CTCN
CLIMATE TECHNOLOGY CENTRE & NETWORK

CTCN Technical Assistance
Response Plan

Country:	Vietnam
Request Identification Number:	2015-040/VIE-01

Title:	Bio-waste minimization and valorization for low carbon production in rice sector

Summary of the CTCN Technical Assistance

Background

Drying/de-husking/milling are crucial post-harvest activities in the production of rice. Around 20% of the initial weight of the paddy remains in form of husks. Vietnam produced an estimated 44 million tons of paddy rice in 2013, with approximately 7 million tons of rice husks available in terms of a potentially usable biomass, noting that up to 15-20% of this amount is valorized within the rice mills themselves, mainly for the drying process.

Rice husk is generally under- and unsystematically used or often dumped and burned. Rice husk therefore represents an enormous potential in terms of organic material to be used as an energy source. Recent development showed clearly, that in Vietnam and also in other Asian countries, the systematic economic valorization of rice husks has become key to boost productivity and tackle environmental issues at the same time.

Thus, there is a large potential for new or existing companies to produce fuels and/or energy from excess rice husks. The produced solid fuels in the form of pellets or briquettes could be used internally or be sold in the national or international market. Other technology alternatives have been explored such as pyrolysis and gasification for the production of solid, liquid and/or gas fuels. The different business models need to be further assessed in order to select the optimal valorization routes of rice husks in Vietnam. The assessment of business models needs to include: technical, economic and sustainability aspects covering the complete chain (from feedstock production to product end use).

Technical assistance proposal

The technical assistance from the CTCN will provide:

1. *A decision making tool for the selection of the optimal valorization route of rice husks*
2. *Validation of developed tool and detailed assessment of technologies and valorization options. This includes overview of a selected number of potential business models, (description and analysis).*
3. *Detailed case study of a bankable project, in partnership with a nominated firm.*
4. *Overview of access to financing options for different business models (different size and ownership)*

The CTCN assistance will build on work previously done under the UNIDO-UNEP RECP Program and will complement (when required) existing studies. These studies will be supplied to the experts' organization(s) performing this response plan.

1. Overview of the CTCN technical assistance

1.1 Technology aspects

The CTCN assistance will provide technical support on the provision of a decision making tool for the analysis and selection of optimal valorization routes of rice husks, including product outlets such as: a) fuels (solid, liquid, gas) or b) heat and/or power. The tool analysis criteria will combine technical, economic and sustainability performance along the complete chain (from feedstock production to processing and end-product use). The tool validation will result in the selection of the optimal valorization route for a given company.

1.2 Objectives (outcomes)

In the short term, it is expected that the CTCN technical assistance will support decision and investment in the rice sector enterprises (e.g. Song Hau Food Company). These investments will further result in the scaling-up of resource efficient and cleaner production technologies within other enterprises in the rice sector.

The valorization of rice husk as fuel and/or energy, the rice sector could not only improve its economic performance but also reduce its carbon footprint by: a) substituting the use of (imported) fossil fuels (coal) and b) displacing the GHG emissions which are generated under the current disposal practices of unutilized rice husks.

1.3 Results (outputs expected from CTCN assistance)

Final outputs will include:

1. A decision making tool/ for the selection of the optimal valorization route of rice husks
2. Validation of developed tool and detailed assessment of technologies and valorization options. This includes overview of a selected number of potential business models, (description and analysis).
3. Detailed case study of a bankable project, in partnership with a nominated firm.
4. Overview of access to financing options for different business models (different size and ownership)

a. Expected use of outputs

The approach described above can be applied to an estimated 100 further similar milling companies in Vietnam. This would include to further assist the Vietnamese industrial sector in general to pursue the restructuring triggered by government policies: Optimal technology and business models selection, and implementation combined with support to investment and access to financing.

2. Description of the Assistance

a. Activities

The CTCN experts organization will clearly build on work previously done under the UNIDO-UNEP RECP Program and will not replicate but complement (when required) existing studies. These studies will be supplied to the experts' organization(s) performing this response plan. The team will cooperate closely with relevant stakeholders (public and private).

Activity 1 – Development of a valorization optimization tool/guideline for the selection of the optimal processing routes of rice husks.

First, the CTCN organization will develop a framework and tool that will enable Vietnamese millers to make sound, informed decisions on potential and optimal valorization routes for their rice husk streams. The team will build – where applicable- on existing prior studies and in close cooperation with the relevant stakeholders (public and private).

The tool will be based on a analytically rigorous multivariate methodology that includes technical, economic and sustainability criteria and indicators. These criteria and indicators will take into account local context (i.e. technologies and strategies, which fit to the local conditions for Vietnam) in addition to techno-economic (more quantitative) indicators.

Activity 1.1

The expert team together with the VNCPC and relevant stakeholders will propose and generate a list of **quantitative criteria and indicators** to be used for the comparison of different processing routes. Criteria and indicators will include:

- Technical: Overall conversion efficiencies, end-product quality and compliance with end user requirement (fuel specs, ash etc.).
- Economic: Logistics (infrastructure, ports, roads), potential cost and sales revenues, potential markets size (local and international).
- Sustainability: Overall emissions along the complete chain with emphasis on emissions of CO_2eq, impacts on women and minority groups

This methodology and approach will be used to develop a decision making tool/ for the selection of the optimal valorization route of rice husks.

Activity 1.2

Based on Activity 1.1, the team will **develop a decision making tool/guideline to select optimal valorization routes of rice husks.** This tool will be flexible and useful for project developers at different company sizes (small to large scale).

The technologies and valorization routes options indicated in Activity 2 are going to be further evaluated based on the criteria indicators defined above, by applying the developed tool.

For each route, the implications of end product properties on end use will be taken into account and processed in the tool as presented below in Activity 2. (e.g. to determine suitability or improvement options to get access to the international biomass fuels market, or for use in e.g. co-processing in cement kilns).

Activity 1 – Deliverables

Deliverables	Delivery date
Tool/guideline for the selection of the optimal valorization route of the rice husks. The tool includes: technical, economic and sustainability criteria and indicators.	*Week 16 after project inception*

Activity 3 – Deliverables

Deliverables	Delivery date
Report on development of the selected business model for a specific state-owned mill company.	*Week 48 after project inception*

Activity 4 – Overview of access to financing options

The CTCN team will provide an overview of access to financing options for:

- The case analyzed in activity 3
- The feasible business models identified in activity 2 that reflect the different types of rice companies in Vietnam in terms of size and ownership.

Among the financing options, carbon finance will be assessed. The consultant will explore how carbon finance can play a role in commercially sustainable rice residues valorization business models in Vietnam.

Activity 4 – Deliverables

Deliverables	Delivery date
Detailed Overview of access to financing options. *Multilateral, PPP, impact investment,* *List of potential sources of funding* *High level list of concrete actions required to develop the project to final investment decision.*	*Week 48 after project inception*

2.2 Synergies and Baseline Setting

- There are various programs to mitigate climate change, essentially from the Ministry of natural resources and environment.
- International technical cooperation project such as that of the joint global UNIDO-UNEP Resource Efficient for Cleaner Production (RECP) Program support the rice sector by exploring opportunities for improved resource productivity and reduced pollution intensity. In the context of that work, so far "low hanging fruit" measures have been implemented in several rice milling companies, with almost no investment needed, leading to an immediate benefit in terms of energy savings documented to amount to 5-7% of the total electricity consumed. This overall improvement of the energy efficiency and management has created confidence among the companies, thereby allowing the proponent to better understand the specific context, future strategy and needs. This basis allowed proposing additional high-impact measures requiring investments in technology and system implementation. In fact some companies have started considering far-reaching investment programs for upgrading their production facilities. Companies expressed needs for technical assistance for implementing biomass conversion technologies.
- A market study on biomass valorization for thermal energy in Vietnam is on-going with the objective to get more insights into the range of products, prices, potential user and client groups, technologies and also business models that are relevant.

- The CTCN intervention would be instrumental in pursuing and concretizing these opportunities.

Timeline

The table below provides an overall timeline for the CTCN assistance.

Activity	*Month*											
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
1 Development of decision support tool												
1.1 Generate a list of criteria and indicators (technical, economic, sustainability)												
1.2 Develop the tool												
Milestone 1: Report on ready to use tool												
2 Analysis of business models												
2.1 Identify existing and propose new business models												
2.2 Analysis of 2.1 results with real data												
Milestone 2: Report business model analysis												
3 Analysis of a bankable Project												
3.1 Apply decision support tool to selected company												
3.2 Assess economic feasibility of the selected technology and business model												
Milestone 3: Report on technology/business model application												
4 Overview of financing options												
Milestone 4: Report on financing opportunities												

2.3 Expertise required

The following expertise and meetings are required to carry out the aforementioned activities

Expertise:

a) Expertise required for the technology and routes assessment:
   - Expertise and deep knowledge on technologies in biomass combustion, gasification, pyrolysis
   - Expertise in fuel production and fuel quality
   - Expertise on fuels properties under combustion conditions and on pre-treatment and conditioning of difficult biomass fuels.
   - Experience in upgrading of low-quality biomass feedstocks to high-quality biomass fuels
   - Expertise on biomass chains techno-economic and sustainability assessments.

b) Expertise required for the business case development:
   - Experience in (bio-) renewables and power markets, biomass valorisation projects (pelletisation, briquetting, others).
   - Experience on economic evaluation of projects
   - Experience and contacts with regional and international bioenergy market players

Meetings required:

a) Kick off meeting
b) Visits to rice mills companies (different scales of production)
c) Midterm project meeting
d) Project finalisation

Others:

a) Travel and per diem for experts are included in the proposed budget in this response plan
b) In addition, resources needed for communication (phone) as well as printing and dissemination of material produced (presentation, reports, briefs, etc.) are considered to be included in the budget in this plan.

2.4 Main partners and stakeholders

Partners	Role to support the implementation of the CTCN assistance
Ministry of Natural Resources and Environment of Vietnam (MONRE)	Official counterpart; oversight; M&E
Vietnam National Cleaner Production Centre (VNCPC)	Technical assistance and in-country working partner
UNIDO	Coordination and synergies with on-going activities
CTCN	Provision of technical assistance and support investment

Stakeholders	Role to support the implementation of the CTCN assistance
Ministry of Agriculture and Rural Development (MARD)	Stakeholder regarding restructuring of rice sector
Rice millers, early movers and others	Uptake and implementation of measures and investment

2.6 Indicative budget

The indicative overall budget is of 250,000 USD. The detailed budget is presented in the table below.

Activities	Estimated Budget (USD)
Activity 1 - Development of a valorization optimization tool/guideline for the selection of the optimal processing routes of rice husks	50,000
Activity 2 - Business models identification and analysis by applying developed tool	80,000
Activity 3 - Detailed analysis of a bankable project, in partnership with a nominated firm	80,000
Activity 4 - Overview of access to financing options	20,000
Measures, evaluation and learning	20,000
Total	250,000

2.7 Gender considerations

The assistance request does not include specific gender considerations. However, the CTCN intervention will be gender-sensitive, which is a prerequisite in all CTCN technical assistance projects. This project's overall impact on gender equality and/or women's empowerment in Vietnam is expected to be modest, but the following questions will be asked during the assessments to make sure assumptions of gender neutrality will not lead to false conclusions:

- How are women included in the rice milling industry today?
- Could the changes in technologies proposed by the CTCN affect women and men differently?
- If so, how can we make sure women and men will benefit equally?
- Are women and men differently impacted by the effects of climate change and/or fossil fuel imports and use?

The CTCN recognizes that due to diverging needs, rights, roles and opportunities women and can be affected differently by the CTCN intervention. The CTCN will make sure to include women in all related capacity building activities to ensure women will receive the necessary skills and education to benefit from the development and become successfully integrated.

2.8 Risk identification and risk mitigation

Risk	Consequence	Probability	Mitigation measure
The data required for developing the proposed tool and methodology is not available	Lower accuracy of the assessment	Medium/Low	The expert team will use in-house data and engineering rules to estimate technology costs and sustainability performance.

The partners and stakeholders consulted propose a different approach to the assessment.	A different assessment approach cannot be developed.	Medium/Low	The expert team will keep close contact with partners and stakeholders to assure that the assessment approach and results are on line with the response plan and comply as much as possible with the needs and expectations of partners and stakeholders.

3. Long-term impacts of the assistance

3.1 Expected climate change-related benefits

CTCN climate technology impact	Anticipated contribution from CTCN assistance
Climate technologies adapted to national context are identified and prioritized to enable their deployment and/or transfer in the requesting countries	The assistance will identify business models which can be deployed in the country
Progress made against mitigation objectives (i.e. energy and carbon intensity reduction) as a result of the response	The assessment will define feasible alternatives for a) the displacement of fossil based energy, b) avoidance of GHG emissions resulting from current practices for rice husks residues disposal
New mitigation or adaptation technology projects/initiatives implemented as a result of the response	When valorisation routes are proven feasible and investments are mobilised then technologies will be implemented
New or strengthened policies/ laws developed, approved and enacted as a result of the response	If the assessment produces results that clearly speak for a certain technology, or clearly identifies a certain barrier, it could serve as the baseline for policy improvements to promote/mitigate the above. Policy improvement in target sectors is part of the national climate strategy
Capacities to access and attract public and private finance increase to enable financing of technology deployment	Activity 4 of this response plan aims to identify access to financing

3.2 Co-benefits

Sustainable Development Goal	Contribution from CTCN assistance
End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	Sustainability in the agriculture sector will be improved by utilizing agricultural wastes and thus reducing GHG emissions
Ensure access to affordable, reliable, sustainable, and modern energy for all	Access to locally produced renewable energy based on waste reduces high costs and risk for energy black outs associated with fuel imports for the affected companies
Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Deployment of waste-to-energy technologies supports economic growth and creates employment opportunities by reducing costs for rice mills and facilitating the development of husk utilization businesses
Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	Provision of technology assessment tools supports sustainable decision making and innovation
Take urgent action to combat climate change and its impacts	Deployment of waste-to-energy technologies replaces fossil fuels and avoids methane emissions from disposed wastes

3.3. Post-assistance plans and actions

Following completion of the project, continued activities and support to replicate and broaden these activities will continue in a number of ways:

- Direct upscaling by working with the second previously identified partner firm to generate a business plan and investment portfolio.
- Pursuing synergies with national efforts to ensure that these outcomes are promoted across the country. For example, including the project results and findings into the national strategy for green growth that is being developed by the Ministry of Planning and Investment (MPI).
- Working with MONRE to include these interventions into their programme for Nationally Appropriate Mitigation Actions (NAMAs) for further support.
- Working with the Ministry of Industry and Trade (MOIT) to include support for these technologies into their existing programmes for modernisation and development of private enterprises.

3.4 Monitoring and Reporting of technical assistance results and impacts

Monitoring and evaluation activities will start to be carried out from the beginning of the implementation phase and continue after implementation has been completed. Involved parties will be the CTC, the response implementer, the NDE and requests proponent, as well as the key stakeholders affected by the intervention. The M&E workplan matrix below outlines the M&E activities, including responsibilities and frequency of reporting. The matrix is complemented by the logframe in Annex I, which includes indicators and means of verification that need to be reported on.

M&E Workplan Matrix

M&E activity	Reported by	Reported when	Reported to
Monitoring			
Progress report on each activity	Response implementer	Monthly	CTM, NDE
Stakeholder feedback report	Selected rice mill with response implementer	Four-monthly	CTM, NDE
Evaluation			
Inception report (1-2) pages with updated workplan/milestones	Response implementer	First week	CTM, NDE
Final activity report (achievements, barriers, lessons learnt, post assistance plans)	Response implementer	End of intervention	CTM, NDE
Post assistance impact report (cost-benefits, sustainability, etc.)	Selected rice mill	6 months after intervention	Response implementer, CTM, NDE

4. Signatures

Signatures of the requesting country

NDE	**Request Proponent**
Name: Le Ngoc Tuan	Name:
Title: Deputy Director - General, International Cooperation Department, MONRE	Title:
Date: 29.01.2016	Date:
Signature:	Signature:

Signatures of the CTCN

CTCN Director	**Climate Technology Manager**
Name: Jukka Uosukainen	Name: Patrick Nussbaumer
Title: Director	Title:
Date: 1 February 2016	Date: 1 February 2016
Signature:	Signature:

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Response Plan

Annex 1: Response Logframe

Activity	Description of sub-activities conducted by the CTCN	Output/ Deliverable	Expected Outcome	Main national partners involved	Objectively Verifiable Indicator	Means of Verification (data source, method of collection, responsibility and periodicity)
Activity 1: *Development of a valorization optimization tool/guideline for the selection of the optimal processing routes of rice husks.*	***Activity 1.1*** *Propose and generate a list of quantitative criteria and indicators (technical, economic and sustainability) to be used for the comparison of different processing routes.* ***Activity 2.1*** *Development of decision making tool/guideline to select optimal valorization routes of rice husks.*	Report and tool/guideline for the selection of the optimal valorization route of the rice husks.	Provision of technology assessment tools supports sustainable decision making and innovation	VNCPC MARDV Rice millers	Report/excel-tool delivered	Lists of criteria and indicators distribution, feedback and selection by main stakeholders; Outputs available and adapted to local context.
Activity 2: *Business models identification and analysis by applying developed tool*	***Activity 2.1*** *Perform a detailed technical assessment of existing outlets and markets* ***Activity 2.2*** *Analysis of the valorization routes defined in activity 2.1.*	Report on business models description and analysis.	The assistance will identify business models which can be deployed in the country	VNCPC Rice millers	Report on business models description and analysis	Outputs available and adapted to local context

Activity 3: *Detailed analysis of a bankable project, in partnership with a nominated firm.*	***Activity 3.1*** *Apply decision support tool to selected company* ***Activity 3.2*** *Assess economic feasibility of the selected technology and business model*	Report on technology/business model application.	Deployment of waste-to-energy technologies supports economic growth and creates employment opportunities by reducing costs for rice mills and facilitating the development of husk utilization businesses. The assessment will define feasible alternatives for a) the displacement of fossil based energy, b) avoidance of GHG emissions resulting from current practices for rice husks residues disposal	VNCPC Rice miller	Report on development of the selected business model for a specific state-owned mill company	Outputs available and adapted to local context
Activity 4: *Overview of access to financing options*	*Overview of access to financing options*	Report on financing opportunities	Capacities to access and attract public and private finance increase to enable financing of technology deployment	MARDV MNREV ADB GEF	Report on financing opportunities	Outputs available and adapted to local context