

Scaling up low methane rice production through digital measurement, reporting, and verification (MRV) tools in Thailand and Pakistan

Scaling up Climate Actions in Asia Pacific

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Background

Project supported by Climate and Clean Air Coalition initiative to reduce short-lived climate pollutants

Aim to reduce paddy rice methane emissions in Thailand and Pakistan

Implemented by UNEP with support from consultants in Thailand (The Creagy) and Pakistan (Helvetas Pakistan and Global Change Impacts Studies Centre)

Focus on national MRV systems for paddy rice



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Methane mitigation in paddy rice

- Reducing the duration of flooding during the growing season (alternate wetting and drying)
- Direct seeded-rice
- Removing crop residues
- Switching from conventional to low-methane rice cultivars
- Laser-leveling fields before planting
- Nutrient management critical to prevent trade-off emissions



Direct seeded rice using a drum seeder. Photo by IRRI.



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MRV of methane reduction in paddy rice, national scale

M: National statistics, farmer logbooks, emission measurements

R: National GHG Inventory using IPCC methods

V: National and international review

EQUATION 5.1

CH₄ EMISSIONS FROM RICE CULTIVATION

$$CH_4 \text{ Rice} = \sum_{i,j,k} (EF_{i,j,k} \cdot t_{i,j,k} \cdot A_{i,j,k} \cdot 10^{-6})$$

Where:

$CH_4 \text{ Rice}$ = annual methane emissions from rice cultivation, Gg CH₄ yr⁻¹

$EF_{i,j,k}$ = a daily emission factor for i, j, and k conditions, kg CH₄ ha⁻¹ day⁻¹

$t_{i,j,k}$ = cultivation period of rice for i, j, and k conditions, day

$A_{i,j,k}$ = annual harvested area of rice for i, j, and k conditions, ha yr⁻¹

$i, j, \text{ and } k$ = represent different ecosystems, water regimes, type and amount of organic amendments, and other conditions under which CH₄ emissions from rice may vary



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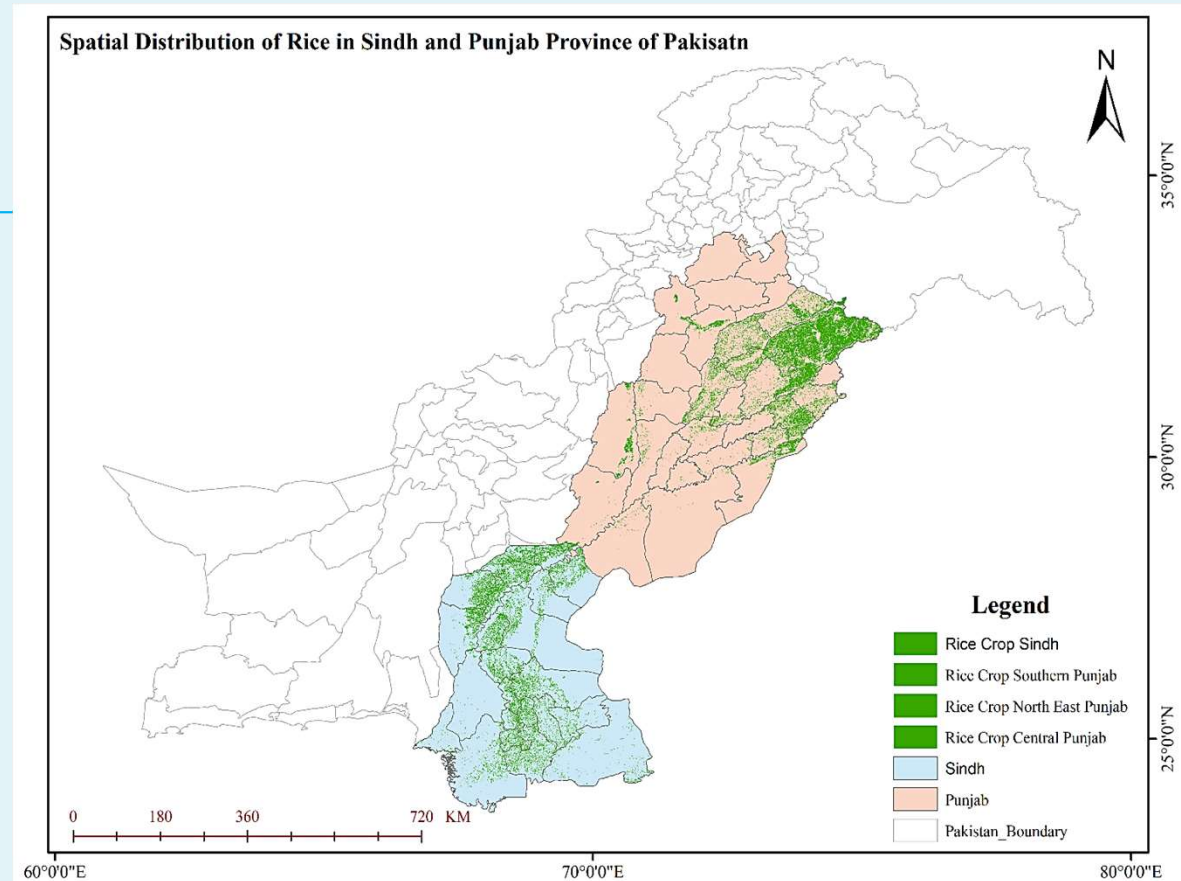
Pakistan agricultural MRV and mitigation

- Agriculture is second highest emitting sector with 223 MT CO₂ eq. in 2018, rice methane 3.5% of ag emissions
- NDC actions for agriculture include improving irrigation practices and water management, promoting climate resilient agriculture and developing resilient seed varieties
- Pakistan submitted their first BUR in 2022
- Pakistan signed Global Methane Pledge at COP26



Pakistan rice MRV status

- Currently ad hoc system, not formalized in law
- Global Change Impacts Studies Centre (GCISC) coordinates inventory compilation and Ministry of Climate Change is the coordinating body
- GIZ Pakistan and CITEPA France sponsored project to support a digital inventory management system, operational by 2023



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Pakistan MRV roadmap

Stakeholder consultations held in Sindh and Punjab provinces for rice

Data requirements were shared with provincial agricultural statistics departments

- Area cultivated
- Area under each irrigation regime
- Mode of irrigation
- Fertilizer and manure application
- Area under stubble burning
- Etc.

This data will be inputted to the inventory software. Tier 1 calculation



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Thailand agricultural MRV and mitigation

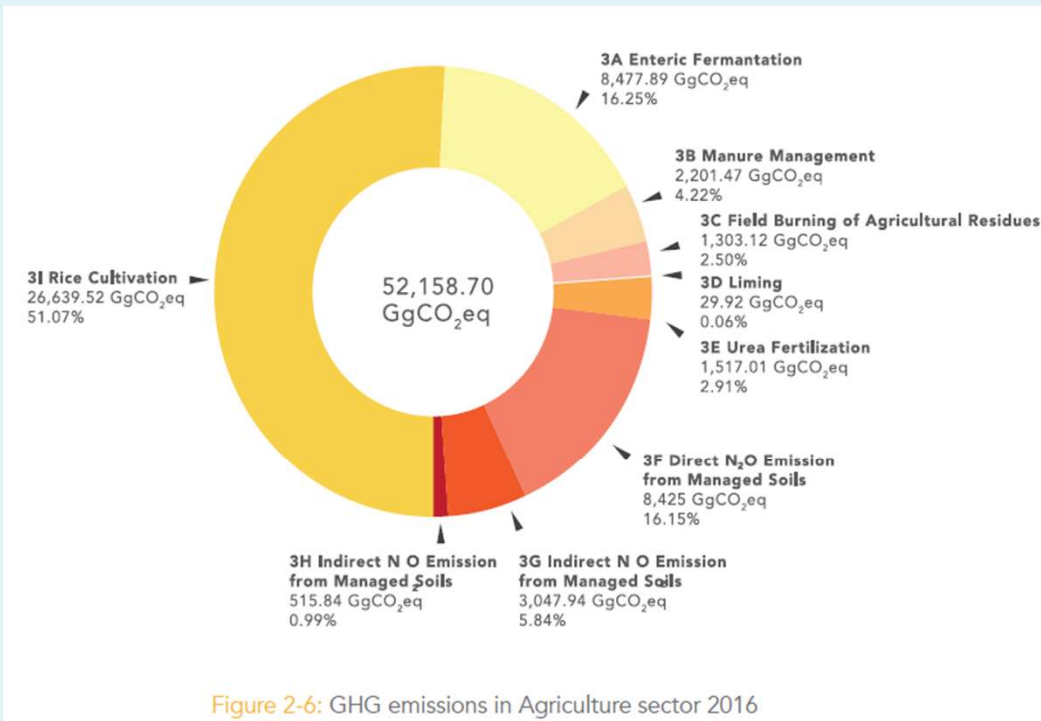
Thailand has a domestic MRV system, with the Office of Natural Resources and Environmental Policy as the national focal point.

Thailand submitted third BUR and revised NDC in 2020.

Rice not included in current NDC, but planned in future

Thai Rice NAMA project (2018 – 2023)

- Methane mitigation through promotion of:
 - Laser land leveling
 - Alternate wetting and drying



Thailand rice MRV status: national and project level

Manual

Digital

Measurement

Reporting

Verification

National level

GHG emissions & Inventory

National statistical data collected by RD, DOAE, OAE

Data input to TGEIS by sectoral lead agencies for GHG inventory calculation and reporting

- Data Entry Template
- Calculate & QC
- Report & Archive

Verified by working groups on GHG inventory through TGEIS

Project level

GHG emission reductions & carbon credits

Raw data from

- Farm survey
- Statistical data from OAE
- Emission Factor

- **Domestic level:** no methodologies in rice methane practices under T-VER except:
 - Good Fertilizer Practice in Agricultural Land
 - Carbon Sequestration and Reducing Emission for Perennial Crop Plantation
- **International level:**
 - CDM: AMS.III.AU Version 4.0.
 - VCS: Calculating Emission Reductions in Rice Management System
 - Sustainable Rice Platform Assurance Scheme

TGEIS is the only digital tool for R&V of GHG emissions at national level while the M at national level and MRV at project level are not digitalized.



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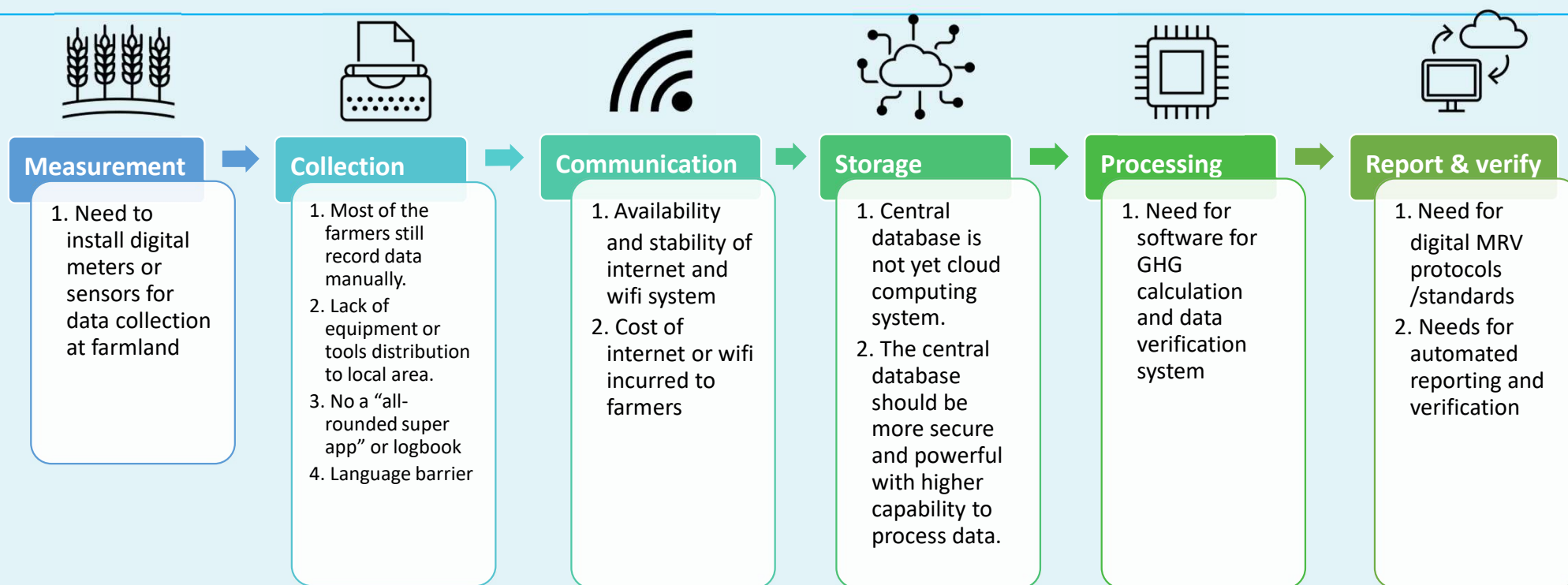
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Challenges to digitize rice MRV in Thailand



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Coverage of current apps

Activity	Parameter	DOAE farmbook	DOAE smartcheck	Smart Rice Farm (SRF)	Thai rice farmer	WMSC	LDD Soil Guide	RiceSAP	LING	SMART Platform	Remote sensing, ML and AI
Burning	Amount of residue before and after burning										
Plowing	Type of engine										
	Type of fuel										
	Amount of fuel										
	Number of plowing times										
	Types of soil amendment equipment									✓	
	Material of soil amendment equipment										
Growing	Size of farmland	✓			✓				✓		✓
	Plantation method			✓							
	Water management					✓		✓		✓	
	Fertilizer management				✓		✓	✓		✓	
Harvest	Soil characteristics: types of soil		✓	✓			✓				✓
	Soil characteristics: soil density		✓				✓		✓		✓
	Soil characteristics: amount of organic matter						✓				
OAE measurements	Plantation area	✓			✓						✓
	Cultivation area	✓			✓						✓
	Rice production			✓	✓			✓			
	Rice yields			✓	✓			✓			
Emission measurements	Methane EF by seasons										
	Methane EF by areas										
	Methane EF by practices										



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Proposed Thailand digital MRV roadmap

Preparation (2023 – 2025)

- Capacity building for farmers
- Development of digital tools & database

Piloting (2025 – 2028)

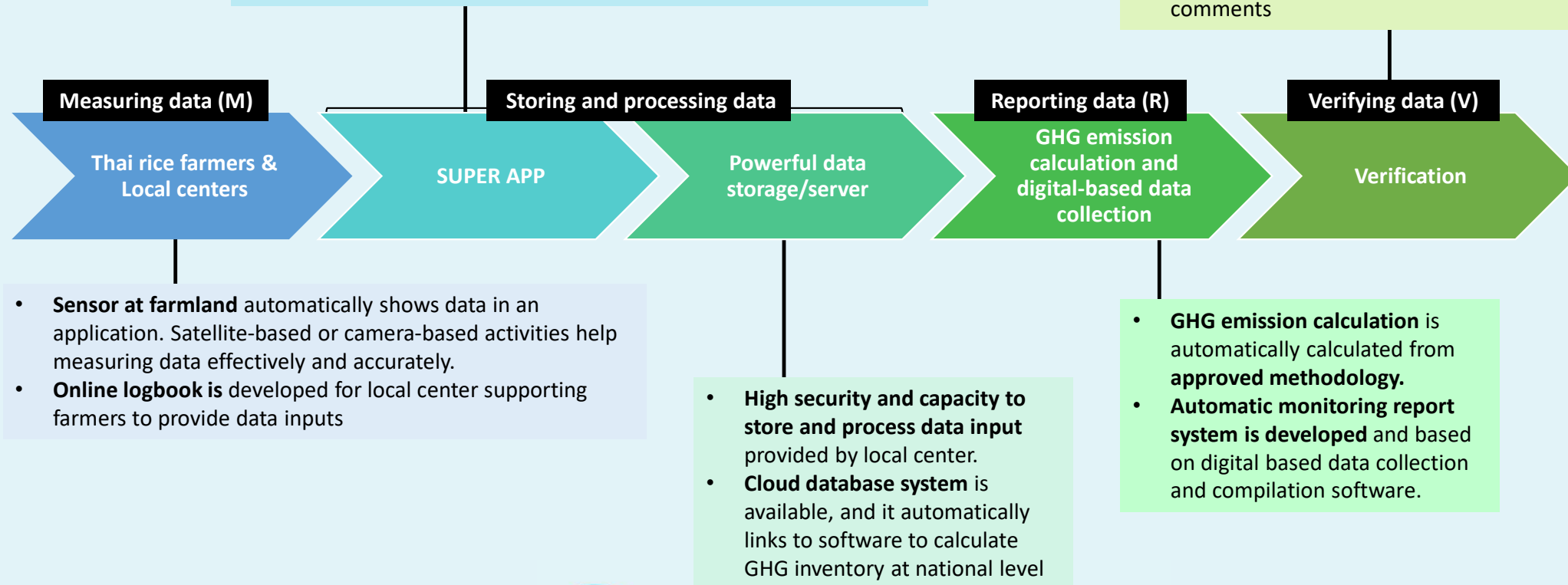
- Selection of pilot farmlands
- Installation of on-site sensors
- Testing digital systems

Implementation (2028 onwards)

- Super app
- Powerful storage data
- Digital MRV implemented

- **Internet and wi-fi are available** and stable to use the application at farmlands
- **One application** that consists of many functions relating to farmer's activities and emission measurement for all farmers and applicable for all agricultural products

- **Automatic verification system**
- Automatically access to public opinion/ comments



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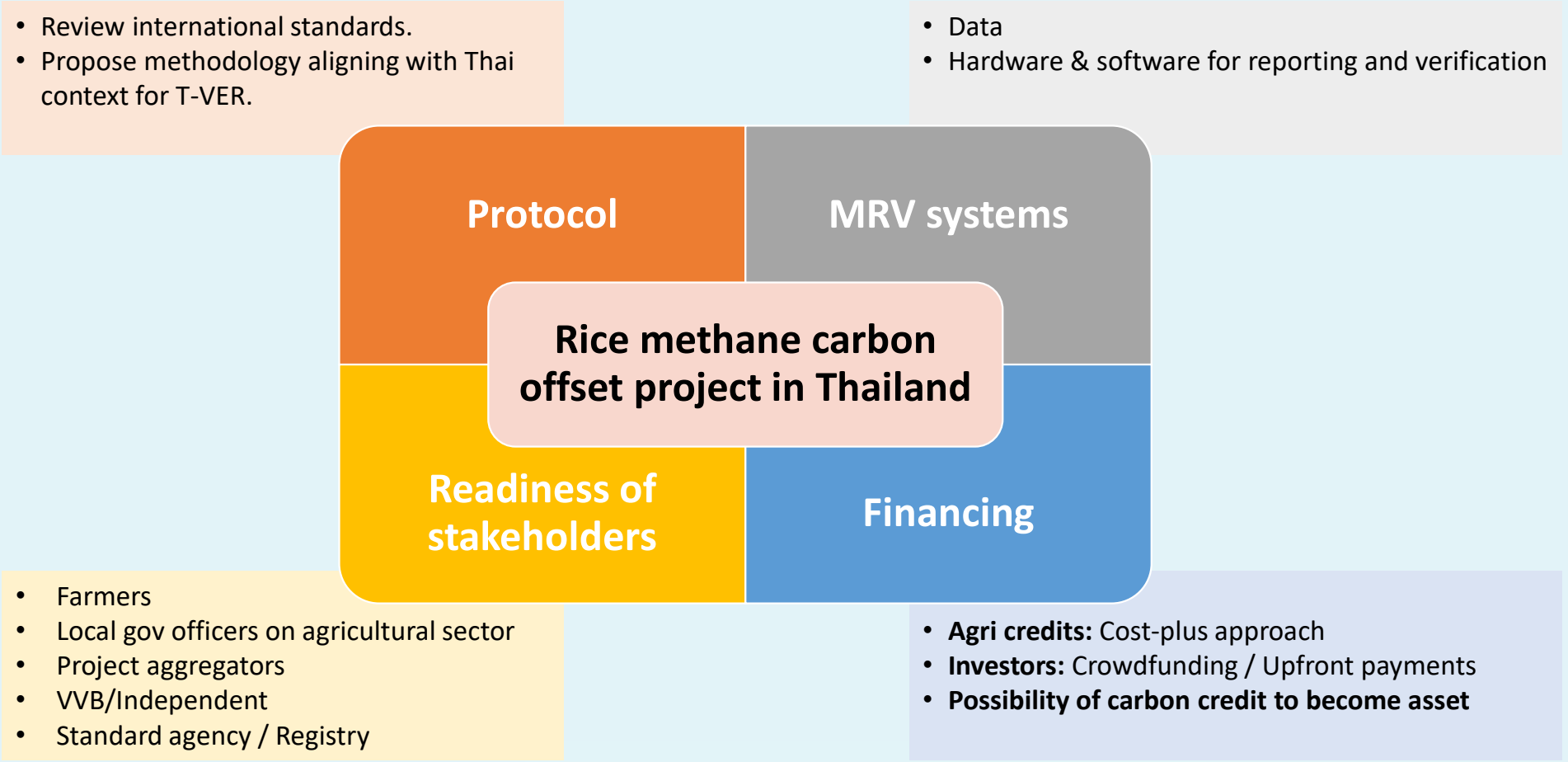
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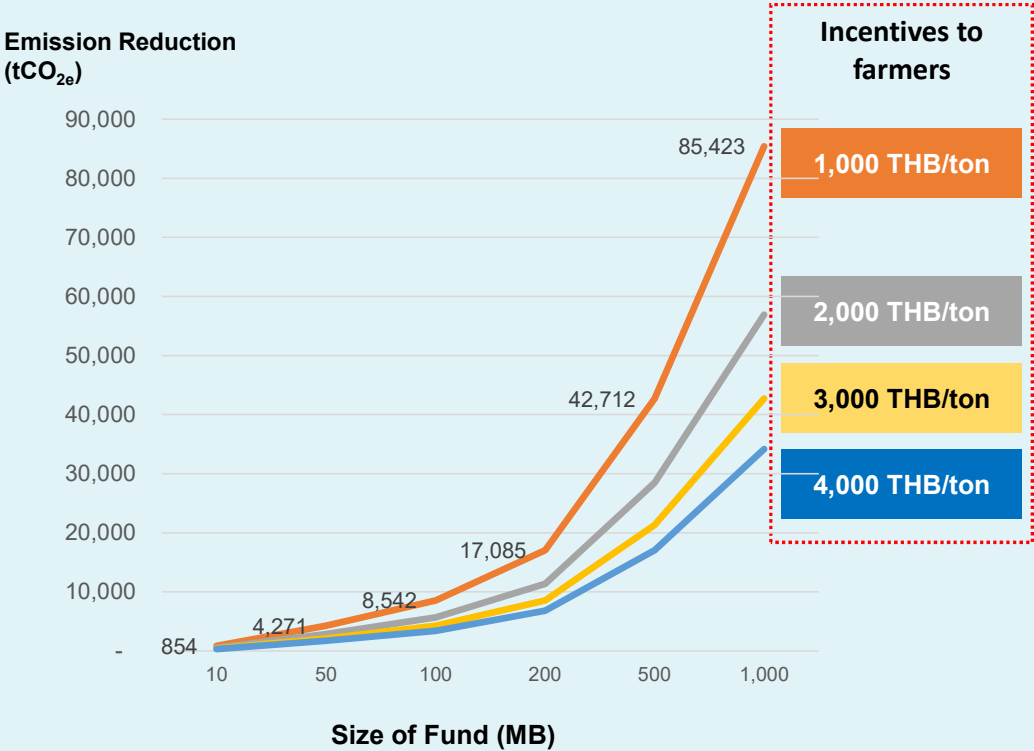
Key components for a rice methane carbon offset project



Financial potential for an offset project

- Financial potential of tCO_{2e} reduction depends mainly on size of fund available to incentivize the farmers.
- At the incentive of 1,000 THB/ton, 1,000-MB fund can result in 85,423 tCO_{2e} reduction.
- Previous incentive of the government¹

Scheme	THB/ton
Rice Price Guarantee Scheme	2,554 – 5,088
Rice Mortgage Scheme	2,491 – 6,950



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