

## T-VER Programme of Activities Design Document




VARUNA (THAILAND) COMPANY LIMITED

Wave BCG (Thailand)


myclimate (Switzerland)



Programme of Activities Details	
<b>Title of PoA</b>	Alternate Wetting and Drying (AWD) in Thailand
<b>Project participant</b>	myclimate (Switzerland)
<b>Co-project participant</b>	Varuna (Thailand) Company Limited Wave BCG Company Limited
<b>Project owner</b>	Farmer
<b>Project type</b>	<input type="checkbox"/> Renewable energy of fossil fuel replacement <input type="checkbox"/> Improvement of the efficiency of electricity and heat generation <input type="checkbox"/> Use of public transportation system <input type="checkbox"/> Use of electric vehicle <input type="checkbox"/> Improvement of the efficiency of engine <input type="checkbox"/> Improvement of the efficiency of energy consumption in building and factory and in household <input type="checkbox"/> Use of natural refrigerant <input type="checkbox"/> Use of clinker substitute <input type="checkbox"/> Solid waste management <input type="checkbox"/> Domestic wastewater management <input type="checkbox"/> Methane recovery and utilization <input type="checkbox"/> Industrial wastewater management <input checked="" type="checkbox"/> Reduction, absorption and removal of greenhouse gases from the forestry and agriculture sectors <input type="checkbox"/> Capture, storage, and/or utilization of greenhouse gas <input type="checkbox"/> Other .....
<b>Programme of Activities</b>	The Emission Reduction Project from Water Management in Rice Cultivation Areas in Thailand (Alternate Wetting and Drying: AWD) has been developed to align with international greenhouse gas reduction goals while creating added value through the development of carbon credit initiatives in the agricultural sector. Covering 8 provinces across

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0


	<p>Thailand, the programme offers a Smart farm platform to monitor and manage rice areas, integrating satellite data with ground truth data to provide insights and ensure transparency. Smart Watcher digital platform on mobile is used for agricultural activity reporting from farmers, ensuring more efficient field management at scale. A combination of ground data and mathematical modelling will be used to estimate ER related to Methane, Nitrous Oxide and Carbon dioxide fluxes. The programme aims to achieve the following objectives:</p> <ul style="list-style-type: none"> <li>Reducing methane emissions from traditional rice farming practices.</li> <li>Providing knowledge and incentives to farmers for AWD adoption through carbon credits mechanism.</li> </ul> <p>Mitigation outcome units generated by this programme are outside Thailand's unconditional and conditional Nationally Determined Contributions (NDCs), and hence are surplus to its NDC target. According to Thailand's NDC Action Plan, 3% of their target is allocated for use within the cooperative approach framework (Article 6.2). This activity will be counted under this percentage.</p> <p>The AWD programme will be implemented in full compliance with: (i) Article 6 of the Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC); (ii) Thailand's Nationally Determined Contributions (NDCs) and its Action Plan 2021-2030 and (iii) The Bilateral Climate Agreement between Switzerland and Thailand under Article 6 of the Paris Agreement. The AWD programme will also be in line with Thailand's "Guidelines for the Use of Carbon Credits for International Purposes" (planned to be approved in Q3 2025). The project type does not correspond to an excluded project type (cf. Annex 2a of the CO2-Ordinance).</p>
--	--

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

<b>Crediting Period</b>	<input checked="" type="checkbox"/> 20 years <15/06/2026 - 14/06/2046>
<b>T-VER Methodology</b>	T-VER-P-METH-13-08
	Enhanced Good Practices in Paddy Rice Field
	1
<b>T-VER Tools (if any)</b>	-

Details of report preparation		
Finish date	June 2026	
Version	01	
Name of reporter	Name	Sirirat Sueamatcha
	Position	Business Coordinator
	Organization	Varuna (Thailand) Company Limited
	Telephone	+6620784058
Validation and Verification Body (VVB)		
Name of VVB	PSUVVB	


Details of the project participant (In case there is more than 1 project participant, please add the list of names)	
Project participant	Varuna (Thailand) Company Limited
Contact person	Sirirat Sueamatcha
Position	Business Coordinator
Address	Vanit Place Aree (25 floor) 304 Phahonyothin Rd, Samsen Nai, Phaya Thai, Bangkok 10400
Telephone	+6620784058

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

E-mail	SiriratS@varuna.co.th
--------	-----------------------


<b>Details of the project participant</b> (In case there is more than 1 project participant, please add the list of names)	
Project participant	Wave BCG Co., Ltd.
Contact person	Korakoj Sanguanpiyapan
Position	Chief Executive Officer
Address	2445/19 Tararom Business Tower, 14th Floor New Petchaburi Rd Bang Kapi, Huai Khwang, Bangkok 10310
Telephone	(+66) 091-010-9920
E-mail	korakoj.s@wavebcg.com

<b>Details of the project participant</b> (In case there is more than 1 project participant, please add the list of names)	
Project participant	Foundation myclimate (Switzerland)
Contact person	Enrica De Luca
Position	Project Manager Bilateral Cooperation
Address	Pfingstweidstrasse 10 8005 Zurich, Switzerland
Telephone	+41 44 500 43 51
E-mail	enrica.deluca@myclimate.org

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

## Content

	<b>Page</b>
Part 1 Programme of Activities Information	7
Part 2 Component Project Activities Information	31
Part 3 Monitoring Plan for Component Project Activities (CPA)	65
Part 4 Local Stakeholder Consultation	89
Appendix 1: Summary of Additionality	98
Appendix 2: Stakeholder Consultation Report	100
Appendix 3: Sustainable Development and Safeguards assessment	114

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

## Part 1: Programme of Activities Information


### 1.1 Objectives and details of programme activities

#### 1.1.1 Objectives of programme activities

The purpose of the programme is the dissemination of Alternate Wetting and Drying (AWD) practices in Thailand, replacing traditional rice farming practices. Each project under the programme will support the programme' goal of reducing methane emissions from rice paddies in Thailand.

Rice production in Thailand, while a significant contributor to the national economy, also generates substantial greenhouse gas emissions. Continuous flooding in paddy fields leads to significant methane (CH<sub>4</sub>) emissions, while the use of nitrogen-based fertilizers contributes to nitrous oxide (N<sub>2</sub>O) emissions. Furthermore, other cropping operations, such as tillage, sowing, harvesting, and water pumping, release carbon dioxide (CO<sub>2</sub>) through fossil fuel combustion. Open burning of rice straw, a common practice in Thailand particularly in irrigated areas, releases CO<sub>2</sub> and harmful pollutants such as black carbon, contributing to both air pollution and climate change. Beyond environmental concerns, farmers in Thailand face various challenges. External factors like climate change and natural disasters can significantly impact production, affecting both quality and quantity, and consequently impacting farmers' incomes and livelihoods. Internal factors, such as limited access to modern agricultural technologies, inadequate financial and bookkeeping management, and poor crop-land suitability, also hinder optimal production and profitability.

The AWD method for rice cultivation is a water management technique to cultivate irrigated rice with much less water than the traditional system of maintaining continuous standing water in the crop field. With AWD, a periodic drying and re-flooding irrigation schedule is applied, allowing the fields to dry up to 35 days before irrigation. This alternation between wet and dry conditions disrupts the environment needed for methane-producing bacteria, as the oxygen levels in the soil increase during the dry phases, actively inhibiting their anaerobic methanogenic activity.

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

### 1.1.2 Description of the organization's activities related to the project


In May 2026, the programme implementation has moved from Varuna (Thailand) Co., Ltd. to Wave BCG. Wave BCG, as well as Varuna, is committed to advancing sustainable development by supporting the achievement of carbon neutrality and net zero greenhouse gas emissions. The company leverages digital technologies and data-driven solutions to enhance environmental management, particularly in the agricultural sector.

In alignment with its carbon neutrality goals, the company promotes practices that reduce greenhouse gas emissions, such as the implementation of Alternate Wetting and Drying (AWD) in rice cultivation. This approach helps reduce methane (CH<sub>4</sub>) emissions while improving water-use efficiency. In addition, the company supports Measurement, Reporting, and Verification (MRV) processes to ensure transparency and credibility in greenhouse gas accounting.

In pursuing net zero emissions, the company plays a key role in developing and supporting carbon credit projects, enabling farmers and relevant stakeholders to participate in climate change mitigation. It also fosters collaboration with public and private sectors to scale up environmentally friendly smart agriculture practices.

Overall, the company's operations reflect a strong commitment to reducing greenhouse gas emissions, promoting efficient resource use, and contributing to long-term solutions for climate change.

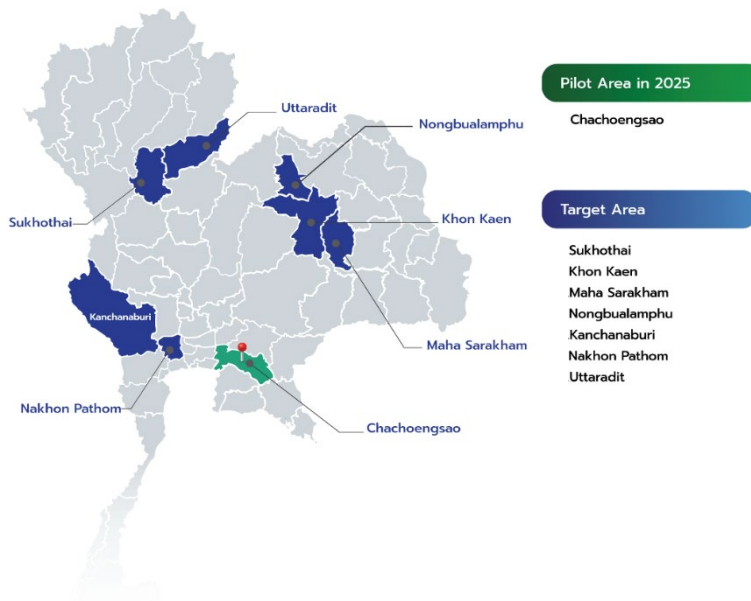
The company has set a target to reduce greenhouse gas emissions from the agricultural sector by more than 1.3 million tons of carbon dioxide equivalent (tCO<sub>2</sub>e) across eight target provinces: Chachoengsao, Sukhothai, Khon Kaen, Maha Sarakham, Nong Bua Lamphu, Kanchanaburi, Nakhon Pathom, and Uttaradit. This will be achieved through the implementation of the Alternate Wetting and Drying (AWD) rice cultivation project, covering a total area of approximately 196,742 hectares

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0


(1,229,634 rai), which significantly contributes to improving water-use efficiency and reducing greenhouse gas emissions in the agricultural sector.

### 1.2 Physical/geographical boundary of T-VER-PoA

The programme will target only provinces with set-up irrigation infrastructures, such as those present in the central regions but as well those in the North-East regions and possibly extending to other provinces with similar infrastructures including Chachoengsao, Sukhothai, Khon Kaen, Maha Sarakham, Nongbualamphu, Kanchanaburi, Nakhon Pathom and Uttaradit. The total area is targeted at 196,742 Ha (1,229,634 rai).



**Figure 1: Map Location of the PoA**


	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

**Table 1: Area participating in the AWD programme in rai per province and year**

Province	Area (rai)	Year
Chachoengsao	118,456	2026-2027-2028
Khon Kaen	51,376	2026-2027
Maha Sarakham	102,295	2026-2027
Nongbualamphu	7,386	2026-2027
Sukhothai	382,356	2027-2028-2029
Uttaradit	257,706	2027-2028-2029
Kanchanaburi	110,349	2028-2029
Nakhon Pathum	199,710	2028-2029
<b>Total</b>	<b>1,229,634</b>	

AWD practices can be carried out both during the wet and the dry season. This programme will conservatively mostly focus on the dry seasons, when fields are artificially irrigated and will only marginally target crops generated during the rainy seasons, as it is more difficult to control the water levels in the channels during the rainy season. For this reason, ex-ante emission reduction calculation is based on the conservative assumption that AWD will be implemented for one harvest season and that 10% of the area will succeed to implement AWD also in the wet season. Nevertheless, the programme will explore the feasibility of expanding AWD practices during the rainy season so that the activity may be cover two crops per year, if proved viable. In particular it is currently expected that this programme will start with the implementation of AWD in the rainy season of 2026 in Chachoengsao (15.06.2026). The expected GHG emission reduction is 1,161,808 tCO<sub>2</sub> (=1,045,627 ITMOs) until 2030 and 8'848'449 until the end of the crediting period.

AWD's controlled irrigation strategy reduces methane emissions, water use, and pumping costs likely without impacting yield while promoting pest control. Additional benefits, such as improved market access, are expected through the future planned accreditation by the Sustainable Rice Platform (SRP). Practices such as the use of organic amendments (e.g., compost, rice straw) instead of chemical ones will be discussed with the farmers. Their adoption will allow farmers to receive a higher-level certification under the SRP.

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

### 1.3 Measure and technology

In Thailand it is common practice that fields are continuously flooded (5–10 cm of standing water) throughout the growing season from the vegetation period, productive period and ripening period. The water is draining out of the field at the end of the growing season (90 days after sowing).

The application of the Alternate Wetting and Drying (AWD) system requires efficient water level management in rice fields. The principle involves alternating between flooded and non-flooded conditions in order to stimulate root development and strengthen rice stems. This practice is implemented during the vegetative period and the ripening period.


Water management begins with maintaining a water level of approximately 5 centimeters above the soil surface. Thereafter, the water is allowed to gradually recede until it falls approximately 10–15 centimeters below the soil surface, or until soil cracking becomes visible. The field is then re-irrigated. This wetting and drying cycle can be repeated several times according to the growth stages of rice, as follows:

**First cycle:** During the vegetative period at approximately 20–25 days after planting, water is allowed to drop 10–15 centimeters below the soil surface before re-irrigation.

**Second cycle:** During the vegetative period at approximately 35–40 days after planting, the same water management practice is applied.

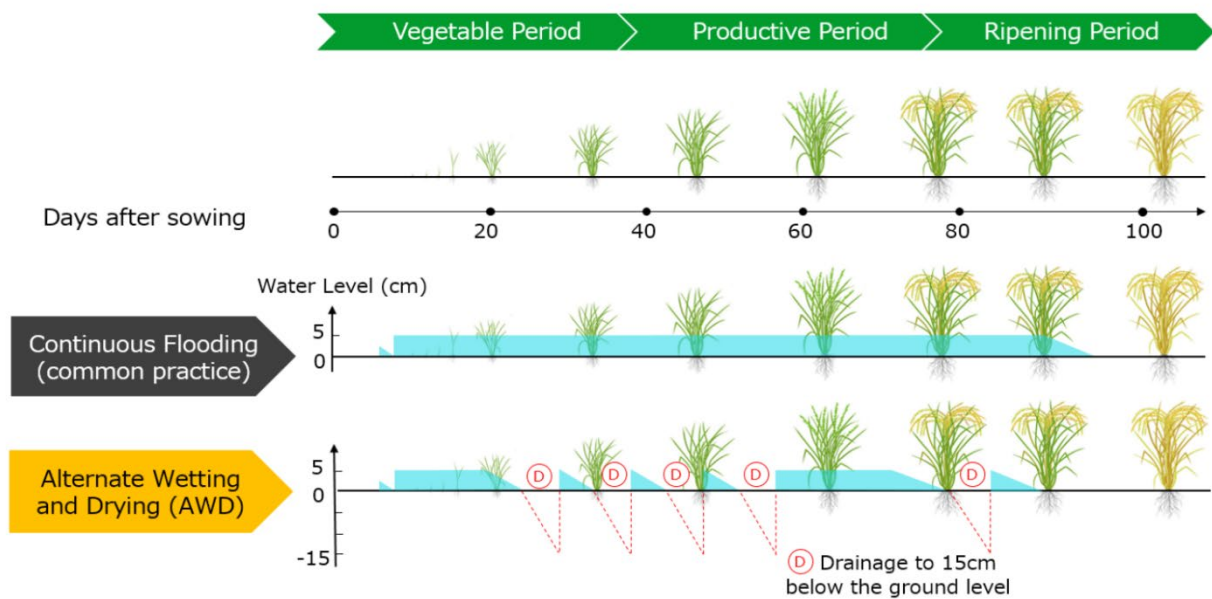
**Third cycle:** During the transition from vegetative to productive stage at approximately 50–55 days after planting, water is again allowed to recede before reflooding.

**Fourth cycle:** During the productive period at approximately 70–75 days after planting, water is managed in the same manner.

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0


**Fifth cycle:** During the ripening period at approximately 90–95 days after planting, the field is allowed to dry to the specified level before re-irrigation.

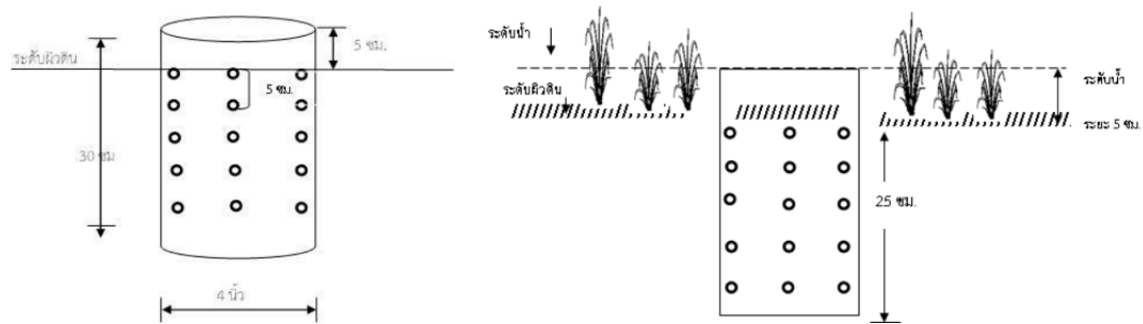
However, the number and timing of drying cycles may be adjusted depending on climatic conditions, site-specific characteristics, and field management suitability in order to achieve optimal rice growth and productivity.



**Figure 2: Illustration of AWD practice**

The AWD tube to monitor water level below the soil surface is a typical AWD tube with standard size of 7-15 cm diameter and 30-40 cm length and is installed 25 cm below ground level, with 5 cm remaining above the surface. It has 10–15 perforations for water level monitoring, spaced every 2–3 cm along the submerged portion (25 cm below ground). The holes have a diameter of 5–10 mm, preventing clogging while ensuring proper water flow. The programme will distribute 1 tube per field and the number of tubes will increase if the elevation within the field changes.

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0




**Figure 3: Illustration of the tube's positioning in the soil**

Knowledge and expertise of AWD water management practice will be transferred through trainings by experts from Thailand's Rice Department and Wave BCG Team. Each farmer will receive at least one level measuring tubes, depending on the size and slope of the field, as the location should be representative of the average water depth in the field.

Flat soil is crucial for the successful implementation of AWD as it ensures uniform water distribution across the field, preventing areas from either drying out completely or remaining overly saturated. The provinces targeted in the AWD programme have been assessed for their topography. It has been determined that Laser Land Levelling (LLL), which is an advanced and costly technique to achieve perfectly flat fields, will not be necessary in these areas due to their naturally suitable land conditions. This natural advantage simplifies the implementation process and reduces costs, making it easier for farmers to adopt AWD practices.




The Smart Watcher application is designed to collect and monitor data necessary to calculate ex-post mitigation outcomes. The application is accessed by a QR code that the farmers can easily scan from their phone. The primary focus of the application is tracking key agricultural and environmental parameters that are crucial for verifying the effectiveness of mitigation practices.


	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

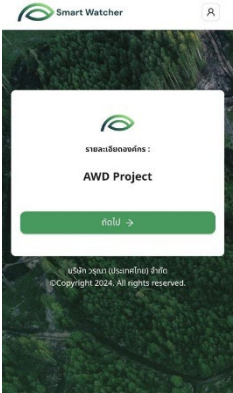
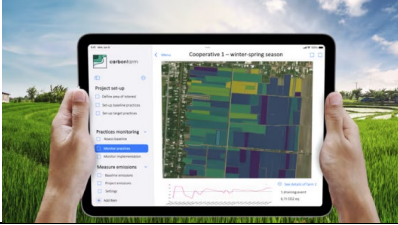
## Implementation Equipment

The tools used for implementing Alternate Wetting and Drying (AWD) rice cultivation, including plot coordinate recording and field data collection for documenting rice farming activities, are detailed in the accompanying table.

**Table 2: Implementation Equipment**


No.	Equipment image	Equipment	Utilization
1		Tube	Used to measure the water level in the rice field
2		Water pump	Used to pump water into or out of rice fields or irrigation canals constructed for rice cultivation activities.
3		Land leveler tractor	Used to remove small mounds and fill low-lying areas in order to smooth and level uneven soil surfaces, thereby improving field uniformity and enhancing water distribution efficiency across the field.

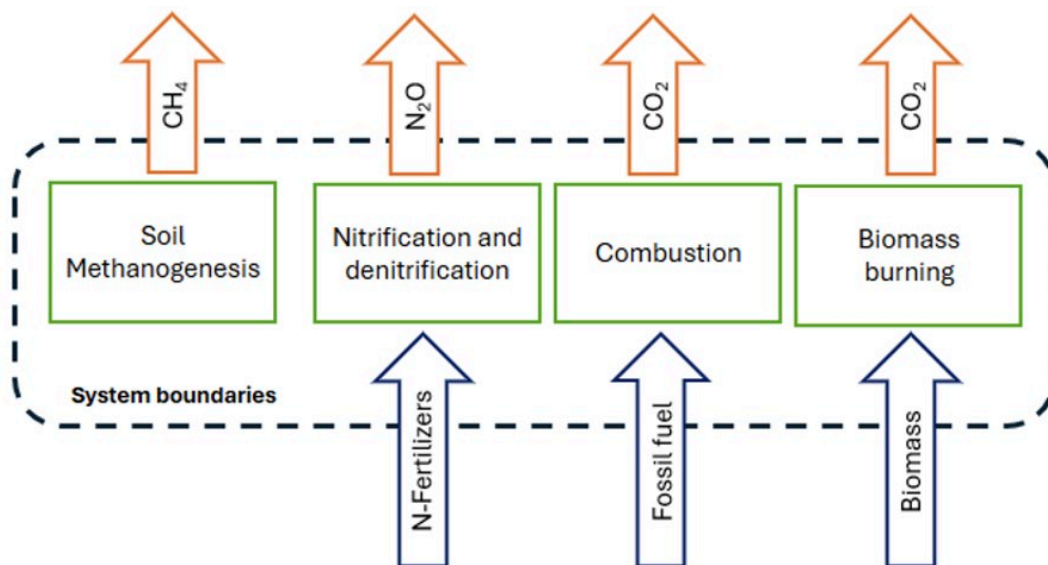
	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

No.	Equipment image	Equipment	Utilization
4		Smart Watcher or similar tool	A web application used to capture images of the water level in rice fields, along with location coordinates and the date of image capture.
5		Carbon Farm platform or similar tool	Platform for collecting and analyzing satellite images

## 1.4 Project Boundary

The geographic boundary encompasses the rice fields where the cultivation method and water regime are changed. The spatial extent of the programme boundary includes all fields that change the cultivation method in the context of the programme activity. The system boundary of the programme can be visualised as follows:

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0



**Figure 4: Schematic representation of system boundaries for baseline scenario above, and project scenarios below. In the project scenario it is estimated that there is no application of urea and liming.**


Soil methanogenesis, urea decomposition, soil carbonate dissolution and neutralization, nitrification and denitrification and fossil fuel combustions and biomass burning are included.

The following emissions are directly influenced by the programme:

- Methane emissions result from the anaerobic decomposition of organic matter by soil methanogen
- microbial transformation of Nitrogen in fertilizers in the soil through nitrification and denitrification processes
- combustion of fossil fuels (e.g.: from increased machineries use)
- biomass burning (i.e.: straw burning)

The following emissions are indirectly influenced by the programme:

- nitrogen losses through volatilization of ammonia and nitrogen oxides, as well as leaching and surface runoff, which subsequently lead to nitrous oxide emissions


	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

The PoA is comprised of projects/CPA, where farmers enrolled in each geographical group per year corresponds to a project, for a forecast of 10 Project/CPA. The 8 provinces are divided into 4 geographical groups:

- the province of Chachoengsao
- the provinces in the North-East, composed by Khon Kaen, Maha Sarakham and Nongbualamphu,
- the provinces in the North, composed by Uttaradit and Sukhothai and
- the provinces in the West composed by Kanchanaburi and Nakhon Pathom.

All farmers enrolled in a given geographical area will be registered in new project every year: since according to the updated Thai guidelines every project has to be validated, this approach has been selected to ensure timely ITMOs' issuance. Here below is the implementation plan per geographical area and year. Each colored box corresponds to a project.

	<b>Total Area rai</b>	<b>2026</b>		<b>2027</b>	<b>2028</b>	<b>2029</b>	<b>2030</b>
<b>Geographical area</b>							
Chachoengsao	118,456	98	99,902	18,456			
North-East (Khon Kaen, Maha Sarakham, Nongbualamphu)	161,057		15,000	146,057			
North (Uttaradit, Sukhothai)	640,062			213,354	213,354	213,354	
West (Kanchanaburi, Nakhon Pathom)	310,059				155,030	155,030	

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

<b>Total New Area (Hectare/Year)</b>	-		<b>115,000</b>	<b>377,867</b>	<b>368,384</b>	<b>368,384</b>	
<b>Cumulative Total Area (Hectare)</b>	1,229,634		115,000	492,867	861,251	1,229,634	1,229,634

## Steps for implementing projects in new areas

Steps for implementing projects in new areas can be divided into steps related to application process for participation in the AWD project and steps related to AWD implementation activities.

### 1) Application Process for Participation in the AWD Project

#### Step 1: Awareness and Application for Participation


Farmers are informed about the project through public relations activities and briefing sessions. They then voluntarily express their interest in participating and submit basic information along with land tenure documents for preliminary eligibility consideration.

#### Step 2: Selection and Registration of Rice Plots

The project developer verifies the qualifications of farmers and their cultivation areas by assessing their suitability in accordance with the criteria set by the Thailand Greenhouse Gas Management Organization (Public Organization) and the T-VER-P-METH-13-08 methodology. Once approved, the farmers and their rice plots are officially registered in the project system.

#### Step 3: Application Registration and Preparation

Farmers attend training sessions on the use of the application and the implementation of Alternate Wetting and Drying (AWD) practices. They then register and use the Smart Watcher application in conjunction with the system of Varuna (Thailand) Co., Ltd. to record relevant data, including:

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

- (1) Plot information, such as geographic coordinates and plot boundaries
- (2) Water management data
- (3) Cultivation activity records

#### Step 4: Field Preparation and Installation of Water Level Monitoring Tubes

Prior to cultivation, farmers are required to prepare their rice fields and install water level monitoring tubes to track subsurface water levels. The guidelines are as follows:

- (1) Use a PVC pipe approximately 20–30 cm in length, perforated around the pipe to allow water flow
- (2) Install the pipe into the soil at a depth of approximately 15–20 cm, ensuring that the top of the pipe is slightly above the ground surface
- (3) Place the pipe in a representative location of the field, avoiding areas that are excessively low-lying or elevated


This installation is intended to monitor water levels and support irrigation management in accordance with AWD principles. For example, water is allowed to recede to approximately -10 to -15 cm below the soil surface before re-irrigation. This is a critical step to ensure proper water management in compliance with project requirements.

#### Step 5: Implementation, Data Recording, and Benefit Sharing

Farmers carry out rice cultivation following AWD practices while consistently recording data through the application for monitoring and evaluation of greenhouse gas emission reductions. Once the project is certified, the results are used to calculate carbon credits, and the benefits are allocated to participating farmers in proportion to their level of participation.

#### 2) AWD Practice Procedure

##### Step 1: Land Preparation


	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

Prior to cultivation, rice fields are prepared to ensure optimal conditions for planting. The process begins with primary tillage, which involves plowing the soil to a depth of approximately 15–30 centimeters. This operation turns over the topsoil, allowing the lower soil layers to be exposed to air. It facilitates the decomposition of organic matter, reduces the accumulation of weeds and soil-borne pests, and improve soil structure, making it looser and more friable. Additionally, leaving the soil to dry for approximately 7–14 days after primary tillage helps to partially balance soil pH and enhances the activity of beneficial microorganisms.

This is followed by secondary tillage, which is conducted after primary tillage. The objective is to break down large soil clods into smaller particles and to evenly incorporate plant residues or organic matter into the soil. Secondary tillage improves soil texture, making it more suitable for rice cultivation, and enhances the soil's water-holding capacity, which is a critical factor for water management under the Alternate Wetting and Drying (AWD) system.

Subsequently, harrowing is carried out to level and smooth the soil surface using appropriate tools or leveling equipment. This process minimizes surface unevenness and slope, thereby reducing variations in water depth across the field. As a result, water levels can be controlled more accurately and efficiently throughout the entire plot. This is essential for implementing AWD practices and helps prevent issues such as waterlogging or excessive drying in certain areas of the field.

In addition, the field must be further leveled to ensure uniformity, enabling effective water level control. A small amount of water is then introduced into the field to prepare for cultivation. Finally, appropriate rice varieties suitable for AWD practices are selected to ensure efficient cultivation and alignment with project principles. The rice varieties applicable to the project area are as follows:

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0


The selection of project areas requires leveraging the national farmer database provided by Rice Department (RD) to preliminarily assess agricultural land size. As AWD farming activities necessitate precise water control for paddy fields, it is essential to integrate irrigation canal data from the Royal Irrigation Department (RID) to identify areas with suitable water inflow and outflow systems. This ensures the identification of optimal locations for implementing AWD farming.

To address the issue of double-counting carbon credits, the programme conducted a cross-check of provincial areas against existing carbon credit initiatives related to rice cultivation. The assessment identified 8 provinces eligible for the implementation of this programme. This assessment, together with the final confirmation from the relevant Thai authorities, ensure the avoidance of overlapping activities and unique credit allocations.

The Mitigation Activity (MA) applies a comprehensive set of measures to prevent double counting, double issuance, and double claiming across domestic and international carbon standards and mechanisms, including TGO, CDM, Verra (VCS), Gold Standard, CORSIA, and Article 6 frameworks. The following methods are implemented:

**Geographical and Programmatic Screening:** The project boundary has been reviewed against existing rice-sector mitigation programmes in Thailand to avoid overlap with other registered or supported activities. The MA will not be implemented in provinces covered by the Thai Rice GCF project or the Thai Rice NAMA programme. Continuous coordination with relevant Thai authorities is maintained to verify that no duplicate activities are registered under other schemes.

**Exclusive Carbon Rights and Ownership:** Carbon rights are transferred from the land owners to Wave BCG via the signing of the contracts. Wave BCG has formally waived all rights to the generated ITMOs to myclimate, ensuring a single ownership and transfer pathway for mitigation outcomes. Carbon rights are contractually assigned to avoid multiple entities claiming the same emission reductions.

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

**Single Registry and Issuance Control:** Emission reductions generated under the programme will be issued exclusively under Article 6 mechanism and will not be simultaneously registered, verified, or issued under TGO, CDM, Verra, Gold Standard, CORSIA, or any voluntary carbon market programme. Prior to issuance, registry screening and due diligence checks will be conducted to confirm that the same project, monitoring area, or emission reductions have not been listed elsewhere.


**Monitoring, Reporting, and Digital Traceability:** Wave BCG uses digital tracking applications and monitoring systems to record farmer participation, field locations, AWD implementation data, and emission reductions. This provides traceable and auditable records to verify that each mitigation outcome is uniquely generated and counted only once.

**Corresponding Adjustments under Article 6:** All mitigation outcomes transferred internationally as ITMOs will be subject to corresponding adjustments by the host country in accordance with Article 6 requirements. This ensures that the emission reductions are not counted simultaneously toward Thailand's NDC and by the acquiring entity or country.

**No Concurrent Climate Finance or Carbon Crediting:** The programme does not receive additional carbon finance from voluntary carbon market standards (e.g., Verra or Gold Standard), CORSIA, or other Article 6 programmes. Likewise, it does not receive overlapping international climate finance or government subsidy schemes linked to the same mitigation outcomes. This minimizes risks of duplicate environmental claims or financial double counting.

**Stakeholder and Government Coordination:** The activity owner and Wave BCG maintain direct communication with relevant Thai governmental authorities to confirm exclusivity of the programme activities and ensure alignment with national accounting systems and registry controls.

**Third-Party Validation and Verification:** Independent validation and verification processes will confirm that the emission reductions are additional, uniquely quantified, and not claimed under another

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

certification mechanism or programme. Documentation reviews will include cross-checks against publicly available registries and databases of TGO, CDM, Verra, and Gold Standard projects.


Together, these measures establish robust safeguards against double counting, double issuance, and double claiming across all applicable carbon standards and climate finance mechanisms.

The mitigation activity is planned to start with the first CPA with an area of 98 rai (15.7 ha) in the province of Chachoengsao (in June 2026). The remaining areas of Chachoengsao and Khon Kaen, Maha Sarakham and Nongbualamphu will be targeted in during 2026 and 2027 (likely in 4 CPAs), areas in the North will be targeted starting from 2027 (likely in 3 PCAs) and areas in the West starting from 2028 (likely in 2 CPAs) to reach a total of 196,742 ha (1,229,634 rai) by 2029. Projects' participation to the programme is subject to approval by the Thai authorities.

A stakeholder consultation (SHC) meeting took place in Chachoengsao in February 2025 to introduce the farmers to the programme, and the farmers of Chachoengsao were visited again by 2026 to sign the contracts. The stakeholder consultation meeting in Khon Kaen, Maha Sarakham and Nongbualamphu are planned for later in 2026. SHC for the additional provinces are planned for year 2027 onwards.

Awareness raising and technical trainings will be key activities in the programme implementation as a way of promoting the adoption of climate smart agriculture and ensuring the proper application of AWD practices. The successful adoption of the new farming practice and technology will depend on the involvement of the farming communities. Therefore, AWD communities will be built and scaled up. There will be dedicated field staff working with community leaders or a community leader will be hired part-time to build trust with farmers and enroll farmers into AWD communities.

### **1.5 PoA T-VER project management structure**

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

### 1.5.1 Project Participant Verification Process

The project proponent establishes procedures to verify the identity and eligibility of farmers prior to their participation in the project. This includes the collection and verification of identification documents, land tenure documents, and geospatial data of rice plots. Field verification and/or the use of satellite imagery or geospatial technologies may also be applied to confirm the existence and boundaries of the project area. Only participants who have successfully passed the verification process will be registered under each Component Project Activity (CPA).

### 1.5.2 Compliance with Criteria and Conditions


All CPAs participating in the project are required to comply with the applicable methodology, rules, and conditions in accordance with T-VER-P-METH-13-08. The project proponent provides training and guidance to farmers on AWD implementation practices, as well as data submission and recording procedures. Regular monitoring is conducted to ensure that project activities, water management, and data reporting are carried out in compliance with project requirements.

### 1.5.3 Prevention of Double Counting

To prevent double counting of greenhouse gas emission reductions, each rice plot is assigned a unique identification code and registered in the project database. Measures are implemented to ensure that the same plot is not registered under multiple CPAs or projects. In addition, cross-checking is conducted with the Rice Department's database, along with the use of geospatial data such as coordinates and plot boundaries. Farmers are also required to sign agreements confirming their participation in only one project.

### 1.5.4 Data Collection and Management for Each CPA

A systematic data management system is established for each CPA, which includes:


	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

- Collection of activity data (e.g., water levels, irrigation events, and cultivation activities) through the Smart Watcher system
- Periodic recording and submission of data, supported by evidence such as photographs
- Storage of data in a centralized database with traceability
- Data validation processes to ensure accuracy and completeness

All data are managed in accordance with Monitoring, Reporting, and Verification (MRV) principles and are made available for third-party verification to ensure transparency, reliability, and the accuracy of greenhouse gas emission reductions under the AWD project.

**General approach to stakeholder engagement:**


1. **Local Stakeholder consultation (LSC):** Before the implementation of the programme, a Stakeholder consultation will take place in person in each province in order to present this programme and the opportunities for farmers to join such an initiative. Community leaders and relevant stakeholders according to Handbook for Organizing Local Stakeholder Consultation and Participation Process for Premium T-VER Project from TGO will be invited to participate and will be able to ask questions regarding the project.
2. **Signing of contract and trainings:** After the stakeholder consultation, a follow up meeting will be organized for the signing of the contract between the farmers and Wave BCG. The contract between Wave BCG and the farmers has the purpose to bind the farmers' participation to the programme with Wave BCG's support, as well as to waive the carbon rights to the programme owner. At the end of the training session, the farmers will be provided with the contract and the AWD tubes. The trainings will include the explanation on how the farmers should use the mobile platform. The invitation to the first training session will clarify that the farmer needs to provide proof of the land right or lease of land for the signing of the contract.

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

3. **Start of implementation:** The signed contract and the proof of land right or land lease will be collected by Wave BCG before the start of the AWD activity. The start of implementation is defined as the starting of the sawing activity occurring right after the signing of the contract.


**Table 3: Participants: State and non-state actors involved in the implementation of the Activity**

	Name	Roles (can be multiple for one entity)
<b>Buyer of the ITMOs</b>	KliK Foundation	The KliK Foundation will be the buyer of the Mitigation Outcomes generated by the Activity.
<b>Project Owner</b>	myclimate	myclimate will be KliK Foundation's contractual partner
<b>Project Developer</b>	Wave BCG	Implementing-lead responsible for project execution, data collection, data analysis to ensure delivery of emission reductions, marketing and communication, and preparing project documents for programme registration, validation and verification according to Premium T-VER standard which allows the trading of mitigation outcomes under Article 6.2 of the Paris Agreement) and Swiss Government's requirements.
<b>MRV</b>	myclimate CarbonFarm	myclimate is responsible for the monitoring, reporting and verification (MRV) of the project to ensure the delivery of ITMOs to KliK Foundation. CarbonFarm, a French AWD monitoring provider, will provide support to myclimate for the development, calibration and application of the mathematical model.
<b>Technology Provider</b>	Varuna (Thailand) Company Limited	Provide technology for the farmers to enhance quality of AWD farming monitoring and managing which is cross checked with satellite and ground data.
<b>Farmers</b>	Farmers, both landowners and renters	Participate to the programme and implement AWD practices. Both farmers owning the fields and farmers renting the fields will be able to participate to the programme.

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

	Name	Roles (can be multiple for one entity)
<b>Main government agency</b>	Rice Department (RD)	Supporting and providing ground data of the potential areas which are suitable for AWD activity, give suggestion to engaging with the farmers for expanding AWD activity across Thailand. The RD shall also confirm that no other AWD programme, neither nationally nor internationally financed, is taking place in the provinces targeted by this programme.
	Royal Irrigation Department (RID)	Providing data on farmer's water usage and areas with water management systems essential for supporting AWD activities and effective water control. The RID shall also confirm that no other AWD programme, neither nationally nor internationally financed, is taking place in the provinces targeted by this programme.
	Department of Agriculture Extension (DoAE)	Supporting local stakeholder initiatives, fostering collaboration, and encouraging farmers to adopt improved rice cultivation practices for enhanced productivity and sustainability.
	Thailand Greenhouse Gas Management Organization (TGO)	Registers projects under TVER Premium, provides guidelines for project development, and develops methodologies.
<b>Government entities responsible for authorization</b>	Department for Climate Change and Environment (DCCE)	Thai authority granting authorization to the programme
	Federal Office for the Environment (FOEN)	Swiss authority granting authorization to the programme

The institutional set up of the AWD Activity involves several key agencies that ensure its effective implementation and sustainability. The RD, as the main government agency, oversees and supports the programme by providing critical ground data and guidelines for engaging with farmers. The RID supplies data on farmers' water usage and identifies areas with necessary water management systems. The AWD schedule will be developed in close collaboration with them, to ensure an optimal implementation of AWD practices. In addition, the DoAE fosters local initiatives and collaboration.


	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

The implementation of the programme is managed by Wave BCG, which coordinates the farmer engagement activities and training sessions in collaboration with the DoAE. Wave BCG also oversees data collection, ensuring that accurate and comprehensive information is gathered from all participants. The technology provider is Varuna, which has been engaged in the project development from its earlier stages and will provide the platform for farmers engagement.

To ensure smooth and effective communication throughout the programme, a coordination group or committee will be established. This group/committee will include representatives from Wave BCG, likely Varuna as the technology provider, the DoAE, and selected farmer leaders from participating communities. The committee will meet regularly to review progress, address any challenges, and facilitate timely information exchange between all stakeholders.

myclimate is responsible for MRV tasks, including summarising data, preparing monitoring reports, and organising verification processes (as well as organizing the programme's validation before its start). This involves meticulous analysis and reporting to ensure that the programme adheres to established standards and achieves its objectives. myclimate's role is crucial in validating the outcomes and maintaining transparency throughout the implementation phase, thereby enhancing trust among stakeholders.



	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

**Table 4: Expected ERs and ITMO volume transferrable to Switzerland for the programme.** Each line corresponds to a monitoring period. The last monitoring period is not complete, as it does not include the credits generated after 31/12/2030

In the table below we indicate the start of the implementation and the day of first effect for this AWD programme and for the first project. The start of implementation is defined as the day for the first project participating in the programme, and it corresponds with the sowing. The day of first effect is the moment when emission reduction starts to be generated: in the case of the AWD programme, this is the same for the programme and for the first project participating in the programme, and it also corresponds to the first day the farmers start applying AWD practices in a farming cycle. The farming cycle starts with seeding.

<b>Date</b>	<b>Programme</b>	<b>First project</b>
<b>Start of implementation</b>	15/06/2026	15/06/2026
<b>Day of first effect</b>	15/06/2026	15/06/2026
<b>End of crediting period</b>	14/06/2046	14/06/2031

Projects/CPAs comprised in this programme, their area available to AWD application, expected date of start of implementation and description of main agriculturally relevant parameters are described in the table below



**1.7 Document or Certificate of Land Use Rights** ( For Reduction, absorption and removal of greenhouse gases from the forestry and agriculture sectors)

- Identification document or certificate of land use rights.
- Identification boundaries of plantation.
- Identification the relevant regulation for project.

**1.8 Double Counting**

The project activity in this project used to register or in the process of registering other carbon other international climate mitigation mechanisms such as Development Mechanism (CDM), Voluntary Carbon Standard (VCS), Gold Standard etc. or Renewable Energy Certificates (REC)

No

Yes

Project Title.....


Scheme.....

Crediting period that is issued.....

**1.9 Additionality**

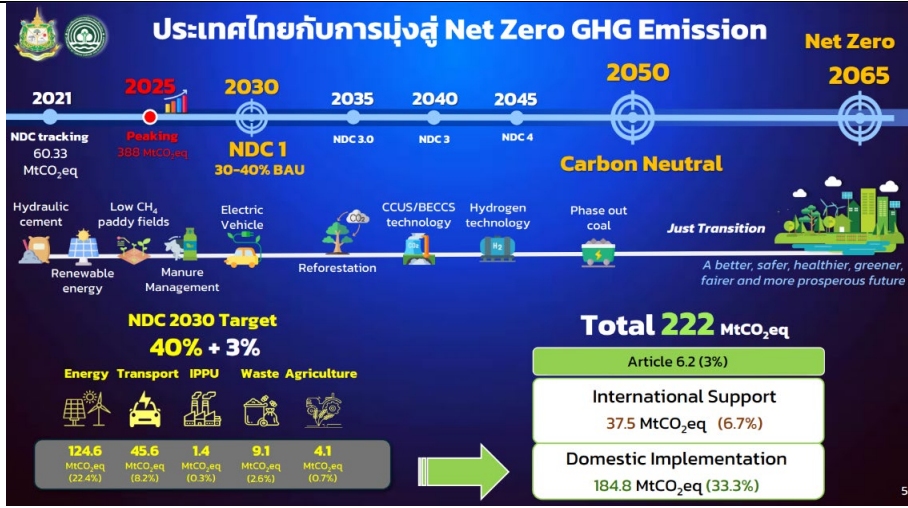
Thailand has made significant commitments under its NDC to reduce greenhouse gas emissions and enhance sustainable agricultural practices. As part of its NDC, Thailand aims to improve water management systems and promote the adoption of advanced farming techniques, including AWD. This commitment is reflected in various initiatives and policies aimed at minimizing methane emissions from rice cultivation, a major contributor to the country's greenhouse gas profile.


The proposed AWD project offers an additional layer of mitigation that complements Thailand's existing commitments. By focusing on areas not currently covered by neither the national AWD initiatives nor by climate finance activities (GCF), this programme ensures that its activities do not overlap with or duplicate the efforts already underway. Instead, it provides a supplementary

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

mechanism to go beyond the NDC targets, both conditional and unconditional, thus contributing to Thailand's overall climate goals in a more ambitious manner.


**Table 5: Related Policy and Regulation**

Related Policy and Regulation	Description
Description	Thailand's 2 <sup>nd</sup> Updated Nationally Determined Contributions (NDC) and its Action Plan 2021-2030
Type	Policy
Impact	 <p>The NDC Action Plan on Mitigation 2021-2030 has been developed as a strategic framework for the main responsible agencies and related organizations to reduce greenhouse gas emissions in Thailand. The plan aims to achieve the country's Nationally Determined Contribution (NDC) targets, which includes a 30–40% reduction from the Business-As-Usual (BAU) scenario by 2030.</p> <p>This Action Plan outlines strategies that collectively represent a potential reduction of 222 million tonnes of CO<sub>2</sub> equivalent (MtCO<sub>2</sub>eq) by 2030. The emissions reductions can be categorized as follows:</p> <p>184.8 MtCO<sub>2</sub>eq (33.3%) from domestic actions (unconditional target).</p>

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

Related Policy and Regulation	Description
	<p>37.5 MtCO<sub>2</sub>eq (6.7%) from international support (conditional target).</p> <p>Furthermore, 3% (ca. 16.6 M tCO<sub>2</sub>eq) will come from Article 6 of the Paris Agreement mechanism, leading to a total of 43%. This will be additional to the country's conditional and unconditional targets. This AWD program falls within this category.</p>

Related Policy and Regulation	Description
Description	Guidelines for the Use of Carbon Credits for International Objectives
Type	Guidelines
Impact	<p>The Guidelines for the Use of Carbon Credits for International Objectives have been adopted by the Cabinet on the 26<sup>th</sup> of August 2025. These provide a list of eligible sectors under Article 6, which includes “methane reduction of rice cultivation”.</p> <p>These guidelines replace the Carbon Credit Management Guideline and Mechanism, which was approved by the National Committee on Climate Change in 2022.</p>

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

## Part 2 Component Project Activity (CPA) Information

### 2.1 Component Project Activities (CPA) Details

The GHG reduction activity for the project is the dissemination and adoption of Alternate Wetting and Drying (AWD) practices in rice cultivation in Thailand, replacing the traditional practice of continuous flooding. This activity is categorized as the Reduction, absorption and removal of greenhouse gases from the forestry and agriculture sectors.

#### Key Aspects of the Activity:

- Technique: AWD is a water management technique involving a periodic drying and re-flooding irrigation schedule. The field is allowed to dry up to 35 days before re-irrigation.
- Mechanism: This alternation between wet and dry conditions increases the oxygen levels in the soil, which actively inhibits the anaerobic methanogenic activity of methane-producing bacteria, thus reducing methane emissions.
- Emissions Reduced/Monitored: The project aims to reduce emissions related to Methane(CH<sub>4</sub>), and Carbon dioxide(CO<sub>2</sub>) monitoring additionally also Nitrous Oxide(N<sub>2</sub>O).

Specifically, the project boundary includes:


- CH<sub>4</sub> emissions from anaerobic decomposition of organic matter.
- N<sub>2</sub>O emissions from the microbial transformation of Nitrogen in fertilizers.
- CO<sub>2</sub> emissions from the combustion of fossil fuels (e.g., from machinery use) and biomass burning (i.e., straw burning).

CPA/Project N.	Geographical area	Total area of rice cultivation –rai <sup>1</sup>	Area to be converted to AWD by the programme - rai	Expected date of start of implementation	Description of the project area	Current planned AWD implementation by the Rice department – rai	Expected number of farmers participating in the activity <sup>2</sup>
1	Chachoengsao	848,510 rai	98 rai <sup>3</sup>	June 2026	<b>Wet seasons:</b> Planting Period: May-June Harvesting Period: Nov-Dec  <b>Dry season:</b> Planting Period: Nov-Dec Harvesting Period: March-April <b>Soil type:</b> Alluvial and Clayey Soil  <b>Location of nearest closed chamber:</b> Chachoengsao <b>Baseline fertilizer type:</b> Chemical fertilizer and some organic fertilizer	1,900 rai (corresponds to <1% of the total area)	2
2			99,902 rai	June 2026 for 5000 rai and the rest in the dry season 2026			2,500
3			18,456 rai	2027			460
4	North-East provinces (Khon Kaen, Maha Sarakham, Nongbualamphu)	459'000 rai	15,000 rai	Dry season 2026	<b>Wet season:</b> Planting Period: May-June Harvesting Period: Nov-Dec  <b>Dry season:</b> Planting Period: Nov-Dec Harvesting Period: March-April <b>Soil type:</b> Sandy and Lateritic Soil  <b>Location of nearest closed chamber:</b> Khon Kaen and Udon Thani <b>Baseline fertilizer type:</b> Chemical fertilizer and some organic fertilizer	0	340
5			146,057 rai	2027			3,700
6	North (Uttaradit, Sukhothai)	876,794 rai	213,354 rai	2027	<b>Wet season:</b> Planting Period: May-June Harvesting Period: Nov-Dec	0	5,400

<sup>1</sup> Information on total area available for rice cultivation was provided confidentially to Varuna

<sup>2</sup> The expected number of farmers participating in the activity have been calculated assuming an average farm size of 40 rai (see also ER calculation)


<sup>3</sup> In the ER excel calculation, the total area in Chachoengsao in the sum of project 1 and 2 (18,953 ha – 118,456 rai).

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

CPA/Project N.	Geographical area	Total area of rice cultivation -rai <sup>1</sup>	Area to be converted to AWD by the programme - rai	Expected date of start of implementation	Description of the project area	Current planned AWD implementation by the Rice department - rai	Expected number of farmers participating in the activity <sup>2</sup>
7			213,354 rai	2028	<b>Dry season:</b> Planting Period: Nov-Dec Harvesting Period: March-April <b>Soil type:</b> Alluvial and Clayey Soil <b>Location of nearest closed chamber:</b> Sukhothai <b>Baseline fertilizer type:</b> Chemical fertilizer and some organic fertilizer		5,400
8			213,354 rai	2029			5,400
9	West (Kanchanaburi, Nakhon Pathom)	908,438 rai	155,030 rai	2028	<b>Wet season:</b> Planting Period: May-June Harvesting Period: Nov-Dec <b>Dry season:</b> Planting Period: Nov-Dec Harvesting Period: March-April <b>Soil type:</b> Alluvial and Clayey Soil <b>Location of nearest closed chamber:</b> Suphanburi and Ratchaburi <b>Baseline fertilizer type:</b> Chemical fertilizer and some organic fertilizer	1900 for Kanchanaburi  (corresponds to <1% of the total area)	3,900
10			155,030 rai	2029			3,900
	TOTAL		1,229,663			3800	31,000

## 2.2 Compliance with T-VER PoA project development criteria

Criteria	Explanation
CPA applies the same T-VER methodology as the proposed Programme of Activities.	The PoA defines the methodology that all of its Component Project Activities (CPAs) must use, as CPAs are essentially the implementation components of the Programme of Activities.
CPA is the same project type as the proposed Programme of Activities.	Be the same project type: The PoA is categorized as the “Reduction, absorption and removal of greenhouse gases from the forestry and agriculture sectors” through a specific activity (Alternate Wetting and Drying in rice farming).
The total amount of expected GHG emission reductions/removals of all CPA shall not be 60,000 tCO <sub>2</sub> eq/year.	Not applicable after updated guidelines from TGO
The size of each CPA shall be a micro-scale project.	Not applicable after updated guidelines from TGO
The addition of CPA have to occur within the timeframe of the registered PoA.	The addition of all Component Project Activities (CPAs), including new farmer groups or areas joining the programme, must be finalized within the registered crediting period of the Programme of Activities (PoA), which extends from June, 2026, to December 31, 2030 and beyond to 14/06/2046.


	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

## 2.3 T-VER Methodology and Tools

No.	Methodology Code	Version	Title of methodology/tool
1	T-VER-P-METH-13-08	1.0	Enhanced Good Practices in Paddy Rice Field

### 2.3.1 Project Conditions of CPA

<b>Code:</b> T-VER-P-METH-13-08	
<b>Version:</b> Version 1.0	
<b>Methodology/tool:</b> Enhanced Good Practices in Paddy Rice Field	
Project Conditions	Justification/Explanation
Project must be located within Thailand	The project is in 8 rice-growing provinces within Thailand.
Paddy rice cultivation areas with identifiable project boundaries	Farm plots will be geo-referenced to ensure clear boundaries and avoid overlap with other projects.
Farmers adopt at least one enhanced good practice (e.g., AWD)	Current practice is continuous flooding, which causes high CH <sub>4</sub> emissions.
Project participants must provide historical data (e.g.: water use, fertilizer application, yields)	Farmers adopt AWD, an approved good practice under the methodology.
Project must demonstrate additionality compared to baseline practices	AWD is not common practice; the project provides training, monitoring, and incentives to ensure adoption.
Monitoring system must be in place (farmer records, field measurements, drone/satellite data, or smart devices)	Monitoring will be the bases for mathematical model.


	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

Compliance with Thai laws, regulations, and agricultural standards	Farmers participate voluntarily, and the project complies with all Thai agricultural laws.
No double counting of GHG reductions (with other carbon programs or mechanisms)	Credits will be registered only under TGO to ensure integrity.
Participation must be voluntary by farmers/communities	Data will be stored for at least 2 verification cycles.


### 2.3.2 Relevant information for calculating greenhouse gas emissions

#### Relevant greenhouse gas sources for calculation

Emission Source	Type of Greenhouse Gas	Detail of activity
Baseline Emission		
Calculation methane reduction from modelling reference by TGO guideline	CO <sub>2</sub>	The CO <sub>2</sub> emissions in the baseline are related to the agricultural practices which burn fossil fuel as well as from the application of limestone, dolomite and urea. The last three have been estimated ex-ante and are excluded because baseline emissions represent < 1% of methane sources (0.33%). The ex-post fossil fuel consumption will be considered for baseline source, despite baseline emissions represents 2.54% of methane sources and according to the methodology, emissions amounting to < 5% of methane sources could be omitted from the estimations.

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

	CH <sub>4</sub>	The activity of methanogenic microorganisms in soil, calculated using modelling parameters (ex-post) and based on default values (ex-ante).
	N <sub>2</sub> O	The N <sub>2</sub> O emissions in the baseline are related to the use of nitrogen-based fertilizers. Direct and indirect baseline emissions have been estimated ex-ante (based on IPCC guidelines) and, despite they represent less than 1% of methane sources (0.14% for direct nitrous oxide emissions and 0.17% for indirect nitrous oxide emissions) and therefore could be neglected, the ex-post emissions will be considered as part of the results of mathematical model developed.
Project Emission		
Improving Water Management of rice cultivation activity for methane reduction	CO <sub>2</sub>	See above. The project will measure these emissions (ex-post) due to the activity.
	CH <sub>4</sub>	The activity of methanogenic microorganisms in soil, calculated using modelling parameters (ex-post) and based on default values (ex-ante).
	N <sub>2</sub> O	See above. The N <sub>2</sub> O emissions for project activity will be part of the results of mathematical model (ex-post).
Leakage Emission		
NA	NA	NA

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0


## 2.4 Calculation of emission reductions of CPA

### 2.4.1 Calculation of baseline sequestration/emission

<b>Code:</b> T-VER-P-METH-13-08
<b>Version:</b> 1.0
<b>Methodology/tools:</b> Enhanced Good Practices in Paddy Rice Field T-VER-P-TOOL-01-13
<b>Equation:</b>
$BE_y = \sum_{s=1}^m BE_s$ $BE_s = \sum_{i=0}^n \left( (CH_{4SOIL,BL,s,i} \times CF) + CO_{2LIME,BL,s,i} + CO_{2UREA,BL,s,i} + N_2O_{SOIL,BL,s,i} \right)$

Where:

$BE_y$	=	Total baseline greenhouse gas emissions in year y (tonnes of carbon dioxide equivalent)
$BE_s$	=	Baseline greenhouse gas emissions in growing season s (tonnes of carbon dioxide equivalent)
$CH_{4SOIL,BL,s,i}$	=	Methane emissions from soil carbon in the baseline scenario during growing season s for sample unit i (tonnes of carbon dioxide equivalent)
$CF$	=	Conservativeness factor or below business-as-usual adjustment factor
$CO_{2LIME,BL,s,i}$	=	Carbon dioxide emissions from lime application in the baseline scenario during growing season s for sample unit i (tonnes of carbon dioxide equivalent)
$CO_{2UREA,BL,s,i}$	=	Carbon dioxide emissions from urea fertilizer application in the baseline scenario during growing season s for sample unit i (tonnes of carbon dioxide equivalent)

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

- $N_2O_{SOIL,BL,s,i}$  = Nitrous oxide emissions from nitrogen fertilizer application in the baseline scenario during growing season s for sample unit i (tonnes of carbon dioxide equivalent)
- $I$  = Sample unit i as listed in Table 1 (n = total number of sample units)
- $S$  = Growing season (s = number of growing seasons in the project year)

### Ex-ante Baseline emissions for $CH_{4SOIL, BL,s,i}$

The baseline and project emissions source of  $CH_4$  – soil methanogenesis are assessed by a process-based model. As per the “Guideline for Premium Thailand Voluntary Emission Reduction Program (Premium T-VER) version 5.0”<sup>4</sup>, if more than 16,000 tCO<sub>2</sub>eq/year, it is considered to be a large-scale project. The project chooses the DNDC based modelling method.


Assessment Method: Modelling

$$CH_{4SOIL,BL,s,i} = GWP_{CH_4} \times fCH_{4SOIL,BL,s,i} \quad \text{Equation 1}$$

Where:

- $CH_{4SOIL,BL,i,t}$  = Methane emissions from soil methanogenesis in the baseline scenario during growing season s for sample unit i (tonnes of carbon dioxide equivalent)
- $fCH_{4SOIL,BL,i,t}$  = Methane emissions from soil methanogenesis in the baseline scenario as simulated by the model during growing season s for sample unit i (tonnes of methane)

<sup>4</sup> Guideline for Premium Thailand Voluntary Emission Reduction Program (Premium T-VER) V.4, provided separately to the validator.

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

$GWP_{CH_4}$  = Global warming potential of methane (tonnes of carbon dioxide equivalent per tonne of methane)

The model estimates greenhouse gas emissions from agricultural systems, including CH<sub>4</sub> and N<sub>2</sub>O emissions from soils. The ex-ante calculations are based on: (1) emission data from experimental or research plots, and (2) data from high-quality academic literature, such as peer-reviewed journal publications.

A Monte Carlo analysis was conducted by repeatedly running the DNDC model while sampling plausible ranges for uncertain inputs (e.g., timing and implementation parameters). This approach generates a distribution of outcomes rather than a single point estimate, allowing for the quantification of uncertainty and sensitivity. It also supports the selection of a conservative average ex-ante value that is not overly influenced by any single assumption. In practice, this method helped produce a more representative sample, particularly after filtering out a significant number of fields due to soil representativeness issues, including clay content.


The scientific basis for applying models to estimate greenhouse gas emissions from agricultural areas is described in Appendix 3 of T-VER-P-METH-13-08 Version 01. In addition, the document “Ex-ante Methodology Overview & Results,” prepared by Carbon Farm, has been shared as a confidential reference.

### **Ex-post Baseline emissions for CH<sub>4SOIL, BL,s,i</sub>**

The baseline and project emissions source of CH<sub>4</sub> – soil methanogenesis will be assessed by a process-based model. As per the “Guideline for Premium Thailand Voluntary Emission Reduction Program (Premium T-VER) version 5.0”<sup>5</sup>, if more than 16,000 tCO<sub>2</sub>eq/year, it is considered to be a

---

<sup>5</sup> Guideline for Premium Thailand Voluntary Emission Reduction Program (Premium T-VER) V.4, provided separately to the validator.

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

large project. The project chooses the modelling method including direct measurement for plausibility checks.

Assessment Method: Modelling

$$CH_{4SOIL,BL,s,i} = GWP_{CH_4} \times fCH_{4SOIL,BL,s,i}$$


Where:

$CH_{4SOIL,BL,i,t}$  = Methane emissions from soil methanogenesis in the baseline scenario during growing season s for sample unit i (tonnes of carbon dioxide equivalent)

$fCH_{4SOIL,BL,i,t}$  = Methane emissions from soil methanogenesis in the baseline scenario as simulated by the model during growing season s for sample unit i (tonnes of methane)

$GWP_{CH_4}$  = Global warming potential of methane (tonnes of carbon dioxide equivalent per tonne of methane)

The model predicts greenhouse gas emissions from agricultural areas, such as CH<sub>4</sub> and N<sub>2</sub>O emissions from soil. The model is calibrated and validated using gas measurements from the following sources: (1) collecting actual emission data from the project area in representative areas, (2) emission data from experimental plots or research plots, or (3) data from high-quality academic literature, such as those reviewed by experts or published in academic journals. A plausibility check will be performed against measurements carried out with closed chambers. This approach is additional to TGO requirements and ensures that the model is conservative and in line with actual field conditions. Specifically for ex-ante, the current version of the model has been calibrated and validated using 125 paired datasets of emission reductions from practice changes across Thailand, Vietnam, and Cambodia, derived from peer-reviewed literature. This version was applied by Carbon Farm to generate the ex-ante estimates. Prior to the first verification, the calibration and validation report will be updated to incorporate any newly available datasets and to ensure that model parameterisation is fully representative of Thai production systems.

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

The scientific principles for using models to assess greenhouse gas emissions from agricultural areas are detailed in Appendix 3 of T-VER-P-METH-13-08 Version 01

### Ex-ante Baseline emissions for CO<sub>2LIME, BL,s,i</sub>

For the assessment of carbon dioxide emissions from liming (using calcite, calcium carbonate, or calcium magnesium carbonate), the calculation is done based on default values as set in T-VER-P-METH-13-08.

Some liming materials are both locally produced and imported. Only the amount produced locally is considered for baseline emissions:

$$CO_{2LIME,BL,s,i} = \sum \left[ \left( (M_{Limestone,BL,s,i} \times A_{s,i}) \times EF_{Limestone} \right) + \left( (M_{Dolomite,BL,s,i} \times A_{s,i}) \times EF_{Dolomite} \right) \right] \times \frac{44}{12}$$

Where:

$CO_{2LIME,BL,s,i}$  = Quantity of carbon dioxide emitted from lime application in the baseline scenario in growing season s of sample unit i (tonnes of carbon dioxide)

$M_{Limestone,BL,s,i}$  = Quantity of lime used in the baseline scenario in growing season s of sample unit i (tonnes of lime per rai)


$EF_{Limestone}$  = Greenhouse gas emission factor from lime use (tonnes of carbon per tonne of lime)

$M_{Dolomite,BL,s,i}$  = Quantity of dolomite applied in the baseline scenario in growing season s of sample unit i (tonnes of dolomite per rai)

$EF_{Dolomite}$  = Greenhouse gas emission factor from dolomite application (tonnes of carbon per tonne of dolomite)

$A_{s,i}$  = Harvested area in growing season s of sample unit i (rai)

$\frac{44}{12}$  = Molecular weight ratio of carbon dioxide to carbon

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

The ex-ante ER calculation has shown that CO<sub>2</sub> emissions from liming are below 5%.

### Ex-post Baseline emissions for CO<sub>2LIME, BL,s,i</sub>

These are assessed as zero, because negligible in ex-ante estimation.

### Ex-ante Baseline emissions for CO<sub>2UREA, BL,s,i</sub>

Urea is broken down by an enzyme called urease, resulting in the release of carbon dioxide gas. Additionally, the ammonia in urea can be transformed, leading to the release of nitrous oxide gas, which will be calculated in a subsequent section.

Some urea fertilizers are both locally produced and imported. Only the amount produced locally is considered for baseline emissions.


For the assessment of carbon dioxide emissions from urea application, a third assessment approach is necessary: calculation using default values with the following equation:

$$CO_{2UREA,BL,s,i} = \sum \left( (M_{Urea,BL,s,i} \times A_{s,i}) \times EF_{Urea} \right) \times \frac{44}{12}$$

Where:

$CO_{2UREA,BL,s,i}$	=	Carbon dioxide emissions from urea application in the baseline scenario in growing season s of sample unit i (tonnes of CO <sub>2</sub> )
$M_{Urea,BL,s,i}$	=	Quantity of urea used in the baseline scenario in growing season s of sample unit i (tonnes of urea per rai)
$EF_{Urea}$	=	Greenhouse gas emission factor for urea (tonnes of carbon per tonne of urea)
$A_{s,i}$	=	Harvested area in growing season s of sample unit i (rai)
$\frac{44}{12}$	=	Molecular weight ratio of carbon dioxide to carbon

The ex-ante ER calculation has shown that CO<sub>2</sub> emissions from urea are below 5%.

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

### Ex-post Baseline emissions for $CO_{2UREA, BL,s,i}$

These are assessed as zero, because negligible in ex-ante estimation.

### Ex-ante Baseline emissions for $N_2O_{SOIL, BL,s,i}$

Nitrogenous fertilizers applied to cultivated land, whether in the form of chemical fertilizers, organic fertilizers, manure, or agricultural residues, undergo transformations by soil microorganisms through nitrification and denitrification processes. During these processes, direct nitrous oxide emissions occur. Additionally, indirect nitrous oxide emissions arise from losses due to ammonia and nitrogen oxide volatilization, as well as leaching or surface runoff, where lost nitrogen is transformed and released as nitrous oxide.


The assessment of nitrous oxide emissions from nitrogen fertilizer application is based on DNDC based modelling method following the scientific principles for using models to assess greenhouse gas emissions from agricultural areas are detailed in Appendix 3 of T-VER-P-METH-13-08 Version 01. In addition, the document “Ex-ante Methodology Overview & Results,” prepared by Carbon Farm, has been shared as a confidential reference.

$$N_2O_{SOIL, BL,s,i} = GWP_{N_2O} \times fN_2O_{SOIL, BL,s,i} \quad \text{Equation 2}$$

Where:

$N_2O_{SOIL, BL,s,i}$  = Nitrous oxide emissions from nitrogen fertilizer application in the baseline scenario in growing season s of sample unit i (tonnes of carbon dioxide equivalent)

$fN_2O_{SOIL, BL,s,i}$  = Nitrous oxide emissions from nitrogen fertilizer application in the baseline scenario obtained from the model in growing season s of sample unit i (tonnes of nitrous oxide)

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

$GWP_{N2O}$  = Global warming potential of nitrous oxide (tonnes of carbon dioxide equivalent per tonne of nitrous oxide)

### Ex-post Baseline emissions for $N_2O_{SOIL, BL, s, i}$

Nitrogenous fertilizers applied to cultivated land, whether in the form of chemical fertilizers, organic fertilizers, manure, or agricultural residues, undergo transformations by soil microorganisms through nitrification and denitrification processes. During these processes, direct nitrous oxide emissions occur. Additionally, indirect nitrous oxide emissions arise from losses due to ammonia and nitrogen oxide volatilization, as well as leaching or surface runoff, where lost nitrogen is transformed and released as nitrous oxide.

If the project requires an assessment of nitrous oxide emissions from nitrogen fertilizer application, the **modelling method** is used.


The assessment of nitrous oxide emissions from nitrogen fertilizer application is based on mathematical model following the scientific principles for using models to assess greenhouse gas emissions from agricultural areas are detailed in Appendix 3 of T-VER-P-METH-13-08 Version 01.

$$N_2O_{SOIL, BL, s, i} = GWP_{N2O} \times fN_2O_{SOIL, BL, s, i}$$

Where:

$N_2O_{SOIL, BL, s, i}$  = Nitrous oxide emissions from nitrogen fertilizer application in the baseline scenario in growing season s of sample unit i (tonnes of carbon dioxide equivalent)

$fN_2O_{SOIL, BL, s, i}$  = Nitrous oxide emissions from nitrogen fertilizer application in the baseline scenario obtained from the model in growing season s of sample unit i (tonnes of nitrous oxide)

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

$GWP_{N2O}$  = Global warming potential of nitrous oxide (tonnes of carbon dioxide equivalent per tonne of nitrous oxide)

## 2.4.2 Calculation of project sequestration/emission

<b>Code:</b> T-VER-P-METH-13-08
<b>Version:</b> 1.0
<b>Methodology/tool:</b> Enhanced Good Practices in Paddy Rice Field T-VER-P-TOOL-01-13
<b>Equation:</b> $PE_y = \sum_{s=1}^m PE_s$ $PE_s = \sum_{i=0}^n \left( CH_{4SOIL,P,J,s,i} + CO_{2LIME,P,J,s,i} + CO_{2UREA,P,J,s,i} + N_2O_{SOIL,P,J,s,i} + CO_{2FUEL,P,J,s,i} + Non - CO_{2BURNing,P,J,s,i} \right)$

Where:


$PE_y$  = Total greenhouse gas emissions from project activities in year y (tonnes of carbon dioxide equivalent)

$PE_s$  = Total greenhouse gas emissions from project activities in growing season s (tonnes of carbon dioxide equivalent)

$CH_{4SOIL,P,J,s,i}$  = Methane emissions from soil methanogenesis from project activities in growing season s of sample unit i (tonnes of carbon dioxide equivalent)

$CO_{2LIME,P,J,s,i}$  = Carbon dioxide emissions from lime application from project activities in growing season s of sample unit i (tonnes of carbon dioxide equivalent)

$CO_{2UREA,P,J,s,i}$  = Carbon dioxide emissions from urea fertilizer application from project activities in growing season s of sample unit i (tonnes of carbon dioxide equivalent)

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

- $N_2O_{SOIL,PJ,s,i}$  = Nitrous oxide emissions from nitrogen fertilizer application from project activities in growing season s of sample unit i (tonnes of carbon dioxide equivalent)
- $CO_{2FUEL,PJ,s,i}$  = Carbon dioxide emissions from fossil fuel combustion from project activities in growing season s of sample unit i (tonnes of carbon dioxide equivalent)
- $Non - CO_{2BURNing,PJ,s,i}$  = Greenhouse gas emissions from biomass burning from project activities in growing season s of sample unit i (tonnes of carbon dioxide equivalent)
- I = Sample unit I as referred in table 1 (n = The total number of sample units)
- S = Growing season (s = The total number of growing seasons in the project)


### Ex-ante Project emissions for $CH_{4SOIL, PJ,s,i}$

As described for the baseline,  $CH_4$  emissions from soil methanogenesis under the project scenario are assessed using a modeling approach. The DNDC model was run repeatedly to generate a range of plausible outcomes, capturing variability and uncertainty in the estimates.

$$CH_{4SOIL,PJ,s,i} = GWP_{CH4} \times fCH_{4SOIL,PJ,s,i} \quad \text{Equation 3}$$

Where:

$$CH_{4SOIL,PJ,i,t} = \text{Methane emissions from soil carbon in the project activities during growing season s for sample unit i (tonnes of carbon dioxide equivalent)}$$

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

$fCH_{4SOIL,PJ,i,t}$  = Methane emissions from soil carbon in the project activities as simulated by the model during growing season s for sample unit i (tonnes of methane)

$GWP_{CH_4}$  = Global warming potential of methane (tonnes of carbon dioxide equivalent per tonne of methane)

The model predicts greenhouse gas emissions from agricultural areas, such as CH<sub>4</sub> and N<sub>2</sub>O emissions from soil. The sources of the validated mathematical model included: (1) emission data from experimental plots or research plots, or (2) data from high-quality academic literature, such as those reviewed by experts or published in academic journals. As indicated in the baseline emissions chapter, this approach is additional to TGO's requirements.

The scientific principles for using models to assess greenhouse gas emissions from agricultural areas are detailed in Appendix 3 of T-VER-P-METH-13-08 Version 01. In addition, the document "Ex-ante Methodology Overview & Results," prepared by Carbon Farm, has been shared as a confidential reference.


### Ex-post Project emissions for CH<sub>4SOIL, PJ,s,i</sub>

As explained for the baseline, the project emissions source of CH<sub>4</sub> – soil methanogenesis is assessed under modelling method including direct measurement as a plausibility check.

$$CH_{4SOIL,PJ,s,i} = GWP_{CH_4} \times fCH_{4SOIL,PJ,s,i}$$

Where:

$CH_{4SOIL,PJ,i,t}$  = Methane emissions from soil carbon in the project activities during growing season s for sample unit i (tonnes of carbon dioxide equivalent)

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

$fCH_{4SOIL,PJ,i,t}$  = Methane emissions from soil carbon in the project activities as simulated by the model during growing season s for sample unit i (tonnes of methane)

$GWP_{CH_4}$  = Global warming potential of methane (tonnes of carbon dioxide equivalent per tonne of methane)

The model predicts greenhouse gas emissions from agricultural areas, such as CH<sub>4</sub> and N<sub>2</sub>O emissions from soil. The sources of the validated mathematical model included: (1) collecting actual emission data from the project area, (2) emission data from experimental plots or research plots, or (3) data from high-quality academic literature, such as those reviewed by experts or published in academic journals. As indicated in the baseline emissions chapter, this approach is additional to TGO's requirements.

The scientific principles for using models to assess greenhouse gas emissions from agricultural areas are detailed in Appendix 3 of T-VER-P-METH-13-08 Version 01.


### Ex-ante Project emissions for CO<sub>2LIME, PJ,s,i</sub>

For the assessment of carbon dioxide emissions from liming (using calcite, calcium carbonate, or calcium magnesium carbonate), the calculation is done based on default values as set in the Premium T-VER methodology:

Some liming materials are both locally produced and imported. Only the amount produced locally is considered for project emissions.

$$CO_{2LIME,PJ,s,i} = \sum[(M_{Limestone,PJ,s,i} \times A_{s,i}) \times EF_{Limestone}] + [(M_{Dolomite,PJ,s,i} \times A_{s,i}) \times EF_{Dolomite}] \times \frac{44}{12}$$

Where:

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

$CO_{2LIME,PJ,s,i}$  = Quantity of carbon dioxide emitted from lime application in the project scenario in growing season s of sample unit i (tonnes of carbon dioxide)

$M_{Limestone,PJ,s,i}$  = Quantity of lime used in the project scenario in growing season s of sample unit i (tonnes of lime per rai)

$EF_{Limestone}$  = Greenhouse gas emission factor from lime use (tonnes of carbon per tonne of lime)

$M_{Dolomite,PJ,s,i}$  = Quantity of dolomite applied in the project scenario in growing season s of sample unit i (tonnes of dolomite per rai)

$EF_{Dolomite}$  = Greenhouse gas emission factor from dolomite application (tonnes of carbon per tonne of dolomite)

$A_{s,i}$  = Harvested area in growing season s of sample unit i (rai)

$\frac{44}{12}$  = Molecular weight ratio of carbon dioxide to carbon

The ex-ante ER calculation has shown that CO<sub>2</sub> emissions from liming are below 5%.


#### Ex-post Project emissions for CO<sub>2LIME, PJ,s,i</sub>

These are assessed as zero, because negligible in ex-ante estimation.

#### Ex-ante Project emissions for CO<sub>2UREA, PJ,s,i</sub>

Urea is broken down by an enzyme called urease, resulting in the release of carbon dioxide gas. Additionally, the ammonia in urea can be transformed, leading to the release of nitrous oxide gas, which will be calculated in a subsequent section.

Some urea fertilizers are both locally produced and imported. Only the amount produced locally is considered for project emissions.

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

For the assessment of carbon dioxide emissions from urea application, a third assessment approach is necessary: calculation using default values with the following equation.

$$CO_{2\text{UREA},PJ,s,i} = \sum \left( (M_{\text{Urea},PJ,s,i} \times A_{s,i}) \times EF_{\text{Urea}} \right) \times \frac{44}{12}$$

Where:

$CO_{2\text{UREA},PJ,s,i}$  = Carbon dioxide emissions from urea application in the project scenario in growing season s of sample unit i (tonnes of CO<sub>2</sub>)

$M_{\text{Urea},PJ,s,i}$  = Quantity of urea used in the project scenario in growing season s of sample unit i (tonnes of urea per rai)

$EF_{\text{Urea}}$  = Greenhouse gas emission factor for urea (tonnes of carbon per tonne of urea)

$A_{s,i}$  = Harvested area in growing season s of sample unit i (rai)

$\frac{44}{12}$  = Molecular weight ratio of carbon dioxide to carbon


The ex-ante ER calculation has shown that CO<sub>2</sub> emissions from urea are below 5%.

#### Ex-post Project emissions for CO<sub>2UREA, PJ,s,i</sub>

These are assessed as zero, because negligible in ex-ante estimation.

#### Ex-ante Project emissions for N<sub>2</sub>O<sub>SOIL, PJ,s,i</sub>

Nitrogenous fertilizers applied to cultivated land, whether in the form of chemical fertilizers, organic fertilizers, manure, or agricultural residues, undergo transformations by soil microorganisms through nitrification and denitrification processes. During these processes, direct nitrous oxide emissions occur. Additionally, indirect nitrous oxide emissions arise from losses due to ammonia and nitrogen oxide volatilization, as well as leaching or surface runoff, where lost nitrogen is transformed and

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

released as nitrous oxide. If the project requires an assessment of nitrous oxide emissions from nitrogen fertilizer application, the DNDC based modelling method is used.

The assessment of nitrous oxide emissions from nitrogen fertilizer application is based on DNDC based modelling method following the scientific principles for using models to assess greenhouse gas emissions from agricultural areas are detailed in Appendix 3 of T-VER-P-METH-13-08 Version 01. In addition, the document “Ex-ante Methodology Overview & Results,” prepared by Carbon Farm, has been shared as a confidential reference.


$$N_2O_{SOIL,PJ,s,i} = GWP_{N_2O} \times fN_2O_{SOIL,PJ,s,i} \quad \text{Equation 4}$$

Where:

$N_2O_{SOIL,PJ,s,i}$	=	Nitrous oxide emissions from nitrogen fertilizer application in the project scenario in growing season s of sample unit i (tonnes of carbon dioxide equivalent)
$fN_2O_{SOIL,PJ,s,i}$	=	Nitrous oxide emissions from nitrogen fertilizer application in the project scenario obtained from the model in growing season s of sample unit i (tonnes of nitrous oxide)
$GWP_{N_2O}$	=	Global warming potential of nitrous oxide (tonnes of carbon dioxide equivalent per tonne of nitrous oxide)

### Ex-post Project emissions for $N_2O_{SOIL, PJ,s,i}$

Nitrogenous fertilizers applied to cultivated land, whether in the form of chemical fertilizers, organic fertilizers, manure, or agricultural residues, undergo transformations by soil microorganisms through nitrification and denitrification processes. During these processes, direct nitrous oxide emissions occur. Additionally, indirect nitrous oxide emissions arise from losses due to ammonia and nitrogen oxide volatilization, as well as leaching or surface runoff, where lost nitrogen is transformed and

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

released as nitrous oxide. If the project requires an assessment of nitrous oxide emissions from nitrogen fertilizer application, the **modelling method** is used.

The assessment of nitrous oxide emissions from nitrogen fertilizer application is based on mathematical model following the scientific principles for using models to assess greenhouse gas emissions from agricultural areas are detailed in Appendix 3 of T-VER-P-METH-13-08 Version 01.

$$N_2O_{SOIL,PJ,s,i} = GWP_{N2O} \times fN_2O_{SOIL,PJ,s,i}$$

Where:

$N_2O_{SOIL,PJ,s,i}$  = Nitrous oxide emissions from nitrogen fertilizer application in the project scenario in growing season s of sample unit i (tonnes of carbon dioxide equivalent)


$fN_2O_{SOIL,PJ,s,i}$  = Nitrous oxide emissions from nitrogen fertilizer application in the project scenario obtained from the model in growing season s of sample unit i (tonnes of nitrous oxide)

$GWP_{N2O}$  = Global warming potential of nitrous oxide (tonnes of carbon dioxide equivalent per tonne of nitrous oxide)

### Potentially neglected emissions

The following emissions sources will be monitored and reported in the ex-post monitoring only if they should account to more than 5% of the total greenhouse gas emissions, as defined in the premium T-Ver methodology. These emissions have been excluded from the ex-ante estimation as they represent less than 5% of estimated total greenhouse gas emissions.

#### Carbon dioxide emissions from fossil fuel combustion


	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

In cases where the project involves the use of machinery or equipment in addition to the existing management practices, such as laser land levelling (LLL) for land preparation or using pumps to pump water into or out of the field, it is necessary to assess the amount of carbon dioxide emissions from the combustion of fossil fuels, either from the use of fossil fuels or the use of electricity (such as electric tractors). It is not expected that neither LLL nor additional pumping will be needed for the implementation of this programme and it is therefore included in the neglected emissions. If the total greenhouse gas emissions exceed 5% of the amount of greenhouse gas reduction, the assessment of carbon dioxide emissions according to Method 3 (Section 5.2.6 from T-VER-P-METH-13-08), which is calculated using default values, would be calculated using the following equation:

$$CO_{2FUEL,PJ,s,i} = \sum \left( (FC_{PJ,s,i} \times NVC_a \times 10^{-6} \times EF_{CO_2,a}) \times A_{s,i} \right) \times 10^{-3} + \sum (EC_{PJ,s,i} \times EF_{Elec,s} \times (1 + TDL_s) \times A_{s,i})$$

Where:

$CO_{2FUEL,PJ,s,i}$	=	Amount of carbon dioxide emissions from the combustion of fossil fuels in the project during growing season s of sample unit i (tonnes of carbon dioxide equivalent)
$FC_{PJ,s,i,a}$	=	Quantity of fuel type a used in growing season s of sample unit i (units per rai)
$A_{s,i}$	=	Harvested area in growing season s of sample unit i (rai)
$NVC_a$	=	Net calorific value of fuel type a (megajoules per unit)
$EF_{CO_2,a}$	=	Greenhouse gas emission factor from the combustion of fossil fuel type a (kilograms of carbon dioxide/terajoule)
$a$	=	Type of fossil fuel
$EC_{PJ,s,i}$	=	Electricity consumption in growing season s of sample unit i (MWh/rai)
$EF_{Elec,s}$	=	Greenhouse gas emission factor for electricity generation/consumption in growing season s (tCO <sub>2</sub> /MWh)

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

$TDL_s$  = Proportion of electricity loss in the power grid for electricity supply to the point of use in growing season s

### Non-CO<sub>2</sub> emissions from biomass burning

The implementation of AWD practices is not expected to change the practices of burning rice stubble and straw within the project area. Nevertheless, if this activity was to occur and if the total greenhouse gas emissions from this activity would exceeds 5% of the total greenhouse gas reduction target, a more detailed assessment of greenhouse gas emissions from biomass burning would be required. This assessment should use Method 3 (Section 5.2.6 from T-VER-P-METH-13-08), which involves calculations using default values based on the following equation:

$$Non - CO_{2BURNing,PJ,s,i} = \frac{\sum MB_{PJ,s,i} \times C_f \times A_{burn,s,i} \times [(EF_{CH_4} \times GWP_{CH_4}) + (EF_{N_2O} \times GWP_{N_2O})]}{10^6}$$

Where:

$Non - CO_{2BURNing,PJ,s,i}$  = Greenhouse gas emissions from biomass burning in growing season s of sample unit i (tonnes of carbon dioxide equivalent)


$MB_{PJ,s,i}$  = Mass of rice stubble and straw burned in the baseline scenario in growing season s of sample unit i (kilograms per rai)

$C_f$  = Burning factor of rice stubble and straw (proportion of biomass as fuel before burning)

$A_{burn,s,i}$  = Area burned in growing season s of sample unit i (rai)

$EF_{CH_4}$  = Methane emission factor from burning agricultural residues (grams of methane per kilogram of dry biomass burned)

$EF_{N_2O}$  = Nitrous oxide emission factor from burning agricultural residues (grams of nitrous oxide per kilogram of dry biomass burned)

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

$GWP_{CH_4}$  = Global warming potential of methane (tonnes of carbon dioxide equivalent per tonne of methane)

$GWP_{N_2O}$  = Global warming potential of nitrous oxide (tonnes of carbon dioxide equivalent per tonne of nitrous oxide)

$10^6$  = Unit conversion (grams per tonne)

### 2.4.3 Calculation of leakage emission

<b>Code:</b> T-VER-P-METH-13-08
<b>Version:</b> 1.0
<b>Methodology/Tool :</b> Enhanced Good Practices in Paddy Rice Field T-VER-P-TOOL-01-13


The Methodology T-VER-P-METH-13-08, as well as guidelines from FOEN, define leakage as any GHG emission impact outside the ITMO project boundary. The Methodology T-VER-P-METH-13-08 considers leakage for AWD to be negligible and therefore does not require any assessment. Most trade-offs are already integrated in the ER calculation (i.e.: estimates of nitrogen emissions, increased fuel consumption, etc). Other potential leakages (e.g.: changes in soil organic carbon) fall outside the scope determined by FOEN for implementing projects abroad under the Framework of the Article 6.2 of the Paris Agreement. Consequently, in line with the T-VER-P-METH-13-08 methodology, the programme is not considered to generate any leakage.

### 2.4.4 Calculation of emission reductions

<b>Code:</b> T-VER-P-METH-13-08
<b>Methodology :</b> Enhanced Good Practices in Paddy Rice Field T-VER-P-TOOL-01-13

$$ER_{total} = BE_y - PE_y - Leakage$$

Where:


	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

- $ER_{total}$  = Total expected emission reductions over the project in year y (tonnes of carbon dioxide equivalent)
- $BE_y$  = Total baseline greenhouse gas emissions in year y (tonnes of carbon dioxide equivalent)
- $PE_y$  = Total greenhouse gas emissions from project activities in year y (tonnes of carbon dioxide equivalent)

### Plausibility check and uncertainty assessment


Quantification models must undergo calibration and validation before being used. The validation serves two purposes. Firstly, it quantifies the uncertainty of the emissions reduction for the combination of the local agro-ecological climate and the change in practices (i.e. adopting AWD) targeted by the project. Secondly, it removes bias. In doing so, it ensures that the outcomes are consistent with the default factors. This, however, is only sufficient if the data put into the model is reasonable. To ensure this is the case, a data QA/QC will be performed, applying simple rules that remove outliers inconsistent with what is considered reasonable practice based on the Carbon Farm experience.

A plausibility check will also be performed during the monitoring, to ensure that fundamental parameters are clearly measured at both project and baseline site and cross-checked with data from other sources. In practice, monitoring values including water level data, are sense-checked as mentioned above, throughout the monitoring period. Moreover, AI will be used to check that PVC pipes are correctly installed, using the available photo evidence. In a similar manner, soil classification is verified using AI and photos, while also being compared against open-source data, notably SoilGrids2.0. The closed-chamber measurements are themselves checked for outliers (see section above)

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

The plausibility check takes place as the model-level, therefore applies to the farmer, the province and the programme level. The uncertainty of the model is calculated during calibration as described above and the uncertainty deduction is calculated as per the Verra Standard (VMD0053) and applied to all seasons (see Chapter 3.1). One of the key improvements in the MA is the adoption of the uncertainty assessment method from the Verra standard which is more stringent and comprehensive than the method provided in T-VER-P-METH-13-08. T-VER-P-METH-13-08 uses a simpler deduction rule, using tiered discounts, whereas VMD0053 uses a more robust approach, requiring a review from an independent modelling expert and explicit bias checks. VMD0053 quantifies uncertainty in a way that ensures that both structural and parameter uncertainty are incorporated into a final model estimate and it includes diagrams to explain the process and explicitly mention the different types of uncertainty.

The model uncertainty is calculated per gas (e.g. CH<sub>4</sub> vs N<sub>2</sub>O) and practice category. In the context of this project, the practice category refers to the change in irrigation regime. Where there is only one change in practice—from baseline irrigation categorized as continuous flooding to project irrigation of AWD—there will only be one category per gas. The model's uncertainty will be known once the project simulations are complete. The size of the uncertainty, as a percentage of the emission reduction, depends on the magnitude of the reduction and the number of fields in the project. This means an estimate of uncertainty can be provided once the practices are clearly defined. This will be possible only once farmers have been surveyed, with all required parameters for the DNDC model included. The final uncertainty will only be available for each reporting period once the observed practice adopted is available. The model's uncertainty is calculated at 90% confidence interval, which is aligned with guidance within T-VER-P-METH-13-08 for uncertainty quantification and deduction. This confidence interval of 90% is more conservative than the standard 67% requirement under Verra's VMD0053 guidance.

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0


Once the model uncertainty is known, the uncertainty discount factor is calculated using the following table, as per T-VER-P-METH-13-08. The uncertainty and uncertainty deduction factor are multiplied together to calculate the uncertainty deduction.

One important detail is that, under VMD0053, the model's uncertainty is calculated directly for the emission reduction. It is not calculated separately for baseline and project emissions, contrary to the example in the table below extracted from the premium T-VER methodology. This approach streamlines the process and aligns with statistical best practices. As the primary focus is on the uncertainty in emission reduction, it is logical to quantify it directly.

Uncertainty (U)	Uncertain Deduction Factor ( $U_d$ )	Applicability
20<U≤30	50%	<b>Example</b> Mean value = 60 ± 15 tCO <sub>2</sub> eq Calculate uncertainty (U) = 15/60 × 100 = 25% Deduction factor ( $U_d$ ) = 25% × 15 = 3.75 tCO <sub>2</sub> eq The discount calculation is based on principle of conservativeness as follows: <b>Baseline</b> = 60 - 3.75 = 56.25 tCO <sub>2</sub> eq <b>Project implementation</b> = 60 + 3.75 = 63.75 tCO <sub>2</sub> eq
30<U≤40	75%	
U>40	100%	

The 90% confidence level sets a relatively high bar. Given the current state of the DNDC model, it would be prudent to conservatively assume an uncertainty range of 30-40%. If we take the value of 35% uncertainty, this implies a 26.25% reduction applied to the emission reduction. This is a conservative value. If the true value is below 30%, the uncertainty reduction will be below 15%

Further information on how the model deals with uncertainty has been provided separately to the validators.

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0


## 2.4.5 Fixed and Monitored Parameters

### Parameters determined and fixed ex-ante

The next parameters are determined and fixed ex-ante and are applied for ex-post ER calculation,

Name	Description	Unit	Value	Source
NCVa	Net Calorific Value of fossil fuel type a (diesel)	Megajoules per liter	36.42	Option 1: From the fuel supplier's invoice: The NCV can be obtained directly from the information provided by the company that supplies the fuel. Option 2: From measurement: The NCV can be determined experimentally by measuring the amount of heat released when a sample of the fuel is burned completely. Option 3: From the Thai Department of Alternative Energy Development and Efficiency (DEDE): This option suggests that the NCV can be found in published reports or databases maintained by the DEDE <sup>6</sup> .
$EF_{CO_2,a}$	Emission factor of greenhouse gases from the combustion of fossil fuel type a diesel	Kilograms of carbon dioxide per terajoule	74100	<a href="#">2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1, Table 1.4</a>
$EF_{CH_4}$	Methane emission factor from agricultural biomass burning	Grams of methane per kilogram of dry biomass burned	2.7	<a href="#">2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 2, Table 2.5</a>

<sup>6</sup> Sources for ex-ante calculation: [The study of emission factor for an electricity system in Thailand 2009](#), [calorific value of fuel](#) and [DEDE summary of Thailand's energy situation](#)


	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

$EF_{N20}$	Nitrous oxide emission factor from agricultural biomass burning	Grams of nitrous oxide per kilogram of dry biomass burned	0.07	<a href="#">2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 2, Table 2.5</a>
$C_f$	Combustion coefficient of rice stubble and straw	Proportion of biomass as fuel before combustion	0.8	<a href="#">2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 2, Table 2.6</a>
$TDL_s$	The proportion of electrical power loss in the electrical grid for supplying electricity to the point of use during growing season $s$ is defined as 0.03 (3%).	-	3%	T-VER-P-METH-13-08 Version 01

The parameter  $CF$  – the below-BAU conservativeness factor – set at 0.89 in T-VER-P-METH-13-08 Version 01, is not applied in the emission reduction calculations, as Carbon Farm derived the ex-ante emission reduction values for paired datasets of emission reductions from practice changes across Thailand, Vietnam, and Cambodia using DNDC (DeNitrification-DeComposition)-based modelling. The following arguments explain why the parameter  $CF$  is not applied.

### **Appropriateness of a conservativeness factor in a Tier 3 setting**

The downward adjustment of the conservativeness factor is primarily intended for situations in which baseline (historical) emissions are estimated using generalized assumptions and then adjusted downward below BAU, i.e. where there is a risk of over-crediting because baseline conditions are not represented accurately but rather in a generalized manner. The application of this conservativeness factor does not appear to be necessary in a Tier 3 modelling scenario, as conservativeness is already inherently addressed through site specificity. Baseline and project emissions are quantified using site-specific modelled scenarios at field level meaning

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

that baseline conditions are explicitly represented, including the existing drainage and water regime practices, rather than being based on generalized BAU assumptions that would require an additional blanket downward adjustment. Furthermore, conservativeness is also addressed through the uncertainty quantification and uncertainty deduction framework under T-VER Premium.

Because the ex-ante and ex-post quantification approaches must be consistent, no conservativeness factor will be applied to ex-post Tier 3 quantification. Accordingly, it has also not been applied to the ex-ante estimates.


Finally it is noted as well that the requirement concerning the conservativeness factor in T-VER Premium is included within a parameter table that contains several values relevant to assessment method 3, but not to assessment method 1.

### **Our ex-ante calculations are already conservative**

The purpose of a conservativeness factor is to introduce conservativeness where estimates are inherently broad. Our ex-ante estimates are significantly less generalized than a default-based approach because we:

- modelled baseline and project emissions at provincial level for the provinces listed in the MADD;
- modelled separate estimates for wet and dry seasons;
- assumed a 20% non-adoption rate; and
- applied an additional layer of conservativeness in the modelling outputs.

The methane and nitrous oxide estimates shared are conservative because the model bias adjustment was set to zero at this stage. This was done intentionally, as an updated model validation report including additional Thailand-specific data is planned for submission at

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0


verification. Therefore, no bias correction has been applied at this stage, as such correction may change later once model uncertainty is reduced. From a modelling perspective, for the defined agronomic scenarios, this means the estimates are as conservative as possible.

In conclusion, our position is based on the following two points:


- *CF* is not applied to Tier 3 quantification; and
- conservative assumptions are already inherently incorporated into the ex-ante model results.

#### 2.4.6 Summary of estimated greenhouse gas emission reductions

Year	d/m/y – d/m/y	Baseline Emission	Project Emission	Leakage Emission	Emission Reduction
1	15/06/2026-31/12/2026	6,787	4,867		1,920
2	01/01/2027-31/12/2027	218,719	156,853	NA	61,866
3	01/01/2028-31/12/2028	770,828	552,794	NA	218,035
4	01/01/2029-31/12/2029	1,310,312	939,680	NA	370,631
5	01/01/2030-31/12/2030	1,800,751	1,291,395	NA	509,356
6	01/01/2031-31/12/2031	1,800,751	1,291,395	NA	509,356
7	01/01/2032-31/12/2032	1,800,751	1,291,395	NA	509,356
8	01/01/2033-31/12/2033	1,800,751	1,291,395	NA	509,356
9	01/01/2034-31/12/2034	1,800,751	1,291,395	NA	509,356
10	01/01/2035-31/12/2035	1,800,751	1,291,395	NA	509,356
11	01/01/2036-31/12/2036	1,800,751	1,291,395	NA	509,356
12	01/01/2037-31/12/2037	1,800,751	1,291,395	NA	509,356
13	01/01/2038-31/12/2038	1,800,751	1,291,395	NA	509,356
14	01/01/2039-31/12/2039	1,800,751	1,291,395	NA	509,356
15	01/01/2040-31/12/2040	1,800,751	1,291,395	NA	509,356
16	01/01/2041-31/12/2041	1,800,751	1,291,395	NA	509,356

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

17	01/01/2042-31/12/2042	1,800,751	1,291,395	NA	509,356
18	01/01/2043-31/12/2043	1,800,751	1,291,395	NA	509,356
19	01/01/2044-31/12/2044	1,800,751	1,291,395	NA	509,356
20	01/01/2045-31/12/2045	1,800,751	1,291,395	NA	509,356
	01/01/2046-14/06/2046	163,705	117,400	NA	46,305
<b>Total until 2030 (tCO<sub>2</sub>eq)</b>		<b>4,107,397</b>	<b>2,945,589</b>		<b>1,161,808</b>
<b>Average until 2030 (tCO<sub>2</sub>e/y)</b>		<b>912,755</b>	<b>654,575</b>		<b>258,180</b>
<b>Total until end crediting period (tCO<sub>2</sub>eq)</b>		<b>31,282,364</b>	<b>22,433,915</b>		<b>8,848,449</b>
<b>Average until end crediting period (tCO<sub>2</sub>eq)</b>		<b>1,564,118</b>	<b>1,121,696</b>		<b>442,422</b>

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

## Part 3 Monitoring of Component Project Activity (CPA)

### 3.1 Monitoring plan

Monitoring of project implementation has been designed to comprehensively cover all key activities within the project area, ensuring data accuracy and enabling systematic assessment of greenhouse gas emission reductions. Responsibilities are clearly assigned at each level, including farmers, the project developer, and field coordinators, to ensure that implementation follows the planned framework and allows for full traceability. The monitoring structure and the relationships among relevant stakeholders are clearly defined in the project document appendix.

#### 3.1.1 Organizational structure for monitoring and roles and responsibilities

To ensure effective project implementation, the roles and responsibilities of relevant stakeholders have been clearly defined as follows:


##### 1) Project Owner

Participating farmers are the primary implementers of project activities in the field and the direct beneficiaries of the project, both in terms of agricultural productivity and income generation from carbon credits.

Roles and responsibilities:

- Implement cultivation practices in their fields in accordance with greenhouse gas mitigation principles, such as the AWD system
- Carry out activities in line with the project plan
- Cooperate with the project team in data collection and record-keeping, including cultivation practices, water management, and related activities through the designated system
- Facilitate site access for monitoring, inspection, and field data collection

##### 2) Project Participant

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

myclimate Company is responsible for defining the overall project framework, including standards, methodologies, and carbon credit management.

Roles and responsibilities:

- Design the project in accordance with the requirements of the Thailand Greenhouse Gas Management Organization (TGO)
- Establish methodologies for calculating and monitoring greenhouse gas emission reductions
- Ensure data quality control and oversee overall project implementation
- Submit applications for carbon credit certification and manage issued credits

### 3) Co-Project Participant

Wave BCG is responsible for implementation at the field level, focusing on data collection, coordination, and farmer support.

Roles and responsibilities:

- Coordinate with farmers and local stakeholders
- Monitor and verify field-level activities
- Collect field data, such as water management, fertilizer application, and photographic evidence
- Prepare reports for use in calculations and verification processes


Varuna (Thailand) Co., Ltd. Will provide support with the use of fertilization with drones and the app Smart Watcher that supports farmers in the implementation of AWD activities.

### 4) Field Project Coordinator

The Field Project Coordinator is responsible for managing and supervising project implementation at the field level to ensure that all activities are conducted according to the project plan and monitoring requirements.

Roles and responsibilities:

- Plan and supervise farmer activities to ensure alignment with project guidelines

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0


- Verify the accuracy, completeness, and consistency of data recorded by farmers
- Monitor overall implementation progress and evaluate project performance
- Conduct field verification, including AWD water levels and fertilizer use
- Coordinate with the project developer to report progress and resolve issues
- Validate data prior to its use in reporting

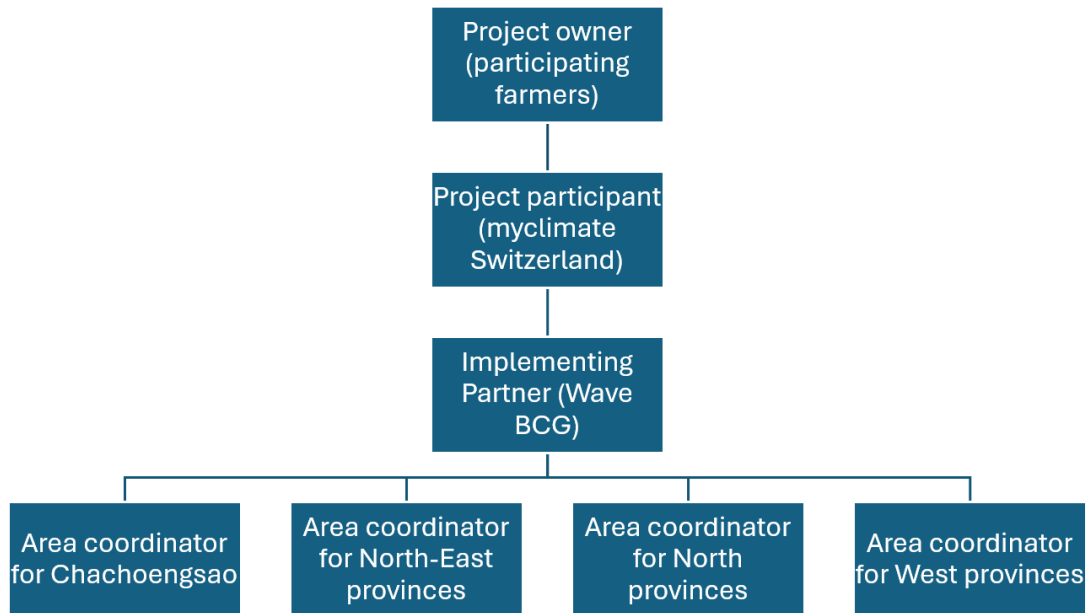
#### 5) Sub-Coordinator

The Sub Field Coordinator supports implementation at the group or plot level, focusing on practical assistance and local coordination to ensure continuous operations.

Roles and responsibilities:

- Communicate project guidelines to farmers and monitor daily practices
- Assist farmers with basic data recording
- Facilitate field data collection
- Compile preliminary data from farmers and submit it to the Field Project Coordinator
- Report issues, challenges, or irregularities observed in the field
- Support the use of project tools, such as the Smart Watcher application

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0



**Figure 6: Organizational structure for monitoring and roles and responsibilities**


### 3.1.2 Carbon Credit Certification Process

myclimate, as the Project Participant, and Wave BCG as the Co-Project Participant and implementing partner, are responsible for managing the carbon credit certification process in accordance with the standards set by the Thailand Greenhouse Gas Management Organization (TGO). The key stakeholders and their roles are as follows:

#### 1) Participating Farmers

Farmers implement project-prescribed practices, such as Alternate Wetting and Drying (AWD), maintain records of cultivation activities, and grant access to project teams for field monitoring and data collection.

#### 2) Wave BCG (Co-Project Participant)

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

Wave BCG is responsible for collecting field data from participating farmers, verifying data accuracy, and preparing greenhouse gas emission reduction reports. The company also coordinates with external entities involved in the project validation and verification processes.

### 3) Submission to TGO

Wave BCG prepares the Project Design Document (PDD) together with Varuna (Thailand) CO., Ltd. in accordance with TGO methodologies and submits it to TGO for preliminary review and consideration.

### 4) Validation and Verification Process


An independent third-party Validation/Verification Body (VVB), namely PSUVVB Center of Measurement and Standard Accreditation, Faculty of Science, Prince of Songkla University, conducts the validation and verification of project data and documentation. Varuna (Thailand) Co., Ltd. acts as the focal point for coordination and responds to all inquiries until the process is completed.

### 5) Carbon Credit Allocation

Upon successful certification, myclimate Company (Project Participant) holds the ownership of the carbon credits and manages their registration in the official registry system. Wave BCG supports the allocation, transfer, or utilization of carbon credits in accordance with the agreed project framework.

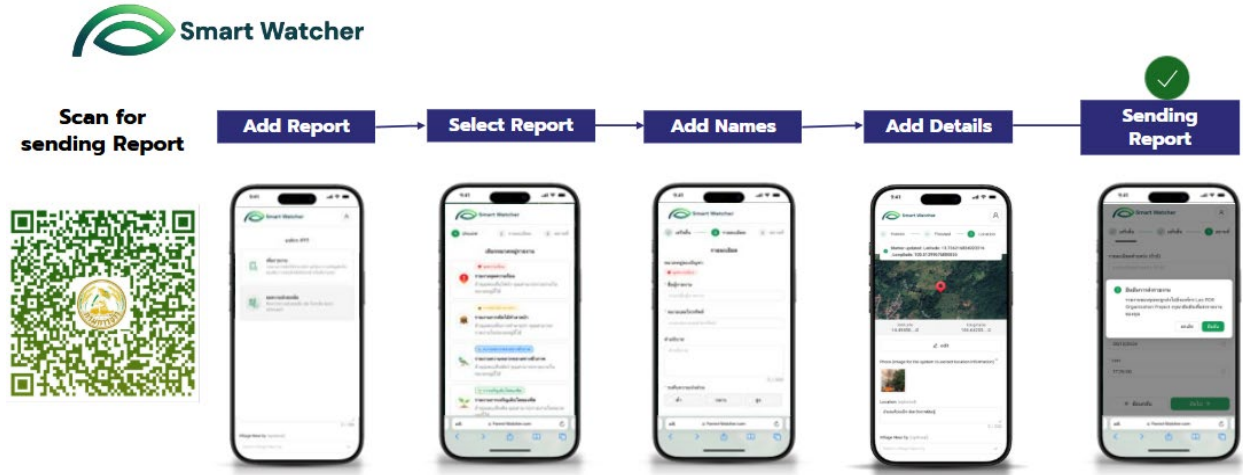
#### 3.1.3 Field Monitoring via Smart Watcher

The **Smart Watcher** application is designed to collect and monitor data necessary to calculate ex-post mitigation outcomes. The application is accessed by a QR code that the farmers can easily

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0


scan from their phone. The primary focus of the application is tracking key agricultural and environmental parameters that are crucial for verifying the effectiveness of mitigation practices.

## Technology for Data Collection and Monitoring

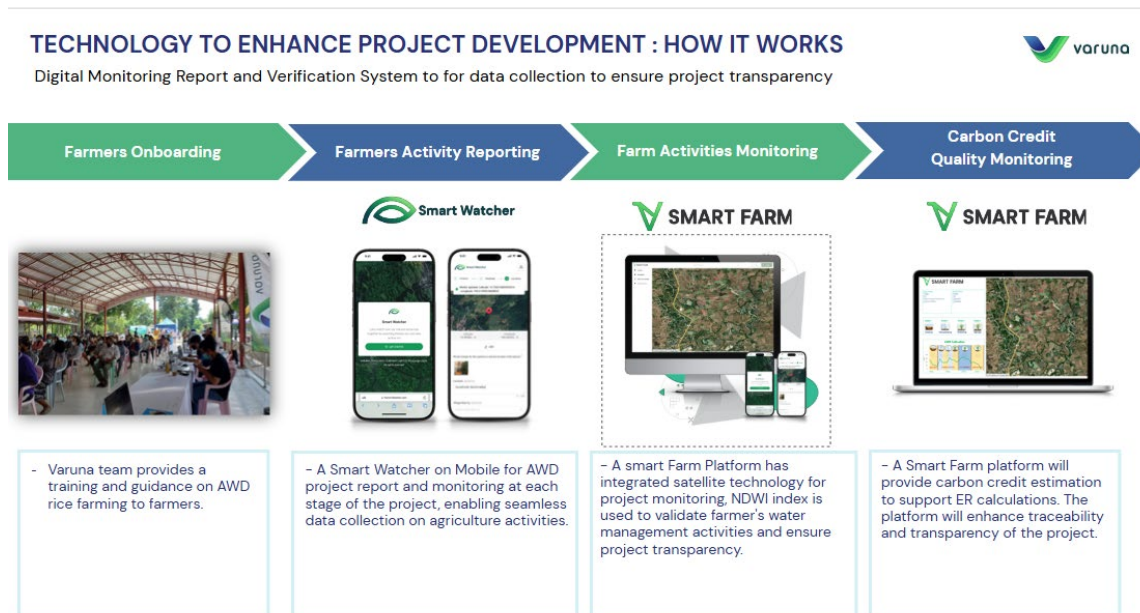


**Figure 8: Smart Watcher Application: How it works**

The platform conveniently supports and guides the farmers in the process of data entry. Above is an illustration of some of the data that the farmer can enter on the platform. Farmers collect field-specific data on crop growth and conditions, such as pictures of activities in the field, pictures of water level, input on field data and yield estimates. The collected data is then uploaded to a centralized digital platform called **Smart Farm platform** where it is analysed using ground data and

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

satellite data. Multiple parameters are collected and used to monitor the AWD practices and ensure that mitigation outcomes are verifiable and reliable for carbon credit generation.




**Figure 9: Smart Farm Platform : How it work**

It is possible that the digital monitoring tool and system for data collection will be upgraded during the implementation. It is not expected that the collected parameters will change, but rather that, to improve accuracy and ease of data collection, a different system may be put in place: any change will be communicated in the yearly monitoring report for each CPAs.

### 3.1.4 Satellite-MRV

Satellite-based MRV is used to monitor rice cultivation activities at a high spatial and temporal resolution using a combination of Synthetic Aperture Radar (SAR) and optical remote sensing data. SAR data is used as the primary data source due to its ability to penetrate cloud cover and vegetation canopy, allowing for all-weather monitoring, particularly important in tropical rice-growing regions with persistent cloud cover, e.g., Thailand.

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

The different practices assessed by the remote-sensing approach include: (1) initial seeding/transplanting dates; (2) field drainage events, which are critical for identifying AWD practices; (3) harvest dates.


### 3.1.5 Process-Based Model Approach

The methane emissions reduction estimation will be calculated with a process-based model approach. A mathematical model calibrated specifically for two climatic regions in Thailand and validated under the Verra standard will be applied for the calculation of emissions reduction. Direct measurements with closed chambers will be carried out through the entirety of the programme as a plausibility check.

The input data of the model, which corresponds to the factors affecting ER, are a combination of remote sensing data and data collected from the field via the Smart Farm Platform. Satellite imagery will be used for broader-scale monitoring, offering real-time insights into the cropping calendar, the irrigation practices and drainages employed in the field, and the burning of straw residue. Complementing this, mobile data collection tools will enable farmers to capture on-the-ground data, such as picture of tube with water depth, plant growth stages and yield data. These data sources will be integrated, analysed and used as inputs to the validated mathematical model.

### 3.2 Parameters not monitored

<b>Parameter</b>	NCVa
<b>Unit</b>	MJ/unit
<b>Description</b>	Net calorific value (NCV) of fuel $\alpha$
<b>Source of data</b>	Option 1 The net calorific value of fossil fuels indicated on the invoice from the fuel supplier. Option 2 From monitoring

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0


	Option 3 Thailand Energy Statistics Report, Department of Alternative Energy Development and Efficiency, Ministry of Energy
<b>Remark</b>	-

<b>Parameter</b>	$EFCO_2,a$
<b>Unit</b>	kgCO <sub>2</sub> /TJ
<b>Description</b>	Emission factor for combustion of fossil fuel $a$
<b>Source of data</b>	IPCC Guidelines 2006, Volume 2, Chapter 1, Table 1.4
<b>Remark</b>	-

<b>Parameter</b>	$EF CH_4$
<b>Unit</b>	gCH <sub>4</sub> /kg dry matter of biomass burnt
<b>Description</b>	Methane emission factor for biomass burning In cases where the IPCC default is applied, a value of 2.7 is assigned.
<b>Source of data</b>	IPCC Guidelines 2019, Volume 4, Chapter 2, Table 2.5
<b>Remark</b>	-

<b>Parameter</b>	$EFN_2O$
<b>Unit</b>	gN <sub>2</sub> O/kg dry matter of biomass burnt
<b>Description</b>	Nitrous oxide emission factor for biomass burning In cases where the IPCC default is applied, a value of 0.07 is assigned.
<b>Source of data</b>	IPCC Guidelines 2019, Volume 4, Chapter 2, Table 2.5
<b>Remark</b>	-

<b>Parameter</b>	$Cf$
<b>Unit</b>	fraction on biomass being burnt in the field


	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

<b>Description</b>	Combustion factor for rice stubble and straw In cases where the IPCC default is applied, a value of 0.8 is assigned.
<b>Source of data</b>	IPCC Guidelines 2019, Volume 4, Chapter 2, Table 2.6
<b>Remark</b>	-

<b>Parameter</b>	<b><i>TDLs</i></b>
<b>Unit</b>	-
<b>Description</b>	Proportion of power losses in the electrical network for electricity supply to end-use locations in seasons A value of 0.03 (3%) is assigned.
<b>Source of data</b>	-
<b>Remark</b>	-

### 3.3 Monitored Parameters

<b>Data / Parameter 1:</b>	$GWP_{CH_4}$
<b>Data unit:</b>	tCO <sub>2</sub> eq/tCH <sub>4</sub>
<b>Description:</b>	Global warming potential of methane
<b>Measurement procedures (if any):</b>	For project proposal documents: use the latest $GWP_{CH_4}$ value announced by TGO, according to IPCC Fourth Assessment (AR4) 2007. For monitoring greenhouse gas reduction: use the $GWP_{N_2O}$ value announced by TGO to assess the amount of greenhouse gases during the crediting period for greenhouse gas certification.
<b>Monitoring frequency:</b>	Every time TGO announces a new value
<b>Source of data:</b>	IPCC Fourth Assessment (AR4) 2007 The latest value announced by TGO (October 27, 2021)


	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

<b>QA/QC procedures</b>	Default value
-------------------------	---------------

<b>Data / Parameter 2:</b>	$GWP_{N2O}$
<b>Data unit:</b>	tCO <sub>2</sub> eq/tN <sub>2</sub> O
<b>Description:</b>	Global warming potential of N <sub>2</sub> O
<b>Measurement procedures (if any):</b>	<p>For project proposal documents: Use the latest GWP<sub>N2O</sub> value announced by TGO, according to IPCC Fourth Assessment (AR4) 2007.</p> <p>For monitoring greenhouse gas reduction: use the GWP<sub>N2O</sub> value announced by TGO to assess the amount of greenhouse gases during the crediting period for greenhouse gas certification.</p>
<b>Monitoring frequency:</b>	Every time TGO announces a new value
<b>Source of data:</b>	<p>IPCC Fourth Assessment (AR4) 2007</p> <p>The latest value announced by TGO (October 27, 2021)<sup>7</sup></p>
<b>QA/QC procedures</b>	Default value

<b>Data / Parameter 3:</b>	$A_{s,i}$
<b>Data unit:</b>	Rai (1 rai = 0.16 ha)
<b>Description:</b>	Harvested area in growing season s of sample unit i
<b>Measurement procedures (if any):</b>	<p>On-site survey: physical inspection of the area.</p> <p>Satellite/aerial imagery: using satellite or aerial photographs to assess the land.</p>


<sup>7</sup> <https://ghgreduction.tgo.or.th/en/premium-t-ver-download/download/6964/3553/32.html>

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

<b>Monitoring frequency:</b>	Every growing season
<b>Source of data:</b>	Survey report with geographic references
<b>QA/QC procedures</b>	The geological survey report and satellite image data are thoroughly checked for completeness

<b>Data / Parameter 4:</b>	$L_s$
<b>Data unit:</b>	Day
<b>Description:</b>	Rice harvesting age in growing season s
<b>Measurement procedures (if any):</b>	On-site survey: physical inspection of farmer record
<b>Monitoring frequency:</b>	Every growing season
<b>Source of data:</b>	Digital record
<b>QA/QC procedures</b>	Data completeness check from farmer records


<b>Data / Parameter 5:</b>	Water Management During the Growing Season
<b>Data unit:</b>	-
<b>Description:</b>	<ul style="list-style-type: none"> <li>● Continuous flooding throughout the growing season</li> <li>● Periodic flooding with one drainage</li> <li>● Periodic flooding with multiple drainages: The field is flooded and drained multiple times, including the practice of alternate wetting and drying, where the water level is lowered to 10-15 cm below the soil surface</li> </ul>
<b>Measurement procedures (if any):</b>	On-site survey: physical inspection of farmer record and project area
<b>Monitoring frequency:</b>	Throughout the growing season

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

<b>Source of data:</b>	Digital record
<b>QA/QC procedures</b>	Data completeness check from farmer or project developer records


<b>Data / Parameter 6:</b>	Pre-Planting Water Management
<b>Data unit:</b>	-
<b>Description:</b>	<ul style="list-style-type: none"> <li>● Flooding for more than 30 days before planting</li> <li>● Short-term flooding of less than 30 days before planting</li> <li>● No flooding for less than 180 days before planting</li> <li>● No flooding for more than 180 days before planting</li> <li>● No flooding for more than 365 days or crop rotation without flooding</li> </ul>
<b>Measurement procedures (if any):</b>	On-site survey: physical inspection of farmer record and project area
<b>Monitoring frequency:</b>	Throughout the growing season
<b>Source of data:</b>	Digital record
<b>QA/QC procedures</b>	Data completeness check from farmer or project developer records

<b>Data / Parameter 7</b>	$M_{SN,PJ,s,i,j}$
<b>Data unit:</b>	Tonnes of nitrogen from chemical fertilizer per rai
<b>Description:</b>	Quantity of chemical fertilizer used in the project during growing season s of sample unit i, fertilizer type j
<b>Measurement procedures (if any):</b>	Data collected and recorded by farmers using appropriate methods (corroborated with photo provided via Smart Watcher)

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

<b>Monitoring frequency:</b>	Throughout the growing season
<b>Source of data:</b>	Digital record
<b>QA/QC procedures</b>	Data completeness check from invoices or withdrawal records or farmer or project developer records
<b>Any comment:</b>	The parameter is not utilized for ex-ante estimation of emission reductions, while for ex-post verification, it serves to demonstrate whether the application of nitrogen-based chemical fertilizers has been reduced by at least 5% compared to baseline levels, in accordance with the requirements outlined in T-VER-P-METH-13-08 Version 01.


<b>Data / Parameter 8</b>	$FC_{P,J,s,i,a}$
<b>Data unit:</b>	Units per rai
<b>Description:</b>	Quantity of fuel type a used in growing season s of sample unit i  This is monitored to ensure that the emissions due to CO <sub>2</sub> are less than 5% of the project emissions and can therefore be excluded. The ex-ante model does not include CO <sub>2</sub> emissions from fuel; ex-post will include CO <sub>2</sub> emissions from fuel only if they are above 5% of total project emissions.
<b>Measurement procedures (if any):</b>	Option 1: If fuel is purchased or withdrawn all at once without storage, the quantity used can be tracked from invoices or withdrawal records.  Option 2: If fuel is stored and used from a storage container, the quantity used should be measured and recorded continuously.
<b>Monitoring frequency:</b>	Throughout the growing season

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

<b>Source of data:</b>	Digital record from invoices or withdrawal records provided by the farmers on the Smart Farmer application
<b>QA/QC procedures</b>	Data completeness check from invoices or withdrawal records or farmer or project developer records


<b>Data / Parameter 9</b>	$MB_{P,J,s,i}$
<b>Data unit:</b>	Kg
<b>Description:</b>	<p>Mass of rice stubble and straw burned in the baseline scenario in growing season s of sample unit i</p> <p>This is monitored to ensure that the emissions due to CO<sub>2</sub> are less than 5% of the baseline emissions and can therefore be excluded. The ex-ante model does not include CO<sub>2</sub> emissions from straw burning; ex-post will include CO<sub>2</sub> emissions from straw burning only if they are above 5% of total baseline emissions.</p>
<b>Measurement procedures (if any):</b>	Use the proportion of agricultural residues to yield based on suitable reference documents for the project area corroborated with photo provided via Smart Watcher.
<b>Monitoring frequency:</b>	Throughout the growing season
<b>Source of data:</b>	Digital record
<b>QA/QC procedures</b>	Data completeness check from farmer or project developer records

<b>Data / Parameter 10</b>	$ROA_{P,J,s,i,om}$
<b>Data unit:</b>	Kilograms per rai, dry weight for straw and fresh weight for other materials

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0


<b>Description:</b>	Quantity of organic material type OM applied in the project during growing season s of sample unit i
<b>Measurement procedures (if any):</b>	Data collected and recorded by the farmer or project developer using via the Smart Watcher Platform (e.g.: photos of farm record book)
<b>Monitoring frequency:</b>	Throughout the growing season
<b>Source of data:</b>	Digital records
<b>QA/QC procedures</b>	Data completeness check from farmer or project developer records
<b>Any comment:</b>	The parameter is not utilized for ex-ante estimation of emission reductions, while for ex-post verification, it serves as an input of the mathematical model.

<b>Data / Parameter 11</b>	$fN_2O_{SOIL,BL,s,i}$
<b>Data unit:</b>	Tonnes of nitrous oxide
<b>Description:</b>	Quantity of nitrous oxide emissions from nitrogen fertilizer application in the baseline scenario obtained from a model in growing season s of sample unit i
<b>Measurement procedures (if any):</b>	<p>Details according to the selected evaluation method, including sampling and data, the use of reference values or recommended values from reliable sources, and calculations using appropriate equations.</p> <p>The scientific principles for using models to assess greenhouse gas emissions from agricultural areas are detailed in Appendix 3 of T-VER-P-METH-13-08 Version 01.</p>
<b>Monitoring frequency:</b>	According to the round of evaluation and monitoring for certification

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0


<b>Source of data:</b>	<p>Measurement report: The values are obtained from the mathematical model that predicts greenhouse gas emissions from agricultural areas, such as CH<sub>4</sub> and N<sub>2</sub>O emissions from soil. The sources of the model include: (1) collecting actual emission data from the project area, (2) emission data from experimental plots or research plots, or (3) data from high-quality academic literature, such as those reviewed by experts or published in academic journals, can be used. The selected reference data should be appropriate and applicable to the project area, especially if there is data consistent with the control factors or agricultural activities of the project.</p>
<b>QA/QC procedures</b>	<p>Appendix 3 - T-VER-P-METH-13-08 Version 01. Mathematical model will go through Independent Model Evaluation prior to verification.</p>

<b>Data / Parameter 12</b>	$fN_2O_{SOIL,PS,s,i}$
<b>Data unit:</b>	Tonnes of nitrous oxide
<b>Description:</b>	Quantity of nitrous oxide emissions from nitrogen fertilizer application in the project scenario obtained from a model in growing season s of sample unit i
<b>Measurement procedures (if any):</b>	<p>Details according to the selected evaluation method, including sampling and data, the use of reference values or recommended values from reliable sources, and calculations using appropriate equations.</p> <p>The scientific principles for using models to assess greenhouse gas emissions from agricultural areas are detailed in Appendix 3 of T-VER-P-METH-13-08 Version 01.</p>

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0


<b>Monitoring frequency:</b>	According to the round of evaluation and monitoring for certification
<b>Source of data:</b>	Measurement report: The values are obtained from the mathematical model that predicts greenhouse gas emissions from agricultural areas, such as CH <sub>4</sub> and N <sub>2</sub> O emissions from soil. The sources of the model includes: (1) collecting actual emission data from the project area, (2) emission data from experimental plots or research plots, or (3) data from high-quality academic literature, such as those reviewed by experts or published in academic journals, can be used. The selected reference data should be appropriate and applicable to the project area, especially if there is data consistent with the control factors or agricultural activities of the project.
<b>QA/QC procedures</b>	Appendix 3 - T-VER-P-METH-13-08 Version 01. Mathematical model will go through Independent Model Evaluation prior to verification.

<b>Data / Parameter 13</b>	fCH <sub>4</sub> SOIL,BSL,i,t
<b>Data unit:</b>	Tonnes of methane
<b>Description:</b>	Quantity of methane emissions from soil carbon sources in the baseline scenario obtained from the model, in growing season s of sample unit i


	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

<b>Measurement procedures (if any):</b>	<p>Details according to the selected evaluation method, including sampling and data, the use of reference values or recommended values from reliable sources, and calculations using appropriate equations.</p> <p>The scientific principles for using models to assess greenhouse gas emissions from agricultural areas are detailed in Appendix 3 of T-VER-P-METH-13-08 Version 01.</p>
<b>Monitoring frequency:</b>	<p>According to the round of evaluation and monitoring for certification</p>
<b>Source of data:</b>	<p>Measurement report: The values are obtained from mathematical model that predicts greenhouse gas emissions from agricultural areas, such as CH<sub>4</sub> and N<sub>2</sub>O emissions from soil. The sources of the model includes (1) collecting actual emission data from the project area, (2) emission data from experimental plots or research plots, or (3) data from high-quality academic literature, such as those reviewed by experts or published in academic journals, can be used. The selected reference data should be appropriate and applicable to the project area, especially if there is data consistent with the control factors or agricultural activities of the project.</p>
<b>QA/QC procedures</b>	<p>Appendix 3 - T-VER-P-METH-13-08 Version 01. Mathematical model will go through Independent Model Evaluation prior to verification.</p>

<b>Data / Parameter 14</b>	$f_{CH_4SOIL,PJL,i,t}$
<b>Data unit:</b>	Tonnes of methane


	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

<b>Description:</b>	Quantity of methane emissions from soil carbon sources in the project scenario obtained from the model, in growing season s of sample unit i
<b>Measurement procedures (if any):</b>	<p>Details according to the selected evaluation method, including sampling and data, the use of reference values or recommended values from reliable sources, and calculations using appropriate equations.</p> <p>The scientific principles for using models to assess greenhouse gas emissions from agricultural areas are detailed in Appendix 3 of T-VER-P-METH-13-08 Version 01.</p>
<b>Monitoring frequency:</b>	According to the round of evaluation and monitoring for certification
<b>Source of data:</b>	<p>Measurement report: The values are obtained from the mathematical model that predicts greenhouse gas emissions from agricultural areas, such as CH<sub>4</sub> and N<sub>2</sub>O emissions from soil. The sources of the model includes: (1) collecting actual emission data from the project area, (2) emission data from experimental plots or research plots, or (3) data from high-quality academic literature, such as those reviewed by experts or published in academic journals, can be used. The selected reference data should be appropriate and applicable to the project area, especially if there is data consistent with the control factors or agricultural activities of the project.</p>
<b>QA/QC procedures</b>	Appendix 3 - T-VER-P-METH-13-08 Version 01. Mathematical model will go through Independent Model Evaluation prior to verification.

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

<b>Data / Parameter 15</b>	$EC_{PJ,s,i}$
<b>Data unit:</b>	MWh
<b>Description:</b>	<p>Electricity consumption in growing season s of sample unit i</p> <p>This is monitored to ensure that the emissions due to CO<sub>2</sub> are less than 5% of the project emissions and can therefore be excluded. The ex-ante model does not include CO<sub>2</sub> emissions from electricity use; ex-post will include CO<sub>2</sub> emissions from electricity use only if they are above 5% of total project emissions.</p>
<b>Measurement procedures (if any):</b>	Modelling calculation based on rated power from equipment manufacturers and recorded operating hours of machinery/equipment from farmers information via the Smart Farmer application, throughout the growing season
<b>Monitoring frequency:</b>	Throughout the growing season
<b>Source of data:</b>	Measurement report
<b>QA/QC procedures</b>	Data completeness check from kWh Meter measure or farmer or project developer records

<b>Data / Parameter 16</b>	$EF_{Elec,s}$
<b>Data unit:</b>	<p>Greenhouse gas emission factor for electricity production/consumption in growing season s</p> <p>This is monitored to ensure that the emissions due to CO<sub>2</sub> are less than 5% of the project emissions and can therefore be excluded. The ex-ante model does not include CO<sub>2</sub> emissions from electricity use; ex-post will include CO<sub>2</sub> emissions from electricity use only if they are above 5% of total project emissions.</p>


	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

<b>Description:</b>	Greenhouse gas emission factor report for electricity production/consumption from projects and activities to reduce greenhouse gases, as announced by TGO.
<b>Measurement procedures (if any):</b>	<p>For project proposal documents:</p> <ul style="list-style-type: none"> <li>● Use the latest EFElec,y value announced by TGO.</li> </ul> <p>For monitoring greenhouse gas reduction:</p> <ul style="list-style-type: none"> <li>● Use the EFElec,y value announced by TGO to assess the amount of greenhouse gases during the crediting period for greenhouse gas certification. However, if TGO has not yet announced an EFElec,y value for that specific year, use the most recent EFElec,y value announced by the TGO for that year instead.</li> </ul>
<b>Monitoring frequency:</b>	Every time TGO announces a new value
<b>Source of data:</b>	For project proposal documents: based on latest value announced by TGO (October 30, 2022) <sup>8</sup>
<b>QA/QC procedures</b>	Default value


### Project Parameter Monitoring Plan

Monitored Parameters	Units	Measurement / Monitoring Methods	Monitoring Frequency	Responsible Parties	Data Sources / Tools	Remarks
Project location	-	Verify plot coordinates using GPS	Once per year	Field Project Coordinator	GPS / GIS maps	Used to verify project boundary


<sup>8</sup> <https://ghgreduction.tgo.or.th/en/premium-t-ver-download/download/6966/3801/32.html>

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

Monitored Parameters	Units	Measurement / Monitoring Methods	Monitoring Frequency	Responsible Parties	Data Sources / Tools	Remarks
Project area size	Rai	Land title documents combined with GPS verification	Once per year	Field Project Coordinator	Land title deed / GPS	Used for GHG emission calculations
Changes in land tenure/land use rights	-	Verification of land ownership documents	Once per year	Varuna (Thailand) Co., Ltd.	Official documents	Must be updated whenever changes occur
Water level in the field (AWD)	cm	Measurement using AWD tube and photographic evidence	Weekly	Sub Field Coordinator	AWD tube / Smart Watcher	Key parameter for CH <sub>4</sub> calculation
Number of wetting–drying cycles	times per cropping cycle	Recording based on water level observations	Weekly	Sub Field Coordinator	Smart Watcher	Used to confirm actual AWD implementation
Duration of dry periods	days	Calculation based on water level data	Weekly	Sub Field Coordinator	Application / field records	Important for emission factor determination
Water consumption	m <sup>3</sup> /rai	Estimation based on pumping duration and flow rate	Per cropping cycle	Participating Farmers / Sub Field Coordinator	Water pump / water usage records	Used to assess water savings
Chemical fertilizer application	kg/rai	Recording of fertilizer application	Per cropping cycle	Sub Field Coordinator	Receipts / records	Used for N <sub>2</sub> O calculation
Organic fertilizer application	kg/rai	Farmer-recorded data	Per cropping cycle	Sub Field Coordinator	Farmer records	If applicable
Lime application (for saline soils)	kg/rai	Usage records	Per cropping cycle	Sub Field Coordinator	Receipts / photographs	Important in saline soil areas

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

Monitored Parameters	Units	Measurement / Monitoring Methods	Monitoring Frequency	Responsible Parties	Data Sources / Tools	Remarks
Biomass burning	kg/rai	Survey/interview methods	Per cropping cycle	Sub Field Coordinator	Photographs / reports	Must specify presence/absence
Rice varieties used	-	Farmer-recorded data	Per cropping cycle	Sub Field Coordinator	Project forms	e.g., 107 / 111
Planting date / harvesting date	date	Activity records	Per cropping cycle	Sub Field Coordinator	Smart Watcher	Used to determine growth stages
Rice yield	kg/rai	Recording of actual yield	Per cropping cycle	Sub Field Coordinator	Photographs / reports	Used to assess productivity
Fuel consumption (diesel)	L/rai	Recording of fuel usage	Per cropping cycle	Participating Farmers	Receipts	Used for CO <sub>2</sub> calculation
Soil conditions (e.g., saline soil)	-	Estimation based on area	Once per year	Varuna (Thailand) Co., Ltd.	Area reports	Used as a static parameter


	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

## Part 4 Local Stakeholder Consultation

### 4.1 Stakeholders consultation process

The stakeholder consultation process for the AWD rice farming project under T-VER Premium is designed to ensure transparency, inclusiveness, and community ownership. The process begins with early engagement, where local stakeholders—including farmers, community leaders, local government agencies, women’s groups, and vulnerable populations—are informed about the project’s objectives, methods, and expected impacts. Public hearings and focus group discussions are then conducted in project areas to gather feedback on potential benefits, risks, and challenges, with attention to diverse perspectives such as age, gender, education level, and farming experience. Inputs from these consultations are systematically recorded, analyzed, and incorporated into the project design to improve feasibility and responsiveness to local needs. The process also includes continuous two-way communication, where stakeholders are updated on project progress, monitoring results, and grievance mechanisms, ensuring that concerns can be raised and addressed throughout implementation.

Stakeholder	Role and Responsibilities
Farmers	- Project Implementors
Local Community (Village Head, Subdistrict Head, District Officer)	- Project Supporters
Government Agencies	- Provide policies and support for AWD - Ensure the project complies with laws and government policies
Private Sector	- Supply necessary materials, equipment, and technology - Participate in promoting marketing and product sales

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

Academics and Agricultural Experts	<ul style="list-style-type: none"> <li>- Provide technical guidance on AWD rice cultivation</li> <li>- Assess project impacts and feasibility</li> </ul>
------------------------------------	--


## 4.2 Summary of comments from stakeholders

The stakeholder engagement meeting, held on 26 February 2025 at the Agricultural Learning Center for Increasing Production Efficiency in Village 4, Don Ko Ka Subdistrict, Bang Nam Prieo District, Chachoengsao Province, aimed to gather opinions, concerns, and attitudes from diverse stakeholders, including details such as gender, age, education level, and occupation. This meeting served as the first public hearing for the Alternate Wetting and Drying (AWD) rice farming project, which will begin in Chachoengsao and expand to Kanchanaburi, Nakhon Pathom, Uttaradit, Sukhothai, Khon Kaen, Maha Sarakham, and Nong Bua Lamphu.

The objectives were to build understanding and awareness of the project's approach, operations, and potential benefits, while also acknowledging possible impacts. It promoted participatory decision-making by enabling stakeholders to express their views, thereby ensuring inclusivity and community acceptance. The meeting also assessed potential economic, social, and environmental impacts to support effective implementation and minimize risks. Additionally, it strengthened relationships among government agencies, private sector actors, and local communities through information exchange and mutual understanding.

### Summary of Participants (By Gender, Age, Farming Experiences and Roles)

Gender	No. of people	Percentage (%)
Male	11	61.11
Female	7	38.89
Total	18	100

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0


Age	No. of people	Percentage (%)
Less than 30 years old	0	0
31-40 years old	4	22.2
41-50 years old	5	27.8
Above 51 years	9	50
Total	18	100

Farming Experiences	No. of people	Percentage (%)
1-5 years	2	11.11
6-10 years old	3	16.67
11-20 years old	3	16.67
Above 21 years	7	38.89
	3	16.67
Total	18	100

Role	No. of people	Percentage (%)
Farmers	11	61.11
Local Leaders	2	11.11
Government	5	27.78
Others	0	0
Total	18	100

## Summary of Comments

### 1. In the past, how has local agriculture in your area been affected?

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0


Farmers explained that their agricultural activities have faced many challenges over the years. Unstable weather conditions and recurring droughts have reduced productivity and made rice farming increasingly uncertain. High production costs, unstable crop prices, and persistently low rice prices have placed significant financial pressure on farming households. Poor soil quality has also contributed to reduced yields, while pests and environmental problems add further difficulties. Despite these hardships, some farmers highlighted positive experiences with Alternate Wetting and Drying (AWD) cultivation, as it uses less water and can help reduce environmental impacts.

## **2 What concerns do you have about this project?**

Several concerns were raised regarding the implementation of this project. Farmers worried about the compatibility of the rice varieties grown locally with AWD techniques and the increased risk of pests, such as rats, during dry periods. Additional challenges include saline soil areas, weed management, and potential rat infestations. Many farmers expressed uncertainty about the clarity, sustainability, and long-term commitment of the project, questioning whether companies involved would continue to provide sufficient support. Concerns were also raised about the willingness of farmers to adopt low-carbon rice cultivation, especially among elderly farmers who may prefer traditional methods and struggle with the introduction of new technology or applications. Farmers further questioned whether compensation would be attractive enough and whether the trial period would justify the effort and potential risks involved.

## **3 What are your additional expectations for this project?**

Despite these concerns, farmers have clear expectations for positive outcomes. They hope the project will lead to higher yields, lower production costs, and increased income through AWD rice farming. Expectations also include achieving better rice prices, both domestically and internationally, and securing more stable markets for high-quality rice. Farmers want the project to deliver tangible benefits, such as improved livelihoods and reduced environmental impacts, and they emphasize the importance of the project being long-term, with continuity to ensure lasting results. Many expressed

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

interests in field visits tailored to local conditions, as well as opportunities for study tours and practical training on AWD methods, where farmers can learn directly from experts while practicing alongside project staff. Ultimately, they expect the project to provide economic stability, environmental sustainability, and greater opportunities for accessing premium markets, ensuring that both current and future generations of farmers can benefit.

#### **4. Improvement and mitigation measures for identified issues**

Based on the stakeholder consultation meeting, key issues and improvement measures for the implementation of Alternate Wetting and Drying (AWD) rice cultivation were identified and summarized as follows:


##### **4.1 Suitable rice varieties**

The project recommends the use of certified RD rice varieties approved by the Rice Department, including RD113, RD117, and RD119, which are suitable for irrigated areas to ensure efficient productivity and alignment with local conditions.

##### **4.2 Pests during the dry season (rodents)**

Rodent management in AWD rice fields during the dry season includes:

- 1) Monitoring: Inspecting rice fields and bunds at least once per week to observe signs of damage such as burrows and stem feeding.
- 2) Environmental management: Cutting grass, removing weeds around bunds and irrigation canals, and repairing bunds to reduce rodent shelter.
- 3) Mechanical control: Installing traps along bunds and affected areas, and regularly adjusting trap placement to improve effectiveness.

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

4) Chemical control (if necessary): Using safe and recommended methods in accordance with relevant authorities, while avoiding harsh chemicals.

5) Data recording: Recording dates, control methods, and results for monitoring and project evaluation purposes.

### 3. Saline soil areas

Saline soil management focuses on salt leaching through repeated flooding and drainage (2–3 cycles) prior to land preparation, combined with soil improvement using organic amendments such as manure, rice husk, and gypsum to enhance soil fertility. Salt-tolerant rice varieties such as KDML105 and RD6 are recommended, using 30–35-day-old seedlings for transplanting. Post-harvest mulching is also applied to reduce salt accumulation in the soil.

### 4. Rodent outbreaks


Rodent control is implemented through bund vegetation management, burrow destruction, and the use of traps and rodenticides in accordance with recommendations from the Department of Agriculture. Community-wide cooperation is essential to effectively reduce rodent outbreaks.

### 5. Weeds

The project implements integrated weed management, including land preparation and plowing, water level control under the AWD system to suppress weed germination, mechanical or manual weeding, and the judicious use of herbicides based on technical recommendations to minimize environmental impact and maintain productivity.

### 6. Project clarity and sustainability

The project has clearly defined operational guidelines with a systematic Monitoring, Reporting, and Verification (MRV) system, in line with the Premium T-VER standards of the Thailand

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

Greenhouse Gas Management Organization (TGO). The system is verifiable by third-party validation bodies (VVBs) and promotes farmer participation to ensure long-term continuity and sustainability.

#### 7. Farmer participation

The project promotes farmer engagement through training, technical support, and financial incentives derived from carbon credits and reduced production costs. An MRV system is implemented to ensure compliance with TGO requirements and verifiability.

#### 8. Implementation challenges

The project prepares risk management measures for potential challenges in AWD implementation by providing training, technical assistance, and continuous monitoring, while adapting practices to local conditions to enhance efficiency and reduce operational barriers.


#### 9. Company support

The project receives support from the company in management, technical advisory, performance monitoring, and provision of necessary resources to ensure effective implementation in compliance with TGO requirements.

#### 10. Acceptance among elderly farmers

The project recognizes that some farmers, particularly elderly ones, may adhere to traditional practices. Therefore, learning is promoted through training, demonstration plots, and close advisory support, along with evidence-based results such as cost reduction and yield improvement to build confidence in AWD adoption.

#### 11. Technology suitability

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

Appropriate technologies are selected based on local context, considering ease of use, cost, and farmer readiness. Training, field demonstrations, and continuous support are provided to ensure effective adoption.

#### 12. Project duration

The project duration is designed to be appropriate for monitoring and evaluation of outcomes, including water use efficiency, cost reduction, and greenhouse gas emission reduction, supported by an MRV system aligned with TGO standards.

#### 13. Mobile application limitations


The project acknowledges limitations among elderly farmers in using digital applications. Therefore, simplified training, field support, and offline data recording systems are provided to ensure complete and continuous participation.

#### 14. Adequacy of economic incentives


The project establishes appropriate incentive mechanisms based on carbon credit revenues and production cost savings. Benefits are clearly communicated, and incentive structures are adjusted to local farmer contexts to encourage sustained participation.

### 4.3 Corrective actions for issues identified in section 4.2

Topic Area	Problems & Concerns	Farmers' Expectations	Alternative Solution Ideas
<b>Weather &amp; Water Management</b>	<ul style="list-style-type: none"> <li>Unstable weather and drought</li> <li>Risk of pests (rats) during dry periods</li> </ul>	<ul style="list-style-type: none"> <li>More stable yields</li> <li>Reduced production costs</li> </ul>	<ul style="list-style-type: none"> <li>Promote AWD and other water-saving practices</li> <li>Develop climate-resilient rice varieties</li> <li>Improve irrigation and water-sharing systems</li> <li>Community pest control campaigns</li> </ul>
<b>Soil &amp; Crop Conditions</b>	<ul style="list-style-type: none"> <li>Poor soil quality</li> <li>Saline soil areas</li> <li>Rice varieties may not suit AWD</li> </ul>	<ul style="list-style-type: none"> <li>Higher yields and better quality rice</li> </ul>	<ul style="list-style-type: none"> <li>Use salt-tolerant and locally adapted rice varieties</li> <li>Soil rehabilitation programs</li> </ul>

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

Topic Area	Problems & Concerns	Farmers' Expectations	Alternative Solution Ideas
			(organic matter, soil amendments)• Seed support and trials of suitable varieties
<b>Pests &amp; Weeds</b>	• Rat infestation• Weed management challenges	• Fewer crop losses, higher income	• Integrated pest management (IPM)• Community-based rat control• Training in weed control under AWD conditions
<b>Economic Pressures</b>	• High production costs• Unstable and low rice prices• Compensation may not be attractive	• Higher income and stable rice prices• Better access to premium/export markets	• Farmer cooperatives to lower input costs• Branding/marketing of low-carbon rice• Certification to access international markets• Incentive schemes linked to performance
<b>Farmer Participation &amp; Capacity</b>	• Limited cooperation among farmers• Elderly farmers reluctant to adopt new methods• Difficulty using applications and technology	• Practical training and study visits• Desire for project continuity	• Peer-to-peer learning with farmer champions• Field visits tailored to local conditions• Simplified or offline tech support• Ongoing staff support for digital tools
<b>Project Design &amp; Support</b>	• Uncertainty about project clarity, sustainability, and duration• Concerns whether company will provide ongoing support• Worry if project trial period will be worthwhile	• Long-term project with guaranteed benefits• Assurance of sustained support	• Transparent communication on project scope and timelines• Secure multi-year funding and partnerships• Phased scaling with clear milestones• Continuous support mechanisms

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

## Appendix 1:

### Summary of Additionality


The programme demonstrates clear additionality at financial, farmer, provincial, and programme levels, showing that adoption of Alternate Wetting and Drying (AWD) practices in Thailand would not be possible without the support of ITMO revenues under the Article 6 framework.

**Financial additionality** is established through a simple cost analysis aligned with FOEN's 2025 requirements. In the absence of ITMO revenues, the Net Present Value (NPV) of the programme is reflecting the high fixed costs and the lack of alternative income streams from AWD implementation. In contrast, with ITMO revenues, the NPV turns positive, demonstrating that carbon revenues are the decisive factor for programme feasibility. Without ITMOs, AWD implementation would remain financially unattractive and would not be scaled up.

**Additionality at the farmers' level** arises from entrenched practices and financial constraints. Farmers traditionally rely on continuous flooding because it reduces risks such as weed infestation and water shortages, and because it is perceived as the most secure method for maintaining stable yields.

In the target districts, there are currently no awareness campaigns or training opportunities that could equip farmers with the knowledge needed to implement AWD correctly. Furthermore, AWD does not directly generate additional income: savings on fuel and pumping costs are modest and uncertain, and cannot be relied upon for daily financial planning. Even modest investments, such as purchasing PVC pipes for AWD tubes, present a barrier for smallholders, who are reluctant to take on extra costs. Finally, without the programme, farmers would lack access to the digital monitoring tools that reduce risks and provide guidance for correct implementation. These barriers apply across Thai rice farmers, the majority of whom are smallholders with limited financial capacity.


**At the CPA level**, the programme addresses gaps in existing government efforts. Provinces were selected specifically because no current or planned programmes are sufficient to shift agricultural practices toward AWD at scale. For example, in Chachoengsao, the government AWD program

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

accounts for 1,900 rai (304 ha) out of more than 1.9 million rai of rice land, representing just 0.1% of the province’s rice-growing area.

Such small-scale efforts are valuable but insufficient to change prevailing practices. The programme complements these initiatives by expanding coverage, building farmer capacity, and introducing financial and organizational mechanisms that enable more widespread adoption. Collaboration with Thai authorities is also planned to ensure robust governance, including tools to avoid double counting such as joint committees, centralized registration systems, and potentially a national farmer registration application.

In conclusion, the programme demonstrates robust additionality at all levels. Farmers face strong cultural, financial, and organizational barriers to adopting AWD; provinces lack sufficient support to trigger large-scale practice change; and at the programme level, implementation is only financially feasible through ITMO revenues. The programme therefore clearly meets the additionality requirements and represents a contribution to achieving emission reductions under Article 6.

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

**Appendix 2:**

**Stakeholder Consultation Report**

**Project: Alternate Wetting and Drying (AWD) Rice Farming for Thai Farmers**


**Agricultural Learning Center for Increasing Production Efficiency**

**Village 4, Don Ko Ka Subdistrict, Bang Nam Prieo District, Chachoengsao Province**

**26 February 2025**

**Varuna (Thailand) Co., Ltd.**



	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

## 1. Background

The project to promote Alternate Wetting and Drying (AWD) rice farming in Thailand is a collaboration between Thailand and Switzerland. Its objectives are to reduce greenhouse gas emissions, enhance sustainable rice production efficiency, and conserve natural resources.

The project is planned to be implemented in 8 provinces: Chachoengsao, Kanchanaburi, Nakhon Pathom, Uttaradit, Sukhothai, Khon Kaen, Maha Sarakham, and Nong Bua Lamphu, with a project duration until 2030. Varuna Company, as the project developer, plays a key role in transferring knowledge and technology to Thai farmers to promote sustainable rice farming systems and reduce environmental impacts.

## 2. Introduction

**2.1 Project Type:** Land Use (Agriculture & Forestry) – Reduction, absorption, and sequestration of greenhouse gases from the forestry and agriculture sectors.


**2.2 Project Scale:** Large-scale – total reduction/sequestration of more than 16,000 tCO<sub>2</sub>eq per year.

**2.3 Project Location:** Chachoengsao (first province where the project starts), Kanchanaburi, Nakhon Pathom, Uttaradit, Sukhothai, Khon Kaen, Maha Sarakham, Nong Bua Lamphu.

**2.4 Expected Completion Period:** 5 years (2025 – 2031).

## 3. Goals

The objective of conducting the stakeholder engagement meeting is to ensure that the organization is informed of the opinions, concerns, and attitudes of stakeholders, and to use this information to develop appropriate engagement plans for each stakeholder group. It also

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

enables the organization to report key issues and concerns raised by stakeholders regarding the implementation of the Alternate Wetting and Drying (AWD) rice farming project.

#### **4.Objectives**

The objectives of the Stakeholder Consultation Meeting for the Alternate Wetting and Drying (AWD) Rice Farming Project are as follows;

##### **4.1 Gather feedback and suggestions from stakeholders:**

To provide opportunities for relevant parties—such as farmers, local communities, and related agencies—to express their opinions and offer suggestions that can be used to further improve the project’s efficiency and better meet stakeholder needs.

##### **4.2 Build understanding and awareness about the project:**

The meeting aims to ensure that stakeholders understand the project’s approach, operations, and potential benefits, as well as possible impacts. This will allow all parties to receive accurate information and develop a clear understanding.

##### **4.3 Promote participatory decision-making:**


By allowing stakeholders to express their opinions, the project encourages inclusive decision-making and active involvement in implementation, ensuring sustainability and community acceptance.

##### **4.4 Assess potential project impacts:**

To evaluate economic, social, and environmental impacts that may arise from project implementation, supporting effective execution and minimizing unforeseen negative consequences.

##### **4.5 Strengthen relationships among stakeholders:**

The meeting also aims to build positive relationships between government agencies, the private sector, and local communities through the exchange of information and mutual understanding.

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

#### **4.6 Improve project implementation based on feedback:**

Suggestions from the meeting will be considered and integrated into project implementation to align with the local context and stakeholder needs, thereby increasing the likelihood of project success.

### **5. Scope of Work**

**5.1 Stakeholder groups:** Farmers, local communities, government agencies, private sector, and experts in agriculture and water management.

#### **5.2 Key issues for stakeholder feedback:**

- Knowledge and awareness of Alternate Wetting and Drying (AWD) rice farming
- Support from various organizations (TGO, government/private sector organizations)
- Resource use (water, land, fuel)
- Environmental impacts
- Economic and social impacts


**5.3 Project area and conditions:** Suitability of areas for AWD rice farming and potential limitations.

**5.4 Impacts and evaluation:** Assessment of economic, social, and environmental impacts of project implementation.

**5.5 Support needs:** Requirements for financial support, technical guidance, and training.

**5.6 Implementation period and monitoring:** Feedback on the project duration and monitoring process.

### **6. Stakeholders Planning**

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

This meeting aims to provide all stakeholder groups with the opportunity to share their opinions and suggestions in order to improve the project, making it more effective and responsive to the needs of the community and farmers.


**Table 1: Expectation of Stakeholders Group Attending the Meeting**

Stakeholder	Expectations
<b>Meeting Organizer (Project Developer)</b>	<ul style="list-style-type: none"> <li>- Prepare and conduct the meeting according to the plan</li> <li>- Share relevant information with stakeholders in advance</li> <li>- Coordinate with all stakeholder groups</li> <li>- Collect and summarize feedback from the meeting</li> </ul>
<b>Stakeholders (Farmers, Communities, Relevant Agencies)</b>	<ul style="list-style-type: none"> <li>- Provide opinions and suggestions about the project</li> <li>- Share views on potential impacts</li> <li>- Collaborate in improving the project to meet needs</li> </ul>
<b>Government Agencies (District Chief, District Agricultural Office, Land Development Department, Rice Department, Village Head, Subdistrict Head)</b>	<ul style="list-style-type: none"> <li>- Provide opinions and suggestions about the project</li> <li>- Share views on potential impacts</li> <li>- Collaborate in improving the project to meet needs</li> </ul>

## 7 Stakeholder Identification

**Table 2: Roles and Responsibilities of Stakeholders**

Stakeholder	Role and Responsibilities
<b>Farmers</b>	- Project Implementors


	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

Stakeholder	Role and Responsibilities
<b>Local Community (Village Head, Subdistrict Head, District Officer)</b>	- Project Supporters
<b>Government Agencies</b>	- Provide policies and support for AWD - Ensure the project complies with laws and government policies
<b>Private Sector</b>	- Supply necessary materials, equipment, and technology - Participate in promoting marketing and product sales
<b>Academics and Agricultural Experts</b>	- Provide technical guidance on AWD rice cultivation - Assess project impacts and feasibility

**Table 3: Activities for stakeholders**

Activities	Stakeholders	Objectives	Communication Channel	Timeline
<b>Public consultation meeting</b>	Farmers, local communities	To gather feedback and suggestions on Alternate Wetting and Drying (AWD) rice farming	On-site meeting	Half-day
<b>Opinion survey</b>	Farmers, local communities, supporters	To collect feedback from stakeholders who are unable to attend activities	TGO website	30 days

## 8. Operation Plan

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

After the public consultation in Chachoengsao Province, additional consultations will be carried out in other provinces. At the same time, the project proposal and registration documents will be revised, and the project will undergo a review by 3<sup>rd</sup> party validators within 2025. For project implementation, farmer registration for participation and training on Alternate Wetting and Drying (AWD) rice cultivation will be conducted to enable the project to commence in by 4Q of 2025 or 1Q of 2026.

Activity	2025				2026				2027				2028				2029				2030				
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
<b>แผนงานเตรียมโครงการ</b>																									
1	การทำเอกสารข้อเสนอโครงการ	■																							
2	การประชุมรับฟังความคิดเห็น	■	■																						
3	การจัดการประชาสัมพันธ์โครงการกับกลุ่มเกษตรกรที่สนใจ		■	■																					
4	การทำเอกสารขึ้นทะเบียนโครงการกับทาง TGO (Premium-TVER)	■	■																						
5	การตรวจสอบความใช้ได้ของโครงการจากผู้ใช้ประโยชน์และตรวจสอบภายนอก			■	■				■			■			■				■			■			■
<b>แผนงานการดำเนินงานโครงการ</b>																									
6	การเปิดลงทะเบียนเกษตรกรร่วมโครงการ				■	■			■	■			■	■			■	■			■	■			■
7	การอบรมเกษตรกรในการทำนาเปียกสลับแห้ง						■	■			■	■			■	■			■	■			■	■	
8	การดำเนินโครงการเปียกสลับแห้ง							■	■			■	■			■	■			■	■			■	■


## 9. Stakeholder Consultation Results

From the stakeholder consultation meeting on Alternate Wetting and Drying (AWD) rice cultivation, conducted on 26 February 2025, a total of 18 respondents' responses to the questionnaire, accounting for 66.67% of the total 27 meeting participants.

### 9.1 General Information

Gender	No. of people	Percentage (%)
Male	11	61.11
Female	7	38.89
Total	18	100

Age	No. of people	Percentage (%)
Less than 30 years old	0	0
31-40 years old	4	22.2

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

41-50 years old	5	27.8
Above 51 years	9	50
<b>Total</b>	<b>18</b>	<b>100</b>

Farming Experiences	No. of people	Percentage (%)
1-5 years	2	11.11
6-10 years old	3	16.67
11-20 years old	3	16.67
Above 21 years	7	38.89
	3	16.67
<b>Total</b>	<b>18</b>	<b>100</b>

Role	No. of people	Percentage (%)
Farmers	11	61.11
Local Leaders	2	11.11
Government	5	27.78
Others	0	0
<b>Total</b>	<b>18</b>	<b>100</b>

## 9.2 Assessment Scoring Results


Assessment Criteria	Level of Understanding/ Acceptance
---------------------	------------------------------------

(5 = Very High, 4 = High, 3 = Moderate, 2 = Low, 1 = Very Low)

## 9.3: Additional Questions / Suggestions Regarding Participating in the Project

### 9.3.1 In the past, how has local agriculture in your area been affected?

- Unstable weather conditions
- Drought problems
- Reduced environmental impact

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0


- High production costs; unstable crop prices
- High expenses
- Low rice prices
- Positive effects because Alternate Wetting and Drying (AWD) rice cultivation uses less water
- Poor soil quality

### 9.3.2. What concerns do you have about this project?

- Rice varieties in the area
- Pests during dry periods (rats)
- Saline soil areas
- Rat infestation
- Weeds
- Clarity and sustainability of the project
- Farmers may not cooperate in cultivating low-carbon rice
- This farming method may face some obstacles
- Whether the company will provide support or not
- Elderly farmers may hold on to traditional beliefs and practices, making it difficult to change their mindset and habits
- The technology introduced may not be suitable for local farmers
- Whether the duration of the project will be worth the trial
- Using applications may be a limitation for elderly farmers
- Compensation may not be attractive enough


### 9.3.3 What are your additional expectations for this project?

- Conduct field visits tailored to each different area
- Achieve higher yields

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

- Gain higher income from alternate wetting and drying rice farming
- Higher rice prices
- Hope that this project will help farmers earn more income
- Increase income while reducing environmental impacts
- Receive more benefits
- Desire for this project to continue
- Hope that the project will be long-term and ensure good rice prices
- The project will benefit farmers
- Rice prices meet expectations
- Want study visits on alternate wetting and drying farming so that interested farmers can gain more knowledge by practicing together with staff
- Lower production costs
- Better access to international markets for quality rice and higher rice prices compared to conventional farming



	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

## 10.2 Letter of Invitation to join the stakeholder consultation



**บริษัท วรุณา (ประเทศไทย) จำกัด**  
**VARUNA (Thailand) Company Limited**

304 อาคารพาณิชย์เออี (อาคาร) ชั้นที่ 25 ชั้น 2501 ถนนพหลโยธิน แขวงสามเสนในเขตพญาไท กรุงเทพมหานคร 10400  
304 WAIIT PLACE AEE (BUILDING A), 25th FLOOR, UNIT 2501, PHAHOLYOTHIN ROAD, SAMSEN NAI, PHAYA THAI, BANGKOK 10400  
Tel: +66(0) 2078 4000 Website: www.varv.co.th

ที่ VRN0010/2568

14 กุมภาพันธ์ 2568

**เรื่อง** ขอเชิญเข้าร่วมประชุมการรับฟังความคิดเห็นผู้มีส่วนได้ส่วนเสียโครงการการทำนาเปียกสลับแห้ง ภายใต้ความตกลงปารีสข้อ 6

**เรียน** นายจรณเกียรติ รักทานิขมิณี ผู้อำนวยการจังหวัดฉะเชิงเทรา

เมื่อวันที่ 24 มิ.ย. 65 นายวราวุธ ศิลปอาชา รัฐมนตรีว่าการกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม กับนางชัชวาลิมา โขมมาภรณ์มนตรีแห่งสหพันธ์ รัฐมนตรีว่าการกระทรวงสิ่งแวดล้อมคมนาคม พลังงานและสาธารณสุข สหพันธ์รัฐสวิส ได้ร่วมลงนามในข้อตกลงการดำเนินงานภายใต้ความตกลงปารีสระหว่างราชอาณาจักรไทยกับสหพันธ์รัฐสวิส (Implementing Agreement to the Paris Agreement between the Kingdom of Thailand and the Swiss Confederation) ณ กรุงเบิร์น สหพันธ์รัฐสวิส ข้อตกลงครั้งนี้ เปิดโอกาสให้ประเทศไทยกับสหพันธ์รัฐสวิส ดำเนินความร่วมมือภายใต้ข้อ 6 ของความตกลงปารีสด้วยความสมัครใจ เพื่อขับเคลื่อนการดำเนินงานตามเป้าหมายการมีส่วนร่วมที่ประเทศกำหนด (Nationally Determined Contribution: NDC) อ่างอิงผลการลดก๊าซเรือนกระจกระหว่างประเทศโดยความร่วมมือนี้ นับเป็นส่วนเพิ่มเติม นอกเหนือจากมาตรการภายใน NDC ของประเทศ ทั้งนี้ การดำเนินงานภายใต้ข้อตกลงฯ จะช่วยให้ประเทศไทยเรียนรู้แนวทางดำเนินการจากโครงการ เพื่อนำองค์ความรู้ที่ได้รับมาต่อยอดและขับเคลื่อนการดำเนินงานให้บรรลุ NDC ของไทย การมุ่งสู่เป้าหมายความเป็นกลางทางคาร์บอน (Carbon neutrality) และการปล่อยก๊าซเรือนกระจกสุทธิเป็นศูนย์ (Net zero GHG emission)

เพื่อต่อยอดความสำเร็จ ในการส่งเสริมการขับเคลื่อนการดำเนินงานให้บรรลุเป้าหมาย NDC ของประเทศไทย และสอดคล้องกับนโยบายการส่งเสริมการปลูกข้าวแบบเปียกสลับแห้งแก่กลุ่มเกษตรกรนาแปลงใหญ่ และศูนย์ข้าวชุมชน ทางบริษัท วรุณา (ประเทศไทย) จำกัด ร่วมกับ Klik Foundation ในฐานะผู้รับซื้อเครดิตในนามของรัฐบาลสวีเดนและนักพัฒนาค้าขายโครงการส่งเสริมการปลูกข้าวแบบเปียกสลับแห้งในพื้นที่ 7 จังหวัด ดังนี้ ฉะเชิงเทรา อุตรดิตถ์ กาญจนบุรี สุโขทัย ปราจีนบุรี นครปฐม และกรุงเทพมหานคร

ในโอกาสนี้ ทางบริษัท วรุณา (ประเทศไทย) จำกัด ใคร่ขอเชิญท่านเข้าร่วมประชุมรับฟังความคิดเห็นผู้มีส่วนได้ส่วนเสีย สำหรับการส่งเสริมการปลูกข้าวแบบเปียกสลับแห้ง (Alternate Wetting and Drying) การดำเนินโครงการภายใต้ Article 6 และ Methodology Premium T-VER ในวันที่ 26 กุมภาพันธ์ 2568 เวลา 8:30 – 12:00 น. ณ ศูนย์เรียนรู้การเพิ่มประสิทธิภาพการผลิตสินค้าเกษตร (หลัก) หมู่ 4 ตำบลคอนเกาะกา อ.บางน้ำเปรี้ยว จ.ฉะเชิงเทรา ทั้งนี้ทางบริษัทฯ ได้มอบหมายให้นางสาวสิริรัตน์ เสือมัจฉา โทร 082 978 0053 เป็นผู้ประสานงานการนัดหมายในครั้งนี้

จึงเรียนมาเพื่อโปรดพิจารณาให้ความอนุเคราะห์และขอขอบพระคุณมาในโอกาสนี้


แผนที่ศูนย์เรียนรู้การเพิ่มประสิทธิภาพการผลิตสินค้าเกษตร (หลัก)



ขอแสดงความนับถือ

**นงนุช เจริญสวัสดิ์พงศ์**

(นางสาวพณัญญา เจริญสวัสดิ์พงศ์)  
ผู้ร่วมก่อตั้งธุรกิจ  
บริษัท วรุณา (ประเทศไทย) จำกัด

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0



## โครงการสนับสนุนการทำเปียกสลับแห้งของเกษตรกรไทย Alternative Wetting and Drying (AWD) in Thailand

บริษัท วารุณา (ประเทศไทย) จำกัด ร่วมกับพันธมิตรจาก Kikik Foundation จากประเทศนิวซีแลนด์ ร่วมทำโครงการสนับสนุนการทำเปียกสลับแห้งของเกษตรกรในประเทศไทย (Alternative Wetting and Drying) เพื่อลดปริมาณการปล่อยก๊าซเรือนกระจกที่เกิดจากการผลิตข้าวของประเทศไทย

**เป้าหมายโครงการ**

- ลดการปล่อยก๊าซเรือนกระจกทำนาแบบดั้งเดิม
- การปรับปรุงโครงสร้างดินที่ยั่งยืนและเพิ่มผลผลิตข้าวในระยะยาว
- เพิ่มรายได้แก่เกษตรกรรายการปลูกข้าวแบบคาร์บอนดี

**พื้นที่เป้าหมาย**  
พื้นที่กว่า 8 จังหวัด ทั่วประเทศ

**ระยะเวลาโครงการ**  
5 ปี (พ.ศ. 2568 - 2573)

**ปริมาณก๊าซเรือนกระจกที่คาดว่าจะลดได้**  
523,000 - 1,185,000 ตันคาร์บอนไดออกไซด์เทียบเท่า

**มาตรฐานการรับรองคาร์บอนเครดิต**  
Insomrs T-VER เกษตรกรยั่งยืน (Premium T-VER)


**เป้าหมายการพัฒนาที่ยั่งยืน (SDG Goals)**



**ร่วมสร้างรากฐาน  
สู่อนาคตที่ยั่งยืน  
ไปกับวารุณา**


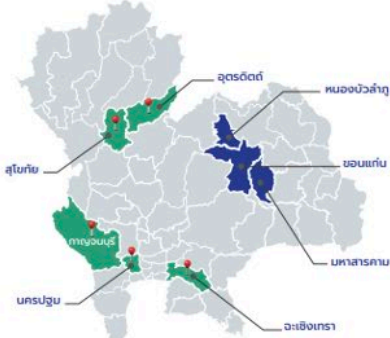
หากคุณสนใจที่จะร่วมสร้างอนาคตที่ยั่งยืน  
พร้อมทำางานเกี่ยวกับโครงการนี้ ติดต่อเราได้ที่

<https://varuna.co.th>  
Varuna - Thailand | Varuna | 0-2078-4058  
varuna.contact@varuna.co.th



## ความร่วมมือจากภาคส่วนต่างๆ

สร้างการเชื่อมต่องานระหว่างชุมชนและหน่วยงาน/องค์กรให้เกิดความยั่งยืนไปด้วยกัน

**พื้นที่ร่วมใจปี พ.ศ. 2568**

- ฉะเชิงเทรา
- กาญจนบุรี
- นครปฐม
- สุพรรณบุรี
- สุโขทัย

**พื้นที่เป้าหมาย**

- ขอนแก่น
- มหาสารคาม
- หนองบัวลำภู

**ร่วมสร้างรากฐาน  
สู่อนาคตที่ยั่งยืน  
ไปกับวารุณา**

หากคุณสนใจที่จะร่วมสร้างอนาคตที่ยั่งยืน  
พร้อมทำางานเกี่ยวกับโครงการนี้ ติดต่อเราได้ที่

<https://varuna.co.th>  
Varuna - Thailand | Varuna | 0-2078-4058  
varuna.contact@varuna.co.th



## Smart Watcher

เทคโนโลยีเพิ่มศักยภาพการดูแลพื้นที่การเกษตรกรรม เพื่อเกษตรกรไทย  
แพลตฟอร์ม Smart Watcher คือตัวเชื่อมเกษตรกรในการติดตามและรายงานผลของการทำงานการเกษตรตามการประเมินผลระยะสั้น และตามฤดูกาลเพื่อใช้ติดตาม (Satellite) ที่เกี่ยวข้องกับการดูแลแปลงเกษตรยั่งยืน ที่ลดความยากที่ผู้ใช้งานราย สดุด แลแสดงผลของงานจัดการแปลงเกษตร

**ฟีเจอร์หลัก Smart Watcher**

- เก็บบันทึกข้อมูลรายแปลง**  
บันทึกผลดำเนินงานตามแผน  
เชิงตัวเลขและเชิงคุณภาพ
- ใช้งานสะดวก  
และมีความแม่นยำสูง**  
ลดความยุ่งยากในการติดตาม  
การดำเนินงาน หรือใช้ติดตามการปฏิบัติงาน  
แบบเรียลไทม์ของข้อมูล  
ที่ส่งมาด้วย AI ในระดับแปลงนา  
แบบรายแปลงได้ทันที
- การเข้าร่วมโครงการ  
และขอรับรองคาร์บอนเครดิต**  
สร้างรายได้ให้เกษตรกรรายแปลง  
Carbon Farming พร้อมใช้แพลตฟอร์ม  
พิสูจน์ตัวตนการปลูกข้าว  
Premium T-VER



## “ทำนาเปียกสลับแห้ง”

เทคนิคเพิ่มศักยภาพการปลูกข้าวด้วยการใช้น้ำอย่างประหยัด

**เปรียบเทียบการทำนาข้าวแบบดั้งเดิม  
และการทำนาข้าวเปียกสลับแห้ง**

การปลูกข้าวแบบดั้งเดิม  
ใช้ปุ๋ยเคมี 100%

ประหยัดน้ำ  
700-1,500 ลิตร/ไร่

การปลูกข้าวแบบเปียกสลับแห้ง  
ใช้ปุ๋ยเคมี 50%

ลดการปล่อย CO<sub>2</sub>  
8-13%

ลดการปล่อย CH<sub>4</sub>  
80%

เหมาะสำหรับนาในเขตชลประทานที่ควบคุมการระบายน้ำได้

**ลดภาวะโลกร้อนด้วย  
เทคนิคการปลูกข้าวแบบเปียกสลับแห้ง**

ลดการปล่อย CO<sub>2</sub>  
และ CH<sub>4</sub>

เพิ่มผลผลิต  
+10%

เพิ่มอายุการใช้งาน  
+1-2 ปี

เพิ่มพื้นที่ปลูก  
+1-2 ไร่/ไร่

ประหยัดน้ำ  
20-30% หรือ 200-300 ลิตร/ไร่

เหมาะสำหรับนาในเขตชลประทานที่ควบคุมการระบายน้ำได้



## SMART FARM แพลตฟอร์ม

แพลตฟอร์มที่อิงสมการคณิตศาสตร์ในการประเมินผลในไร่ของเกษตรกร ผ่าน Smart Farm Platform พร้อมประมวลผลค่าความเปลี่ยนแปลงในดัชนีชี้วัดที่เป็น Normalized Difference Water Index (NDWI)


**ประโยชน์ของการทำนาเปียกสลับแห้ง**

- การเพิ่มผลผลิตข้าว  
เฉลี่ย 10-15%
- การใช้น้ำอย่างมีประสิทธิภาพ  
ลดการใช้น้ำ 20-30%
- การลดต้นทุนการผลิต  
เฉลี่ย 10-15%
- การเพิ่มผลผลิตข้าว  
เฉลี่ย 10-15%
- การลดการปล่อย CO<sub>2</sub>  
8-13%
- การลดการปล่อย CH<sub>4</sub>  
80%
- การเพิ่มอายุการใช้งาน  
+1-2 ปี
- การเพิ่มพื้นที่ปลูก  
+1-2 ไร่/ไร่

**ร่วมสร้างรากฐาน  
สู่อนาคตที่ยั่งยืน  
ไปกับวารุณา**

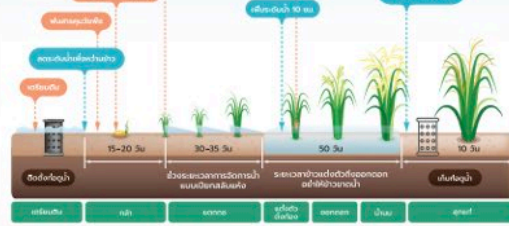
หากคุณสนใจที่จะร่วมสร้างอนาคตที่ยั่งยืน  
พร้อมทำางานเกี่ยวกับโครงการนี้ ติดต่อเราได้ที่

<https://varuna.co.th>  
Varuna - Thailand | Varuna | 0-2078-4058  
varuna.contact@varuna.co.th



## เทคนิคการจัดการน้ำอย่างประหยัดแบบเปียกสลับแห้ง

ตรวจสอบน้ำในแปลงดูที่ค่าค่าความชื้น 10 ซม. ใต้ดินเป็นเกณฑ์ความชื้น 5 ซม. (รวมค่าที่ดูน้ำ)



**ร่วมสร้างรากฐาน  
สู่อนาคตที่ยั่งยืน  
ไปกับวารุณา**


หากคุณสนใจที่จะร่วมสร้างอนาคตที่ยั่งยืน  
พร้อมทำางานเกี่ยวกับโครงการนี้ ติดต่อเราได้ที่

<https://varuna.co.th>  
Varuna - Thailand | Varuna | 0-2078-4058  
varuna.contact@varuna.co.th



### 10.3 Pictures of Events



	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

### Appendix 3:

## Sustainable Development and Safeguards assessment

SDGs and Environmental and Social Risk Assessment for the implementation of AWD practices in Thailand under the framework of the Article 6 of the Paris Agreement

### Introduction

Alternate Wetting and Drying (AWD) is a water management practice designed to enhance sustainability in irrigated rice cultivation by reducing methane emissions and improving resource use efficiency. Developed by Varuna and myclimate under the framework of Article 6 of the Paris Agreement and the Switzerland–Thailand bilateral agreement, this programme seeks to balance environmental and social benefits with social responsibility.

The activity does not fall under any of the category of projects that are required to carry out an Environmental (and Social) Impact Assessment<sup>9</sup> according to the Thai law, nevertheless the programme has carried out an Environmental and Social risk assessment in this document (Safeguards Assessment). In line with TGO requirements to ensure sustainable development and identify safeguards<sup>10</sup>, the risk assessment has identified safeguards to mitigate risks of negative environmental and social impacts that may arise from project implementation.

The programme adheres to the Quality, Safety, Security, Health and Environment Policy of AI and Robotic Ventures<sup>11</sup>, to which Varuna belongs to.

### Sustainable Development Goals (SDGs)

Besides the obvious contribution of the programme to combating climate change (SDG13), this programme will also positively impact farmers' income (SDG 1), ensure sustainable food production and foster food-security (SDG 12, SDG 2), will create job opportunities during the trainings and monitoring (SDG 4 and SDG 8), will broaden the use of high-tech instruments (SDG 9), will optimize water usage (SDG 6), improve soil conditions (SDG 15) and will also promote gender equality by engaging with female farmers (SDG 5). This MA will monitor the three most relevant SDGs among the abovementioned ones. The following targets and indicators identified with the application of the GS impact tool<sup>12</sup> will be monitored to track the programme's progress and its contribution to driving sustainable development in Thailand.


SDG	Target	Relevance:	Monitoring parameter:
SDG 2: Zero hunger	2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality	The adoption of AWD practices requires less water enabling therefore more drought resistant cultivation practices. This strengthens farmers' capacity for adaptation to climate change.	Number of farmers adopted practices promoted by the project

<sup>9</sup> <https://eiathailand.onep.go.th/imgeditor/maptaput/EIA-Eng-2021.pdf>

<sup>10</sup> <https://tver.tgo.or.th/index.php/en/en-premium/kar-phathna-khorngkar-en/pre-en-project-specification/pre-en-sustainable-development-and-safeguards-assessment>

<sup>11</sup> <https://arv.co.th/en/who-we-are/sustainability/2>

<sup>12</sup> <https://globalgoals.goldstandard.org/430-iq-sdg-impact-tool/>

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

SDG 3: Good health and wellbeing	3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	The programme will train farmers in avoiding the practice of open straw burning, which causes considerable air pollution.	Area under reduced/avoided open burning of biomass, crop residue
SDG 6: Clean Water and Sanitation	6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	The adoption of AWD practices requires less water enabling the preservation of natural freshwater bodies and addressing water scarcity issues	Land area provided with (i) new, (ii) improved irrigation and drainage services

## Safeguards assessment

### 1. Non-Discrimination, Gender equality, Inclusion and Freedom of Expression

#### Potential Risks:

The risk of discrimination arises primarily from entrenched social hierarchies and institutional barriers that could exclude certain groups—such as women, ethnic minorities, tenant farmers, or those lacking land documentation—from programme access and benefits. In rural Thailand, customary land tenure and informal arrangements are common, potentially preventing renters or sharecroppers from equal participation. There is a risk that women and marginalized populations may be sidelined in benefit sharing, training, or decision-making, perpetuating existing inequalities.

Power dynamics in rural communities may discourage open feedback, with stakeholders fearing reprisal if they raise concerns about programme implementation or benefit allocation.

#### Risk and Safeguard assessment:

To address these risks, the programme's eligibility criteria are intentionally broad, welcoming all rice farmers, irrespective of land ownership or gender. Legal land use is verified through a range of accepted documents, including leases and certificates, reducing the administrative burden on non-owners.

Discrimination on the basis of gender or religion is not common in Thailand and is not expected, nevertheless the programme strives to ensure non-discrimination. The programme actively encourages participation of female farmers and ensures equal access to training, technology, and incentives.

To foster a safe environment, multiple reporting channels—including hotlines, anonymous emails, and physical drop-boxes—are actively promoted. Independent committees comprising community representatives, government officials, and third-party experts ensure grievances are reviewed impartially. Whistleblower protections are codified, guaranteeing confidentiality and safeguarding against retaliation.

**Risk Likelihood: Negligible**

### 2. Labour, Child Rights, and Equal Opportunity


#### Potential Risks:

As the AWD initiative creates opportunities in field monitoring, data entry, and community leadership, there is a potential for unintentional child labour or unfair practices, particularly where informal labour arrangements are the norm. Power imbalances could also lead to discrimination or harassment within new employment avenues.

#### Risk and Safeguard assessment:

The programme adheres to the Thai labour law and ILO conventions, with explicit clauses against child and forced labour. All staff and participants are educated about anti-harassment and equal opportunity policies upon enrolment. A clear, confidential grievance mechanism is accessible for reporting abuses, and all complaints are independently reviewed to guarantee fair outcomes and corrective action.

**Risk Likelihood: Negligible**

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

### 3. Corruption, Fraud, and Good Governance

**Potential Risks:**

Risks include misallocation of resources, undue influence in benefit distribution, or manipulation of emissions data, particularly given the financial incentives associated with carbon credits. The complex flow of funds across borders raises concerns about transparency and the potential for illicit activity.

**Risk and Safeguard assessment:**

Varuna adheres to integrity policies, sexual harassment policies, and anti-corruption policies in line with PTTEP requirements and in line with AI Robotic’s Quality, Safety, Security, Health and Environment Policy ([link](#)). Varuna conducts business with honesty and integrity. Both aggressive and passive corruption will not be permitted.

Varuna has positioned itself to comply with Anti-Money Laundering legislation and laws. By maintaining an organized and ethical business practice, the company is dedicated to preventing any involvement in acts that facilitate money laundering.

Robust financial controls are in place: all transactions are conducted via regulated bank channels, with clear documentation. Data collection leverages secure digital platforms, with traceable audit trails and government oversight, reducing manual intervention and the scope for tampering. Closed chamber measurements—subject to manipulation—are reserved for plausibility checks, while primary verification relies on satellite and remote data, further limiting opportunities for fraud.

**Risk Likelihood: Minor**

### 4. Privacy and Data Security

**Potential Risks:**

The use of digital platforms and remote sensing requires the collection of personal and geospatial data, raising risks of misuse, unauthorised sharing, or data breaches that could undermine trust and violate privacy rights.

**Risk and Safeguard assessment:**

The data collected will be strictly used only for the MRV of the programme. Any disclosure will be avoided, with the exception of the Thai and Swiss authorities and the VVB bodies.

In the event of a suspected or confirmed data breach, there will be temporary suspension of affected systems. There will be an incident response including notification to all related parties and root cause analysis investigation.

**Risk Likelihood: Minor**

### 5. Occupational Health and Safety

**Potential Risks:**

Introducing new practices or technologies may inadvertently expose farmers to unfamiliar risks, from equipment-related injuries to unfamiliar field conditions.

**Risk and Safeguard assessment:**

Risk assessments confirm AWD does not introduce hazards beyond those in traditional rice cultivation nor does it require the application of heavy machineries. Farmer training covers nevertheless safe operation of technology and best practices for fieldwork. Feedback loops allow prompt identification and mitigation of unforeseen risks, with adjustments to protocols as needed.

**Risk Likelihood: Negligible**

### 6. Cultural Heritage and Practices


**Potential Risks:**

Any shift in farming practice can affect cultural heritage, particularly if traditional methods are deeply tied to local identity or community rituals.

**Risk and Safeguard assessment:**

There is no significant cultural practices that is expected to be lost; AWD is an adaptation of existing rice farming rather than a fundamental change.

**Risk Likelihood: Negligible**

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

## 7. Economic and Livelihood Risks

### Potential Risks:

Transitioning to AWD may present economic risks: initial yield reductions, increased management complexity, or upfront costs could deter adoption or impact farmer incomes.

### Risk and Safeguard assessment:

Yield impacts are closely tracked, with rapid-response extension support if unexpected losses occur. Financial incentives from carbon credits cushion short-term income variability and defray costs for technology or infrastructure upgrades. Ongoing capacity building and technical support lower adoption barriers, and the use of SMARTfarmer platform encourage knowledge exchange.

**Risk Likelihood: Minor; mitigated through design**

## 8. Programme Governance, Participation, and Communication

### Potential Risks:

Lapses in communication, lack of transparency, or insufficient engagement can erode trust and hinder widespread adoption.

### Risk and Safeguard assessment:

Routine stakeholder engagement is built into the programme's lifecycle, from design through evaluation. Digital and face-to-face communication tools ensure all participants are informed and heard. Feedback and grievance mechanisms are reviewed for effectiveness and accessibility at least annually, with results shared openly.

**Risk Likelihood: Negligible**

## 9. Water Quality and Accessibility

### Potential risk:

AWD alters irrigation schedules, which could disrupt water allocation for downstream users or impact local water quality due to changes in flooding and drainage patterns.

### Risk and Safeguard assessment:

AWD is implemented only in regions with established irrigation infrastructure and in coordination with local water authorities and farmer water-user groups. Impact assessments are conducted before initiation to ensure no adverse effects on community water access. Adaptive management allows for real-time adjustments to scheduling should conflicts or issues arise.

In general, AWD practices improve water accessibility by allowing a reduced use of water resources.

**Risk Likelihood: Negligible (Positive)**

## 10. Soil Health and Quality

### Potential Risks:

Potential negative impacts on soil organic carbon (SOC) due to increased aeration from intermittent drying.

### Risk and Safeguard assessment:

Current science suggests SOC changes are minimal due to offsetting effects. Farmer training emphasizes sustainable residue management improving soil health which is expected to improve due to enhanced root growth and better aeration.


**Risk Likelihood: Negligible to Positive**

## 11. Air Quality

### Potential Risks:

While AWD has large beneficial effects on air quality due to reducing methane emissions, there are risks associated to the potential increased machinery use and continue field residue burning.

**Risk and Safeguard assessment:**

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

Training modules discourage residue burning and promote alternative uses for straw, such as composting or mulching, with compliance monitored via satellite imagery. Machinery use is not expected to be required as the majority of the farmers operate in flat lands. Impact to air quality is monitored and largely compensated by CH<sub>4</sub> emissions reductions

**Risk Likelihood: Negligible (Positive)**

## 12. Biodiversity and Ecosystem Services

### Potential Risks:

Altering hydrology may affect field flora and fauna, potentially reducing local biodiversity if not managed with ecological sensitivity.

### Risk and Safeguard assessment:

AWD supports integrated pest management and reduces periods of stagnant water, which can benefit soil organisms and beneficial insects.


**Risk Likelihood: Positive**

## Conclusions

The programme contributes to 4 SDGs: climate action (SDG 13), zero hunger (SDG 2), good health and wellbeing (SDG 3) and clean water and sanitation (SDG 4).

The Safeguard assessment is summarized in the following table:

Risk Area	Potential Risks	Mitigation Measures (safeguards)	Likelihood
Non-Discrimination, Gender equality, Inclusion & Freedom of Expression	Exclusion of marginalized groups	Broad eligibility; outreach; continuous monitoring	Negligible
Labour, Child Rights & Equal Opportunity	Child labour, unfair practices	Adheres to law; anti-harassment policies; grievance mechanism	Negligible
Corruption & Governance	Resource misallocation, fraud	Financial controls; audits; digital traceability	Minor
Privacy & Data Security	Data misuse or breaches	Restricted use; incident response plan	Minor
Occupational Health & Safety	New operational risks	No complex new technologies required; feedback loops	Negligible
Cultural Heritage & Practices	Impact on traditional practices and local identity	AWD adapts existing rice farming; no significant cultural loss expected	Negligible
Economic & Livelihoods	Yield, income risks	Monitoring; financial incentives; support platforms	Minor
Programme Governance, Participation & Communication	Poor communication, lack of transparency, insufficient engagement	Routine stakeholder engagement; effective communication tools; annual review of feedback mechanisms	Negligible
Water quality & accessibility	Water disruption	Coordination with authorities; adaptive management; AWD	Negligible (Positive)

	Thailand Voluntary Emission Reduction Program	T-VER-P-F004-PDD(PoA)
	Premium T-VER	
	Project Design Document for Programme of Activities	VERSION 2.0

Risk Area	Potential Risks	Mitigation Measures (safeguards)	Likelihood
		practices reduce water usage	
Soil quality	Soil changes	Promotion of sustainable practices	Negligible (Positive)
Air Quality	Increased machine use and Residue burning	Training on avoid use of heavy machineries; Discourage burning; Reduce CH <sub>4</sub> emissions	Negligible (Positive)
Biodiversity	Biodiversity impacts	AWD support ecosystem services	(Positive)

This Environmental and Social Risk Assessment demonstrates that the AWD programme in Thailand developed under the framework of the Article 6 of the Paris Agreement and the bilateral agreement between Switzerland and Thailand, as structured in the Mitigation Activity Design Document, is well-aligned with international best practices and does not generate significant negative impacts. Minor negative impacts are further mitigated by the safeguards in place. The programme includes robust safeguards, transparent monitoring, and strong stakeholder engagement, ensuring that AWD implementation not only reduces greenhouse gas emissions but also delivers social, economic, and environmental co-benefits for Thai rice farmers and their communities.