CTCN
CLIMATE TECHNOLOGY CENTRE & NETWORK

Technical Assistance Response Plan – Terms of Reference

Country	**Viet Nam**
Request ID#	2016000061
Title	Cost-benefit Assessment of Mitigation Options in Rice Production: Data compilation, tools and training within the Vietnamese context
NDE	Name: Mr. Pham Van Tan Position: Deputy Director-General Organization: Department of Climate Change, Ministry of Natural Resources and Rural Development Environment (MONRE) Email: pvtan11@gmail.com Address: Department of Climate Change (DCC) Ministry of Natural Resources and Agriculture and Rural Development Environment (MONRE), No. 10 Ton That Thuyet, Cau Giay, Hanoi, Viet Nam
Proponent	Name: Dr. Tran Dai Nghia Position: Director Organization: Department of Natural Resources and Environmental Economics Studies (DNREE), IPSARD Email: Tran.nghiadai99@gmail.com Address: Department of Natural Resources & Environmental Economics Studies, Institute of Policy & Strategy for Agriculture and Rural Development (IPSARD), No. 16 Thuy Khue, Tay Ho, Hanoi, Viet Nam

Summary of the CTCN technical assistance

Viet Nam's effort in sustainable rice production has been remarkable but not yet fully mainstreamed emissions reduction practices and technologies on rice cultivation as part of its development strategies. Accelerating this shift requires empowering key stakeholders to make informed decisions that would deliver effective and efficient mitigation options to reduce GHG and other negative externalities in rice production.

The technical assistance aims to enable a range of stakeholders to assess the costs and benefits of mitigation options to prioritize suitable technologies for adoption and define investment portfolios and policies for Viet Nam's rice production. Specifically, it will develop decision support tools to identify cost-efficient mitigation options for rice and identify suitable production areas for these options.

It will be implemented through the Institute of Policy and Strategy for Agriculture and Rural Development, in close collaboration with the Ministry of Natural Resources and Environment and the Ministry of Agriculture and Rural Development. The deliverables are expected to be completed within a period of 12 months.

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Agreement:

(If possible, please use electronic signatures in Microsoft Word file format)

National Designated Entity to the UNFCCC Technology Mechanism
Name: Mr. Pham Van Tan
Title: Deputy Director-General
Date: 15/3/2019
Signature:

Proponent (signature of the Proponent is optional)
Name: Dr. Tran Dai Nghia
Title: Director
Date: 16/03/2019
Signature:

UNFCCC Climate Technology Centre and Network (CTCN)

Name: Jukka Uosukainen
Title: CTCN Director
Date: 12/03/2019
Signature:

1. Background and context

Rice is a staple crop of Viet Nam with an annual paddy production of 45.10 million metric tons and milled rice production of 29.5 million metric tons in 2015[1]. More than half of the country's population (64.8%) still lives in rural areas, and more than a third (39.57%) relies on agriculture for employment (ILO, 2018). Rice remains as the country's staple food. Over last few decades, Viet Nam has strengthened its rice sector through various policies and programs which has not only helped it to tackle food insecurity but also emerge as a strong rice economy. The rice sector contributes a fifth of Viet Nam's GDP as the country is one of the world's leading rice exporter and the second largest exporter in ASEAN following Thailand with about and annual export of 7 million metric tons. With a growing population and desire to develop export markets, the government of Viet Nam has undertaken several steps to increase rice production through supporting policies and programs. One of the important considerations is also to limit the adverse impact of the increased cultivation of rice on the environment due to the increased use of chemical fertilizers and methane emissions from paddy fields.

Rice cultivation is one of the major sources of global GHG emissions from the agriculture sector. Agriculture sector accounts for about 30% of the Viet Nam's total GHG emission as reported in second Biennial Updated Report submitted to UNFCCC in 2017. The total GHG emission from agriculture sector in Viet Nam is 89.4 $MtCO_2e$ in 2013[2], of which rice cultivation contributed the largest share with about 44.7 $MtCO_2e$. Hence, rice cultivation is explicitly mentioned in the country's INDC as a mitigation target under the agricultural sector. Specifically, the INDC emphasizes on reducing GHG emissions in agriculture sector through conducting research; applying production processes and economic technologies that efficiently use farm inputs. The Second Technology Needs Assessment[3] for Viet Nam, conducted in 2012, has also emphasized that there is a significant potential of GHG mitigation in rice cultivation under agriculture sector and prioritized technology options like alternate wet and dry rice irrigation.

Viet Nam's effort in sustainable rice production is remarkable. However, this shift still lacks the critical mass action to put forward different options for reducing emissions from rice cultivation as part of sustainable development strategies. Accelerating this shift requires empowering stakeholders through information/ experience sharing and capacity development to implement cost effective measures. Decision-makers at various levels are increasingly in need of information about options for mitigation in rice production to make informed decisions on the challenges posed by climate change.

Viet Nam therefore asked for the CTCN's assistance to enable a wide range of stakeholders (from farming communities to policy makers) to assess the costs and benefits of mitigation options to prioritize suitable technologies for adoption and define investment portfolios and policies for Viet Nam's rice production. Vietnam is also in the process of revising its NDC, expected to be completed

[1] A research article on Reducing Greenhouse Gas Emissions in Rice Grown in the Mekong Delta of Viet Nam dated- 12 September 2018
[2] The second BIENNIAL UPDATED REPORT of Viet Nam to UNFCCC
[3] Chapter 2. Agriculture Sector in TNA for climate change mitigation for Viet Nam in 2012- http://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/TNR_CRE/e9067c6e3b97459989b2196f12155ad5/dcbfb9116c5e43ff8879fe320075d7d5.pdf

in 2020. Mitigation options are carefully evaluated in term of feasibility as well as cost and benefits, including mitigation options in agricultural sector. Outcomes of this TA support will be important input for selecting mitigation options from agricultural sector for the revised NDC of Vietnam.

This request was initiated by the Institute of Policy and Strategy for Agriculture and Rural Development (IPSARD) as part of the consultations meetings during the drafting of the proposal for restructuring of the Vietnamese rice sector. IPSARD identified the lack of an economic assessment of mitigation options as a shortcoming in the planning process for low emissions strategies in the rice sub-sector. CTCN was found to be the appropriate institution to contact in order to fill this knowledge gap.

2. Problem statement

The past three decade saw Viet Nam's rapid progress in its agricultural production, which helped the country's economic development. However, this growth also came at the expense of the country's environment through soil and water pollution, land and forest degradation, biodiversity loss, and increased GHG emissions.

Viet Nam's shift from agricultural output and trade related targets to targets that include sustainable development related goals started in 2013, when the Ministry of Agriculture and Rural Development (MARD) launched the country's Agricultural Restructuring Plan. Since then, Viet Nam embarked on pursuing a remarkable effort to develop sustainable agriculture production, of which rice comprises a substantial portion. This is evident from its adoption of system of rice intensification (SRI), rice– shrimp or rice–fish diversified systems, improved crop varieties, alternative wetting-drying irrigation (AWD), among others. With these, Viet Nam has been able to increase the farmer's income and rice production to emerge as a global leader. However, it has been strongly felt that the rice sector needs optimization of cost to retain the competitiveness in the international market. The cost of rice even with the modern low carbon technologies adopted are high due to a wide range of input cost of low GHG alternatives as per a study conducted by USAID[4]. Moreover, the lack of information among the stakeholders and decision markers for conducting the cost benefit assessments about the low GHG alternative are also impeding their adoption for rice cultivation.

Although a wide range of proven and easily implementable climate change mitigation technologies and practices in agriculture sector is already available, planners and decision makers often do not have access to information that would deliver the most effective and efficient options to reduce GHG and other negative externalities in agriculture. There are some on-going large investments in which mitigation options have been studied or applied to the country's agriculture sector include World Bank's Viet Nam Sustainable Agriculture Transformation Project (USD 476 million), ADB's Viet Nam Low Carbon Agricultural Support Project (USD 74 million), and BMZ-IRRI's Rice Straw Management project.

It is critical for policy and decision makers to have access to decision support tools that can evaluate and compare the GHG reduction costs of different production options from a broad range of sectors, including agriculture. Over the past decade, several methodologies have been put forward to analyze GHG abatement costs for many global and national carbon emission reduction assessments.

[4] USAID report on Achieving Low Emissions Growth for Rice Cultivation in Viet Nam: A Role for Behavioural Constraints in Viet Nam

However, many of the assessments have been carried at out the national or macro level and follow a top-down approach. This type of approach provides useful information on the overall economic costs that could inform macroeconomic and national fiscal policies. However, it fails to provide nuanced information needed in planning at the local levels, and abatement potential and costs for specific mitigation options. This is critical for both national and local decision makers since the costs of a given option will vary over time as a function of markets, demographics and technology development. This highlights the need for a more dynamic means for assessing costs and benefits to a range of mitigation options, which at the same time allows a rapid updating in response to socio-economic and technological changes.

Decision-makers at various levels are increasingly in need of information about options for mitigation in rice production to make informed decisions on the challenges posed by climate change. Meanwhile, newly developed tools -- such as GHG calculators composed of user-friendly and electronic spreadsheet-based tools -- may become instrumental in guiding decision making. However, these GHG calculators are limited to bio-physical factors and do not include any options for considering socio-economic data — nor as input neither as output of the computation routines. To make these tools applicable for decision making, it seems imperative to supplement the socio-economic dimension of mitigation programs and to translate them into Vietnamese context.

This Technical Assistance will address key obstacles in the adoption of mitigation options, namely the lack of data and usable tools for assessing the costs and possible benefits in terms of emission reduction vis-à-vis the potential socio-economic impacts. The envisaged activities comprise the development of a data sets and an interactive tool specifically tailored for the rice subsector in Viet Nam. It should further be noted that the mitigation technologies in rice production are much more matured than the technological options for any other crop or subsector within the agriculture sector. Thus, improved data sets and tools target one of the most promising avenues for mitigation in Viet Nam — in terms of feasibility as well as dimension. Given the ample relevance of the topic, this TA may in the future lead to similar initiatives in other countries of the region.

The Technical Assistance (TA) will help bolster the government to increase their Nationally Determined Contribution (NDC) commitments to reduce greenhouse gas (GHG) emissions to 25% compared to business-as-usual (BAU) scenario. The unconditional target for GHG reduction for the agriculture sector is only 6.3 MtCO2e) but with international support this could be higher up to 45.78 MtCO2e (MONRE 2015 in Vieweg et al. 2017).

3. **Logical Framework for the CTCN Technical Assistance:**

	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Objective: To enable a wide range of stakeholders — from farming communities to policy makers -- to assess costs/ benefits of mitigation options as a mean to prioritize suitable technologies for adoption and define investment portfolios and policies for Viet Nam rice production.												
Outcome: The stakeholder will be enabled to take cost benefit decisions for prioritizing and adopting cost-effective suitable technologies for rice production, with least GHG emission and high co-benefit potential, in Viet Nam with effective investment portfolios having appropriate supporting policy in place.												
Output 1: Development of implementation planning and communication documents												
Activity 1: *The implementer must undertake the following activities at the beginning and at the end of the CTCN technical assistance.* i) A detailed work plan of all activities, deliveries, outputs, deadlines and responsible persons/organisations and detailed budget to implement the Response Plan. The detailed work plan and budget must be based directly on this Response Plan; ii) Based on the work plan, a monitoring and evaluation plan with specific, measurable, achievable, relevant, and time-bound indicators used to monitor and evaluate the timeliness and appropriateness of the implementation. The monitoring and evaluation plan should apply selected indicators from the Closure and Data Collection report template and enable the lead implementer to complete the CTCN Closure and Data collection report at the end of the assignment (please refer to item iv below and section 14 in the Response Plan); iii) A two-page CTCN Impact Description formulated in the beginning of the technical assistance and update/revised once the technical assistance is fully delivered (a template will be provided); iv) A Closure and Data Collection report completed at the end of the technical assistance (a template will be provided).												
Deliverable 1: i) Detailed work plan ii) Monitoring and evaluation plan iii) CTCN Impact Description iv) Closure and Data Collection report												
Output 2: Development of an interactive and dynamic tool to calculate cost and benefits of mitigation actions in rice sector												
Activity 2.1: *Develop tool to conduct cost-benefit assessments for various mitigation options for rice production.* The activity consists of the following sub-activities:												

a) Desk review, comparison and analyze existing literature on data requirements, methodologies and non-proprietary tools for assessing costs and benefits of different mitigation options for rice production across the value chain. The review should, among others, include but not limited to Cool Farm Tool, EX-ACT, Carbon Calculator, MACC, and CALM. A seminal analysis of different calculators has already been conducted by FAO and CGIAR-CCAFS, especially those used by MARD in updating agriculture sector's contribution in NDC of Vietnam, but requires updating, especially in the context of a tropical developing country such as Viet Nam. The review should also involve a cursory investigation on the readily available data, preferably Tier 2[5] (or above), and their potential sources.

b) Develop a use case for the tool in order to understand the intended user profiles, access to technology, and level of initial capacity. User profile and needs for the tool will be identified through stakeholder consultations that involves the NDE, IPSARD, MARD, the NDC updating team, select producer groups, research organizations and other relevant stakeholders. Through the same consultation process, a range of mitigation options that can be evaluated (e.g., alternate wet and dry irrigation, interventions with reduced fertilizers, short duration variety) by the tool will also be identified and explored. The implementing partners should include further in-depth discussions and/or consultations that will better inform the model design and ensure that it is equipped with functionalities that best reflect the needs and context of the country. **[WS2a]**

c) Develop or adopt a model and initiate the designing of the draft tool based on the model developed/ adopted for assessing abatement costs and benefits of different mitigation options for rice production across the value chain for Viet Nam. The model should take into account the country's local context (crop varieties, agro-ecological conditions and cropping systems, and production, social and economic conditions, NDC targets, among others) and the best available data in consultation with MONRE, MARD, the NDC updating team and IPSARD. It should propose clear set of criteria for selecting low carbon/cost effective, high co-benefit options, carbon balance model, baseline and alternative/low carbon pathway scenarios (with/without), cost-effectiveness framework, among others. The model should take into account inputs and recommendations gleaned from consultations with relevant stakeholders.

Protocols and workflows used in the development of the tool should ensure that it takes advantage and utilize all existing as well as new data sets. They should also ensure inter-operability of datasets and taxonomies used and generated by the GIS maps developed under Output 3 and other GIS platforms operated by MONRE, MARD, IPSARD and other relevant government agencies. The protocols and

[5] Tier 2 applies country-specific emission factors and parameters more appropriate to the forests, climatic regions and land use systems in that country. More highly stratified activity data may be needed in Tier 2 to correspond with country-specific emission factors and parameters for specific regions and specialised land-use categories.

workflows will also undergo consultation with MONRE, MARD, IPSARD and other stakeholders. The agreed protocols and workflows will become the basis for the design of the tool mentioned in above point. It should undergo internal beta testing, involving CTCN, project proponent (IPSARD), the NDC updating team, and the NDE, before it is piloted to identify potential bugs and test for usability and performance.

A user friendly input system will be designed which should allow for customization based on the need of users (typologies as a result also the expert consultations) and should take into account nuances and limitations of data available in the country, but at the same time extensible enough as new and better information becomes available (i.e., from changes in market prices and introduction of technologies). It shall also have an open framework that allows for updating, refinement and adoption to other agriculture commodities. The tool should be upgradable to be applicable to adaptation options as well should the country decide to revisit and update them. Both the interface and the manual should be user-friendly and sufficiently intuitive to be understood by a broad range of users.

d) Acquire secondary data from relevant data providers. This involves the retrieval, acquisition and storage of relevant and viable secondary data identified that will serve as inputs to the model. With support from MONRE and IPSARD, establish protocols for data acquisition (e.g.., memorandum of agreements, co-publishing agreements) and processing (i.e., when files differ in format and/or schema) with data set providers to ensure smooth and easy updating and/or input of new information into the tool. The data set providers here refer to other government agencies, development partners, academic/research institutes who may supply relevant data. The TA will not include any cost pertaining to data acquisition and licensing.

   The viability of these data as inputs to the tool should be assessed whether they are readily available and easily accessible, free and non-proprietary. Identify potential barriers (i.e., issues related to copyright, privacy, format compatibility, data interoperability, etc.), provide recommendations for remedy these barriers if possible, and incorporate these recommendations in the development of the model should the country decide to revisit and update the tool.

e) Validate the models and tools developed for cost-benefit analysis and for mapping suitable areas for select climate change mitation options. The model developed through consultations would be validated through a validation workshop with well-respected scientists and experts that are highly knowledgeable and have extensive experience on climate and agricultural science, the country's agriculture and rice productions systems, national economic and development planning, agro-ecology, and related fields. Proposed processes and workflows for the tool should be presented and validated as well. **[WS2b]**

f) Pilot test the tool developed. The beta tested version of the tool should also be pilot tested, through a pilot training workshop, using the real-world use-case scenarios identified in the previous consultation. The training should also involve experts, relevant stakeholders and decision makers, and should guide the users to do further improvements on the tool's framework and interface. **[WS2c]**

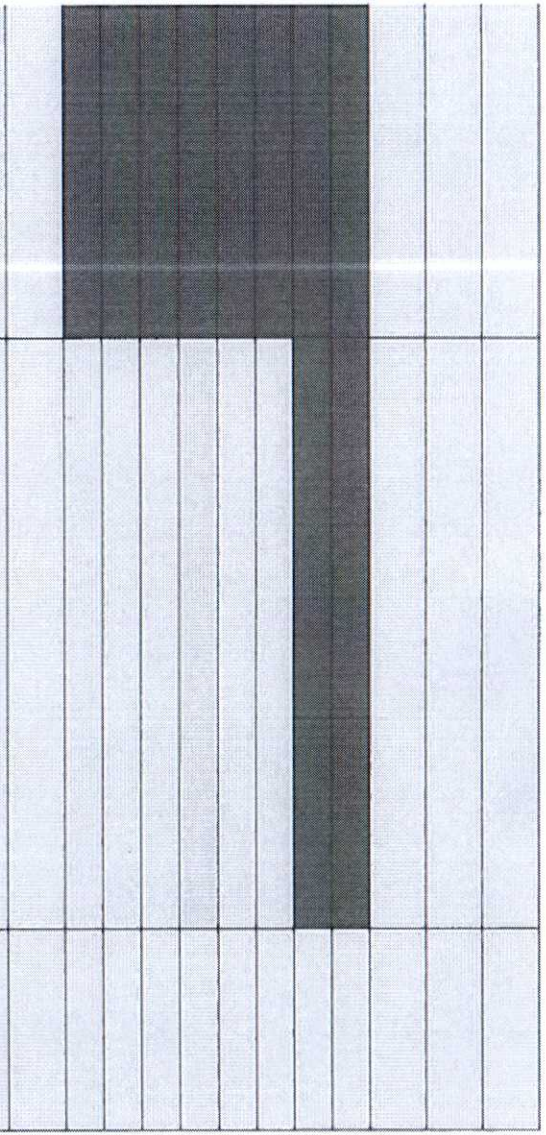
g) Finalize a user-friendly tool for assessing the costs and benefits of defined mitigation options for rice production in Viet Nam. The final version of the model and tool will be developed based on the inputs from users and experts that validated and tested these. This should also include further enhancements on the user interface based on users' feedback during the regional pilot training.

Activity 2.2. *Develop training manual and documentation materials for the cost and benefit assessment tool (in English).* The activity consists of the following sub-activities:

- Develop and deploy the training manual. The manual should include a concise but intuitive step-by-step (beginner's) guide (with diagrams) on how to use the tool. These materials should be informed by the outcomes and lessons learned from pilot testing activity. The manual should be introduced and feedback will be sought through regional pilot training workshop (WS2a) for selected participants from relevant government agencies. It should also include a section on recommended readings and other references on GHG calculation methods and marginal abatement cost curves, real-world and/or hypothetical examples, and other concepts critical to the appreciation and understanding of how the tool works and how the information generated by it can be applied. The manual and training will be tailored in such a way that relevant government agencies and research performing organizations will be able to outscale the use of the tool after the project.
- Document the model and tool development. This shall include a comprehensive report on the concepts, methodologies and data used in the model and tool, including macros and scripts used. The report should also include recommendations on how the improve and extend the tool.

Deliverables 2:

1. List and descriptions of mitigation options to be included in the tool
2. List and descriptions of use cases for the tool
3. Inception and consultation workshop (WS2a and WS3a)
4. Model for assessing abatement costs and benefits with protocols and workflows
5. Cost-benefit assessment tool, including full documentation and source code



6. Training manual and step-by-step user's guide, including illustrations with use case studies or hypothetical examples (in English and Vietnamese) 7. Validation workshop, including documentation (WS2b and WS3b) 8. Detailed report or working paper on methodology 9. Two regional pilot training workshops, including documentation (WS2c and WS3c)												
Output 3: Geographic information system (GIS) based mapping and analysis tool to support the propagation of climate change mitigation technology options that will enhance the country's rice production												
Activity 3.1: *Design and develop GIS maps and analysis tool that allows for the assessment of the suitability of climate change mitigation options on select rice production areas in Viet Nam.* This activity includes the following sub-activities: • Desk review and inventory existing data and maps on rice production (i.e, yield, crop masks for different varieties, topographic/LiDAR maps, soil characteristics, irrigation and hydrological maps, social, economic and demographic indicators, climate, environmental and other physico-chemical characteristics). The review shall also include the state of the art on rice production mapping technologies, and shall include review of available data and potential sources for RSGIS data. It shall also identify potential barriers (i.e., issues related to copyright, privacy, format compatibility, data interoperability, etc.), provide recommendations to remedy these barriers, where possible, and incorporate these recommendations in the development of the GIS model and in the development of the maps and the analysis tool. • Consult with relevant stakeholders and potential users of the GIS maps and analysis tool. Identify and establish communication with potential sources of remote sensing and GIS data, and identify gaps and needs for a comprehensive rice production database and map that allows for climate change mitigation planning for agriculture. In close consultation with national and local level agricultural technicians and technical staff, conceptualize, design and develop a decision support framework for identifying and deploying mitigation options that are suitable in rice production areas. This should also involve an assessment of the technical capacities of the government agency to whom the GIS maps will be turned over, and provide recommendations to the government on how this could be addressed in the medium-term. The consultation process should be designed to ensure that it is able to take into account the needs and profiles of the intended users of the tool[6]. **[WS3a]**												

[6] They can have the same or similar profile as the ones identified under Activity 2.

- Develop GIS maps and analysis tool. This involves the development of protocols and mechanisms for rapid assisted and/or semi-automatic acquisition and analyses of satellite imagery, other remote sensing data and geographical information system (GIS) data. Based on consultations with key stakeholders and national experts (WS1b), develop the protocol or workflow for identifying suitable rice production areas where selected mitigation technologies that can be applied. In addition, the service provider should also provide steps and recommendations for acquisition, configuration, and installation of data server, if applicable. Use-case scenarios identified in Activity 2 can also be applied in generating sample suitability maps for the pilot training. The maps and tools should be upgradable to be applicable to adaptation options as well should the country decide to revisit and update them. Similar to Activity 2, the GIS map model and analysis tool should also undergo validation from national experts and other key stakeholders. **[WS3b]**

- Retrieve, archive and store required best available geo-referenced information on Viet Nam's rice production areas in non-proprietary format. The GIS database should be setup, configured and initialized, with essential maps and dataset collected, indexed, digitized and encoded. The GIS maps should be developed in formats that can be accessed and modified using free and open source software platforms and should easily be deployable to GIS servers if needed. Protocols and workflows used in the development of the system should ensure that the database and mapping system take advantage and utilize all existing GIS and other data sets generated by MARD, IPSARD and other government agencies. They should also ensure inter-operability of datasets and taxonomies used and generated by the GIS platform operated by these agencies.

- Generate suitability maps based on use case scenarios. Using the method of analysis developed, generate the suitability maps for select pilot rice production areas in the country.

Activity 3.2: *Develop training materials and documentation for the GIS maps.* This activity includes the following sub-activities:

- Develop training manual and conduct training workshops to central and regional offices on the roll-out and use of the web GIS application. The manual should include a brief introduction on remote sensing and GIS, their application to geospatial planning for agriculture, real-world and/or hypothetical examples, and other concepts critical to the appreciation and understanding of how the web GIS application works and how the information generated by it can be applied. It should also include a concise but intuitive step-by-step (beginner's) guide (with diagrams) on how to use the maps and conduct the suitability analysis. These materials should be informed by the outcomes and lessons learned

from pilot testing activity. The manual should be tested by holding regional pilot training workshops for select participants from relevant government agencies. **[WS3c]** • Fully document the process for the design and development of GIS maps. This entails a detailed narrative on how the maps and analysis tools were developed, and how they can be applied as decision support parameters for evaluating the suitability of various climate change mitigation technology options. It should also contain instructions on how the maps and tool(s) can be maintained, updated and expanded. This shall include documentation on mapping data and design requirements, protocols and workflow for analysis and retrieval satellite imagery, remote sensing data and external GIS data, and the concept and design of the analyss tool (decision support module) for mapping areas where certain climate change mitigation practices can be optimally applied. The report should also include recommendations on how the improve and extend the tool to other commodities.												
Deliverables 3: 10. GIS maps and analysis tools for identifying suitable areas for climate change mitigation options in format that is compatible with free and open-source GIS software 11. Inception and consultation workshop (WS2a and WS3a) 12. Full documentation and source code 13. Vector and raster maps in non-proprietary formats 14. Training manual and step-by-step user's guide (in English and Vietnamese) 15. Two regional training workshops, including documentation (WS2b and WS3b)													
Output 4: Dissemination of information on the application of cost-benefit assessment and GIS tools in promoting mitigation investments for agriculture													
Activity 4.1: *Develop communication materials* • This includes the preparation of presentation materials and brochures for each tool that show cases their salient features, underlying science/methodology, sample applications, and practical case studies. • The service provider, together with CTCN, the NDE and project proponent, to disseminate these materials to their own partners and networks.													
Activity 4.2: *Conduct a national science and innovation policy workshop*													

• The workshop will present and validate project findings, and the tools developed and their underlying methodologies, as well as to get feedbacks to further improve them and/or suggestions to extend the system to other sectors or commodities and/or other areas. **[WS4a]** • The workshop will also provide an avenue to determine gaps and give recommendations in policy research and development to allow more evidence-based planning and decision making in the agriculture sector and provide space to suggest ways forward to enable better sharing of data and information for better and sound agricultural planning.	
Activity 4.3: *Share project findings and lessons learnt to other (rice-growing) countries in the ASEAN community and to other regions* • This includes co-hosting/participation in at least CTCN two webinars • Present the project in at least 1 key regional technical conference promoting climate smart and/or sustainable agriculture/rice production. • Organize and accompany 2 project proponent staff on south-south exchange mission (2-3 days) to another ASEAN country to show case the results and potential application project as well as to learn about the country's planning systems for agriculture in the context of climate change	
Deliverables 4: 1. National technical workshop (WS4a) 2. Webinars co-hosted with CTCN 3. Presentation materials for each tool demonstrating salient features, underlying science and practical applications (in English) 4. 2-page brochure for each tool with sample applications (in English) 5. Policy paper with practical case studies (in English) 6. Textual input to NDC within the scope of this TA	

* All reports, files and other documents submitted as deliverables should be in editable formats

4. Resources required and itemized budget:

		Input: Travel	**Inputs: Meetings/events**		**Estimated cost**

Activities and Outputs	**Input: Human Resources** *(Title, role, estimated number of days)*	*(Purpose, national vs. international, number of days)*	*(Meeting title, number of participants, number of days)*	**Input: Equipment/Material** *(Item, purpose, buy/rent, quantity)*	*Please accumulate the costing at Activity and Output level and provide an estimated costing range for each activity and the total Response Plan*	
					Minimum	**Maximum**
Output 1: Development of implementation planning and communication documents						
Activity 1.1: All implementers must undertake the following activities at the beginning and at the end of the CTCN technical assistance.	Project manager/ Climate change specialist (2 person-days); Agriculture economist (1 person-day); RSGIS specialist (1 person-day); Gender specialist (10 person-days);				4,300	5,700
Output 2: Development of an interactive and dynamic tool to calculate cost and benefits of mitigation actions in rice sector						
Activity 2.1: Develop tool to display and generate cost-benefit assessments for mitigation options for rice production	Project manager/ Climate change specialist (24 person-days); Agriculture economist (31 person-days); Data modeler (25 person-days);	Travel to VN (travel + 5 days DSA, to also cover 3 days for WS2a+WS3a); Scoping mission - Hanoi + two pilot areas (Lead + 2 local consultants x 6 days DSA)	Inception workshop and consultation on cost-benefit model and GIS model development (50 participants, 3 days) [WS2a+WS3a] National validation workshop (40 pax, 2 days) [WS2b+WS3b]		47,310	60,310
Activity 2.2. Develop training manual and documentation	Communications specialist (10 person-days);	Travel to 2 regional pilot training areas (3 local consultants, 10	Regional pilot training workshop for cost-benefit and GIS tools (50	Printing and publication	29,300	36,800

materials for the cost and benefit analysis tool (in English and Vietnamese)	Project manager/ Climate change specialist (3 person-days); Agriculture economist (9 person-days); Data modeler (3 person-days);	days DSA to cover for 3 days x 2 for WS2c+WS3c and 2x local return trips)	participants, 3 days, 2 sites) [WS3c+WSc]			
Output 3: Geographic information system (GIS) based mapping and analysis tool to support the propagation of alternate-wetting and drying and other climate change mitigation technologies that will enhance the country's rice production						
Activity 3.1. Design and develop GIS data architecture and maps that allows for the assessment of the suitability of alternate wetting and drying and other climate change mitigation options on select rice production areas in Viet Nam	Project manager/ Climate change specialist (15 person-days); Agriculture scientist (31 person-days); RSGIS Specialist (31 person-days); GIS data modeler/specialist (25 person-days);	Consultation meetings with experts and project proponents (3 persons, ~5 days, Hanoi only)			32,100	42,300
Activity 3.2: Develop training materials and documentation for the GIS maps	Communications specialist (10 person-days); Project manager/ Climate change specialist (3 person-days);			Printing and publication	10,200	14,000

	RSGIS Specialist (1 person-days); GIS data modeler/specialist (1 person-days); Agriculture scientist (1 person-days);					
Output 4: Dissemination of information on the application of cost-benefit analysis and GIS tools in promoting mitigation investments for agriculture						
Activity 4.1: Develop communication materials	Communications specialist (10 person-days); Project manager/ Climate change specialist (3 person-days); RSGIS Specialist (1 person-day); GIS data modeler/specialist (1 person-day); Agriculture scientist (1 person-day); Agriculture economist (1 person-day); Data modeler (1 person-day);			Printing and publication	8,600	12,400
Activity 4.2: Conduct a national science and innovation policy workshop	Communications specialist (3 person-days);	Travel to VN (travel + 3 days DSA, inc. 1 day for WS4)	Science and innovation policy workshop on TA contributions to NDC target setting and		5,310	6,810

	Agriculture economist (2 person-days); Agriculture scientist (2 person-days);		implementation/Terminal Workshop (40 persons, 1 day) [WS4]			
Activity 4.3: Share project findings and lessons learnt to other (rice-growing) countries in the ASEAN community and to other regions	Project manager/ Climate change specialist (1 person-days); Agriculture economist (3-person days)	One mission to 1 ASEAN country (3~4 persons, 5 days); Domestic travel (lumpsum)			8,600	11,350
Estimated range of costing for the entire Response Plan					**145,720**	**189,670**

5. Profile and experience of experts

Based on the required Human Resources identified in section 4 (Resources required and itemized budget) please provide a description of the required profile of all involved experts for the implementation of the CTCN Response Plan.

Experts required	Brief description of required profile
Project manager/ Climate change specialist	Advanced degree in agriculture, soil science or rural development, with specialization and extensive research/work background in conducting GHG inventory and assessment for agriculture, forestry and land use sectors, design and development of sustainable agriculture production systems, climate smart agriculture practices and similar projects. Must have considerable knowledge and work experience on developing and applying marginal cost curves for agriculture and/or natural resources management sectors. Must have considerable work experience in tropical agriculture particularly in developing country settings, preferably in the ASEAN
RSGIS specialist	Advanced degree in agriculture, environmental management, geography, rural development, with specialization in remote sensing and geographic information system (RSGIS) At least ten years relevant work experience in developing, analysing and packaging RSGIS data products for use in agriculture or natural resource planning, and in the calibration and use of remote sensing data and indices for use in crop production assessments Must have considerable work experience in Viet Nam

GIS data modeler/specialist	Advanced degree in agriculture, agriculture engineering, environmental management, geography, rural development, with specialization in geographic information systems (GIS) and data modelling At least ten years relevant work experience in designing data infrastructure for use in online decision support systems, preferably in agriculture, and in designing and developing of web GIS platforms, using free and open source software (FOSS), with direct applications in natural resource management and/or agriculture spatial planning Must have considerable work experience in Viet Nam
Agriculture scientist/Agronomist (National)	Advanced degree in agriculture, soil science or rural development, preferably with specialization in sustainable farming systems At least ten years relevant work experience in advanced crop management techniques, soil and crop suitability, development of decision support and management tools, planning and implementation of sustainable agriculture production and/or climate smart agriculture projects, and working knowledge on deployment of alternate wetting and drying and other climate change mitigation technologies option Must have considerable work experience in Viet Nam
Agriculture economist	Advanced degree in agriculture management and development, resource economics, business development, and related fields At least ten years relevant work experience in agriculture development and planning strategies at both local and national level, including their implementation and monitoring, and highly knowledgeable of the country's institutions, policies and sectoral plans related to agriculture, and have working knowledge in applying a range of cost benefit analysis tools and methodologies for the sector. Must have considerable work experience in Viet Nam
Data modeler	Degree in computer science, agriculture engineering, management information systems, with specialization in At least five years relevant work experience in developing ICT and/or packaging RSGIS data products, in designing data infrastructure for use in online decision support systems, preferably for agriculture planning, in developing Excel-based tools Must have considerable work experience in Viet Nam
Communications specialist	Degree in development communications, multimedia arts, journalism and related fields At least five years relevant work experience in designing and developing publication and communications materials for development organizations, including graphic design, editing and proof reading, in organizing and facilitating workshops, seminars and other large group meeting events. Must have considerable work experience in Viet Nam, and have native fluency in Vietnamese and excellent command of English
Gender specialist	The Gender Specialist shall have the following expertise and experience: Understanding of gender considerations with regards to role of women in agriculture sector specifically rice cultivation in Viet Nam

	The Gender Expert shall have proficiency in reading, writing and speaking in English and must be able to communicate with stakeholders effectively.

6. Intended contribution to impact over time

The proposed CTCN assistance would help Viet Nam to: (1) develop an interactive and dynamic decision support tool to calculate cost and benefits of mitigation actions in rice sector; (2) develop a remote sensing and geographic information system (RSGIS) based mapping and analysis tool to supporting the propagation of alternate-wetting and drying and other climate technologies that will enhance the country's rice production; and (3) increased the understanding and develop the capacities of relevant stakeholders to apply cost benefit analysis and RSGIS tools to identify, assess and decide on the most appropriate mitigation options for rice production on specific production areas.

The decision support tools developed under the TA will provide planners and other relevant stakeholders with best-available information on the costs and benefits of different mitigation options. This allows for better targeting and upscaling of climate smart agriculture practices, such as better management of agriculture soils, fertilizers and other chemicals, and debris and residues. It also enables the government to program similar investments at scale and mainstream them into their agricultural commodity programs. The tool will also contribute to the development of the country's GHG inventory and MRV system. This will have significant contributions in Viet Nam's future national communications to the UNFCCC as it would provide more reliable information sources for its national GHG inventory, and could potentially be used as a tool in calculating cost-benefits of investment potfolios inline with the implementation of the country's NDC.

The main beneficiaries of the TA are from national and governments as well as research and extension services in Viet Nam:

- The proposed tool will enhance capacity of National Agricultural Research and Extension Services (NARES) and agricultural staff/officials at local levels to make reliable cost-benefit assessment of mitigation options in rice production to inform policy makers
- Using reliable data on GHG emissions and cost-benefit assessment of mitigation options will allow better targeting and upscaling of mitigation practices
- Implementing relevant mitigation options recommended by the proposed tool will contribute to attain the targets set by the government of Viet Nam in the 2015 INDC.
- Improving the future National Communications of Viet Nam to the UNFCCC by facilitation substantiated statements in chapter 'mitigation' for the most important subsector within the GHG inventory of the country
- Policy makers and NARES in other ASEAN countries will be provided valuable information on the possible strategy to improve decision making on mitigation projects

7. Relevance to NDCs and other national priorities

The technical assistance requested through this concept note aligns well with Viet Nam's NDC. Indeed, as part of the measures to achieve the GHG emissions mitigation targets, the Viet Nam government proposed in the NDC to develop national GHG inventory system; establish systems for measuring, reporting and verification at the national and sectoral levels in order to monitor and supervise GHG emissions activities. The government also proposed to enhance cooperation in scientific research, information exchange on the formulation and implementation of policies; and remained open to the support of international organizations in finance, capacity building and

technologies in the implementation of climate change strategies and policies. This Request for Technical Assistance is also in line with Viet Nam's efforts on restructuring the rice sector.

8. Linkages to relevant parallel on-going activities:

The proponent of this TA (IPSARD) is directly involved in two projects dealing with mitigation in the rice subsector of Viet Nam. The actual request has been triggered by the desire to make the outputs of these projects more tangible and relevant for the implementation of mitigation programs:

1) Policy Information and Response Platform on Climate Change and Rice in the ASEAN and its member countries (PIRCCA) project has been operating in Viet Nam since 2014. The main goal of the PIRCCA project is to bridge the gap between science and policy and enable policy makers to make informed decision on climate change. In its initial stage the project documented the key stakeholders, engagement mechanisms, national priorities and knowledge gaps in climate change. This documentation has led to initiate the development of knowledge on mitigation options for policy by profiling climate change information to the need of specific stakeholders.

2) The Climate and Clean Air Coalition to reduce short-lived climate pollutants (CCAC) has the goal to support large-scale implementation of mitigation technologies in rice production through its paddy rice work stream. Starting work in Viet Nam in January 2015, the project has identified region-specific opportunities and barriers for out scaling of mitigation options, mapped out stakeholder networks including their level of influence on adoption. The CCAC initiative has also generated suitability maps (in GIS format) for water-saving technologies, although these maps are at this point only the bio-physical feasibility and not the economic viability of these mitigation options.

In addition, the TA will also reach out to other related on-going and planned projects to explore potential synergies and complementation in project activities, including:

- The Viet Nam Sustainable Agriculture Transformation Project (vnSAT) is operational from 2015-2020 and is implemented by MARD. It will support the efforts of the government to implement its Agricultural Restructuring Plan, relevant sector plans, and national plans for climate change adaptation and mitigation in the agricultural sector (including its Green Growth Strategy). Total project costs amount to USD301 million, of which USD238 million are financed by the World Bank. Among the project's outcome areas is institutional strengthening to support agricultural transformation and support for sustainable rice-based systems.
- The ADB funded Viet Nam Low Carbon Agricultural Support Project will enhance climate smart agriculture development and practices focused on strengthening Low Carbon Agriculture (LCA) policies and institutions; establishing infrastructure support for agri-waste management; and, enhancing LCA technology and development transfer. These will be parts of climate change (CC) mitigation and adaptation measures to reduce greenhouse gas (GHG) emission in 19 provinces of Viet Nam.
- The TA will also aim to align and support the updating agriculture sections in NDC being submitted to UNFCCC in 2020, the National Adaptation Program in Agriculture (NAP-Ag), Updating the Action Plan on Responding to Climate change and Sea level Rise of Agriculture and Rural Development Sector in the Period 2021-2030, and Vision to 2050 and the Implementation Plan of the Paris Agreement in Agriculture and Rural Development Sector on Vietnam in the Period 2021-2030.

9. Anticipated follow up activities after this technical assistance is completed:

The proposed tool will be updated as needed in response to ongoing changes in market prices and technologies. IPSARD will maintain and update the proposed tool and share it with other

stakeholders. The tool will also be publicly available through different online portals. Case studies will be implemented using the proposed tool to communicate with policy makers as a means for paradigm adjustment in climate change policy. National and provincial policy makers (mainly from MARD and provincial DARDs) will use the tool and socio-economic suitability maps for planning purposes in order to achieve mitigation commitments laid out in Viet Nam's INDC.

10. Gender and co-benefits:

Imbedded in design of the activities:	A gender mainstreaming analysis is mandatory to include for all technical assistances. A gender expert will be assigned to carry out an assessment and evaluation regarding gender mainstreaming during the implementation of the TA. A critical aspect of the TA request was to investigate socio-economic variables that make such technologies tenable and acceptable. In this regard, wherever applicable, factors that directly or indirectly increases women's access to productive resources or increase their household- and farm-decision-making opportunities will be given priority (i.e., yield increasing, drudgery reducing, labour-saving, energy saving, ICT-based technologies and practices). This will be embedded in the model used for the cost benefit analysis (Output 2) and the decision support module for climate change mitigation options for rice (Output 3). *In addition, please describe all support to gender aspects, women's equality and other co-benefits embedded into the Response Plan (please include a reference to the actual activities and outputs as described in section 3).*
Gender and co-benefits intended as result of the activities:	*Please describe all gender aspects, women's equality and other co-benefits expected as a result of the CTCN technical assistance.* Women in Viet Nam forms a substantial part of the agriculture labour force. They also play a crucial role in transforming the country's agriculture sector into a sustainable and low carbon pathway due the range of roles they play at all stages of the value chain, not just for rice production, but also in fisheries, forestry, and other natural resource management sectors as well. Through the TA, planners and decision makers for agriculture at both national and local level will be provided with the capacities to promote and invest on climate-smart and labour-saving technologies and practices that would ensure and bolster equal access for women to productive resources.

11. Main in-country stakeholders in implementation of the technical assistance activities:

Using the table below, please list and describe the role of in-country stakeholders, participants and beneficiaries who will be involved in or directly consulted during implementation of the assistance.

In country stakeholder	Role in implementation of the technical assistance

Institute of Policy and Strategy for Agriculture and Rural Development (IPSARD)	• Work closely with the entity selected to provide the technical assistance and ensure coordination of activities at the national and local levels. • Identify the key stakeholders and ensure a participatory approach in generating data on the calculation of GHG emissions and cost-benefit assessment of mitigation options. • Oversee the maintenance and updating of the proposed tool • Organize capacity building training activities at the local, national and regional levels
Ministry of Agriculture and Rural Development (MARD)	• Ensure the participation of stakeholders in the project at the national level • Assist IPSARD and the entity chosen for the technical assistance by providing data and relevant information for the calculation of GHG emissions and cost-benefit assessment of mitigation options
Ministry of Natural Resources and Environment (MONRE)	• Ensure coordination with on-going mitigation projects in Viet Nam • Ensure the participation of stakeholders in the project at the national level • Assist IPSARD and the entity chosen for the technical assistance by providing data and relevant information for the calculation of GHG emissions and cost-benefit assessment of mitigation options.
Department of Agriculture and Rural Development (DARDSs) and local governments (provinces, communes)	• Ensure the participation of local stakeholders in the Rural Development (DARDs) and project • Provide data and relevant information for the calculation of GHG emissions and cost-benefit assessment of mitigation options applied in the provinces when requested • Facilitate data collection at the field level
Ministry of Planning and Investment (MPI)	• Ensure that model assumptions used in the tools are in line with national economic and development planning priorities
Department of Survey and Mapping	• Government Decree No.444-TTg on the 14th of December 1959, and it has responsibilities to carry out state managements on survey and mapping activities and implementation of national survey and mapping work.
Academic and research performing organizations	• Provide critic and feedback to improve the tools that will be develop • Provide guidance on possible sources of data or best proxy indicators, and other relevant information
Development organizations (CIAT, FAO, SERVIR, IUCN, UNDP)	• Provide data and relevant information for GHG calculation, and maps for rice production, irrigation and hydrology, crop suitability (current and future), and other thematic maps and data

12. SDG Contributions:

Instructions: Please complete the grey section below for ***a maximum of three SDGs*** *that will be advanced through this TA. A complete list of SDGs and their targets is available here: https://sustainabledevelopment.un.org/partnership/register/.*

Goal	Sustainable Development Goal	Direct contribution from CTCN TA (1 sentence for top 1-3 SDGs)
1	End poverty in all its forms everywhere	
2	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	The technical assistance will provide planners and decision makers in Viet Nam robust means for identifying and evaluating different effective and cost-efficient options to make their agriculture production sustainable and climate friendly
3	Ensure healthy lives and promote well-being for all at all ages	
4	Ensure inclusive and equitable quality education and promote life-long learning opportunities for all	
5	Achieve gender equality and empower all women and girls	
6	Ensure availability and sustainable management of water and sanitation for all	
7	Ensure access to affordable, reliable, sustainable, and modern energy for all (consider adding targets for 7)	
	7.1 - By 2030, ensure universal access to affordable, reliable and modern energy services	
	7.2 - By 2030, increase substantially the share of renewable energy in the global energy mix	
	7.3 - By 2030, double the global rate of improvement in energy efficiency	
	7.a - By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology	
	7.b - By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support	
8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Agriculture remains a major source of livelihood in Viet Nam. Shifting to climate friendly production technology, management and practices not only makes the sector sustainable but more productive as well.
9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	
10	Reduce inequality within and among countries	
11	Make cities and human settlements inclusive, safe, resilient and sustainable	
12	Ensure sustainable consumption and production patterns	
13	Take urgent action to combat climate change and its impacts	*All TAs should indicate relevance to Goal 13 and at least one target below (13.1 to 13.b).*
	13.1 - Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	
	13.2 - Integrate climate change measures into national policies, strategies and planning	The TA will provide tools that can be used for evidence-based planning that could enable the country to shift investments in rice production and agriculture production, in general, to a more sustainable and low carbon path way.
	13.3 - Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	The tools develop will increase the knowledge and understanding of national and local agricultural planners and extension service officers on the range of options they have to adopt rational and climate smart technologies and management practices.
	13.a - Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly $100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible	

	13.b - Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities	
14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development	
15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	
16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	
17	Strengthen the means of implementation and revitalize the global partnership for sustainable development	

13. Classification of technical assistance:

Please indicate primary type of technical assistance. Optional: If desired, indicate secondary type of technical assistance.

Please tick off the relevant boxes below	*Primary*	*Secondary*
☐ 1. Decision-making tools and/or information provision	☒	☐
☐ 2. Sectoral roadmaps and strategies	☐	☐
☐ 3. Recommendations for law, policy and regulations	☐	☐
☐ 4. Financing facilitation	☐	☐
☐ 5. Private sector engagement and market creation	☐	☐
☐ 6. Research and development of technologies	☐	☐
☐ 7. Feasibility of technology options	☐	☐
☐ 8. Piloting and deployment of technologies in local conditions	☐	☒
☐ 9. Technology identification and prioritization	☐	☒

Please note that all CTCN technical assistance contributes to strengthening the capacity of in country actors.

14. Monitoring and Evaluation process

Upon contracting of the implementing partners to implement this Response Plan, the lead implementer will produce a monitoring and evaluation plan for the technical assistance. The monitoring and evaluation plan must include specific, measurable, achievable, relevant, and time-bound indicators that will be used to monitor and evaluate the timeliness and appropriateness of the implementation. The CTCN Technology Manager responsible for the technical assistance will monitor the timeliness and appropriateness of the Response Plan implementation. Upon completion of all activities and outputs, evaluation forms will be completed by the (i) NDE about overall satisfaction level with the technical assistance service provided; (ii) the Lead Implementer about the knowledge and learning gained through delivery of technical assistance; and (iii) the CTCN Director about timeliness and appropriateness of the delivery of the activities and outputs.