



Asian Development Bank



Greater Mekong Subregion

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# Capacity Building for Efficient Utilization of Biomass for Bioenergy & Food Security in the GMS

TA7833-REG

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## INTERIM REPORT

*Landell Mills*  
DEVELOPMENT CONSULTANTS

In association with



## KEY DATA

<b>Name of Project:</b>	Capacity Building for the Efficient Utilization of Biomass for Bioenergy and Food Security in the Greater Mekong Subregion (TA7833-REG)
<b>Contractor(s):</b>	<b>Landell Mills Limited (LML)</b> , Bryer-Ash Business Park, Trowbridge, Wiltshire, BA14 8HE, UK. +44 1225763777 (landell-mills.com). <i>In consortium with:</i> <b>Nexus Carbon for Development (Nexus)</b> , #33 E3 Sothearos Blvd, Corner St. #178, Phnom Penh, CAMBODIA (nexus-c4d.org)
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## CONTENTS

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<b>ACRONYMS</b> .....	<b>IV</b>
<b>EXECUTIVE SUMMARY</b> .....	<b>1</b>
<b>1. INTRODUCTION</b> .....	<b>3</b>
<b>2. PROJECT OVERVIEW</b> .....	<b>5</b>
<b>3. IMPLEMENTATION ARRANGEMENTS</b> .....	<b>7</b>
<b>4. SCOPE AND DEFINITION OF PROJECT TO DATE</b> .....	<b>10</b>
4.1. Overview .....	10
4.2. Project Progress and Scope as at March 2014 .....	11
4.2.1. Project Impact .....	11
4.2.2. Project Outcome .....	11
4.2.3. Output 1 - Enhanced regional cooperation in bioenergy development to foster and safeguard food security .....	12
4.2.4. Output 2 - Pilot-tested climate-friendly biomass investment projects for wider implementation .....	13
4.2.5. Output 3 - Enhanced capacity for efficient use of biomass .....	17
4.2.6. Output 4 - Development and dissemination of knowledge products .....	20
<b>5. PROPOSED WORKPLAN (2014 – 2015)</b> .....	<b>22</b>
<b>6. PROJECT RESOURCES (INPUTS AND BUDGET)</b> .....	<b>23</b>
6.1. Consultant TA Team .....	23
6.2. Project Reimbursable Expenditure .....	24
6.3. Project Support .....	26
<b>7. IMPLEMENTATION ISSUES AND LESSONS LEARNT</b> .....	<b>27</b>
<b>APPENDIX 1: DESIGN AND MONITORING FRAMEWORK (DMF)</b> .....	<b>31</b>
<b>APPENDIX 2: PROPOSED AMENDED DMF PERFORMANCE TARGETS</b> .....	<b>33</b>
<b>APPENDIX 3: SUMMARY OF PROGRESS AGAINST THE DMF</b> .....	<b>34</b>
<b>APPENDIX 4: DESCRIPTION OF PILOT PROJECTS</b> .....	<b>41</b>
Figure 1: TA7833 Institutional arrangements .....	7
Table 1: Government counterpart agencies and personnel for TA7833 .....	8
Table 2: Knowledge Product Outputs .....	20
Table 3: Proposed Work Plan (2014-2015) .....	22
Table 4: International staff engaged on TA7833 (contract variation#2) .....	23
Table 5: Proposed Additional Inputs .....	23
Table 6: Summary of TA7833-REG Project Reimbursable Expenditure (US\$) .....	24
Table 7: Proposed Amendment to Project Reimbursable Budget (US\$) .....	25
Table 8: Breakdown of Amended Seminars, Workshops and Training Budget (US\$) .....	25
Table 9: Breakdown of Amended Studies, Surveys and Reports (US\$) .....	26
Table 10: Issues Encountered, Recommendations and Remedial Actions .....	27
Table 11: Pilot Project Milestone Payment Status .....	46

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## ACRONYMS

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ADB	Asian Development Bank
APMB	Agricultural Project Management Board
AROS	Asian Regional Organic Standard
ASEAN	Association of Southeast Asian Nations
BEFS	Bioenergy and Food Security
CASP	Core Agricultural Support Program
CDM	Clean Development Mechanism
CEDAC	Centre d'Etude et de Développement Agricole Cambodgien
CER	Certified emissions reduction
CFA	Climate-friendly agriculture
CLV	Cambodia, Lao PDR and Viet Nam
IFOAM	International Federation of Organic Agriculture Movements
DAHP	Department of Animal Health and Production, MAFF Cambodia
DARD	Department of Agriculture and Rural Development (MARD Viet Nam)
DCP	Department of Crop Production (MARD Viet Nam)
DMF	Design and Monitoring Framework
EA	Executing Agency
EOC	Environmental Operations Centre
Eol	Expression of interest
EU	European Union
FAO	Food & Agriculture Organization (United Nations)
GAP	Good Agricultural Practices
GBEP	Global Bioenergy Partnership
GHG	Greenhouse gas
GMS	Great Mekong Subregion
GOMA	Global Organic Market Access
GoV	Government of Viet Nam
IA	Implementing Agency
ICS	Improved cookstoves
ICT	Information and communication technologies
IFOAM	International Federation of Organic Agriculture Movements
LML	Landell Mills Limited
MAF	Ministry of Agriculture and Forestry (Lao PDR)
MAFF	Ministry of Agriculture, Forestry and Fisheries (Cambodia)
MARD	Ministry of Agriculture and Rural Development (Viet Nam)
MEM	Ministry of Energy and Mines
MFI	Microfinance institutions
MIME	Ministry of Industry, Mines and Energy
MOE	Ministry of Education
MoF	Ministry of Finance
MoIT	Ministry of Industry and Trade
MONRE	Ministry of Natural Resources and Environment
MoST	Ministry of Science & Technology
MPI	Ministry of Planning & Investment
NBP	National Biogas Program
NDF	Nordic Development Fund

NFP	National Focal Point (of the Implementing Agency)
NGO	Non-Governmental Organization
NPI	National Project Implementation
PDR	People's Democratic Republic
PGS	Participatory Guarantee Systems
PPP	Public-private partnerships
PPTA	Project Preparatory Technical Assistance
PSC	Project Steering committee
PSD	Private sector development
RETA	Regional Technical Assistance
RfP	Request for Proposals (RfP)
SME	Small and Medium Sized Enterprise
SNV	Netherlands Development Organisation
SOP	Standard operating procedures
SRI	System of Rice Intensification
TA	Technical Assistance
TFP	Technical Focal Point (of the Implementing Agency)
ToR	Terms of Reference
UK	United Kingdom
US\$	United States Dollar
WB	World Bank
WGA	Working Group on Agriculture

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## EXECUTIVE SUMMARY

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1. The following interim (mid-term) report provides a summary of the work completed to date, reasons for deviations from the original scope of work and work plan, and a proposed work plan for the remainder of the project.

2. The last six months have been the most productive of the project to date which is a tribute to the efforts of the team and government counterparts, as well as the excellent co-operation from ADB. Assuming that a time extension to the project is granted, the project is now likely to meet its original objectives.

3. Under output 1, *'Enhanced regional cooperation in bioenergy development to foster and safeguard food security'*, the TA has worked with government officials to develop work plans based on country's priorities. The TA identified early in its implementation that the ability to start from a regional perspective that would be used to develop a harmonized approach to policies, regulations, standards, certification etc was found to be inappropriate and unsupported by each of the participating countries. A key message was the desire to develop country level programs for strengthening their own institutions and then to share these with the other participating countries. Through the process of regional sharing it was claimed greater harmonization opportunity would emerge. In response we have worked extensively in the development of national level programs that are driven by the TFPs and NFP representation of national priorities. The process has been informed through sharing review of international experience with standards and certification and a review of national policies, regulations and plans relating to the biomass sectors. Priorities in each country, which the TA will support, include the following:

- Cambodia – preparation of standards for organic rice and biodigesters;
- Laos PDR – preparation of standards for organic rice and biofertilizer;
- Viet Nam – preparation of standards for climate friendly rice and/or biofertilizers.

4. Work is well underway in Cambodia and Laos PDR, although is further behind in Vietnam due to a need to match the work required with the resources and time available under the TA.

5. Under output 2, *'Climate-friendly, gender-responsive biomass investment projects, pilot tested through implementation in Cambodia, Lao PDR, and Viet Nam'*, seven pilot projects are now under implementation as follows:

- Cambodia:
  - PP#1: Improved Cook Stove Up-scaling
  - PP#2: Farm Demonstration of Biofertilizers for Upscaling Investment
  - PP#3: Production and Testing of Biofertilizers
- Vietnam:
  - PP#1: Improved Cook Stove Use
  - PP#2: Bioslurry Management
  - PP#3: Demonstration of Biofertiliser and Biochar Soil Amendments
- Laos:
  - #PP1: Cluster Biomass Technology and Biofertilisers

6. Under output 3, *'Enhanced capacity for the efficient utilization of biomass'*, a number of training events and study-tours have taken place, while in December 2013 the first regional conference on Efficient Utilization of Biomass for Bioenergy & Food Security in the Greater Mekong Subregion was organized in Hanoi attended by over 100 participants from government, academia and civil society. In addition each pilot has an awareness and training program incorporated into the design and implementation arrangements while biobriefs which are a series of newsletter style files comprising of 2 or 3 pages overview and findings of issues arising through

the TA are being produced and disseminated. Additional capacity building activities will include a video series and a distance learning program.

7. Under output 4, '*Development and dissemination of knowledge products*', the TA is producing a range of knowledge based products including technical reports and feasibility studies. These can be accessed at:

<https://drive.google.com/folderview?id=0B1wKP1C0cX-jdUhvMDNvcmEyZHc&usp=sharing>

8. Specific knowledge products will be developed to promote knowledge transfer and cooperation between more advanced GMS countries and CLV. A series of technical knowledge papers are being prepared as stand-alone reports as a means of providing access to international and regional knowledge regarding key topics and themes. These products will collectively form a biomass compendium that will also include specific outputs from the pilots including proposed upscaling business models.

9. While significant progress has been achieved in the last 12 months, due to loss of time at the TA start-up, an extension of time is required if the project is to meet its objectives. While it would be possible to squeeze activities in Output 1, 3, and 4 into 2014, the farm demonstration pilots for bioslurry, biochar and biofertilizer use on rice and vegetable crops will require the extension of the TA to enable the pilots to be implemented due to the cropping seasons and the need to use the dry season for non-rice demonstration plots.

10. It is therefore proposed that the TA be extended by one year to enable (i) the dry season vegetable cropping season to be included, and (ii) to evaluate the business models to the level of detail that will assist ADB to include the business models in future investment programs. This would be a no-cost time extension, but would require the re-allocation of budget lines including the contingency. An extension of time is proposed for a streamlined core team of specialists. This re-allocation will have no impact on the budget for proposed activities under the 'Seminars, Workshops & Training' and 'Studies, Surveys & Reports' budget lines, under which a number of additional activities are proposed.

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## 1. INTRODUCTION

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11. The Greater Mekong Subregion (GMS) Working Group on Agriculture (WGA) oversees regional cooperation in agricultural development under a wider GMS regional cooperation program. In 2007, the WGA conducted a regional study on strategic options for biofuel and rural renewable energy development in the GMS. The study developed into a GMS Strategic Framework and Action Plan for Biofuels and Rural Renewable Energy, which was endorsed at the fifth annual WGA meeting in the People's Democratic Republic of Lao (Lao PDR) in 2008. To implement the framework, GMS countries requested Asian Development Bank (ADB) assistance for bioenergy development, including technology transfer from more advanced countries in the GMS to Cambodia, Lao PDR, and Viet Nam, to diversify the region's energy options while ensuring food security.

12. In response, the ADB confirmed the 'Capacity Building for the Efficient Utilization of Biomass for Bioenergy and Food Security in the Greater Mekong Subregion (TA7833)' project financed with a grant from the Nordic Development Fund (NDF). This grant is administered by the ADB alongside the agriculture ministries of Cambodia, Lao PDR and Viet Nam in the form of a project for implementation during a period of 42 months (July 2011 to December 2014). The project concept was presented and endorsed by the GMS countries at the annual meeting of the WGA in Viet Nam in 2010. A fact-finding mission in early 2011 concluded broad agreement on the concept paper. TA7833 primarily focuses on Cambodia, Lao PDR and Viet Nam (CLV). The project intends to lay the foundations for potential investment projects to subsequently scale-up successful outcomes.

13. In December 2011, ADB contracted a consortium of consulting firms led by Landell Mills Ltd (LML) of the United Kingdom to provide technical assistance (TA) to support project implementation by the agriculture ministries. The TA Design and Monitoring Framework is provided in APPENDIX 1:.

14. By June 2012 the agricultural ministries of CLV, in their respective roles as TA7833 Implementing Agencies (IA), had nominated counterpart government staff and resources to lead implementation of TA7833 with support from the Consultants. During the same period, project start-up was mostly concluded with the CLV governments providing office accommodation, etc.

15. The early TA activities focused on mapping existing implementation structures in CLV for efficient utilization of biomass for bioenergy and food security. The three national workshops were held during February and March 2012 within which key topics for potential studies and pilot projects were prioritized and agreed, along with recommendations on the advantages and disadvantages of both existing and new implementation structures.

16. Potential implementation partners such as national and international non-government organizations (NGOs), enterprises, public and private centers of excellence and public-private partnership (PPP) modalities have been identified. In each country, potential implementation partners for capacity development have been identified and shortlisted. In addition, pre-selection criteria have been drawn up for TA7833 to identify suitable public and private institutions as: i) distance learning partners, and; ii) project implementation partners.

17. This period provided significant input to understanding the current status of priority technologies, policies and standards, in addition to highlighting existing capabilities, priorities and future plans of both Government and key stakeholders. These assessments were built upon the inception workshops and stakeholder meetings in each capital city, initial tri-country missions involving TA experts and the *1<sup>st</sup> GMS Regional Forum on Harmonization of Standards in Bioenergy and Food Security* in Nanning, China from 1 to 6 July 2012 (see *Report on Proceedings*)<sup>1</sup>.

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<sup>1</sup> <https://docs.google.com/open?id=0B1wKP1C0cX-jb1gxbm1zVks3c0U>



18. However, the extended inception phase of the TA and lack of progress on pilot project implementation resulted in the replacement of the TA Team Leader in November 2012. There followed an intensive review process covering work completed to date, development of a comprehensive workplan and schedule and extensive restructuring of the consultant TA team / inputs. These were presented in the revised Inception Report submitted in March 2013.

19. The following interim (mid-term) report provides a summary of the work completed to date, reasons for deviations from the original scope of work and work plan, and a proposed work plan for the remainder of the project. The last six months have been the most productive of the program to date which is a tribute to the efforts of the team and government counterparts, as well as the excellent co-operation from ADB. Feasibility studies for the pilots were completed, pilots selected and tendered, contracts signed and implementation begun. Support to the development of improved standards and certification for the utilization of biomass for bioenergy and food security has gathered pace, particularly in Cambodia and Laos, and a capacity building programme started. While much work still needs to be done, the TA now has momentum with most of the logframe outputs likely to be achieved. The achievement of these outputs requires the approval for a twelve month TA extension that has been discussed with ADB. The following report is based on the assumption that the extension will be granted and is therefore reflected in the proposed work program.

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## 2. PROJECT OVERVIEW

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20. TA7833 is a regional capacity development technical assistance project. The project's impact will be to improve the efficient utilization of biomass in Cambodia, Lao PDR and Viet Nam within the wider context of bioenergy and food security. The outcome will be *efficiently operating pilot projects in biomass use*, determined by achievement of the following outputs:

**i) Output One: Enhanced regional cooperation on bioenergy development to foster and safeguard food security**

21. The output will be achieved through a regional approach to climate-friendly agricultural development through sharing national experiences with institutional processes and mechanisms for introducing and operating regulatory and non-regulatory approaches for biomass related technologies while ensuring their compatibility with international trade obligations. The primary focus of the TA strategy for output 1 shifted during the extended inception phase away from a purely regional harmonization approach to one of building national level awareness, priorities and institutions that are being shared and discussed collectively through regional forums and sharing of outputs. The change responds to a common concern expressed by the government counterparts that harmonization from regional to national level was simply unacceptable and that the process need to build a national position that could then be modified or adapted in response to regional benefits and opportunities.

22. The strategy for this output has therefore been modified which created greater ownership but significantly increases the complexity of what is being delivered through the TA due to the range of priorities and the potential scope for some of these i.e., climate friendly rice standards, as well as the vastly differing institutional contexts that the three countries are required to operate within and the limitations over the process for decision making. The TA offers technical input and the institutional knowledge of what is being developed regionally and internationally along with a process through which priorities are shaped and developed.

23. Using these national programs as a basis for regional learning and sharing is the critical step in achieving the overall output. The overall output as stated has not changed in principle however the indicator targets of the output have been modified.

**ii) Output Two: Climate-friendly, gender-responsive biomass investment projects, pilot tested through implementation in Cambodia, Lao PDR, and Viet Nam**

24. Candidate technologies include, but will not be limited to: biogas & bioslurry; improved cook stoves; biochar production and application, and; climate friendly agriculture value chains. Feasibility studies will be completed for priority topics and used to define pilot projects based on technologies successfully tested on a smaller scale. In addition, business model case studies will be completed for successful projects as a means of identifying potential upscaling modalities. The pilot projects will be used to define future investment options for upscaling in terms of technologies and business modalities if they are identified as being feasible and viable.

25. A significant constraint for piloting business models is the inability of ADB to use TA funds in a manner that is similar to their usual sovereign lending products and as such the provision of TA funds for government expenditures is simply not possible. Further, many of the business models will build around revolving funds or alternative credit systems that cannot be piloted over a 1 or 2 year TA program. The other challenge is to move away from a supply push for technology to one of demand creation for the use of technology outputs which fundamentally changes the manner in which upscaling is organized.

**iii) Output Three: Enhanced capacity for the efficient utilization of biomass**

26. The output will raise awareness of the biomass resources and their potential uses amongst officials and policy makers as well as decentralized agencies and supporting civil society groups to enable potential investment options to be fully understood. Gender-sensitive capacity-building will be provided to participating central and local governments, service providers, communities and

women's groups. Activities will strengthen institutional and technical capacity to expand biomass investments and ensure sustainable uptake by rural communities. Distance learning methods will be implemented to reach more rural communities and capacity building support will be offered to project stakeholders. Capacity building for ADB safeguards, feasibility assessment and project approval due diligence will be provided.

**iv) Output Four: Development and dissemination of knowledge products**

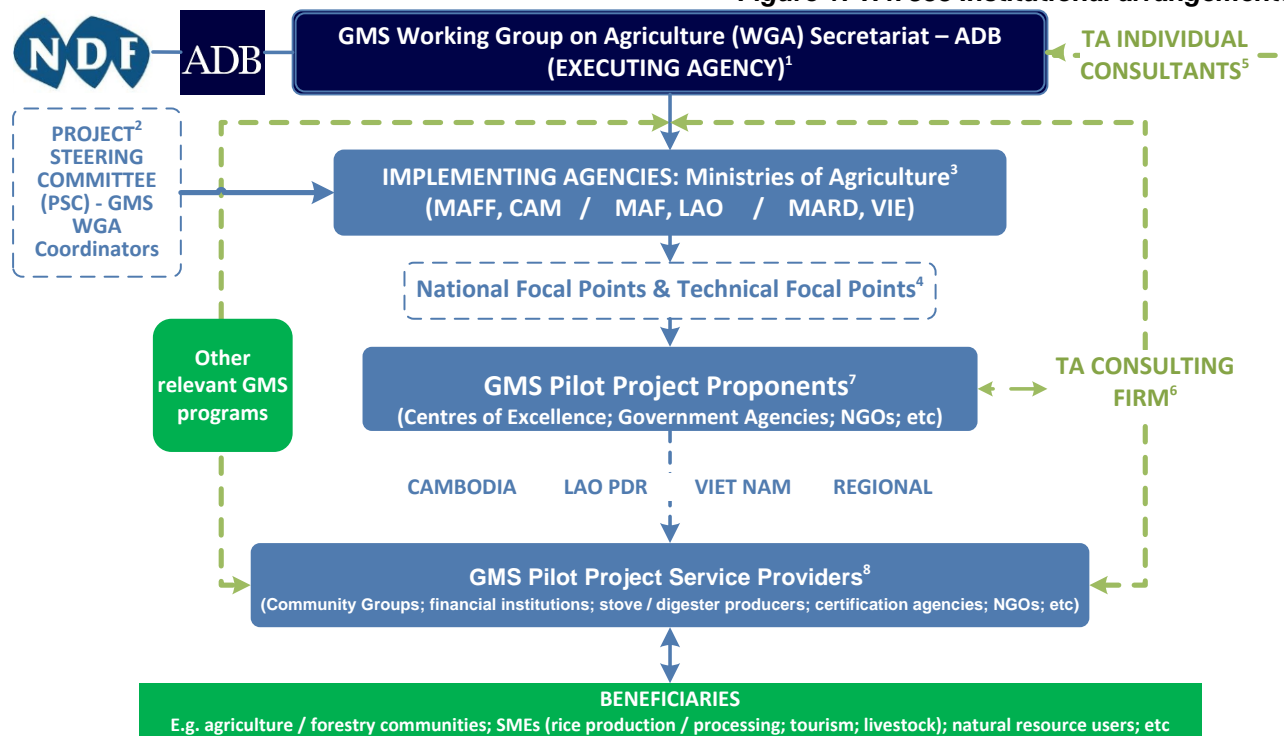
27. Using output from the Global Bioenergy Partnership (GBEP), the TA will develop a common methodology for assessing the supply of biomass and prioritizing its use for enhancing energy and food security. Knowledge products will be developed to promote knowledge transfer and cooperation between more advanced GMS countries and CLV. Baseline surveys will be carried out and a monitoring system established.

### 3. IMPLEMENTATION ARRANGEMENTS

28. As presented in the figure below, the *Executing Agency (EA)* for this project is the GMS Working Group on Agriculture (WGA) Secretariat, supervised by staff from the ADB's Southeast Asia Department<sup>2</sup>. High-level project supervision function is provided by the National Coordinators of the GMS WGA from Cambodia, Lao PDR and Viet Nam, which together form the TA7833 Project Steering Committee (PSC).

29. The Ministry of Agriculture, Forestry and Fisheries (MAFF), Cambodia; Ministry of Agriculture and Forestry (MAF), Lao PDR; and Ministry of Agriculture and Rural Development (MARD), Viet Nam are the official Implementing Agencies (IA).

Figure 1: TA7833 Institutional arrangements



30. The GMS Environmental Operations Center (EOC), Bangkok supports administration of the TA and provides access to regional data and information. The EOC seeks to identify synergies and collaboration with other GMS-wide initiatives such as the ADB's Core Environment Program and Biodiversity Corridor Initiatives.

31. Each IA (MAFF / MAF / MARD) had identified and officially nominated *national focal point* (NFP) agencies or individuals to lead implementation of TA7833's project activities on behalf of each country according to the wider arrangements detailed in the figure above. In further discussions with each IA and based on initial lessons learned from TA7833 coordination under project implementation, additional *technical focal point* (TFP) personnel were identified and recommended to take the lead in technical coordination of country-level activities (see the table below). One of the challenges for the TA is the need to operate across a wide range of sectors and institutions many of which have only limited basis for working collaboratively within government systems that limit the movement of resources between different cost centers.

<sup>2</sup> Dr. Sununtar Setboonsarng, TA7833 Project Officer & Principal Natural Resources and Agriculture Economist, Environment, Natural Resources and Agriculture Division, Southeast Asia Department, ADB

**Table 1: Government counterpart agencies and personnel for TA7833**

ROLE	NAME	POSITION
<b>Cambodia</b>		
WGA Coordinator	H.E. SAN Vanty	Under-Secretary of State, Ministry of Agriculture, Forestry & Fisheries (MAFF)
WGA National Secretariat Support Unit (NSSU) National Focal Point	Mr. Prum Somany	Deputy Director, Department of International Cooperation, Ministry of Agriculture, Forestry and Fisheries (MAFF)
<i>GMS-WGA National Secretariat Specialist</i>	<i>To be decided</i>	<i>Individual consultant contracted by ADB, to help coordinate all activities under CASP II's TAs including TA7833.</i>
National Focal Point (NFP)	Dr. Sar Chetra	Department of Animal Health & Production, MAFF
Technical Focal Points (TFP)	Biogas - Dr. Sar Chetra	Deputy Director of DAHP
	Biochar - Dr. Chan Saruth	Director of Department of Agricultural Engineering of General Directorate of Agriculture, MAFF
	Biofuel - Mr. Iv Phirun	Deputy Director of Department of Industry Crop of General Directorate of Agriculture, MAFF
	ICS - Mr. Khorn Saret	Deputy Director of Forestry & Community Forestry of Forestry Administration, MAFF
	Standards - Mr. Chheng Uddara	Director, Standards Development, Training & Consultancy Dep., Institute of Standards, Ministry of Industry, Mines & Energy (MIME) <sup>3</sup>
<b>Lao PDR</b>		
WGA Coordinator	H.E. Phouang Parisak Pravongviengkham	Vice Minister, Ministry of Agriculture and Forestry (MAF)
WGA National Secretariat Support Unit (NSSU) National Focal Point	Mr. Inthadom AKKHARATH	Deputy Director International Cooperation Division Department of Planning, MAF
<i>GMS-WGA National Secretariat Specialist</i>	<i>Sengphet (Anna) Lattanavong</i>	<i>Individual consultant contracted by ADB, to help coordinate all activities under CASP II's TAs including TA7833.</i>
National Focal Point (NFP)	Mr. Inthadom AKKHARATH	Deputy Director International Cooperation Division Department of Planning, MAF
Technical Focal Points (TFP)	Biogas - Mr. Nivat PHANAPHET	Deputy head of Livestock Management Center, Department of Livestock & Fisheries, MAF
	Biochar - Mr. Lattana PHASAYSOMBATH	Director of Agro-Forestry Training Centre (NAFES), MAF
	Biofuel - Mr. Khamphone MOUNLAMA	Deputy Director of Research Management Division (NAFRI)
	ICS - Mr. Boualom XAYSANAVONG	Technical staff, Ministry of Energy & Mines (MEM)
	Standards - Ms. Nisith KHAMMOUNHEUANG	Head of Standards Division, Ministry of Science & Technology (MoST)
<b>Viet Nam</b>		
GMS-WGA Coordinator	Mr. Tran Kim Long	Director General, International Cooperation

<sup>3</sup> [www.isc.gov.kh](http://www.isc.gov.kh)

ROLE	NAME	POSITION
		Department, Ministry of Agriculture and Rural Development (MARD)
WGA National Secretariat Support Unit (NSSU) National Focal Point	Mr. Nguyen Thanh Dam	Deputy Head in charge, Multilateral Cooperation Division, International Cooperation Department, Ministry of Agriculture and Rural Development (MARD)
<i>GMS-WGA National Secretariat Specialist</i>	<i>Ms. Truong Thi Van Anh</i>	<i>Individual consultant contracted by ADB, to help coordinate all activities under CASP II's TAs including TA7833.</i>
National Focal Point (NFP)	Mr. Nguyen The Hinh	Agricultural Project Management Board (APMB), MARD
Technical Focal Points (TFP)	Biogas - Ms. Nguyen Quynh Hoa	Official, Livestock Environment Division, Department of Livestock Production, MARD
	Biochar - Mr. Vu Tien Dung	Deputy Director of AST project, APMB, MARD
	Biofuel - Mr. Nguyen Tu Hai	Official, Department of Crop Production, MARD
	ICS - Mr. Tran Ngoc Tue	Deputy Head, Biomass Energy Division, Forestry Science Technique Application Centre, MARD
	Standards – TBD	Awaiting approval by MARD

32. In addition to the Consultant firm, ADB contracted a *Regional Cooperation and Trade Facilitation Specialist* and *Regional Knowledge Management Specialist* as individual consultants located in the WGA Secretariat that will work with the Consultants during TA7833 implementation, starting from June 2012. To date the integration of these roles within the TA has been limited.

33. The GMS EOC in Bangkok serves as the facility for accessing regional data and information of relevance. In addition, the EOC plays a key role in identifying synergies with and fostering collaboration with other GMS-wide initiatives such as the ADB's Core Environment Program and Biodiversity Corridor Initiatives. Here the role of the public private partnership expert was providing a promising platform on which TA7833 and EOC could develop joint programs. Unfortunately the EOC position is currently concluded.

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## 4. SCOPE AND DEFINITION OF PROJECT TO DATE

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### 4.1. OVERVIEW

34. Biomass provides a locally available, and renewable, source of energy, particularly in rural areas in CLV, where biomass based energy remains the predominant energy source. In areas endowed with forest and/or agricultural, food processing, agro-industrial and domestic organic residues, bioenergy production is increasingly cost effective and a competitive energy alternative.

35. The TA terms of reference scope includes the need to improve the quality of country-level data on biomass resources and to strengthen national and institutional capacities to collect, analyze and disseminate information related to efficient utilization of biomass for energy and food security, by focusing on key technologies that contribute to both. TA scope is limited to pilot biomass utilization technologies that use small-scale technology operating at the household and the community level. Institutional and regulatory frameworks, capacity development and knowledge management will reflect the wider biomass utilization subsector needs.

36. The TA supports the continued strengthening of cooperation between member countries, acting as a catalyst for building development dividends not always possible at the national level. The TA will support dialogue between regional actors (top-down), as well as support the scaling-up of local community-based initiatives (bottom-up). At the regional level, the project facilitates high-level dialogue on a common approach to bioenergy development for pro-poor climate change mitigation, energy self-sufficiency and food security. The project also works with local governments and stakeholders to put in place the human and institutional capacity to increase adoption of technologies to promote the efficient use of biomass for the benefit of rural poor while enhancing food security.

37. The efficient utilization of biomass requires technologies that transform agricultural and forestry residues, which create environmental problems and pollute waterways when left to decay, to produce bioenergy, biochar and organic fertilizers<sup>4</sup>. Currently, technologies and the required skills for the conversion of agricultural and forestry residues into bioenergy carriers like biogas, wood or straw-based pellets / briquettes and biochar have been promoted by a range of stakeholders and donors with mixed results. Some of the initiatives have entered into upscaling, whilst others remain in various stages of technology readiness and are present only on a limited scale.

38. Bioenergy can be generated from biomass either directly or indirectly converted in either: solid, liquid or gaseous forms. Modern bioenergy relies on efficient conversion technologies which are increasingly available. The project defines bioenergy as: *“...renewable energy from plants and animals. Organic matter containing bioenergy is known as biomass that can produce heat ... or be modified to create cellulosic ethanol. Since almost all bioenergy can be traced back to solar energy, bioenergy has the advantage of being a renewable energy source, and should be harnessed in a sustainable manner.”*

39. ADB's bioenergy policy states that it can only support bioenergy sourced from non-food crops and 'agro-waste'. The TA scope is defined by this policy which requires: (i) the feedstock is not a food crop; (ii) any land involved in bioenergy development is unsuitable for food crops; (iii) no deforestation is associated with bioenergy development, and; (iv) the net energy balance is positive. The scope of the TA excludes liquid bioenergy for transportation (transport biofuel as bioethanol or biodiesel).

40. The scope of biomass feedstock for bioenergy is further limited by CLV government representatives to include only (i) rice husks, (ii) straw, (iii) bamboo, (iv) nut shells, (v) fruit waste,

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<sup>4</sup> ADB's 'Technical Assistance Report 44474-01, Capacity Building for the Efficient Utilization of Biomass for Bioenergy and Food Security in the Greater Mekong Subregion' (ADB, 2011)

(vi) non-food oil bearing plants, (vii) animal manure and (viii) other agro-waste wherever these are abundant with the potential to create environmental problems<sup>5</sup>.

41. The development of skills required for production of bioenergy carriers like biochar, briquetting and plant oil targets households and small community-based enterprises as the development of a viable bioenergy market is not possible without the involvement of the private sector. Therefore counterparts and key informants sought by the project include public and private sector enterprises, as well as research centers, universities and vocational training centers in the TA stakeholder group.

## **4.2. PROJECT PROGRESS AND SCOPE AS AT MARCH 2014**

42. A summary of progress against the Design and Monitoring Framework is included in APPENDIX 3:

### **4.2.1. Project Impact**

43. The impact of the project is: *'Improved use of biomass in Cambodia, the Lao PDR, and Viet Nam'*.

44. The objective verifiable indicators (OVI) (performance targets & Indicators) for achievement of the impact are:

*'By 2020:*

- *5% increase in production of clean bioenergy from biomass (2011 baseline: 0.1%)*
- *5% increase in use of by-products of bioenergy systems (bio-slurry and biochar) (2011 baseline: 0%)'*

45. Achievement of the impact (and measuring of performance) is outside the scope of the project. However, it is clear that the impact is still relevant and that the project outcome and outputs will contribute to the impact, particularly increase in the use of by-products of bioenergy systems (bio-slurry and biochar).

### **4.2.2. Project Outcome**

46. The outcome of the project is: *'Efficiently operating pilot projects in biomass use'*.

47. The objective verifiable indicators (performance targets & Indicators) for achievement of the outcome are:

*'By 2014: At least two investment modalities for biogas and bioslurry (Cambodia and the Lao PDR); three for biochar (Cambodia, the Lao PDR, and Viet Nam); two for improved cookstoves (the Lao PDR and Viet Nam); and three for inclusive supply chain of certified biofuel and organic crops in (Cambodia, the Lao PDR, and Viet Nam)'*

48. The pilot projects will be assessed and used as a basis for preparing proposals for future investment modalities (to be funded through a future ADB loan or other potential investors). Early discussions with the government and ADB however resulted in the project dropping research into investment modalities for certified biofuel. Pilots, for which investment modalities will be prepared, cover the following:

- Biogas and bioslurry (OVI – two in Cambodia and Lao PDR; Pilot Projects – two in Laos PDR and Vietnam)
- Biochar (OVI – three in Cambodia, Lao PDR, and Viet Nam; Pilot Projects - three in Cambodia, Lao PDR, and Viet Nam)

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<sup>5</sup> WGA meeting, 12 July 2012, Nanning, China



- Improved cookstoves (OVI – two in Lao PDR and Vietnam; Pilot Projects – three in Laos, Cambodia and Vietnam)
- Organic crops (OVI – three in Cambodia, Lao PDR, and Viet Nam; Pilot Projects – four in Cambodia, Laos PDR and Vietnam)

49. Thus the performance targets have changed slightly from the Design and Monitoring Framework. Although at least 10 investment modalities will still be assessed, the type of investment modality differs slightly in terms of numbers per country and technology. This is because they have been prepared in a participatory manner and based on feasibility and need in each country, following discussions, and feasibility studies (plus a rapid appraisal) in each country.

50. In terms of timing, the selection, feasibility, procurement and contracting of pilots has taken longer than planned so it is unlikely that these will be completed by the current contract end date of June 2014. Assuming a no-cost extension is given these should be finalized by early 2015. So while the OVIs have changed slightly the overall outcome of the project, *Efficiently operating pilot projects in biomass use*, should be achieved, assuming a no-cost time extension is granted.

#### **4.2.3. Output 1 - Enhanced regional cooperation in bioenergy development to foster and safeguard food security**

51. The objective verifiable indicators (performance targets & Indicators) for achievement of the output are:

*'By 2014: Mechanism tested for harmonizing at least three bioenergy standards<sup>6</sup> and certification systems, and a common method of assessing greenhouse gases'*

52. The TA has worked with government officials to develop work plans based on country's priorities. As mentioned previously the TA identified early in its implementation that the ability to start from a regional perspective that would be used to develop a harmonized approach to policies, regulations, standards, certification etc was found to be inappropriate and unsupported by each of the participating countries. A key message was the desire to develop country level programs for strengthening their own institutions and then to share these with the other participating countries. Through the process of regional sharing it was claimed greater harmonization opportunity would emerge.

53. In response we have worked extensively in the development of national level programs that are driven by the TFPs and NFP representation of national priorities. The process has been informed through sharing review of international experience with standards and certification and a review of national policies, regulations and plans relating to the biomass sectors.

54. Regional conferences and a series of national and a regional learning forums during 2013 have confirmed the preference for using national priorities. Most priorities are linked to the desire to have the TA support a process that supports the development of improved standards and certification (e.g. on biodigesters, organic fertilizers and organic rice) within each country.

55. Options for learning from each other that lead to harmonization will be facilitated through another regional forum during 2014. To identify priorities the TA supported the NFPs to establish policy working groups (or consultative groups) in each country, supporting these through subject-specialist resource persons, and sharing knowledge and ideas between countries where possible. The outputs from these working groups will include new draft standards as well as roadmaps for taking the process forward in the future. These standards and roadmaps will then be presented by each country in a regional forum so opportunities for harmonisation can be identified.

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<sup>6</sup> Including standards set by such organizations as the Global Alliance on Clean Cookstoves and the Roundtable on Sustainable Biofuels, along with quality assurance from regional quality assurance centers to be established for biogas, improved cookstoves, bio-char, etc.

56. The agreed priorities are:
- Cambodia – standards for organic rice and biodigesters;
  - Laos PDR – standards for organic rice and biofertilizer;
  - Viet Nam – standards for climate friendly rice and/or biofertilizers.

57. Thus while standards will be developed these may not necessarily be bioenergy standards. It is felt that this demand-based approach adopted will provide greater ownership and sustainability than sticking rigidly with the Design and Monitoring Framework (DMF).

58. In this process Cambodia placed high priority on an organic rice standard. The draft standard was developed and then shared with the Laos working group that has also prioritized organic standards. Currently Laos PDR is developing its own standard that is closely mirroring the Cambodia standard. Similar opportunities will emerge for biofertilizers between Viet Nam and Laos and for biodigester standards between Cambodia and Viet Nam.

59. This process thus seeks to build a regional policy sharing dialogue as a step towards supporting shared learning and to understand the potential benefits of moving towards common sets of bioenergy standards. The further development of supporting systems will be needs based. Support for systems relating to certification, accreditation systems, traceability and labeling systems will be defined as part of the implementation frameworks for the standards. These will define the training needs to be supported by the TA in the latter half of 2014.

60. In terms of developing a common method for assessing greenhouse gases, it is unclear on how this contributes to the project impact i.e. the theory of change is unclear. This activity is better assessed as part of a lifecycle analysis activity undertaken as part of Output 4.

61. In view of the current scope of the output, we recommend a change to the performance targets with an amended OVI as follows:

*'By 2014: At least three standards and certification systems established that enable improved use of biomass in Cambodia, the Lao PDR, and Viet Nam, and which have the potential to foster future cross-border harmonisation'*

62. See proposed amended Design and Monitoring Framework (DMF) in APPENDIX 2:

#### **4.2.4. Output 2 - Pilot-tested climate-friendly biomass investment projects for wider implementation**

63. The objective verifiable indicators (performance targets & Indicators) for achievement of the output are:

*'By 2014: Construction of at least 500 bio-digesters, 600 biochar kilns, 75,000 improved cookstoves; and introduction of at least 300 farmers to sustainable certification standards'*

64. The TA screened a range of proposed interventions and during the inception phase was inundated by proposals from a range of groups seeking additional seed funding, additional financing for existing programs, and even funding for failing biofuel enterprises. The resultant confusion over the purpose of the TA resulted in significant delays in finalizing the inception work plan and supporting report. After changes to the team leadership a rapid review and consolidation of the work to date was completed and agreement reached on the scope of technologies to be included in the TA. For each of the technologies a technology readiness assessment using the NASA framework was applied to the agreed technologies within each of the countries. The assessment rapidly highlighted the constraints that the TA faced for developing business models for upscaling. These challenges relate to differences in readiness between technologies, and also for the same technology in different countries. Of the technologies only ICS technology was

considered to be close to full readiness for commercialization in Cambodia, with slightly lower readiness in Laos PDR and Viet Nam. Biogas technology was also considered ready in Viet Nam, but somewhat less so in Cambodia and Laos PDR due to alternative energy sources, and lower intensity of livestock. Bioslurry management technology, one of the priority technologies for TA7833, was even less ready in all three countries due to the continued need for technology development and its testing/demonstration. Biochar was far less ready. For biochar the constraints relate to (i) technology for its production and the likely commercial viability of smallscale production technologies, (ii) the commercial attractiveness of biochar as a soil amendment that may provide significantly higher levels of public goods than perceived private benefits to land owners, (iii) the safety of biochar production and use, and (iv) the low levels of knowledge regarding biochar use applicable to GMS.

65. Based on the above, feasibility studies were commissioned in both Cambodia and Viet Nam.

**i) Cambodia**

66. For Cambodia the ICS feasibility study identified an integrated demand aggregation and promotion business model linked to the ICS suppliers association supported by GERES as a model to be piloted. The model seeks to use womens union and or committees to provide a product awareness and education, product sales and distribution systems. The model builds capacity, provides supplier linkages, establishes inventories and then rewards the sales achievements in an output based payment model. The linkage to suppliers seeks to encourage supplier participation through the provision of access to revolving funds for upgrading production capability and providing business development services.

67. In the proposed demonstration of bioslurry management the feasibility study found somewhat ambivalent results. In Cambodia where farmers have larger land areas than in Viet Nam the farmers in Takeo were found to be using a higher proportion of their slurry for crop nutrients. Major constraints relate to labor availability, the lack of appropriate bioslurry management technologies, and the social unacceptability of moving slurry away from the households into a commercial use. The willingness of biogas households to relinquish or sell surplus bioslurry was very low. The feasibility study found that the only acceptable business model would involve the provision of infrastructure to move slurry from the digestors to irrigation canals or cropping fields. Alternately the option of moving slurry through tankers to a compost making business owned by the slurry producing households was suggested to provide a nutrient enriched compost products. The findings are reflected in the redefinition of the pilot business models described below.

68. The Cambodia biochar feasibility study assessed both the production and use of biochar. In this regard Cambodia differs from other countries in that there is a pre-existing supply of biochar from gasification plants used to power rice mills. Further the Department of Agriculture Engineering has pioneered the development of a top draft kiln based on technology adaptation from a range of international and regional technology developments. The feasibility findings highlighted the lack of knowledge and evidence of biochar benefits to land users. Further opportunities identified included linking the pilots to existing product manufacturers using biochar within a biofertilizer and the possible integration of rice husk biochar into urban solid waste compost to improve its value to make the composting operation more viable. The feasibility study highlighted the need for a demonstration approach rather than upscaling existing technology.

69. The Cambodia pilots for biochar and bioslurry are therefore based on (i) moving from a soil amendment focus delivering public good values of increased soil carbon capture to a focus on private goods based on supplying soil nutrients while achieving soil carbon benefits over a longer time horizon, (ii) building a public private partnership approach to biochar/biofertilizer product development which in an upscaling model could use product development grants, (iii) ensuring a demonstration focus based on product testing and then product farmer demonstrations using demonstration plots linked to farm field schools, (iv) the demonstrations should be linked to both rice and vegetable production systems, and (v) that small scale production of biochar by linking

local farmer of womens groups with a local kiln to produce biochar using local products as part of building the key farmer network already emerging through the biochar program of the Department of Engineering. Two pilots are being implemented – one for the definition, production and testing of new products including an upcoming biofertilizer formulation workshop involving participants from all 3 countries. The pilot program is also being supported by a testing of regional biochar samples to ensure occupational health and safety elements and appropriately addressed. Further there is recognition of the role of women in vegetable production. As such the TA will provide a specific gender training program to empower women to understand biomass and nutrient management options available at the village level.

70. The three Cambodian pilot projects are as follows:
- PP#1: Improved Cook Stove Up-scaling
  - PP#2: Farm Demonstration of Biofertilizers for Upscaling Investment
  - PP#3: Production and Testing of Biofertilizers

71. See APPENDIX 4: for a description of each.

## ii) Viet Nam

72. The ICS feasibility study identified extremely heterogeneous contexts for ICS between the rice production areas and the more dryland land use systems. The feasibility identified a higher probability of success in the dryland more remote area for introducing ICS technology. This reflected the availability of fuel sources and also the increasing role of LPG as an accessible energy source. The feasibility study highlighted the high demand for ICS and the potential benefits they offered with the most desirable features of ICS being stove durability and cooking efficiency. Locally available ICS stoves were identified and discussed along with some of the improved cook stoves from other parts of Viet Nam. The proposed business model is to connect the Womens Union to stove producers and then provide a grant for the purchase of inventory that will be revolved into replacing stove inventory. For the pilot the Womens Union also receives an output achievement payment and will also hold the retail margin on stoves to cover costs.

73. The subsequent pilot is now being implemented. The preferred stoves are being tested at Hanoi University Technology and the women union member have received training and support for establishing inventory and are running sale promotions at two sites – the first promotion achieved sales of nearly 300 stoves in one district and 80 in the other. Monitoring has however flagged consumer concerns over some of the preferred stoves and one of the more prominent ICS in Viet Nam has been found to (i) corrode quickly and (ii) produce significant amounts of smoke and is not appreciated by consumers. The low value of stoves, short life span and rapid changes to technology raise significant questions about the longer term viability of ICS as they are currently understood and promoted. The additional benefits of higher costs stoves or alternate energy sources would appear to be more attractive in early feedback from ICS users.

74. The feasibility into bioslurry management highlighted a number of significant issues. Firstly, the high density of biodigesters installed in Viet Nam makes bioslurry a significant environmental risk. Past and to an extent ongoing biogas programs have prioritized household affordability of biodigesters as a means for achieving sales targets and the subsequent ratification for CDM qualification. The affordability issue has involved a significant tradeoff in the under investment in environmental protection from the risk of bioslurry production. In one district the data from the feasibility study indicates an estimated 150,000m<sup>3</sup>/annum is discharged into ground or surface water. The actual nutrient release is difficult to ascertain due the wide range of operational performance but on average biodigester users added inadequate biomass and waste, used significantly more water and operated on minimal hydraulic retention times such that gas production was lower than expected and waste water volume significantly increased. The proposed management solutions are all tightly constrained by (i) limited land per household, (ii) the distance from the households to cropping land which is also distributed over many plots, (iii) labor availability. The proposed business model is to attempt to demonstrate demand for slurry as a nutrient source through mixing with composts or direct application. Further options will look at

installing charcoal/biochar filter on slurry tanks or slurry overflows to strip nutrients from the slurry and then using the filter material in home gardens and cropping systems.

75. The Viet Nam biochar feasibility study has identified the extremely marginal nature of biochar production and use in some parts of Viet Nam. The lack of readily available biochar resources limits the future viability of biochar. Rice husk is retained by rice mills which central and north Viet Nam are small such that the husk remains widely dispersed reducing the viability of a biochar enterprise. Where mills are larger, husk has alternative uses including grinding into flour for export to the Middle East to make polyethylene products and heat pressing into briquettes used as a fuel source for furnaces and home cooking. The requirement for the TA7833 to address smaller scale very much limits viable options. The use of ICS stoves that produce char in very limited quantities has limited application due to (i) the volume required for soil amendment applications, (ii) labor to use the biochar is scarce and high value, and (iii) the variable quality of char produced by ICSs.

76. The pilot will (i) demonstrate small kilns for use alongside rice mills, (ii) integrate biochar/bioslurry and compost with NPK fertilizer into SRI production demonstrations, (iii) demonstrate prototype kiln for in field production of biochar from rice straw. The Vietnam biochar pilots will follow a similar strategy to Cambodia by defining biofertilizer product formulations and then demonstrating and testing these.

77. The three Vietnam pilot projects are as follows:

- PP#1: Improved Cook Stove Use
- PP#2: Bioslurry Management
- PP#3: Demonstration of Biofertiliser and Biochar Soil Amendments

78. See APPENDIX 4: for a description of each.

### iii) Laos PDR

79. In Laos PDR no feasibility study was possible with no expression of interest in completing one or all three feasibility studies. Under the leadership of the NPI a rapid assessment team was formed and a rapid assessment undertaken in two locations identified by the NFP and TFPs. The locations were selected for accessibility and also to test options for using local entrepreneurs. The approach in Laos PDR differs from the other two countries. In Laos the strategy seeks to identify the available biomass resources in an area and then seek to define uses of these biomasses that best meets their potential uses. In each location there will be aspects of biogas, biochar / bioslurry, composts, biofertilizers, and their use within home gardens, high value crops and rice production systems. Each location has an entrepreneur being a farmer with a large land holding, more livestock and with some commercial interests. The production of biofertilizer and biochar etc will be linked to this enterprise or to local farmer groups that are mostly organic produce farmers some of which may be certified.

80. Within Laos there is a low technology chimney venting system for producing an ash/char product from rice husk that are burnt in a pile with an airflow chimney arrangement – this produces uneven product quality and also significant amounts of soot. The pilot will introduce the top updraft kilns from Cambodia to demonstrate a more efficient means of producing biochar. The pilot will import two kilns for demonstration purposes and will support skills from Cambodia to train Laos in the fabrication and production of kilns locally. Biogas in Laos has struggled to become viable in part due to the low livestock density and due to the availability of fuel sources. The pilot will support limited biogas technology in the form of lower cost Vietnamese technology that will be demonstrated in the two pilot sites, with the slurry being incorporated into composts, and biofertilizer products. Household cooking will be supported through the introduction of ICS through creating a sale outlet in each commune for a range of preferred ICSs. The new superman 2 Laos stove being the primary stove, however the recently developed wood ICS supported by the World Bank has also been identified to have consumer demand. The ICS business model in Laos differs

from the SNV /Normai value chain approach in that the TA does not seek to enhance the existing technology, it seeks to pilot means of getting the technology upscaled in terms of its use.

81. The Laos pilots are being closely integrated with the output one working groups on standards in terms of organic production and biofertilizer specifications and use. The pilots will be used to inform the WG but will also respond to the WG outputs as a test of the standards and implementation processes.

82. The Laos pilot project is titled: #PP1: Cluster Biomass Technology and Biofertilisers. See APPENDIX 4: for a description.

#### **iv) Value chain models**

83. Other value chain models have been identified and assessed including:

- the 3 plus and 3 minus model of rice production in Viet Nam,
- the Business Advisor model to build supply chains to end users developed by IDE in Cambodia,
- a somewhat related model in the Laos rice milling sector where grants to mills were linked in the mills building supply contract and linking suppliers to inputs – increasing output of farmer and mill throughput,
- the deep placement of fertilizer model supported by CODESPA in Tuyen Quang province of Viet Nam that increased productivity by 24% and reduced environmental pollution significantly while creating local businesses,
- the compost operation of COMPED in Battambang Cambodia,
- Green Mountain Fertilizer in Cambodia that linked organic fertilizer biochar and trichoderma with significant results in fruit trees and other household crops,
- the organic rice models in Cambodia (CEDAC) and their vertically integrated model for rice production and milling.

84. Each one of these models has something to offer the future project designs in terms of developing products for improved biomass use. The models have been detailed in the Business models for Inclusive Value Chain Reports prepared by the private sector specialist.

85. In view of the current scope of the output, while climate-friendly biomass investment projects will be pilot-tested for wider implementation, the OVIs will not be achieved as stated. This is because the project is testing business models for future scale-up, not to construct a specific number of bio-digesters, biochar kilns, or improved cookstoves, or to test these particular technologies. Thus we recommend a change to the performance targets with an amended OVI as follows:

*'By 2015, at least 10 business models which promote the scale-up of climate-friendly biomass investments tested.'*

86. See proposed amended Design and Monitoring Framework (DMF) in APPENDIX 2:.

#### **4.2.5. Output 3 - Enhanced capacity for efficient use of biomass**

87. The objective verifiable indicators (performance targets & Indicators) for achievement of the output are:

*'By 2014: Increased capacity for gender-sensitive investment among at least 500 government officials, 400 service providers, and 3,000 lead farmers (i.e., at least 55% of those to be trained will be women and at least 70% of those trained will have increased capacity)'*

88. The output will raise awareness of the biomass resources and their potential uses amongst officials and policy makers as well as decentralized agencies and supporting civil society groups to

enable potential investment options to be fully understood. Gender-sensitive capacity-building will be provided to participating central and local governments, service providers, communities and women's groups. Activities will strengthen institutional and technical capacity to expand biomass investments and ensure sustainable uptake by rural communities. Distance learning methods will be implemented to reach more rural communities and capacity building support will be offered to project stakeholders. Capacity building for ADB safeguards, feasibility assessment and project approval due diligence will be provided.

#### **i) Training and Study Tours**

89. The TA supports individuals to attend training events and has included participation in an IBI conference in China (3), hosting of a study tour on Biochar in Seam Reap (33 participants), and specialized training and awareness raising in China on biochar production and application and supply chain development (6). From 16th-18th December 2013 the first regional conference on Efficient Utilization of Biomass for Bioenergy & Food Security in the Greater Mekong Subregion was organized in Hanoi attended by over 100 participants from government, academia and civil society. Copies of presentations are available at:

<https://drive.google.com/folderview?id=0B1wKP1C0cX-jLWJTNU54SXFkUk&usp=sharing>

The final day of the conference included a training session on the application of the FAO's Bioenergy and Food Security (BEFS) Analytical Framework and Tool Box<sup>7</sup>.

90. During January 2014 a field trip was organised in January for NDF and ADB staff to visit sites where biomass use, bioslurry and biochar incorporation had been undertaken in Cambodia. The visit involved meetings with officials and farmers.

91. A four day-workshop involving both public sector and private sector representatives on formulation of biochar based biofertilisers was organised in March 2014 in Cambodia for 11 government officials from CLV. The purpose was to develop knowledge and consensus on procedures and ingredients for specifying 4-5 biofertilizer products in terms of their ingredient mixes and formulations to be used in the pilot programs under output 2, followed by a half day on kiln design for making biochar from rice straw.

92. Finally, each pilot has an awareness and training program incorporated into the design and implementation arrangements. For example, in Cambodia each farm demonstration will be linked to a farmer field school program meeting once a month for rice and one every two weeks for vegetable production. The ICS programs have training for stove producers, women's union members, who in turn train commune members in the benefits and use of ICS's.

#### **ii) Gender Based Training**

93. During the NDF visit in January 2014 the issue of women's access to biochar, bioslurry knowledge and skills was raised. In response the TA has developed a program of gender based training that will align with the farm demonstration plots but will involve women only and target building their understanding of nutrients, crop needs, and the use of slurry compost and biochar. The training will target women from all villages in each commune. There should be 2 -3 lead women from each village, who are willing and have experience in planting vegetables. The lead women who are respected by other women in the village can become trainers in the future – these lead women will be the focus of the training program in the expectation that they become commune resource persons in these subject areas. A total of 20 to 30 women would participate in each training with up to 6 training locations/events held in Cambodia. If successful the extension of the training to Laos and Viet Nam will be assessed.

#### **iii) Video Series**

94. The *TA7833 Training Video Series* aims to address these two principle capacity development requirements:

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<sup>7</sup> [www.fao.org/bioenergy/foodsecurity/befs](http://www.fao.org/bioenergy/foodsecurity/befs)

- Enhancing target farmers' understanding of the true value of biomass resources, knowledge of various resource use options and confidence in applying this knowledge within biomass use);
- Enhancing target stakeholders' understanding of successful approaches for scaling-up the dissemination of improved cookstoves (ICS).

95. In close coordination with the operation of pilot projects under TA7833 Output 2, the Training Video Series aims to address capacity development needs in CLV by intelligently engaging the target beneficiaries through the production and dissemination of easily accessible and highly practical training videos.

96. The videos will address the following major topics (i) healthy soils (30min) , (ii) biomass conversion technologies, (iii) formulating and application of soil amendments and biofertilizers (30min) and (iv) Scaling up ICS usage (40 min). The videos will be produced professionally and will have local language translation for the three national languages. They will be distributed widely both through direct distribution, event distribution and via the media.

#### **iv) Bio Briefs**

97. The TA has started to produce biobriefs which are a series of newsletter style files comprising of 2 or 3 pages overview and findings of issues arising through the TA. The biobriefs are distributed in each country via direct email and by physical distribution at events where feasible. Each brief can be customized for each country to make it more relevant. The range of topics is not fixed and will continue to develop as issues arise and findings from the pilots studies etc are recorded. Currently the biobrief series consists of the following range of topics.

- (i) Climate change & agriculture
- (ii) Biomass & resource availability in GMS
- (iii) Bioenergy & food security overview
- (iv) Healthy soils and Nutrient Management
- (v) Organic agriculture & standards
- (vi) CF value chains
- (vii) CF Soil amendments – inc. biochar and bioslurry
- (viii) Improved Cookstoves
- (ix) Standards & Certification
- (x) Sustainability criteria & indicators

#### **v) Distance Learning**

98. A distance learning program is being developed and will be implemented during 2014. The Distance Learning (DL) Program aims to strengthen the understanding and knowledge of key government and civil society stakeholders in Cambodia, Lao PDR and Viet Nam (CLV) within the field of bioenergy, food security and sustainable agriculture. Specifically, the course is focused on enhancing the participants' understanding of the value of biomass resources and improving their ability to support biomass resource use decision-making, policy and practice.

99. The DL Program will focus on capacity building of CLV government officials and civil society stakeholders (CSS) at the national and sub-national level (primarily provincial) and especially those with a gender-sensitive remit. The DL Program will come under the overall management of the *GMS Working Group on Agriculture (WGA)* or nominated representatives thereof. This is to ensure a common learning platform for relevant GMS stakeholders and foster regional cooperation, knowledge harmonization and transfer within the GMS.

100. The initial DL Program pilot course will be developed and facilitated by the TA7833 TA team<sup>8</sup> under the overall management of WGA-nominated *Co-Facilitators*. *WGA Coordinators* from Cambodia, Lao PDR and Viet Nam will be invited to nominate *Co-Facilitators* from their countries, who together, would form a *Distance Learning Program Committee* to supervise and steer the

<sup>8</sup> National Project Implementation Specialists (NPIs) and International Capacity Building Specialist



administration, coordination and curriculum of the DL Program on behalf of the WGA. The DL Program Committee and TA team would be responsible for development and sign-off on the Program curriculum and course content, including managing scheduled reviews, revisions and reporting Program progress on a monthly basis.

101. At the end of the pilot course, the Program will be evaluated by the DL Program Committee, WGA Coordinators, ADB representatives and the TA7833 TA team and course feedback from the participants. Based on the outcome of this evaluation process, the DL Program may be revised in terms of content, scope and approach.

102. The review process will then look at the administration and management mechanisms used during the pilot course and recommend options for institutionalizing the Program within the WGA framework or transfer of operations to a recognized regional-level institute to maintain, advance and expand the provision of the Program in the GMS and certificate graduates accordingly on an ongoing basis. During the pilot course, TA7833 will assess institutions and options for such collaboration and make recommendations

103. In conclusion, while it is not possible at this stage to accurately estimate the exact number (and gender disaggregation) of government officials, service providers and lead farmers whose capacity will be increased by the end of the program, it is likely that the OVIs will be more or less achieved.

#### 4.2.6. Output 4 - Development and dissemination of knowledge products

104. The objective verifiable indicators (performance targets & Indicators) for achievement of the output are:

'By 2014:

- *Methodology for assessing and prioritizing the use of biomass for bioenergy and food security*
- *Compendium of good practices in biomass use*
- *Booklets on different models of improved cookstove, biochar kiln, and biodigesters'*

105. The TA is producing a range of knowledge based products some of which are technical reports, others are feasibility studies. A complete list of outputs to date is provided in the following table. These can be accessed at:

<https://drive.google.com/folderview?id=0B1wKP1C0cX-jdUhvMDNvcmEyZHc&usp=sharing>

**Table 2: Knowledge Product Outputs**

<b>Knowledge Product Outputs</b>
Agricultural Biomass Resource Assessment in CAM, LAO and VIE
Biomass and Biochar in the Greater Mekong Subregion
Report on Feasibility Study for a Pilot Investment Project Demonstrating the Production and Use of Biochar as a Soil Amendment
Report on Feasibility Study for a Planned Pilot Investment Project for Scaling-Up Adoption of Improved Cookstoves
Report on Feasibility Study for a Planned Pilot Investment Project for Scaling-Up Proven Biogas Technology and Efficient Bioslurry Management Practices
Report on Feasibility Study for a Pilot Investment Project to Scale-Up the use of Biochar from Rice Husks in Climate-Friendly Rice Production
Report on Feasibility Study for a Planned Pilot Investment Project for Scaling-Up Improved Cook Stove Use
Report on Feasibility Study for a Pilot Investment Project to Scale-Up Efficient Bioslurry Management Practices within the VIE National Biogas Program
Report on the Rapid Appraisal for Efficient Utilization of Biomass for Bioenergy and Food Security
Bulletin – Bio-Brief#01: Overview of TA7833-REG
Bulletin – Bio-Brief#02c: Climate Change in the GMS: CAM

Bulletin – Bio-Brief#02l: Climate Change in the GMS: Laos
Bulletin – Bio-Brief#02v: Climate Change in the GMS: VIE
Bulletin – Bio-Brief#03: Climate Change & Agriculture in the GMS
Bulletin – Bio-Brief#04: Food Security in the GMS
Bulletin – Bio-Brief#05: Biomass Resources in the GMS
Agriculture, Food Security and Climate Change in the GMS
Introduction to Standards, Certification and Labelling Systems for Sustainability in the GMS
Business Models for the Scaling-Up of Climate-Friendly Agricultural Value Chains in the GMS

106. Specific knowledge products will be developed to promote knowledge transfer and cooperation between more advanced GMS countries and CLV. A series of technical knowledge papers are being prepared as stand-alone reports as a means of providing access to international and regional knowledge regarding key topics and themes. These products will collectively form a biomass compendium that will also include specific outputs from the pilots including proposed upscaling business models. The following provides a list of knowledge product topics:

- (i) Climate Change Agriculture and Food Security (completed)
- (ii) Biomass Resource Assessments and Availability (completed)
- (iii) Biochar (in progress)
- (iv) Biogas and bioslurry (in progress)
- (v) Healthy Soils – soil amendment and soil nutrients (in progress)
- (vi) Climate friendly soil amendments (in progress)
- (vii) Climate friendly value chains
- (viii) Improved cook stoves (in progress)
- (ix) Certification and Standards (completed)
- (x) Innovative business models (completed)
- (xi) GHG Emissions and Carbon Markets
- (xii) Indicators

107. It is also proposed to use the pilot projects as case studies for lifecycle and least cost assessments and how these could be combined with the biomass assessment framework within a multi-criterion decision framework. This would then feed into the compendium.

108. In conclusion, it is likely that the OVIs will be more or less achieved.

## 5. PROPOSED WORKPLAN (2014 – 2015)

109. The loss of time at the TA start-up has had a significant impact on the deliverables. Over the last 12 months momentum has been re-established and program activities are being implemented with greater focus and consensus with the counterpart agencies. The contracting of the pilot projects under output 2 provides NFPs to clearly demonstrate the benefits that will flow from the TA to their seniors and public officials. Procurement complexity for the pilots has also contributed to the time line required to achieve operational pilot investments.

110. While it would be possible to squeeze activities in Output 1, 3, and 4 into 2014, the farm demonstration pilots for bioslurry, biochar and biofertilizer use on rice and vegetable crops will require the extension of the TA to enable the pilots to be implemented due to the cropping seasons and the need to use the dry season for non-rice demonstration plots.

111. It is therefore proposed that the TA be extended by one year to enable (i) the dry season vegetable cropping season to be included, and (ii) to evaluate the business models to the level of detail that will assist ADB to include the business models in future investment programs. Based on such an extension the following work plan is proposed.

**Table 3: Proposed Work Plan (2014-2015)**

I	Activities	2014												2015					
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
<b>A</b>	<b>Policy WG standards</b>																		
	(i) Cambodia																		
	(ii) Laos PDR																		
	(iii) Viet Nam																		
	Regional Forum																		
	Follow up training																		
<b>B</b>	<b>Cost Effectiveness Framework</b>																		
<b>C</b>	<b>Life Cycle Analysis</b>																		
<b>D</b>	<b>International / Regional Conference</b>																		
	<b>Output 2:</b>																		
<b>A:</b>	<b>Pilot Projects (ICS)</b>																		
	Pilot Projects																		
<b>B</b>	<b>Pilot evaluation</b>																		
<b>C</b>	<b>Investment Business models</b>																		
<b>D</b>	<b>ADB training</b>																		
	<b>Output 3:</b>																		
	Gender training																		
	Biobriefs																		
	Video Production																		
	Distance Learning																		
	<b>Output 4:</b>																		
	Knowledge Products																		

## 6. PROJECT RESOURCES (INPUTS AND BUDGET)

### 6.1. CONSULTANT TA TEAM

112. A summary of consultant inputs used to date, and those remaining, is as follows:

**Table 4: International staff engaged on TA7833 (contract variation#2)**

NAME	SPECIALIST POSITION	INPUTS UTILIZED* (MONTHS)	INPUTS REMAINING (MONTHS)
<b>INTERNATIONAL</b>			
Lindsay SAUNDERS	Team Leader	6.77	3.43
Donah BARACOL-PINHÃO	Legal Standards & Certification Specialist	5.90	0
Greg MUNFORD	Capacity Building & Distance Learning Specialist	1.70	1.30
Ewan BLOOMFIELD	Improved Cookstove Specialist	0.77	0.23
Jason YAPP	Private Sector Development Specialist	6.00	0
Simon SHACKLEY	Biomass / Biochar Technology Specialist	3.78	0.42
Replaced Consultants (MANG AND HUBA)	Previous Team Leader and Capacity Building & Distance Learning Specialist	5.5	0
<b>NATIONAL</b>			
Mao Moni RATANA	Cambodia National Project Implementation Specialist (NPI)	11.00	0.50
Bounthavy CHALEUNPHONH	Laos National Project Implementation Specialist (NPI)	9	2.5
Li Thi THOA	Vietnam National Project Implementation Specialist (NPI)	12.00	2.00
Replaced or finished Consultants	Various	42.15	8.07

\*As of end March 2014

113. In order to complete the project activities, as proposed in the work plan above, a budget reallocation is requested in order to extend the time of a streamlined team of core specialists, as follows:

**Table 5: Proposed Additional Inputs**

NAME	SPECIALIST POSITION	INPUTS REMAINING (MONTHS)*	INPUTS REQUIRED (APRIL 14 – JUNE 15) (MTHS)	EXTRA INPUTS NEEDED (MTHS)	JUSTIFICATION
<b>INTERNATIONAL</b>					
Lindsay SAUNDERS	Team Leader	3.43	6.75	3.32	Oversight of all activities; Monitoring of pilots; preparation of investment modalities; preparation of compendium
Simon SHACKLEY	Biomass / Biochar Technology Specialist	0.42	4.25	3.83	Preparation of knowledge products on biochar; least cost analysis and lifecycle analysis; support to monitoring pilots; support to preparation of

					compendium
Greg MUNFORD	Capacity Building & Distance Learning Specialist	1.30	5	3.7	Preparation of bio-briefs; co-ordination of knowledge product preparation; support to implementation of video and distance learning program
Jason YAPP	Private Sector Development Specialist	0	1	1	Preparation of knowledge product on Biogas and bioslurry and support to conference
Stephen JOSEPH	Biofertiliser Specialist (New Position)	0	2.5	2.5	Support to biofertiliser / organic fertilizer standard prep in Vietnam and Laos; training as required; support to monitoring of biofertiliser pilots as required
<b>NATIONAL</b>					
Mao Moni RATANA	Cambodia National Project Implementation Specialist (NPI)	0.5	8.7	8.20	Monitoring of pilots and co-ordination of activities in-country. Full-time till end April then 70% onwards
Bounthavy CHALEUNP HONH	Laos National Project Implementation Specialist (NPI)	2.5	12	9.50	Monitoring of pilots and co-ordination of activities in-country. Full-time required as weaker implementing partners
Li Thi THOA	Vietnam National Project Implementation Specialist (NPI)	2.0	7	5.00	Monitoring of pilots and co-ordination of activities in-country. Full-time till end April then 50% onwards

\*As of end March 2014

## 6.2. PROJECT REIMBURSABLE EXPENDITURE

114. The following table shows expenditure to date under the project (not amounts invoiced to, or paid by, ADB).

**Table 6: Summary of TA7833-REG Project Reimbursable Expenditure (US\$)**

Category	Budget (VO#2)	Expenditure*	Balance
Per Diems	120,630	46,075	74,555
Office Operations	150,000	135,000	15,000
Equipment	90,000	27,391	62,609
Seminars, Workshops & Training	560,000	145,911	414,089
Studies, Surveys & Reports	925,000	325,000	600,000
Contingencies	134,970	0	134,970
<b>TOTAL</b>	<b>1,980,600</b>	<b>679,377</b>	<b>1,301,223</b>

\*As at end March 2014

115. In order to finance a 12 month no-cost extension, including extension of inputs as stated above, we propose a re-allocation as follows:

**Table 7: Proposed Amendment to Project Reimbursable Budget (US\$)**

Category	Budget (VO#2)	Change	New Budget	Justification
Per Diems	120,630	-29,485	91,145	Less per diems required than originally estimated. Reliance on home-based NPIs.
Office Operations	150,000	45,000	195,000	Extension of office operations till March 2015
Equipment	90,000	-57,609	32,391	Majority of equipment now purchased. Minimal additional budget required
Seminars, Workshops & Training	560,000	-118,175	441,825	See table below
Studies, Surveys & Reports	925,000	893	925,893	See table below
Contingencies	134,970	-134,970	0	Use required to fund time extension
<b>TOTAL</b>	<b>1,980,600</b>	<b>-294,346</b>	<b>1,686,254</b>	

\*As at end March 2014

116. A breakdown of the expected use of the 'Seminars, Workshops and Training' budget and 'Studies, Surveys and Reports' budget is as follows:

**Table 8: Breakdown of Amended Seminars, Workshops and Training Budget (US\$)**

Item	Budget (US\$)
<b>Completed</b>	
Inception/Stakeholder Workshops (Cambodia)	2,073
Inception/Stakeholder Workshops (Laos)	3,013
Inception/Stakeholder Workshops (Vietnam)	2,627
1st GMS Forum, Nanning, China	32,301
IBI Congress, Beijing	4,828
Regional Biochar Whorkshop, Siem Reap	25,123
Biochar Training, Hangzhou, PRC	9,882
GACC Forum, Phnom Penh	3,798
1st National Forum (Cambodia)	2,354
1st National Forum (Laos)	2,245
1st National Forum (Vietnam)	3,391
1st Regional Conference (December 2013)	62,614
Resource person - Stephen Joseph	13,170
Biofertiliser meeting	7,290
<b>On-going</b>	
Bio-Briefs	16,703
<b>Expected</b>	
Gender training and biomass use, Cambodia	16,383
Distance Learning	22,000
Videos	57,030
GMS Forum on Policy, Standards & Indicators	35,000
Final conference	80,000
Other training (TBD)	40,000
<b>TOTAL</b>	<b>441,825</b>

**Table 9: Breakdown of Amended Studies, Surveys and Reports (US\$)**

<b>Item</b>	<b>Budget (US\$)</b>
<b>Completed</b>	
Feasibility Studies (Cambodia)	60,523
Feasibility Studies (Laos)	707
Feasibility Studies (Vietnam)	49,444
Rapid Appraisal for Pilots (Laos)	5,979
Biochar Sample Testing	4,300
NDF Cambodia Visit	2,505
Policy Working Group Meetings (Cambodia)	14,296
Policy Working Group Meetings (Laos)	22,681
Policy Working Group Meetings (Vietnam)	7,556
Resource person - Claudius Bredehoft (GIZ)	7,500
Resource person - Eric Buysman (Biodigester standards)	8,500
<b>On-going</b>	
Pilot Project#1-CAM-ICS_MekongTT	54,500
Pilot Project#2-CAM-BioFert_Demo_CelAgrid	71,696
Pilot Project#3-CAM-BioFert_Test_Mcarbon	68,921
Pilot Project#1-LAO-BiomassCluster_NCG	232,365
Pilot Project#1-VIE-ICS_EPRO	66,515
Pilot Project#2-VIE-Bioslurry_CARES-SEDCC	76,045
Pilot Project#3-VIE-Biochar_CTDEP	85,985
<b>Expected</b>	
Due Diligence Potential of Silicosis Risk from the Production, Handling and Use of Rice Husk Biochar	2,520
10 kilns, digestors (small) and pelleters for Laos Pilot	50,000
Resource person - Vietnam WG support	10,000
Resource person - Sam Bryant (KP)	6,250
Dissemination of compendium	5,000
Other (TBD)	12,104
<b>TOTAL</b>	<b>925,892</b>

### 6.3. PROJECT SUPPORT

117. In order to provide increased support to the team, as of May 2013 a senior Director from Landell Mills (Simon Foxwell, Director, Asia/Pacific Division) has been appointed to provide day-to-day oversight, in conjunction with the team leader, and to act as the liaison person with ADB. This has continued and relationships with ADB and stakeholders remain good. The Landell Mills' Finance Manager's time to the project has increased in order to provide support to the verification and payment of pilot contractor milestones.

## 7. IMPLEMENTATION ISSUES AND LESSONS LEARNT

118. The major lessons learned during the implementation of the TA have been listed in monthly and progress reports. These are presented in the following table.

**Table 10: Issues Encountered, Recommendations and Remedial Actions**

ISSUES ENCOUNTERED	RECOMMENDATIONS & REMEDIAL ACTIONS
<p><b>Regional cooperation</b> Lack of operational procedures for ADB implementation and procurement in Regional Technical Assistance Projects</p>	<p>WGA standard operating procedures (SOPs) covering the role of the public sector in Regional TA projects and the basis for their engagement for services supported by an ADB OSFMD agreement for the procurement systems and documentation is required.</p> <p>SOPs have been under preparation by the ADB TA7833 Regional Cooperation Specialist, but despite repeated requests the TA team has not yet received these.</p> <p>Significant delays were experienced with respect to clarifying ADBs procurement options for supporting public sector participation. The inability to pay for participation and the lack of government funding for participation will slow and minimize the value of policy work and counterpart participation</p>
<p><b>Implementing Agency engagement</b> Official IA counterpart staff nomination and resource allocation process was only completed on 08 June 2012, resulting in delays in completing the inception phase and commencing implementation.</p> <p>The ADB and Consultant have raised concerns about these initial delays in TA inception and implementation and their knock-on effect on the project performance – e.g. the DMF references milestones in 2011, even though the contract was not signed until December 2011.</p>	<p>Such constraints are to be expected due to the complex regional nature and innovative, pioneering approach of TA7833. All parties continue to work hard to recover the lost time.</p> <p>Enhancing opportunities for communication and collaboration are considered prime approaches for enhancing engagement.</p>
<p><b>TA Team leadership</b> TA7833 complexity (different perspectives on immature technologies; difficult regional cooperation and varying IA priorities; specification to use innovative financing mechanisms; etc.) led to a loss of direction by the TA Team Leader and a lack of project progress.</p>	<p>Team leader replaced and TA team and approach streamlined. Revised work plan elaborated and distributed to project partners. Extra backstopping resources provided through a Landell Mills Director.</p>
<p><b>Intermittent inputs do not work effectively</b></p>	<p>The TA team was resourced with a large number of experts in each country but most of these were part time. Part time work may appear to be attractive but for most nationals it is in fact extremely difficult to organize and then manage time inputs to enable a genuine team participation and approach. The team has operated far more smoothly since the reduction in the number of experts and the increased duration of inputs. A key lesson for future TAs is the need for a national coordinator to be full time to ensure that programs and processes are being sustained.</p>
<p><b>Immature technologies</b> The ToR specify up-scaling of a wide range of</p>	<p>Liquid biofuels such as jatropha-derived biodiesel</p>



<p>technologies, however many of these are not sufficiently mature for up-scaling.</p>	<p>will not be included in TA activities due to key concerns about the feasibility of jatropha, lack of farmer / government commitment and interest and the broad-based questions regarding the potentially negative correlation between jatropha production and food security.</p> <p>Biochar and bioslurry technologies are also assessed to be too immature and as such the targets for their adoption in the DMF are considered too optimistic.</p> <p>Pilot projects will focus on demonstrating production and management of the more immature technologies and how these products can be integrated into greener value chains.</p> <p>The immaturity of technology has been highlighted in biochar and bioslurry. The need for both is to shift the focus from which technology to product development and formulation linked to fertilizer supply chains.</p>
<p><b>Technology adoption indicators are not realistic</b> For example, the DMF indicates the following: Construction of at least 500 bio-digesters, 600 biochar kilns, and 75,000 improved cookstoves</p>	<p>A program target to upscale 75,000 cook stoves in the three countries far exceeds both the resources available and the likely uptake rate – further it would exceed the ICS stove producer capacity</p> <p>500 biodigesters is optimistic given that the ADB has existing lending products in place for biodigesters in Viet Nam and the assessment of biodigesters in Cambodia and Laos is negative</p> <p>600 biochar kilns is simply unsupportable – there is no local production of kilns that has a commercial basis. Kiln technology and feed stocks are not well known and the benefits of biochar may not warrant the investment of resources. Further, the international experience with biochar is to move away from high volume soil amendments to incorporation of biochar into nutrient products where the biochar changes the characteristics of the biochar through reduced volatilization and provides potential water and nutrient release benefits lowering overall demand for nutrients.</p>
<p><b>Scale of technology</b></p>	<p>The preference for household-level technology, while appropriate for ICS, may be inappropriate for biochar and to a lesser extent bioslurry. The financial viability of such technologies will determine the extent of their adoption.</p> <p>However TA findings and expert opinion currently suggests that the viability of small-scale technology that has adequate safeguards may be insufficient to generate viability and attract investment and adoption.</p> <p>Experience in Thailand and China suggest that the biochar and bioslurry sectors emerge from a</p>

	<p>demand for biofertilizer from specialist agents that collect from product catchment areas. The focus should maybe move away from technology of production to how to build supply chains – a key finding from the assessment of climate friendly value chains in GMS</p>
<p><b><i>Donor crowding within the ICS sector</i></b></p>	<p>The ICS sector has a range of players many of whom offer subsidies and grants for the adoption of ICS technologies. The continued investment from the WB, EU and other ADB TAs that offer more concessional investment makes a purely commercial value chain less likely. The TA is focusing its ICS pilots on stove producer risk reduction through skill development, and demand aggregation through women’s unions.</p> <p>ICS technology in GMS is highly visible, however the gains from the technology are relatively small and with most improved stoves failing to address the durability of stoves it is questionable if significant gains are being achieved.</p>
<p><b><i>Innovative financing mechanisms</i></b></p> <p>The purpose of the TA is to pilot implementation mechanisms. The assumption being that innovative implementation mechanisms will support up-scaling initiatives more effectively. Numerous innovative financing mechanisms were identified by the TA in 2012 and provisionally endorsed by the ADB and team leadership in relation to proposed potential pilot implementation modalities. However, rigorous internal review has revealed that: (i) the nature of the modalities is not fully understood by all project parties; (ii) the complex institutional requirements for options including revolving funds and social merchant banking are not in place; (iii) the constraint of timelines for outcome-based funding would ensure that the TA would be closed prior to outcomes being achieved, making financing impossible; (iv) the TA resources are too limited to adequately finance the required investment funds including development bonds and social merchant banks at sufficient scale; (v) the risk averse nature and novelty factor of national and regional private sector stakeholders for engaging in such innovative modalities, and; (vi) the questionable performance of some of the proposed mechanisms, across a range of scenarios (e.g. Nepal), and the degree to which critical success factors are represented within the GMS – e.g. social merchant banking is a mix of financing modalities that individually are used in other ADB loan projects, many of which require 1-2 years to establish.</p>	<p>The TA has modified its position on innovative financing and will limit its modalities to a focus on the use of output-based financing to offset the business and market risk of stove producers. The financing modality for biogas and biochar will continue to emerge throughout the pilot projects and their implementation.</p> <p>Private-sector stakeholders and financing institutions will continue to be targeted for relevant awareness-raising and capacity building activities so as to raise the profile and confidence levels of potential future investors re. TA7833-relevant themes.</p> <p>One option of output based funding is for new product formulation for biochar supply chain development.</p> <p>An important question to be asked is can an ADB TA operating for 2-3 years be expected to pilot innovative financing arrangements that require new or reformed institutions to operate them, and can a TA flow funds into such institutions in a cost effective and transparent manner</p>
<p><b><i>Focus on standards and certification</i></b></p>	<p>The TA team has adapted its approach and has focused on areas where the government has requested assistance i.e. demand-led. This has led to improved engagement, ownership and results, particularly in Laos and Cambodia. In Vietnam the exact scope of work is still to be determined due to concerns that the request for project assistance (for an SRI standard) may be outside the scope of the</p>

	project given the complexities.
<b><i>ADB procurement</i></b>	<p>A critical, if not unique, experience of the TA7833 is the ability to use ADB procurement modalities in a manner that enables implementation of a pilot program. Many contracts for services are small, target local service providers and are as such unattractive to these firms due to the cost of competing compared to the potential benefits.</p> <p>The TA ToR indicated the use of innovative PPP modalities. Achieving these through a TA financing modality is remarkably difficult, time consuming and uncertain. Differing interpretation of rules and processes has resulted in repeat actions and time delays.</p>

## APPENDIX 1: DESIGN AND MONITORING FRAMEWORK (DMF)

Design Summary	Performance Targets & Indicators with Baselines	Data Sources & Reporting Mechanisms	Assumptions and Risks
<p><b>Impact</b></p> <p>Improved use of biomass in Cambodia, the Lao PDR, and Viet Nam</p>	<p>By 2020:</p> <p>5% increase in production of clean bioenergy from biomass (2011 baseline: 0.1%)</p> <p>5% increase in use of by-products of bioenergy systems (bio-slurry and biochar) (2011 baseline: 0%)</p>	<p>Project baseline and benchmark surveys</p> <p>Periodic surveys and annual reports of agriculture and energy ministries of Cambodia, the Lao PDR, and Viet Nam<sup>9</sup></p>	<p><b>Assumptions</b></p> <p>The governments of Cambodia, the Lao PDR, and Viet Nam remain committed to regional cooperation in clean bioenergy and food security.</p> <p><b>Risk</b></p> <p>Private sector investment is constrained by over-regulation.</p>
<p><b>Outcome</b></p> <p>Efficiently operating pilot projects in biomass use</p>	<p>By 2014:</p> <p>At least two investment modalities for biogas and bioslurry (Cambodia and the Lao PDR); three for biochar (Cambodia, the Lao PDR, and Viet Nam); two for improved cookstoves (the Lao PDR and Viet Nam); and three for inclusive supply chain of certified biofuel and organic crops in (Cambodia, the Lao PDR, and Viet Nam)</p>	<p>Project completion report</p> <p>Annual reports from agriculture ministries of Cambodia, the Lao PDR, and Viet Nam</p>	<p><b>Assumptions</b></p> <p>The central and provincial governments remain committed to working with the poor in remote areas.</p> <p><b>Risk</b></p> <p>Pilot projects are not successfully implemented.</p>
<p><b>Outputs</b></p> <p>1. <i>Enhanced regional cooperation in bioenergy development to foster and safeguard food security</i></p> <p>2. <i>Pilot-tested climate-friendly biomass investment projects for wider implementation</i></p>	<p>By 2014:</p> <p>Mechanism tested for harmonizing at least three bioenergy standards<sup>10</sup> and certification systems, and a common method of assessing greenhouse gases</p> <p>Construction of at least 500 bio-digesters, 600 biochar kilns, 75,000 improved cookstoves; and</p>	<p>Consultants' reports and document records of agriculture ministries of Cambodia, the Lao PDR, and Viet Nam</p> <p>Agricultural household survey reports of Cambodia, the Lao PDR, and Viet Nam</p> <p>Benefit and impact monitoring reports</p> <p>Project review missions</p>	<p><b>Assumptions</b></p> <p>The consulting team is given timely access to records, information, personnel, and relevant geographic sites.</p> <p>Local officials, technicians, and lead farmers are available to participate in training</p>

<sup>9</sup> a Ministry of Agriculture, Forestry and Fisheries (Cambodia); Ministry of Agriculture and Forestry (Lao PDR); and Ministry of Agriculture and Rural Development (Viet Nam)

<sup>10</sup> b Including standards set by such organizations as the Global Alliance on Clean Cookstoves and the Roundtable on Sustainable Biofuels, along with quality assurance from regional quality assurance centers to be established for biogas, improved cookstoves, bio-char, etc.

<p><i>3. Enhanced capacity for efficient use of biomass</i></p> <p><i>4. Development and dissemination of knowledge products</i></p>	<p>introduction of at least 300 farmers to sustainable certification standards</p> <p>Increased capacity for gender-sensitive investment among at least 500 government officials, 400 service providers, and 3,000 lead farmers (i.e., at least 55% of those to be trained will be women and at least 70% of those trained will have increased capacity)</p> <p>Methodology for assessing and prioritizing the use of biomass for bioenergy and food security</p> <p>Compendium of good practices in biomass use</p> <p>Booklets on different models of improved cookstove, biochar kiln, and biodigesters</p>		<p>Development partners and the private sector are keen to participate in the TA activities.</p> <p><b>Risks</b> Cambodia, the Lao PDR, and Viet Nam cannot agree on harmonized standards and certification systems</p>
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## APPENDIX 2: PROPOSED AMENDED DMF PERFORMANCE TARGETS

Design Summary	Performance Targets & Indicators	Proposed New Performance Targets & Indicators
<p><b>Impact</b></p> <p>Improved use of biomass in Cambodia, the Lao PDR, and Viet Nam</p>	<p>By 2020:</p> <p>5% increase in production of clean bioenergy from biomass (2011 baseline: 0.1%)</p> <p>5% increase in use of by-products of bioenergy systems (bio-slurry and biochar) (2011 baseline: 0%)</p>	
<p><b>Outcome</b></p> <p>Efficiently operating pilot projects in biomass use</p>	<p>By 2014:</p> <p>At least two investment modalities for biogas and bioslurry (Cambodia and Lao PDR); three for biochar (Cambodia, Lao PDR, and Viet Nam); two for improved cookstoves (the Lao PDR and Viet Nam); and three for inclusive supply chain of certified biofuel and organic crops in (Cambodia, Lao PDR, and Viet Nam)</p>	
<p><b>Outputs</b></p> <p><i>1. Enhanced regional cooperation in bioenergy development to foster and safeguard food security</i></p>	<p>By 2014:</p> <p>Mechanism tested for harmonizing at least three bioenergy standards and certification systems, and a common method of assessing greenhouse gases</p>	<p>By 2015:</p> <p>At least three standards and certification systems established that enable improved use of biomass in Cambodia, the Lao PDR, and Viet Nam, and which have the potential to foster future cross-border harmonisation</p>
<p><i>2. Pilot-tested climate-friendly biomass investment projects for wider implementation</i></p>	<p>Construction of at least 500 bio-digesters, 600 biochar kilns, 75,000 improved cookstoves; and introduction of at least 300 farmers to sustainable certification standards</p>	<p>At least 10 business models which promote the scale-up of climate-friendly biomass investments tested.</p>
<p><i>3. Enhanced capacity for efficient use of biomass</i></p>	<p>Increased capacity for gender-sensitive investment among at least 500 government officials, 400 service providers, and 3,000 lead farmers (i.e., at least 55% of those to be trained will be women and at least 70% of those trained will have increased capacity)</p>	
<p><i>4. Development and dissemination of knowledge products</i></p>	<p>Methodology for assessing and prioritizing the use of biomass for bioenergy and food security</p> <p>Compendium of good practices in biomass use</p> <p>Booklets on different models of improved cookstove, biochar kiln, and biodigesters</p>	

## APPENDIX 3: SUMMARY OF PROGRESS AGAINST THE DMF

DESIGN SUMMARY	PERFORMANCE TARGETS AND INDICATORS	PROGRESS TO DATE (DEC 2011 – MARCH 2014)
<b>IMPACT</b>		
Improved use of biomass in Cambodia, the Lao PDR, and Viet Nam	<p>By 2020:</p> <p>5% increase in production of clean bioenergy from biomass (2011 baseline: 0.1%)</p> <p>5% increase in use of by-products of bioenergy systems (bio-slurry and biochar) (2011 baseline: 0%)</p>	<p>Achievement of the impact (and measuring of performance) is outside the scope of the project. However, it is clear that the impact is still relevant and that the project outcome and outputs will contribute to the impact, particularly increase in the use of by-products of bioenergy systems (bio-slurry and biochar).</p>
<b>OUTCOME</b>		
Efficiently operating pilot projects in biomass use	<p>By 2014:</p> <p>At least two investment modalities for biogas and bioslurry (Cambodia and the Lao PDR); three for biochar (Cambodia, the Lao PDR, and Viet Nam); two for improved cookstoves (the Lao PDR and Viet Nam); and three for inclusive supply chain of certified biofuel and organic crops in (Cambodia, the Lao PDR, and Viet Nam)</p>	<p>The pilot projects will be assessed and used as a basis for preparing proposals for future investment modalities (to be funded through a future ADB loan or other potential investors). Early discussions with the government and ADB however resulted in the project dropping research into investment modalities for certified biofuel. Pilots, for which investment modalities will be prepared, cover the following:</p> <ul style="list-style-type: none"> <li>• Biogas and bioslurry (OVI – two in Cambodia and Lao PDR; Pilot Projects – two in Laos PDR and Vietnam)</li> <li>• Biochar (OVI – three in Cambodia, Lao PDR, and Viet Nam; Pilot Projects - three in Cambodia, Lao PDR, and Viet Nam)</li> <li>• Improved cookstoves (OVI – two in Lao PDR and Vietnam; Pilot Projects – three in Laos, Cambodia and Vietnam)</li> <li>• Organic crops (OVI – three in Cambodia, Lao PDR, and Viet Nam; Pilot Projects – four in Cambodia, Laos PDR and Vietnam)</li> </ul>
<b>OUTPUTS &amp; ACTIVITIES</b>		
<b>OUTPUT 1: ENHANCED REGIONAL COOPERATION IN BIOENERGY DEVELOPMENT TO FOSTER AND SAFEGUARD FOOD SECURITY</b>	<p>Mechanism tested for harmonizing at least three bioenergy standards<sup>11</sup> and certification systems, and a common method of assessing greenhouse gases</p>	<p>The following priorities have been identified on a demand-led basis:</p> <ul style="list-style-type: none"> <li>• Cambodia – standards for organic rice and biodigesters;</li> </ul>

<sup>11</sup> Including standards set by such organizations as the Global Alliance on Clean Cookstoves and the Roundtable on Sustainable Biofuels, along with quality assurance from regional quality assurance centers to be established for biogas, improved cookstoves, bio-char, etc.

DESIGN SUMMARY	PERFORMANCE TARGETS AND INDICATORS	PROGRESS TO DATE (DEC 2011 – MARCH 2014)
		<ul style="list-style-type: none"> <li>• Laos PDR – standards for organic rice and biofertilizer;</li> <li>• Viet Nam – standards for climate friendly rice and/or biofertilizers.</li> </ul> <p>To date a draft standard for organic rice in Cambodia has been developed; while a draft standard for organic rice in Laos is in development (using the Cambodia one as a template) and a draft standard for biodigesters in Cambodia.</p>
1.0 Holding of regional forums to facilitate high-level dialogue within the region on bioenergy and food-security policy issues		<p>1st GMS Forum for was successfully accomplished in Nanning in July 2012 and reported in the IR and the ‘<i>Report on Proceedings</i>’</p> <p>TORs prepared and agreed for policy working groups (WGs) to prepare policy road maps for standards, certification and labeling for biomass related technologies and climate friendly agriculture based on the national forums completed during this progress period – see 1.1.</p> <p>WGs formed. First 2 (of 3) WG meetings held in Laos and Cambodia. See 1.1.</p> <p>Vietnam WG on hold pending discussions on what can be achieved in the scope of the project.</p>
1.1 Testing of mechanisms to facilitate adoption of common set of sustainable indicators, bioenergy and trade standards, certification systems an eco-labeling		<p>Harmonization Roadmap devised and agreed at 1st GMS Forum as initial mechanism for facilitating dialogue and ultimate adoption of common standards. See p12 of ‘<i>Report on Proceedings</i>’</p> <p>3 National policy forums (May 2013) - one in each country, which involved a more intensive mechanism for national-level dialogue for wider harmonization. The forums provided a venue for policymakers and public officials to discuss policies and opportunities relevant to their country, and engage with other stakeholders and experts. The forums provided a process for developing policy strategies that will be presented at the 2<sup>nd</sup></p>



DESIGN SUMMARY	PERFORMANCE TARGETS AND INDICATORS	PROGRESS TO DATE (DEC 2011 – MARCH 2014)
		<p>regional forum.</p> <p>Reports on the 3 national policy forums submitted</p> <p>Report on 'Introduction to Standards, Certification and Labelling Systems for Sustainability' finalized (Oct 2013)</p> <p>Priority areas identified in Laos and Cambodia and roadmaps under development.</p> <p>Draft organic rice standard prepared in Cambodia and shared with Laos PDR</p>
<p>1.2 Holding of annual international workshop on household bioenergy and food security to foster exchange of information, particularly between more advanced Greater Mekong Subregion countries and Cambodia, the Lao PDR, and Viet Nam</p>		<p>Regional Conference held in Hanoi in Dec 2013. Included training on FAO-BEFS</p>
<p><b>OUTPUT 2: PILOT TESTED CLIMATE FRIENDLY BIOMASS INVESTMENT PROJECTS FOR WIDER IMPLEMENTATION</b></p>	<p>Construction of at least 500 bio-digesters, 600 biochar kilns, 75,000 improved cookstoves; and introduction of at least 300 farmers to sustainable certification standards</p>	<p>In view of the current scope of the output, while climate-friendly biomass investment projects will be pilot-tested for wider implementation, the OVIs will not be achieved as stated. This is because the project is testing business models for future scale-up, not to construct a specific number of bio-digesters, biochar kilns, or improved cookstoves, or to test these particular technologies. Thus we recommend a change to the performance targets as stated above.</p>
<p>2.0 Conduct biomass assessment and development of criteria for selection of pilot project areas by 2012</p>		<p>Regional biomass resource assessment submitted. Options for integrating this within a multi-criteria decision support tool linked to life cycle analysis have been developed and are being reviewed. It is proposed to use these as an integral part of the compendium on biomass under Output 4</p> <p>Feasibility studies completed and pilots selected.</p>
<p>2.1 Implementation of pilot projects in lower cost biogas technologies as</p>		<ul style="list-style-type: none"> <li>- Priority topics by country agreed</li> <li>- Terms of reference for feasibility studies prepared</li> </ul>

DESIGN SUMMARY	PERFORMANCE TARGETS AND INDICATORS	PROGRESS TO DATE (DEC 2011 – MARCH 2014)
investment options involving use bioslurry for high vale crop production		<p>and approved by ADB and IAs.</p> <ul style="list-style-type: none"> <li>- Expression of interest for feasibility studies in Viet Nam and Cambodia received, evaluated and contracted. Laos PDR had no national EOI despite a second round of advertisement although an EOI was received from a Viet Nameese contractor for Bioslurry and Biochar work but was not approved by government. Rapid appraisal of options undertaken in Laos by the TA team</li> <li>- All FS completed (3 in Cambodia and 3 in Vietnam)</li> <li>- Value chain business models for potential upscaling case studies identified and business model report finalized and submitted</li> <li>- Procurement for pilots using a shopping and RFP modality approved by ADB</li> <li>- TORs approved for proposed pilots</li> <li>- All pilot projects contracted and underway</li> <li>- Baseline data being collected</li> </ul>
2.2 Conduct of reviews to identify appropriate biochar, ICS and biofuel investment modalities by 2012 and implementation of pilot project by 2014		<p>Summary reviews of ICS, Biochar and carbon emissions, the private sector, financing modalities, and the institutional frameworks in CLV completed.</p> <p>Technology commercialization status assessment based on NASA's Technology Readiness Levels (TRL) completed and included in inception report – highlighting the immature nature of biochar and bioslurry technologies for widespread up-scaling.</p> <p>Biofuel technology has been dropped based on TA team findings and CLV Government skepticism.</p> <p>ICS review finalised</p> <p>Biochar Technologies review finalised</p> <p>Financing modalities for biomass technology report finalised</p> <p>Biochar testing undertaken</p>

DESIGN SUMMARY	PERFORMANCE TARGETS AND INDICATORS	PROGRESS TO DATE (DEC 2011 – MARCH 2014)
		<p>Training in Cambodia for participants from CLV on how to develop knowledge and consensus on procedures and ingredients for specifying 4-5 biofertilizer products in terms of their ingredient mixes and formulations to be used in the pilot farm demonstration programs (see also 3.2)</p> <p>Further dialogue on the design of rice straw kilns for turning surplus straw to biochar in the field immediately after harvesting has proposed alternate designs for inclusion in pilot program</p>
<p><b>OUTPUT 3: ENHANCED CAPACITY FOR EFFICIENT USE OF BIOMASS</b> Increased capacity for gender-sensitive investment among at least 500 government officials, 400 service providers, and 3,000 lead farmers (i.e., at least 55% of those to be trained will be women and at least 70% of those trained will have increased capacity)</p>		<p>See below. Approximately 168 government officials have been trained to date (approx. 30% women) (more if those receiving bio-briefs are counted). This will increase substantially with the start-up of the distance learning program. Gender-specific training is due to start in April/May 2014. Training of farmers and service providers is now starting under the pilots.</p>
<p>3.0 Development of gender- sensitive training programs including distant learning activities, use of these for training local and central govt officials, farmers organization and womens groups (30% women by 2013)</p>	-	<ul style="list-style-type: none"> <li>- Awareness-raising activities were initiated through inception workshops (Cambodia and Lao PDR) and a stakeholder meeting in Viet Nam in February 2012. Participation at these events totaled 121 government and non-government stakeholders (32% women) from across the GMS.</li> <li>- In September 2012, TA7833 provided support for attendance of the TFP-Biochar from CLV (total 3 participants; 0% women) at the International Biochar Initiative (IBI) Congress in Beijing, China.</li> <li>- From 04-07 March 2013, TA7833 hosted the <i>Regional Workshop &amp; Study Tour on Efficient Utilization of Biomass for Biochar Production &amp; Application Biochar</i> in Siem Reap, Cambodia. The event was attended by 33 government and non-government CLV stakeholders (19% women). See <i>Report on Proceedings</i>.</li> <li>- Each pilot includes a capacity building program that</li> </ul>

DESIGN SUMMARY	PERFORMANCE TARGETS AND INDICATORS	PROGRESS TO DATE (DEC 2011 – MARCH 2014)
		<p>will be developed and delivered during the pilot implementation</p> <ul style="list-style-type: none"> <li>- 5 biobriefs disseminated (based on knowledge products (KPs) – see output 4</li> <li>- Distance-learning proposal finalized</li> <li>- Video proposal finalized</li> </ul>
3.1 Conduct training in the implementation of the investment project by 2014		None
3.2 Conduct of training in the use of biomass to enhance food security and soil carbon sequestration by 2014		<p>Biochar/ICS study-tour and training – see 3.0 above</p> <p>Study-tour and training on biochar in PRC (Oct 13)</p> <p>Training in Cambodia for participants from CLV (11) on how to develop knowledge and consensus on procedures and ingredients for specifying 4-5 biofertilizer products in terms of their ingredient mixes and formulations to be used in the pilot farm demonstration programs.</p> <p>Field trip organized for NDF and ADB in Cambodia</p> <p>Proposal developed for specific gender-based training in Cambodia linking biochar to home garden systems</p>
<p><b>OUTPUT 4: DEVELOPMENT AND DISSEMINATION OF KNOWLEDGE PRODUCTS</b></p> <p>Methodology for assessing and prioritizing the use of biomass for bioenergy and food security</p> <p>Compendium of good practices in biomass use</p> <p>Booklets on different models of improved cookstove, biochar kiln, and biodigesters</p>		<p>See details below. The TA is producing a range of knowledge based products some of which are technical reports, others are feasibility studies. A complete list of outputs to date can be accessed at:</p> <p><a href="https://drive.google.com/folderview?id=0B1wKP1C0cX-jdUhvMDNvcMeyZHc&amp;usp=sharing">https://drive.google.com/folderview?id=0B1wKP1C0cX-jdUhvMDNvcMeyZHc&amp;usp=sharing</a></p>
4.0 Development of methodology for assessing and prioritizing the use of biomass for energy and food security by		Existing resource assessments for CLV have been compiled. international assessment methods identified and a proposed assessment framework is being

DESIGN SUMMARY	PERFORMANCE TARGETS AND INDICATORS	PROGRESS TO DATE (DEC 2011 – MARCH 2014)
2012 and dissemination of the methodology through regional forums, training, and capacity building by 2014		reviewed  Draft high level assessment completed and submitted
4.1 Establishment of baseline information and monitoring and evaluation system for pilot projects by 2012		Baseline requirements specified in the pilot feasibility study ToR  Baseline and on-going monitoring requirements specified in pilot project TORs  Baseline data being collected
4.2 Conduct key studies such as life cycle assessments, least cost options, and eco-labeling by 2013		Options have been outlined for using the pilot projects as case studies for lifecycle and least cost assessments and how these could be combined with the biomass assessment framework within a multi-criterion decision framework.
4.3 Publication of compendium of good practices in biomass use and booklets containing information on different models of ICS biochar kilns and bio-digesters by 2014		A number of Knowledge Products produced: <ul style="list-style-type: none"> <li>- Standards and Certification – submitted (See output 1)</li> <li>- Climate Change, Food Security &amp; Bioenergy – submitted</li> <li>- Biochar and Climate-Friendly Soil Amendments – draft submitted for review</li> <li>- Biogas / Bioslurry - draft submitted for review</li> <li>- Improved Cookstoves KP – partly drafted</li> </ul>
4.4 Analysis of potential climate change scenarios and their likely impact on the availability of different type of biomass and assessment of need for the development of alternative biomass sources by 2013		None

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## APPENDIX 4: DESCRIPTION OF PILOT PROJECTS

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### 1. CAMBODIA

#### 1.1 PP#1: Improved Cook Stove Up-scaling

The pilot will seek to increase ICS uptake and supply in two districts: S'Ang district in Kandal province and Sandan district in Kompong Thom province. The pilot will support existing ICS stove producers located close to the pilot sites to increase production through the use of a revolving grant. The pilot will work with 4 existing ICS producers to produce the stoves for the pilot project. Stoves to be distributed in each pilot location will be supplied by 2 ICS producers that are located near the pilot places and each will receive a revolving grant to expand their production of up to \$5,000 per ICS producer. The grant will be revolved back to the ICS producer association to ensure production capacity is improved and it is available only if stove Quality Control systems of the stove producers association are applied – this would again be an output based payment but advancement is 50% up front and 50% based on increased production level.

The Pilot will also promote ICS use through increased awareness and education through demonstration of new ICS by the local women's union or other women's group. The women's group will form direct agreement with the stove producers and are expected to build demand for ICS and also provide additional competition within the supply chain to ensure lower prices to consumers. The unions will receive a grant to purchase their initial sales stock on which they will also receive commission. The combination of grant and commission will enable subsequent orders and continued activities.

The women saving group or female group of forest community members are both potential partners and will require training and education on ICS – with demonstration. It is proposed that the group receive commission as an output based incentive for each ICS sale amounting 7% – 10 % of retail price – effectively lowering local retail prices and adding competitive forces with existing resellers. To help for their investment, the group will receive advance cash flow of \$5,000 per each to order ICS stoves. Through purchase direct of producers the groups will also make their commission on each stove.

Another distribution channel is the existing retailers in each pilot location. They can be found in village market or commune or district downtown. They use their own capital to order stoves and sell them for their income. They will receive benefit from the pilot project on support on the awareness and education in the market place on ICS advantages. The Womens group could choose to work through local retailers.

Two distribution models in each location will be arranged using (i) women's group and (ii) existing retailers. The performance from these two groups will be compared as part of the pilot monitoring.

Outputs will be as follows:

- Output 1: Reliable ICS supply Chain Established – Output Indicators: ICS producer contracts and ICS availability in pilot districts
- Output 2: Increased Uptake of ICS in two districts – Output indicators: Two women's Groups contracted to ICS suppliers, a minimum of 500 ICS stoves purchased in each district with at least 70% of all capacity building and awareness raising participants are female
- Output 3: Pilot Assessment and Reporting - Output Indicator – Monthly reports, Project completion report

## 1.2 PP#2: Farm Demonstration of Biofertilizers for Upscaling Investment

The pilot seeks to demonstrate the range of products formulated under the pilot: Biochar/bioslurry/other biomass/ and inorganic materials (clays, etc.) - value added product development and testing. The products formulated and produced will be demonstrated in farmer demonstration plots that have agronomic support in their design monitoring and measurement. Further the pilot will work closely with the Department of Agricultural Engineering (DAE) of General Directorate of Agriculture (GDA) of MAFF to introduce, train and monitor the production of biochar using mobile low cost TLUD kilns. The biochar produced will then be mixed with manure or NPK for application to vegetables or rice within the Farm Demo plots.

The outputs will be:

- A detailed design of farm demonstration programs within 1 month of contracting that completes all pilot activities within 10 months and is approved by TA 7833 for Inception milestone.
- Identify farmer groups and communes in Takeo for trialling of 10 pyrolysis drum kilns for biochar production from a range of available agri-residues, with supporting composting infrastructure for the incorporation of bioslurry with 10 farm demo plots established
- Ingredient supply chains confirmed within 10 weeks of contracting with supporting germination tests
- Farm Demonstration plots identified within 12 weeks of contracting
- Farm demonstration plot used for (i) collecting data on the impact of the differing products and existing farm practice (control plots) – including physical input – output levels, financial data for inputs and outputs, gender disaggregated labor inputs, and soil nutrient level changes
- Monitoring and Evaluation systems established and included in the work plan

## 1.3 PP#3: Production and Testing of Biofertilizers

The pilot seeks to supply finance as a product development grant to create added value to compost based products through the inclusion of rice husk biochar, manures, bioslurry and possible NPK to reduce environmental pollution and increase the value of compost derived fertilizer products.

The scope of the project is limited to biochar and bioslurry related fertilizer and soil amendment products and their testing in Battambang and Kampong Chhnang provinces. Compost and bioslurry products will be sourced from COMPED and NBP, respectively, and rice husk char from rice mill stockpiles. The fertilizer products will be demonstrated in vegetable and rice production field trials and will include an agreed set of product formulations based on crop nutrient demands and international experience in biochar, bioslurry and product pelletising.

The outputs will be:

- A detailed design of product formulations and field tests within 1 month of contracting that completes all pilot activities within 10 months.
- Compost supply chains agreed within 6 weeks of contracting
- Establish an agreement for accessing pelleting machine at Green Mountain Ltd formed with NPI (TA7833) within 4 weeks of contracting
- Formulations produced and germination tests completed within 12 weeks of contracting
- Conduct trial production runs for pelletized and non-pelletized products and evaluate product quality – adjust formulation as required to meet nutrient targets
- Establish, manage and monitor a Product Field Trial site (using 4 replicates of 4 or more treatments in a block design) identified within 12 weeks of contracting
- Monitoring and Evaluation systems established and included in the work plan

## **2. VIETNAM**

### **2.1 PP#1: Improved Cook Stove Use**

The pilot seeks to test a business model for increasing the use of ICS in two districts through supporting marketing and promotion of selected stoves and by developing a local sales network using existing farmer and women's unions as commissioned sales agents effectively extending the ICS supply chain into the two districts. For the business model to replicate an upscaling program the pilot would be managed and implemented through a single service provider that is to be contracted by TA7833.

The pilot investment will achieve the following outcome: A business model tested for future upscaling of ICS using market based incentives. The outcome will be supported by the following pilot outputs:

- Output 1: Market based stove supply chain from producers to consumers established using local farmer and women unions
- Output 2: Stove producers operating a sustainable business
- Output 3: Number of households using ICS increased by 15% per commune by Pilot completion

### **2.2 PP#2: Bioslurry Management**

The pilot will demonstrate means of using bioslurry that are environmentally sound. The bio-slurry, when treated as an additional nutrient input to compost and properly managed, can be transformed into a valuable fertilizer – either liquid or solid - instead of a potentially hazardous pollutant. The large volume of liquid bioslurry and solid bioslurry (scum) that is currently discharged to the environment will be the feedstock of the Pilot. This practice not only saves organic resources but contributes to the environmental improvement through the improvement of soil, ground water and air.

The expense of the household for inorganic fertilizer and organic compost accounts for 60 percent of investment for crop establishment. The pilot aims to reduce this expense to 40 percent by replacing inorganic fertilizer with bioslurry integrated with composted biomass.

For the pilot it is expected that awareness improvement for environment, community is strengthened. Through capacity building and training stakeholders will be provided information and knowledge on biogas technology, its benefits and impacts as well as knowledge on composting and properly fertilizer utilization.

The implementation of pilot fits the current Vietnamese Good Agricultural Practices (VietGAP) program. According to VietGAP, soil should be managed, e.g. soil is analyzed to control and evaluate the quality and potential risks. Fertilizers and organic fertilizers that are used for crops should be documented in order to avoid contamination on agricultural products. Organic fertilizer has to be treated and managed to ensure the quality of the fertilizer.

The pilot impact will be reduced agricultural pollution and investment while increased revenue of households, knowledge on cultivation, biogas technology and composting process; improved the community relation; be a good example for duplication.

The outcome of the pilot will be an assessment of the model for the use of bioslurry for up-scaling.

The outputs will be:

- Knowledge products on biogas technology, bioslurry and composting bioslurry fertilizer
- Production and use of bioslurry-enhanced compost;
- Demonstration of compost-bioslurry on vegetable crops;



- Capacity building and training for enhanced knowledge and technology development and transfer systems

### **2.3 PP#3: Demonstration of Biofertiliser and Biochar Soil Amendments**

The pilot seeks to test if biochar biofertilizer product development is able to create viable fertilizer products to substitute (in full or at least in part) for inorganic fertilizer and to support a future supply chain that is able to reduce environmental pollution and increase the value of biofertilizer products, including NPK – biochar fertilizer pellets where c. 25% of the NPK is replaced, with the aim of yields remaining the same and even increasing.

The scope of the project is limited to Hanoi and An Giang Provinces.

The pilot will:

- Implement at 2 communes, one in each province – a static biochar production kiln from rice straw to assess viability
- In Hanoi implement a biochar, biofertiliser and pelleting demonstration program
- In each Province implement a farmer group TLUD biochar production capability

Outputs include:

- A final work plan agreed within 1 month of contracting that completes all pilot activities within 10 months.
- Modify existing TLUD kilns
- Fabricate a replicate rice straw kiln
- Produce sufficient biochar to demonstrate production technology and to produce sufficient biochar for the demonstrations and trial areas plus for training and capacity building purposes
- Incorporate biochar filters into 10 biogas plants in Dong An District Hanoi and conduct NPK testing to ascertain the effectiveness of the filters to extract NPK from bioslurry
- Provide agronomic input to defining biochar related products for inclusion in the demonstrations
- Ingredient supply chains confirmed within 10 weeks of contracting
- Formulations defined, produced and tested within 12 weeks of contracting
- Establish, manage and monitor a Product Field Trial site (using 2 replicates of selected treatments in a block design) identified within 10 weeks of contracting
- Farm Demonstration plots identified within 12 weeks of contracting
- Monitoring and Evaluation systems established and included in the work plan

## **3. LAOS PDR**

### **3.1 PP#1: Cluster Biomass Technology and Biofertilisers**

The pilot will support 2 outputs including: (i) to increase the number of households using ICS stoves within the two clusters of 6 villages by offering an output based incentive to the Lao Women's Union, and (ii) the production of enhanced soil fertilizers and soil amendments from rice husk, bioslurry and compost formulations and their demonstration through farm demonstrations in two development clusters.

The ICS program will be offered in both clusters within the 3 villages within each cluster and within the cluster development centers. The purpose of the pilot is to test the use of a supply chain output based incentive program to stimulate the adoption of improved ICS. In doing so, the pilot does not seek to create technology; it seeks to increase the use of best available technologies currently available.

The pilot will conduct testing of selected ICS stoves, train and resource village women's unions to conduct awareness, demonstration and education programs that lead to sale of approved ICS products, and oversee feedback and evaluation by the user. The village level Women's Unions will be linked to stove producers who will be eligible for a production support grant.

Outputs will include:

- 4 ICS stoves tested within 6 weeks of contracting
- Women union engagement confirmed within 5 weeks of contracting
- Output incentive payment agreed with each women's union within 5 weeks of contracting
- Awareness and Education Program developed within 8 weeks of contracting
- Undertake Women's Union training and evaluate effectiveness within 10 weeks of contracting
- Complete a stove producer business planning program for the producers with supply agreements to the Women's Unions within 12 weeks
- Define the Inventory stocking requirements for each Union
- Village demonstration programs starting from week 12 after contracting
- Monitoring and reporting confirming that 40% of households have adopted ICS within 10 months.
- A final work plan agreed within 1 month of contracting
- Enterprise participation agreement completed within 6 weeks of contracting:
- Biochar kilns procured within 5 weeks of contracting and rice husk produced within 8 weeks of contracting
- Compost and dung supply chains formed within 6 weeks of contracting
- New composite digester procured, installed and user training, slurry tested for nutrient content within 8 week of contracting
- Pelletisers procured and training provided within 10 weeks of contracting
- Formulations defined, produced and tested within 12 weeks of contracting
- Demonstration sites identified within 10 weeks of contracting
- Farm Demonstration plots identified within 12 weeks of contracting
- Monitoring and Evaluation systems established and included in the work plan

**Table 11: Pilot Project Milestone Payment Status**

Contract	Contractor	Start / End Date	Schedule of Payments	Amount (US\$)	% of Contract	Output approved	Amt paid
<b>CAMBODIA</b>							
PP#1: Improved Cook Stove Up-scaling	<b>Mekong TT</b> - Mr. PROM NGA [ngaprom@mekongthinktank.com]; +855 12 345 222	17.2.2014 / 30.11.2014	Contract signing	8,175	15%	Y	8,175
			Approval of work plan (5 weeks after contracting) Including disbursement of \$28,000 revolving fund to ICS producers and women groups for ICS sale incentives (After contract signed with ICS producers and women group)	16,350	30%		
			Approval of Mid-Term Report – by end of Month 3 Output 1: Contracts with suppliers and capacity strengthening revolving grants awarded Stove producer linkages to Womens unions established Output 2: Womens Unions letter of agreement completed Capacity strengthening and awareness raising undertaken	13,625	25%		
			Submission of Draft Final Report including training summary and pilot evaluation report	10,900	20%		
			Approval of Final Report	5,450	10%		
				<b>54,500</b>			<b>8,175</b>
PP#2: Farm Demonstration of Biofertilizers for Upscaling Investment	<b>CelAgrid</b> - Mr. KHIEU BORIN [khieu_borin@celagrid.org; +85512828942; +85523223640].	07.02.2014 / 30.12.2014	Contract signing	10,754	15%	Y	10,754
			Approval of work plan (5 weeks after contracting)	17,924	25%		
			(i) Approval of Mid-Term Report (ii) TULD Kilns operating (iii) Farm Demonstrations established and Training program tested and being implemented (iv) Farm demo monitoring framework agreed and operating	17,924	25%		
			Submission of Draft Final Report including product testing findings, and training evaluation report	14,339	20%		
			Approval of Final Report	10,755	15%		
				<b>71,696</b>			<b>10,754</b>
PP#3: Production and Testing of Biofertilizers	<b>Mekong Carbon</b> - Mr. Sar Samnang [sarsamnang7@gmail.com; +85512481169].	06.02.2014 / 30.11.2104	Contract signing	10,338	15%	Y	10,338
			Approval of work plan (5 weeks after contracting)	17,230	25%		
			Approval of Mid-Term Report – App product formulations and supporting lab tests	17,230	25%		

			Submission of Draft Final Report including product testing findings, and training evaluation report	13,784	20%		
			Approval of Final Report	10,339	15%		
				<b>68,921</b>			<b>10,338</b>
<b>VIET NAM</b>							
PP#1: Improved Cook Stove Use	<b>EPRO Consulting JSC (EPRO)</b> and Centre for Social Initiatives Promotion (CSIP) Ms. Tang Thi Hong Loan Email: loan.tth@eprovn.com Tel: +84913211299	15.12.2013 / 15.10.2014	Contract signing	9,977	15%	Y	9,070
			Approval of work plan	23,280	35%	Y	24,187
			Approval of Mid-Term Report (Mth 6)	19,954	30%		
			Submission of Draft Final Report	6,652	10%		
			Approval of Final Report	6,652	10%		
				<b>66,515</b>			<b>33,257</b>
PP#2: Bioslurry Management	Associate of Center for Agricultural and Ecological Studies (“ <b>CARES</b> ”) and Sustainable Energy Development Consultancy Joint Stock Company (“ <b>SEDCC</b> ”) Ms. Nguyen Thi Bich Yen Email: ntbyen@hua.edu.vn; Tel: 84-438768046	28.2.2014 / 30.10.2014	Contract signing	11,407	15%	Y	11,407
			Approval of work plan (5 weeks after contracting)	22,814	30%		
			Approval of Mid-Term Report – and delivery of knowledge product, production of bioslurry compost products and the design of crop demonstration program	19,011	25%		
			Submission of Draft Final Report including crop demonstration findings, and training evaluation report	11,407	15%		
			Approval of Final Report	11,407	15%		
				<b>76,046</b>			<b>11,407</b>
PP#3: Demonstration of Biofertiliser and Biochar Soil Amendments	Centre for Technology Development and Environmental Protection ( <b>COTDEP</b> ) Dr. Nguyen Dinh Manh, Vice Director and Dr Nguyen Cong Vinh Vinhfri@gmail.com	1.3.2014 / 30.12.2014	Contract signing	12,898	15%	Y	12,898
			Approval of work plan (5 weeks after contracting)	21,496	25%		
			Approval of Mid-Term Report – App product formulations and supporting lab tests	25,795	30%		
			Submission of Draft Final Report including product testing findings, and training evaluation report	17,197	20%		
			Approval of Final Report	8,599	10%		
				<b>85,985</b>			<b>12,898</b>
<b>LAO PDR</b>							
#PP1: Cluster Biomass Technology and Biofertilisers	<b>National Consulting Group (NCG)</b> Mr. Videth Visounnarath General Director National Consulting Group	10.02.2014 / 31.03.2015	Contract signing	34,855	15%	Y	34,855
			Approval of work plan (5 weeks after contracting)	69,709	30%	Y	69,709
			Approval of Mid-Term Report – App product formulations and supporting lab tests	46,473	20%		

	(visounnarath@yahoo.com)		Submission of Draft Final Report including product testing findings, and training evaluation report	58,091	25%		
			Approval of Final Report	23,237	10%		
				<b>232,365</b>			<b>104,564</b>
<b>Total</b>				<b>656,028</b>			<b>191,393</b>
<b>%</b>							<b>29%</b>