveness of the organizational arrangements and involvement of partner agencies*
- *Updates on any changes in circumstances that positively or negatively affect the implementation of the program, especially any key changes or deviations from the C-PDD.*

2 MRV system

A short description of the implementation of the MRV system, including:

- *Organizational structure, responsibilities and training conducted;*
- *General description of MRV methods and approaches used (with reference to MRV manuals applied or reference to step-by-step details in an appendix).*
- *Updates on any changes compared to the description that was provided in the C-PDD.*

3 Quantification of emission reductions

3.1 Baseline emissions in the reporting period

For each baseline year, a table like this:

Year of the baseline	Baseline emissions
	Rice cultivation emissions (tCO_2e) Fertilizer emissions (tCO_2e) Fossil fuel emissions (tCO_2e) Total baseline emissions (tCO_2e)
Stratum 1	.. ..
Stratum 2	.. ..
..	.. ..
Stratum 10	—
Total baseline during the baseline year	..

3.2 Emissions in each year with mitigation actions in the reporting period

For each year with mitigation actions, a table like this:

Year of the mitigation action	Project emissions
	Rice cultivation emissions (tCO_2e) Fertilizer emissions (tCO_2e) Fossil fuel emissions (tCO_2e) Total project emissions (tCO_2e)
Stratum 1	.. ..
Stratum 2	.. ..
..	.. ..
Stratum 10	—
Total project emissions during the year	..

3.3 Emission reductions in each year in the reporting period

	Total emission reductions (tCO_2e) in each year with mitigation action
	Year X Year Y Year Z Total emission reductions
Stratum 1	.. .. ..
Stratum 2	.. .. ..
..	.. .. ..
Stratum 10	—
Total emission reductions during each year	—
Total emission reductions in the reporting period	—

4. Uncertainty of emission reduction estimates

State the total uncertainty of estimated emission reductions in each year in the reporting period. (refer to appendix for details of methods and assumptions)

Identify the main sources of uncertainty that were identified and their contribution to uncertainty

Parameter	Sources of uncertainty	Analysis of contribution to overall uncertainty
e.g. ROA	*e.g. sampling error*	*.....see guidance on uncertainty above*
.....	.....	.....
.....	.....	.....
.....	.....	.....

5. QAQC procedures applied

Describe the QAQC procedures applied (with reference to an appendix for details), especially with focus on the parameters identified as main sources of uncertainty in section 4.

6. Measures to avoid double counting

Describe measures used to ensure that the ERs reported in the reporting period have not already been transferred to other entities.

(7. Sustainable development indicators and application of safeguard requirements)

7.1 Sustainable development indicators

Requirements for this section have not been elaborated in this manual. An initial list of sustainable development indicators is provided in the table below

Sustainable Development co-benefits	Indicators	Metric
Farmer profitability	Average gross margin as a percent of rice sales revenue	%
Environmental health benefits	Average percent reduction in use of chemical pesticides	%
Value chain integration	Number of cooperatives (and ha) with long-term supply contracts with agribusiness	No. of cooperatives, hectares
Marketing	Tonnes paddy sold through long-term supply contracts	Tonnes
Export competitiveness	Percent of rice produced in specialized cultivation area that is exported under low-carbon high quality Vietnamese brands	%
Policy support to low-emission rice production	Number of specific policy mechanisms implemented by central and local governments in the MKD area	No. of policy mechanisms
Public investment in low-emission rice production	Total GoV investment in low-emission rice production	$
Agribusiness investment in low-emission rice production	Total agribusiness investment in low-emission rice production	$

7.2 Safeguards

7.2.1 Applicable safeguard requirements

Clearly describe the applicable safeguard requirements.

7.2.2 Implementation of safeguards and performance of safeguarding activities

Describe the activities undertaken to implement the applicable safeguards and the results.

Annex 1: Step-by-step MRV procedures applied

Annex 2: Emission reduction calculation method

This will generally be the same as the methodology, with additional explanation of how the methodology equations are applied in the project context during this reporting period. Where relevant, attach calculation spreadsheets or other material needed to understand how the calculations were made.

Annex 3: Description of each parameter

This Annex shall include a parameter-disclosure table listing, for each parameter used in the calculations: (i) parameter name and unit; (ii) value or values applied in the reporting period; (iii) data source and version; (iv) uncertainty range or margin of error applied; and (v) any deduction rate or buffer applied. This table is intended to provide a transparent basis for independent review of the calculations. Where relevant, attach spreadsheets or other supporting documentation. It will follow the tables for parameters not monitored and parameters monitored in the methodology.

Annex 4: Uncertainty analysis methods and assumptions

Annex 5: Details of QAQC procedures applied

Annex 6: Province annual monitoring reports

An annual monitoring report for each province presenting results in terms of

- *baseline and project activity data;*
- *emission reductions achieved;*
- *MRV performance, highlighting any quality issues to be addressed in the coming year.*

A15. Measurement of methane emission factors and scaling factors

A15.1. Purpose

A15.1.1 The purpose of direct measurement is to obtain estimates for each stratum for each rice cultivation season of CH_4 fluxes from paddy soil methagenosis under 3 treatments: continuous flooding without organic amendment and non-flooded < 180 days pre-season ($EF_{c,g,s}$), and mid-season drainage and AWD under comparable conditions. The latter two measurements are used to estimate stratum-specific values for the IPCC parameter SF_w. These stratum-specific estimates of $EF_{c,g,s}$ and SF_w can be used to replace the default values presented in Tables 3 and 4 of the 'Guiding Methodological Rules and Principles' document.

A15.2 Requirements and procedures

A15.2.1 General requirements

Site selection, setting up field measurement equipment, measurements, transport of gas samples, laboratory analysis and calculation of seasonal fluxes, emission factors and scaling factors must be done by appropriately qualified and experienced personnel. Requirements and procedures should follow those approved in 4831/QĐ-BNN-KHCN, 'Decision on the issuance of a handbook on greenhouse gas emission measurement in rice cultivation' by the Ministry of Agriculture and Rural Development, 22 November 2016, unless otherwise specified in this Appendix.

A15.2.1.1 Site Selection

Field measurements must be taken at sites that represent each numbered stratum shown in Table 2 of this methodology. Within each site, locations for each treatment should be as close as possible to minimize the effects of other factors, while isolating each water regime treatment plot to avoid lateral flows from flooding plots to MSD or AWD plots. For each measurement site in each rice cropping season, measurements for each treatment must be conducted with 3 replicates. If resources are sufficient for multiple sites per stratum or measurements in more than one year, the preference is to select sites representing a range of values in soil characteristics (e.g. clay content), as this is likely to strongly influence the relationships between water depth under drainage, duration of drainage and methane emissions.

A15.2.1.2 Sampling equipment

Detailed specifications for design of chambers and base and other tools are given in 4831/QĐ-BNN-KHCN and summarized in Table A15.1.

Table A15.1 Summary of requirements for chamber design

Feature	conditions
Field location	At least 2 m from field edge, installed 1 day before the first measurement
Chamber material	Glass, plastic or plastic-coated aluminum
Shape and size	Square, rectangular or cylindrical; minimum volume of about 125 liters, height of sampling box must be 10 cm higher than maximum height of rice plant
Base specifications and placement	Materials: Stainless steel, aluminum or plastic. Size: minimum volume 36 liters. Design: the base is equipped with a water circulation pipe between the inside and outside of the base (located about 1 - 2 cm from the ground), with rubber plugs for sealing during sampling. The top of the base has a groove filled with water so that when the air collection box is placed on top of the base, the water will create a seal that prevents air from circulating in and out. Base placement: the base is placed 7 – 10 cm below the soil surface
Other equipment	Thermometer to measure temperature inside the chamber; Fan for mixing air inside the chamber during sampling, connected to batteries outside the chamber; pressure valve; gas sampling tube connected to 3-way valve; sampling syringe; sample vials; clock to determine time of sampling.
Number of rice plants enclosed	Each replication and treatment shall enclose the same number of rice plants, with the exact number determined according to the size of the chamber. The number of plants enclosed shall be recorded for each measurement.

A15.3 Overview of measurement program

The sub-national EFc from Document 2626 and IPCC default scaling factor SFw will be used to calculate ERs generated between Jan 2023 and August 2025.

Starting in September 2025, direct measurements will be conducted for 1 year to determine stratum-specific values of EFc and SFw for each season.

Depending on the results of the first year of measurement and resource availability, it will be decided whether to do more direct measurements.

The 10 strata for measurement are shown in Appendix A8 in this manual.

A15.3.1 Site selection

Site selection will be based on the 10 strata in Appendix A8 and also consider the location of MRV demonstration sites. The sites with coordinate systems and administrative address are shown in Table A15.2.

In pilot phases that are not fully financed through carbon revenues, the final monitoring plan, including the number of measurement sites per stratum, will remain subject to budget and operational constraints. Where resources allow additional sites beyond the minimum, allocation shall follow a risk-based prioritization, with additional sites assigned to strata characterized by higher expected variability in soil or hydrological conditions, or to strata covering larger areas of the program. The rationale for the final allocation shall be documented in the C-PDD or in the annual program monitoring plan.

Table A15.2 Location of 10 sites representative of 10 strata for field experiments to measure GHG emission and determine Emission Factors (EF) and scaling factors (SF)

Sub-region	Soil type	Name of stratum	Name of sub-strata
Upstream	Alluvial soils	1	1CF; 1MSD
	Acid sulphate soils	2	2CF; 2 MSD
Mid-region	Alluvial soils	3	3CF; 3 MSD
	Acid sulphate soils	4	4CF; 4 MSD
	Medium and light saline soils	5	5CF; 5 MSD
Coastal area	Alluvial soils	6	6CF; 6 MSD
	Acid sulphate soils	7	7CF; 7 MSD
	Medium and light saline soils	8	8CF; 8 MSD
Ca Mau Peninsula	Acid sulphate soils	9	9CF; 9 MSD
	Medium and light saline soils	10	10CF; 10 MSD
	Total number of strata/ sub-strata	10	20

Note: Alluvial soils in the Ca Mau Peninsula (Stratum 11 in Annex A8) are not included in the initial measurement plan due to the small area covered by this stratum. They could be added at a later stage should resources allow.

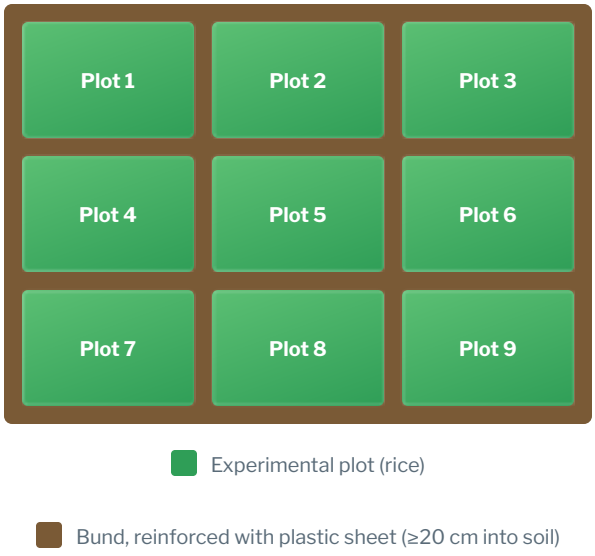
A15.4. Treatments, replicates and parameters to measure

Field experiments will be conducted at each site on 10 strata with 3 treatment and 3 replications. Table A15.3 shows the treatments.

Table A15.3 Treatments in the field experiments

Treatment code	*Treatment explanation*	*Remark*
T1	Continuous flooding without organic amendment and non-flooded < 180 days pre-season	
T2	Mid-season drainage without organic amendment and non-flooded < 180 days pre-season	
T3	Alternative Wet and Dry without organic amendment and non-flooded < 180 days pre-season	

Figure A15.1 Layout of field experiment with 9 plots (green) in split block design separated by bunds (brown) that are reinforced by plastic sheets; these sheets should be inserted up to 20cm into the *soil to prevent lateral flow from the flooded to the non-flooded plots*



A15.5. Field measurement and laboratory analysis methods

A15.5.1. Measurement procedures

For GHG emissions, detailed procedures are given in 4831/QĐ-BNN-KHCN and summarized in Table A15.4.

Table A15.4 Summary of sampling procedure requirements

Feature	conditions
Sampling frequency	Not less than 8 - 10 times per crop season, once a week during the first 50 days after transplanting and once every two weeks thereafter until 15 days before harvesting
Sample timing	Sample between 8:00 – 10:00 am. Four consecutive samples to be taken at t0 (after placement of top chamber), t1 (10 minutes), t2 (20 minutes), t3 (30 minutes), with sampling times 10 minutes apart.
Sample storage until analysis	Transfer air samples into evacuated vial for storage and transport to the laboratory

Note: Standardized morning sampling between 08:00 and 10:00 is retained for operational feasibility. Available evidence from Viet Nam suggests that diurnal sampling does not materially change estimated fluxes relative to single morning measurements in comparable rice systems (Pandey et al., 2014, Agriculture, Ecosystems and Environment, 196:137 to 146, doi:10.1016/j.agee.2014.06.010).

In addition, water tubes or water sensors will be used to measure water depth at each gas (or laser-based) sampling event.

A15.5.2 Gas analysis

Gas analysis may use gas chromatograph (GC) equipped with a flame ionization detector (FID) or a laser spectroscope. If GC is used, the procedures in 4831/QĐ-BNN-KHCN must be followed, as summarized in Table A15.5. If laser spectroscope is used, the manufacturer's instructions must be followed, and the choice to use laser spectroscope must be justified by a validation study. Gas analysis must be conducted in a laboratory with a quality assurance and management system in place.

Table A15.5 Summary of GC laboratory analysis requirements

Feature	condition
Method	Gas chromatograph with flame ionization detector (FID) or laser spectroscope
Injection	Direct injection or with multi-port valve and sample loop
Column of GC	Packed (e.g. molecular sieve) or capillary column
Calibration	With certified standard gas each day of analysis before and after the analyses are done

A15.5.3. Calculation of seasonally-integrated emission factors and scaling factors

Data processing and quality control procedures must follow 4831/QĐ-BNN-KHCN. For calculation of CH4 emission factor in each treatment plot (mg/m^2/h):

$$F=(\frac{\Delta C}{\Delta t})*(\frac{v}{A})*(\frac{M}{V})*(\frac{P}{P_0})*(\frac{273}{Tkelvin})$$

Where:

F is the emission factor of a given measurement date per treatment

ΔC is the change in CH_4 concentration during the time period Δt;

v and A are the volume of the gas sampling box and the bottom area of the gas measuring box (L);

M is the atomic mass of that gas;

V is the volume occupied by 1 mol of gas at standard temperature and pressure (22.4 L);

P is atmospheric pressure (mbar), P_0 is standard pressure (1013 mbar);

Tkelvin: 273+ Ttb

Ttb = (T_0+ T_1 + T_2 + T_3)/4

In practice, ΔC/Δt is determined by linear regression of the four concentration measurements (C0, C1, C2, C3) taken at t0, t1, t2 and t3, with the slope of the regression line representing the rate of concentration change. This is consistent with Decision 4831/QĐ-BNN-KHCN issued by the Ministry of Agriculture and Environment and with standard chamber flux protocols.

The seasonal cumulative emission of CH_4 per rice cropping season in each treatment plot is calculated using the formula:

$$=(n2-n1)*\frac{(F_{n1}+F_{n2})}{2}+(n3-n2)*\frac{F_{n2}+F_{n3}}{2}+...+(nc-nx)*\frac{F_{nc}+F_{nx}}{2}$$

Where n1, n2, n3 are the dates of the 1st, 2nd and 3rd sampling; nx is the xth sampling day before the last sampling, nc is the day of the last sampling and Fn1, Fn2, Fn3, Fnx, Fnc are the average daily emissions of CH4 (mg/m^2/day) corresponding to sampling days n1, n2, n3, nx and nc.

The average value for each stratum of seasonal CH_4 emission flux for each treatment in each rice cropping season is calculated as the arithmetic average of the replicates. Uncertainty (i.e., the margin of error expressed as a percentage of the mean) is calculated as:

> $$\textit{Margin of error} = [(1.96 \times \sigma) \div \bar{x}] \times 100$$

Where σ is the standard deviation, and $\bar{x}$ is the mean.

Scaling factors for MSD and AWD may be represented as a fraction of seasonal CH_4 emissions under continuous flooding as in the IPCC Guidelines, or using equations fit to the data demonstrating acceptable relationships between CH_4 emission (or CH_4 emissions as a fraction of EF_c) and other parameters (e.g. days of effective drainage) monitored using this methodology. Where regression equations are used to estimate scaling factors, uncertainty of the scaling factors can be expressed using root mean square error (RMSE) of the fit.

A15.5.4 N2O measurements

Where N2O measurements are conducted, the purpose is to assess whether the use of the IPCC default direct N2O emission factor for rice fields (EF1FR) is conservative under the program conditions, and whether adjustment is needed to reflect local conditions.

Where N2O measurements are conducted, samples shall be analyzed using gas chromatographs equipped with electron capture detectors (ECD).

Flux and N2O emission factor calculations shall follow recognized international chamber-method guidelines, including the Global Research Alliance N2O chamber methodology guidance, or other peer-reviewed methods.

A15.6. Data analysis

Data will be analyzed using professional software/program following statistical guidelines, e.g. Statistical Analysis System (SAS) Proprietary Software, to test whether GHG emissions from treatment are significantly different. Additionally, regression methods will be used to assess whether there is a relationship between seasonal emissions and frequency or duration of drainage in the season and/or water depth.

A15.7. Reporting of results and meta-data

Report structure (at each measurement location at the research point in 1 season)

- Cover page.

- Report name.

- Agency performing the task.

- Managing agency.

- Objective of the task.

- Main content of the report.

- Table of contents.

Main content of the report

The report should briefly and clearly present the following contents:

I. Introduction (State the reason and purpose of implementing the activities of measuring GHG emissions)

II. Content, location, parameters of monitoring, sampling and sample analysis

- Content, location of monitoring;

- Sampling conditions: [this is important information that must be recorded and kept: temperature, weather characteristics (rain, sun, ...), water level characteristics, plant growth level, rapid measurement parameters at the site (pH, soil temperature, ...) in the test/monitoring form or record].

- Monitoring and analysis parameters at the points [Specify the quantity of each indicator for each type of sample (CH_4, N_2O)].

- Number of samples and sampling locations with sampling location diagram [brief outline of the location of the implementation site, map illustrating the sampling location and description of the sampling location].

- Name of the agency responsible for the analysis.

- Sampling equipment and methods: [Briefly state the sampling equipment and tools used in the report]

- Analytical methods: [Analytical methods used in the report, if using standard methods, just write the name of the standard used].

III. Analysis and evaluation of results

Monitoring results, analysis and discussion (state measurement methods, calculation methods, analysis, use of statistical methods (descriptive statistics and analytical statistics) to comment and evaluate the collected data and information. The evaluation should be based on the allowable thresholds of TCVN or other cited international Standards. For regulations and standards, the latest documents must be applied.

- CH_4 emission results (EFc and scaling factors)
- N_2O emission results

- Uncertainties of the CH_4 emission results
- Results of QA/QC implementation during the analysis

IV. Conclusion and Recommendations

References

Appendices Maps

Diagrams of the location of the monitoring and sampling areas Illustrative images

Results of on-site monitoring data

Other documents

END OF PACKAGE

A complete, carbon-market-grade MRV framework

Methodology, Implementation Manual and international peer-review record — together providing an end-to-end system from scientific rules to field operations, designed for replication across the world's rice-producing nations.

THE WORLD BANK
IBRD • IDA | WORLD BANK GROUP

Prepared in support of the Viet Nam Ministry of Agriculture and Environment under the Transformative Carbon Asset Facility (TCAF). May 2026.

1MHA RICE PROGRAM
MRV PACKAGE