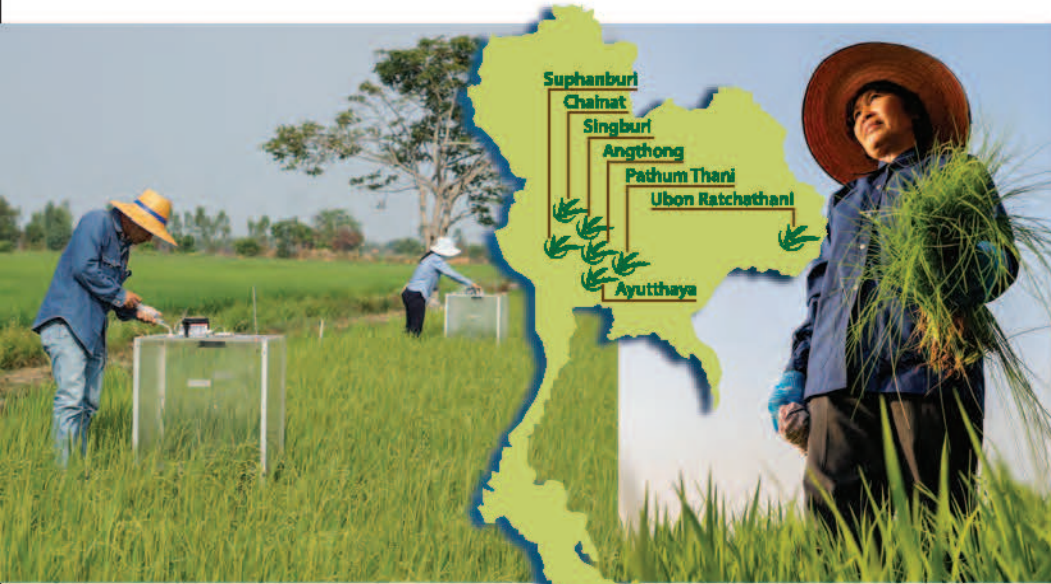


## Background and Rationale

Thai Rice Department and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH cooperate in the study of greenhouse gas (GHG) emissions from rice farming. This cooperation is under the integrated work of three projects, namely Thai Rice NAMA, Market Oriented Smallholder Value Chains (MSVC) and Thai-German Climate Programme - Agriculture (TGCP-Agriculture).

Thai Rice NAMA is a joint project with the Thai government, funded by the NAMA Facility which supports projects in developing countries to accelerate carbon-neutral development. Thai Rice NAMA encourages local rice farmers to implement low-emission rice farming and to make climate-friendly services and technologies accessible to farmers.

The MSVC project enables smallholder rice farmers to access sustainable market-oriented smallholder value chains and supports rice farmers who face the risk of being excluded from markets due to the rising uncertainties from climate change conditions.



TGCP-Agriculture works to develop a Measurement, Reporting and Verification (MRV) system to monitor GHG emissions from rice farming and to upscale adoption of the Sustainable Rice Platform Standard on Sustainable Rice Cultivation in Thailand.

One activity of TGCP-Agriculture is to conduct demonstration plots for measuring GHG emissions from the paddy fields. Emissions from plots applying low-emission agricultural techniques (i.e., land laser levelling, alternate wetting and drying, site-specific nutrient management and straw/stubble management) are compared to plots where farmers apply conventional cultivation practices. Farmers are assisted by provincial rice research and seed centres to adopt the low-emission technologies in the demonstration plots. These practices not only help to mitigate GHG emissions but also to improve rice production by increasing yield and heightening the quality of rice produced.

The TGCP-Agriculture project is working with the Thai Rice NAMA and MSVC to collect gas samples from the demonstration plots in six provinces in the Central Plains of Thailand (i.e., Angthong, Ayutthaya, Chainat, Pathumthani, Singburi and Suphanburi) and from the demonstration plot in Ubon Ratchathani province in the Northeast. The collected gas samples are analysed in rice research centres to support the assessment of overall climate change mitigation and adaptation potential of the rice sector. The followings are steps in the operation of GHG emission measurement.

Thai Rice Department collaborates with GIZ as well as IRRI in the training of officials to define the detailed protocols on gas sampling and measurement, including the development of technical manuals. This collaboration supports Thai agencies to develop a MRV system for the rice sector that meets international standards, and to implement the system to counter climate change.

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Sustainable Agrifood System in ASEAN

## Measurement of Greenhouse Gas (GHG) Emissions from Rice Cultivation:

### The Cooperation between Thai Rice Department and GIZ



# Operational Process of GHG Emissions Measurement

## 1. Farm Site Selection

To assess mitigation potentials of the low-emission rice farming techniques, the experimental trial includes gas sample collection from two distinct treatments (i.e., mitigation and conventional techniques). The first step is to select farm sites which are appropriate for the experimental treatments.

-The first farm site is the mitigation plot in which rice is grown with four technologies recommended by Thai Rice Department, namely land laser levelling (LLL), alternate wetting and drying (AWD), site-specific nutrient management (SSNM) and straw/stubble management.

-The second farm site is the conventional plot in which rice is grown by farmers' common practices.



## 2. Soil Analysis

Soil samples are collected from the experimental plots before preparing the land for rice planting. Samples are sent to Thai Rice Department's Soil Analysis Laboratory, located at Pathum Thani Rice Research Centre (PTT-RRC) for analysis of the chemical composition. The soil analysis involves the following parameters.

- Soil Characteristics
- Soil pH
- Organic Matter (OM)
- Total Nitrogen (N)
- Available Phosphorus (P)
- Exchangeable Potassium (K)
- Electric Conductivity (EC).



## 3. Gas Chamber Installation

The growth of rice plants in the experimental plots should not be affected by the gas sample collection. A walkway for gas collectors is installed in the paddy fields throughout rice growing season to facilitate the gas sample collection. Wooden bridges made from weather-resistant materials are installed in the connection point with the gas sample boxes. Three gas samples boxes are installed in each experimental plot for replication of the gas measurement.



## 4. Equipment Preparation Before Gas Sampling

Before the field work, lab officers vacuum the gas sample vials by placing them in a vacuum glass jar and sealing them with aluminum caps. Afterward, the gas sample vials are labelled with the locations of experimental plots, sampling dates, treatments and sampling durations.

When collecting the gas samples in the field, the lower boxes are placed in the paddy field first. Gas sample collectors pour water into the lower boxes to check and prevent the possibility of gas leakage. Then, the upper boxes with the lids are placed on the top of the lower boxes. To measure the exact temperature, there is a point on the box lid to insert a thermometer.



## 5. Time for Gas Sampling

Gas sample collection takes place every week throughout the rice growing season. The gas sample collection starts seven days after transplanting or sowing and the operation lasts until the harvesting time.



## 6. Gas Sampling in Rice Paddy Fields

Plastic syringes are used to extract the gas sample (quantity of 35 ml) from the gas chamber. Then, the extracted gas samples are injected into the vacuumed gas sample vials. The frequency of gas sampling collection is based on the International Rice Research Institute (IRRI) Standard by Minamikawa et al. (2015). The gas sample collection is repeated five times (at 0, 6, 12, 20 and 30 minutes).

After the process of gas sample collection, vacuum gas sample vials are packed in the sealed foam boxes and delivered to Prachinburi Rice Research Center, Chainat Rice Research Centre, Ubon Ratchathani Rice Research Centre or National Rice Science Institute (Suphanburi), where the laboratories for GHG emission analysis are located.



## 7. Gas Analysis with Gas Chromatographs: GC

After the gas samples are delivered to the above-mentioned rice research centres and rice science institute, the laboratories use gas chromatographs (GC) to analyse the collected gas samples. Laboratory officers inject gas samples into a GC which evaluates GHG concentration of the gas samples. The laboratory officers report the data on GHG concentration from experimental plots. These data are later used in GHG emission calculation, utilising a tool called "SECTOR for Rice" (Spatially-aggregated Emissions Calculator for Rice).

