Cost-benefit Assessment of Mitigation Options in Rice Production: Data compilation, tools and training within the Vietnamese context

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Final Report

submitted to the

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Rice Science for a Better World

Final Report of TA:

Cost-benefit Assessment of Mitigation Options in Rice Production: Data compilation, tools and training within the Vietnamese context (CBA-Rice)
CTCN ref. 2016000061

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Deliverables due in the Final Report

Deliverables	
Output 2: Development of an interactive and dynamic tool to calculate cost and benefits of selected mitigation actions in rice sector	
D 2.6	Cost-benefit assessment tool, including full documentation and source code
D 2.7	Training manual and step-by-step user's guide, including illustrations with use case studies or hypothetical examples (in English and Vietnamese)
D 2.8	Two regional pilot training workshops for at least 40 local participants each, including documentation (held jointly with the regional pilot training workshop under Activity 3.2)
D 2.9	Detailed report or working paper on methodology
Output 3: Geographic information system (GIS) based mapping and analysis tool to support the propagation of selected climate change mitigation technology options that will enhance the country's rice production	
D 3.5	Training manual and step-by-step user's guide (in English and Vietnamese)
D 3.6	Two regional training workshops for at least 40 local participants each, including documentation (held jointly with the regional pilot training workshop under Activity 2.2)
D 3.7	Full documentation and source code
Output 4: Dissemination of information and capacity building on the use of cost-benefit assessment and GIS tools in promoting mitigation investments for agriculture	
D 4.1	Textual input to NDC within the scope of this TA
D 4.2	Presentation materials for each tool demonstrating salient features, underlying science and practical applications (in English)
D 4.3	National technical workshop for at least 40 national participants and the South-South exchange mission (2-3 days) to another ASEAN country

D 4.4	Webinars co-hosted with CTCN
D 4.5	2-page brochure for each tool with sample applications (in English)
D 4.6	Policy paper with practical case studies (in English)

LIST OF ATTACHMENTS:

1. D2.6/D2.7: Cost-benefit assessment tool – COMPARE tool and User Manual (English and Vietnamese [https://ghgmitigation.irri.org/knowledge-products/mrv-toolbox/rice-cba)
2. D2.8/D3.6: Report - Regional training workshop [https://drive.google.com/file/d/1-WdYWtFwF_ON0nkGQQe5Nksc9WMXqCIb/view?usp=sharing]
3. D2.9: Detailed report on methodology of cost and benefit calculation tool [https://drive.google.com/file/d/1kiRamQVR_DQP40wJ9t5txmRXqgMXY9xk/view?usp=sharing]
4. D3.7: Full documentation and source code of GIS-based mapping and analysis tool [https://drive.google.com/file/d/1PXP_zoQbSecpwZhvSW1MhBApb_FAk3uK/view?usp=sharing]
5. D4.1: Textual input to Vietnam's NDC [https://drive.google.com/file/d/1bJC4A_JTdAko_fzhq0gA5HzNsiXx9a5g/view?usp=sharing]
6. D4.2: Presentation materials for each tool demonstrating salient features, underlying science and practical applications [https://drive.google.com/drive/folders/1L9sM_wb815cWAPrDIP838QHqWeHzvH5Z?usp=sharing]
7. D4.3a: Report of national technical workshop [https://drive.google.com/file/d/15EVnkzQKHdcOVyRkDOSZ2fWM69xsZCsf/view?usp=sharing]
8. D4.3b: Journal article based on the results of the South-South Exchange Mission [https://www.frontiersin.org/articles/10.3389/fsufs.2020.575823/full]
9. D4.4a: Webinar concept note and materials (including recorded video presentation) [https://drive.google.com/drive/folders/1qqA2f2vTtVYJwOTPpgW4nJZbhXgFFKsf?usp=sharing]
10. D4.4b: Webinar report [https://drive.google.com/file/d/1ylg3TlkVY1awvGuGxQX4r5tdPc5m4M6x/view?usp=sharing]
11. D4.5: Brochures for 3 tools [https://drive.google.com/drive/folders/1v9N8VJXTfCFkliLp1ABXc4_qojusVADN?usp=sharing]
12. D4.6: Policy paper with case analysis [https://drive.google.com/drive/folders/1vDrgjA48RRb41jqWb7rCAlJfK0ShhiSu?usp=sharing]
13. Download links to MapAWD tool and SECTOR tool with user manuals [https://ghgmitigation.irri.org/knowledge-products/mrv-toolbox/sector] [https://ghgmitigation.irri.org/knowledge-products/mrv-toolbox/mapawd]

DETAILED UPDATES:

D 2.6 Cost-benefit assessment tool, including full documentation and source code

Based on comments from participants in two training workshops (on 10th November and 1st December 2020), the TA team made further refinements to the CBA tool to allow:

- The dynamic change of land use by season over the project's time horizon;
- Dividing Capital and Operational expenditures over the project's time horizon;
- Differentiating the rice selling prices by production package in each season to allow for the possibility of higher valued rice produced by improved practices;
- Adding a carbon price and adding the revenue from carbon abated.

The tool was then finalised with the official name "**Cost Impact Analysis for Rice Emissions**" – COMPARE. The COMPARE tool is made available for public download, see Attachment #1.

D 2.7 Training manual and step-by-step user's guide, including illustrations with use case studies or hypothetical examples (in English and Vietnamese)

The User manual was updated to reflect the modifications in the COMPARE tool and is also publicly available (in both English and Vietnamese), see Attachment #1.

D 2.8 / D3.6 Two regional pilot training workshops for at least 40 local participants each, including documentation

Two regional training workshops took place on 10th November and 1st December 2020. A detailed training report was submitted to UNIDO on 8th December 2020, see Attachment #2. A news article about the first workshop can be found here.

D 2.9 Detailed report or working paper on methodology (of cost and benefit calculation tool)

UNIQUE Land Use and Forestry developed a report detailing the development process of the cost and benefit analysis tool, namely COMPARE, see Attachment #3.

The report explains the purpose and key functions of the tool to assess economic and carbon impacts of different rice management practices at a regional level in Vietnam, as requested by the Ministry of Agriculture (represented by IPSARD). The development of the tool involved a desk review of existing tools, various rounds of stakeholder consultations from October 2019 to April 2020 (via workshops/meetings/emails). The refinement of the tools was based on comments from two regional training workshops in November and December 2020.

The report also explains the methodology, components, the flows of inputs and outputs in the COMPARE tool, as well as how the results are presented. Advantages of the COMPARE tool compared to existing tools are also mentioned, for example:

- the COMPARE tool is adapted to three different groups of users; the advanced users can modify the cost structure as per specific needs/contexts;
- it can be applied for various scales (province, region, national), and allows different combinations of mitigation packages;
- it takes account of regional differences in terms of agroecological and economic conditions, and rice production practices.

D 3.5 Training manual and step-by-step user's guide (in English and Vietnamese)

The Vietnamese version of MapAWD User Manual is available together with the tool and its User Manual in English at https://ghgmitigation.irri.org/knowledge-products/mrv-toolbox/mapawd

D 3.7 Full documentation and source code (of GIS-based mapping and analysis tool)

The climatic AWD suitability mapping methodology (integrating a GIS component) was developed by IRRI to support the outscaling of AWD in Vietnam. Using data on rainfall, potential evapotranspiration, and potential soil percolation rate, the suitability of a specific area to apply AWD is analysed by 10-day period and by season. As a result, three suitability levels are determined and illustrated on the area's map showing high suitability, moderate suitability, and low suitability for AWD. The tool development involved the formulation of protocols and mechanisms for acquisitions and analyses of GIS data.

The development of this methodology is participatory in nature, started with a pilot in An Giang province (Mekong River Delta region). After the success in An Giang province, IRRI finetuned the methodology and developed a generic tool, namely MapAWD, to support users to quickly analyze AWD suitability at any geographical scales. The tool was then introduced in a training workshop in November 2020 with specific and illustrative use-case scenarios. The full documentation (see Attachment #4) describes the development process and the stakeholders involved, as well as the components of the tools. It also gives the source codes in VBA language and system requirements for the tool to operate. The best available geo-referenced information on Vietnam's rice production areas have also been acquired and shared in non-proprietary format.

D 4.1 Textual input to NDC within the scope of this TA

In 2016, Vietnam submitted its Intended Nationally Determined Contribution (INDC) to the UNFCCC. Subsequently, the Ministry of Agriculture and Rural Development developed the NDC implementation plan in agriculture, proposing GHG mitigation targets and the actions to be taken in the rice sector. To inform the revision of Vietnam's NDC and the planning of NDC implementation in rice production, the TA team review the previous studies conducted by IRRI to inform Vietnam's NDC revision and planning of NDC implementation in the coming years.

Vietnam has prioritized AWD and other water-saving techniques as a key option for GHG reduction in the agriculture sector and has developed different scenarios for scaling these technologies with both domestic and international investments. However, the suitability of rice land for applying water-saving technologies may vary due to heterogeneous climatic and bio-physical conditions in different areas. Based on the previous studies, IRRI assessed the suitability of the areas proposed in Vietnam's scaling plans to apply AWD, including the climatic suitability as well as the adoption capacity. In addition, the TA team estimated the potential of GHG mitigation of these plans. These assessments employed the recently developed tools and the new emission factors that IRRI published in 2020 in cooperation with the Institute for Agricultural Environment (IAE).

The technical inputs have been submitted to the Institute of Policy and Strategy for Agricultural and Rural Development (IPSARD), providing the best available reference to support AWD implementation plans in the rice sector in Vietnam. The document also makes recommendations to conduct more comprehensive and detailed analysis of suitability and reduction potential in different provinces and in line with MARD's outscaling strategy. See Attachment #5

D 4.2 Presentation materials for each tool demonstrating salient features, underlying science and practical applications (in English)

A set of presentations were developed to describe the tools and how they are interlinked to provide comprehensive assessment of the mitigation practices in rice production. The materials start with an overview of the tools, their main uses, and the steps of the assessment process where each tool fits in, illustrated in the figure below.

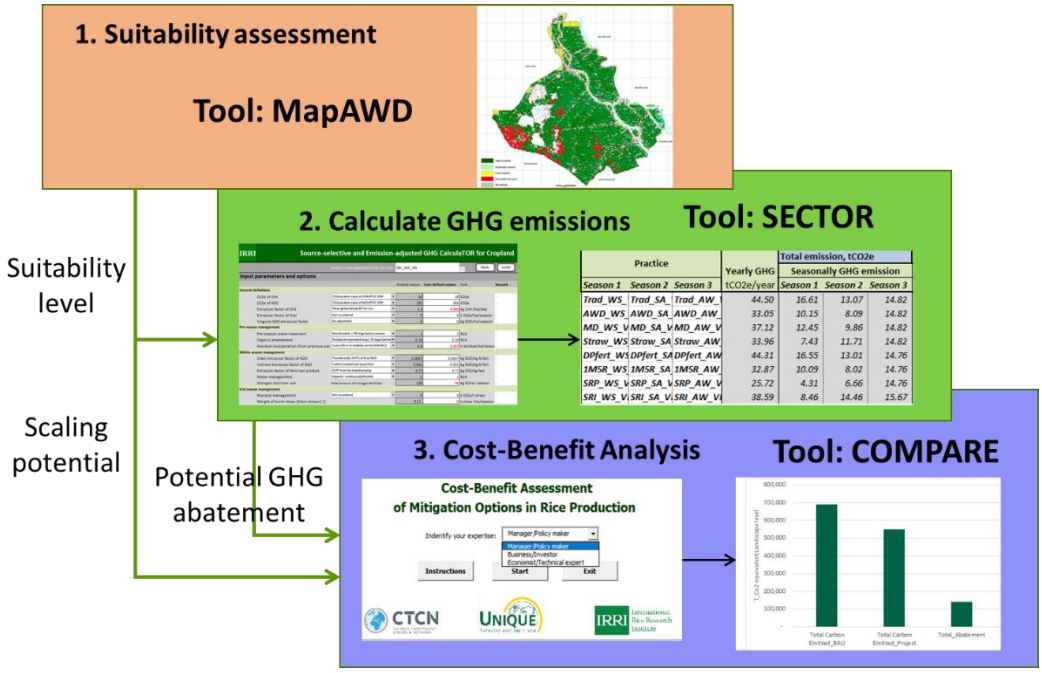

Figure 1: Overview of the tools and how they are interlinked

The other separate presentations demonstrate each tool with key functions, methodologies, programming languages and software, and step-by-step guidance. Each tool is accompanied with sample exercises for practice. Details of the materials are as follows.

1. Sector:

- GHG emission from rice production
- GHG mitigation methods in rice production
- Guides to Source-selective and Emission-adjusted GHG Calculator for Cropland: SECTOR
- Practice with sample data

2. MapAWD:

- Emission reduction through water management
- Defining techniques and scale of water management
- Guides to use the suitability evaluating tool: MapAWD
- Practice with sample data

3. COMPARE

- Why do Cost Benefit Analysis?
- The Tool – what does it do?
- Using the Tool - inputs and outputs
- Interpreting the results

- Advanced features: Economic indicators, Tool inner workings, and Useful functions

The full set of presentation material are in Attachment #0.

D 4.3 National technical workshop for at least 40 national participants and the South-South exchange mission (2-3 days) to another ASEAN country

The workshop was organized on 26 March 2021 in collaboration with the Department of Crop Production (DCP), and had the participation of 42 participants who were representatives from the ministries and agencies involved in the planning and implementation of Vietnam's NDC, the private sector and international organizations. Aiming to promote the NDC implementation in rice sector in Vietnam and define priorities for NDC implementation in the rice sector, the workshop presented an analysis of NDC implementation scenarios in the rice sector. Using MapAWD, SECTOR, and COMPARE (later referred to as MRV tools – MRV stands for Monitoring, Reporting and Verification for mitigation projects in rice), the TA team had developed and analyzed three scenarios for NDC implementation in the rice sector. The presentation showcased the use of these tools and potential application in NDC implementation planning. It initiated an insightful discussion among the participants about the roles of stakeholders, investment needs, methods to measure and verify GHG mitigation, and how to mobilize and coordinate the support from domestic and international partners. The workshop was broadcasted in several media channel, including the VTC news, IRRI News, and the Agriculture News. The workshop report is provided in Attachment #0.

Parts of the results of this TA have been being transferred to partners in the Thai Rice NAMA project which works mainly with the SECTOR tool. Dr. Bjoern Ole Sander represented the TA team and attended a knowledge sharing event for institutions in Thailand working on climate change mitigation, in which he presented on the MRV tools. The event was organised online (due to travel restrictions) in collaboration with King Mongkut's University of Technology Thonburi (KMUTT). Within this collaboration, IRRI and the KMUTT conducted a study using the first GIS-based suitability analysis in Thailand for rice and also estimated the CH4 emission mitigation potential. A journal article was produced as a result of this study, see Attachment #0. The TA team is working with an UNEP team in Thailand to explore further opportunities to apply the tools within a CCAC-funded project.

D 4.4 Webinars co-hosted with CTCN

Following the workshop with national partners, the TA team organised a webinar in collaboration with the Global Research Alliance on Agricultural Greenhouse Gases (GRA) to introduce the tools to international audience. Scheduled on April 28th, the webinar targeted to reach the GRA Paddy Rice Research Group (PRRG), researchers, government officers from rice-growing countries.

The webinar would introduce the SECTOR, MapAWD, COMPARE, and a carbon footprint calculation tool recently developed by IRRI named DISPLAY, and promoted their application to assist the planning and implementing cost-effective mitigation programs in other countries, contributing to achieving their NDC targets. See the webinar's concept note and materials in Attachment #0.

After participants have the chance to try out the tools, two in-depth sessions for questions and answers are planned in the first week of May to help participants gain a more thorough understanding about the functions and uses of these tools. Advanced features of the tools and use-case scenarios can be introduced to familiarise them with the tools and enable them to explore and take advantages of these dynamic and interactive tools to suit the specific context and needs of different countries/user groups. See the webinar report in Attachment #10

D 4.5 2-page brochure for each tool with sample applications (in English)

To widely disseminate the MapAWD, SECTOR, and COMPARE tools, the TA team developed a brochure for each tool to showcase the main features, uses, advantages, and key steps to work with the tools. The brochures deliver user-friendly contents with infographics and sample applications of the tools to visualise how they work and the results they produce. They also link to a webpage where the tools can be publicly accessed and downloaded with user manuals. Example of the COMPARE brochure is given below.

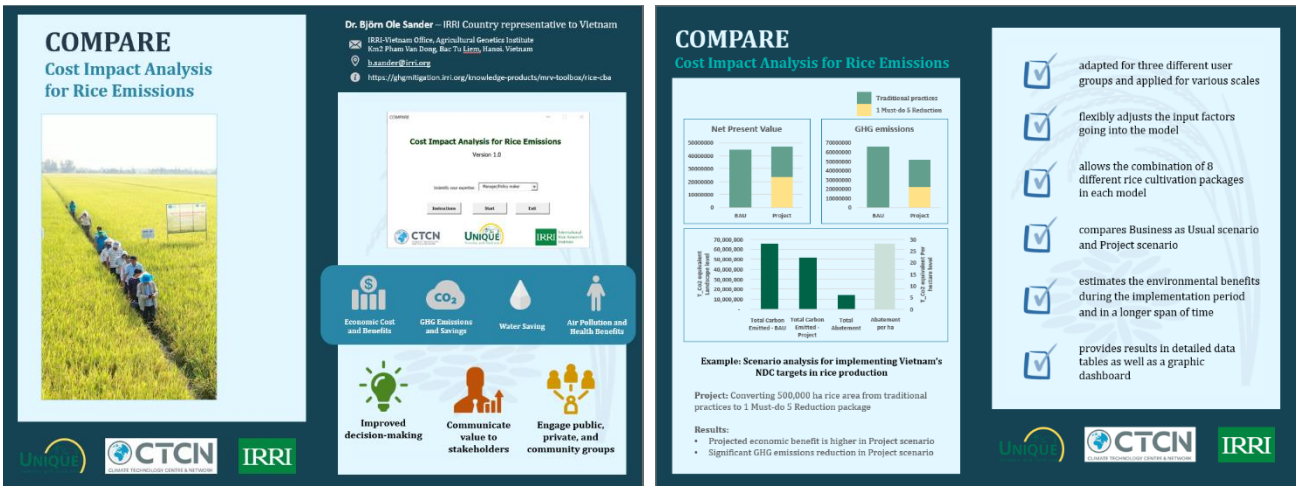

Figure 2: COMPARE brochure

All three brochures are available in Attachment #11.

D 4.6 Policy paper with practical case studies (in English)

Developing on the assessment of AWD suitability and mitigation potential to achieve Vietnam's NDC targets in agriculture (D4.1), a case analysis was conducted for the implementation plans set by the ministry of Agriculture and Rural Development and the Ministry of Natural Resources and Environment. The analysis looks at Vietnam's NDC targets and contribution of the rice sector, and the proposed mitigation measures for rice with domestic and international investments. Then, four scenarios of mitigation in rice are proposed to meet the domestic and international targets and evaluated on three aspects: mitigation potential, feasibility (suitable areas for scaling), and cos-benefit. These scenarios are regional and seasonal specific, detailing the areas and investment needs in each area as well as the rate of project expansion.

At first, MapAWD is employed to determine the suitable areas for water-saving techniques in the rice growing regions of Vietnam by season. The areas with high suitability are where both AWD and Mid-Season Drainage (MSD) are applicable, whereas moderately suitable areas are feasible for just the MSD technique. After the areas for each technique is identified, the scenarios are inputted into SECTOR to estimate the annual mitigation potentials of four scenarios. The shortfalls in mitigation targets after rice mitigation actions are identified with suggestions of interventions to address. Lastly, the COMPARE tool is applied to perform a cost-benefit analysis of the scenarios. The results demonstrate the required investment, benefits to farmers, and Carbon abatement costs.

Based on the results, the analysis made policy recommendations for planning mitigation project in rice to achieve Vietnam's (updated) NDC targets in agriculture. More importantly, it showcases the tools and how they can be applied to inform NDC implementation planning. In addition, the paper present existing challenges in constructing realistic estimates of mitigation potential as well as investment needs for mitigation plans in rice. See the policy paper in Attachment #12.