



METHANE TO MARKETS PARTNERSHIP

AGRICULTURE SUBCOMMITTEE ACTION PLAN

Introduction

The Methane to Markets (M2M) Partnership is an international initiative that aims to reduce global methane emissions in order to enhance economic growth, strengthen energy security, improve air quality, improve industrial safety, and reduce emissions of greenhouse gases. In the agricultural sector, methane recovery and use as a clean energy source can be a highly sustainable solution, contributing to a number of environmental objectives as well as providing social and economic benefits for rural communities.

The Terms of Reference for the Partnership broadly define the role of the subcommittees as being “responsible for guidance and assessment of area specific activities and engaging representatives of the private sector, development banks, researchers and other relevant governmental and non-governmental organisations”. The Subcommittees are charged with developing an action plan for these activities which should include:

- Overview of methane recovery and use opportunities and descriptions of available technologies and best practices
- Identification of key barriers and issues for project development
- Identification of possible cooperative activities to increase methane recovery and use in the sector
- Discussion of country-specific needs, opportunities and barriers; and
- Outreach to engage Project Network members

The Agriculture Subcommittee recognises that, under the Partnership, priority is given to activities that have the greatest chance to achieve emissions reductions in the near term. However, a number of important barriers to project development need to be addressed that are associated indirectly or in the longer-term with emissions reductions.

Origins of the Agriculture Subcommittee and Action Plan

At the Ministerial inaugural meeting of the Partnership in Washington in November 2004, the Steering Committee created the Task Force on Agriculture and directed them to consider the extent to which the Partnership should address methane recovery and use opportunities in the agriculture sector. At the second meeting of the Partnership in Buenos Aires in November 2005, the Task Force presented their conclusions which stated that agriculture was a significant source of methane emissions and there were particular opportunities for capturing

and utilising methane from manure waste management. The Steering Committee accepted the Task Force recommendation to establish a new subcommittee on Agriculture.

The work conducted by the Task Force provided useful background information for the work of the subcommittee and the development of this Action Plan. Two meetings were held by teleconference and members agreed to develop country profiles to compile information on agricultural emissions and identify emission reduction opportunities. This was followed by a final meeting of the Task Force where the group held a workshop including presentations of country profiles, technical presentations and case studies.

This Action Plan sets out the broad framework of activities for the Agriculture Subcommittee. [Annex 1](#) provides a more detailed summary of ongoing and planned activities. [Annex 2](#) provides detailed information on activities in member countries. The Action Plan is intended to be a living document that will be updated on an ongoing basis to reflect new projects and priorities as the work of the subcommittee develops. Following its creation in November 2005, the subcommittee has held two meetings in conjunction with international expert workshops, in the UK (Sheepdrove Farm, December 2006) and Argentina (Buenos Aires, May 2007). A further subcommittee meeting is planned for 1st December 2007 in conjunction with the Partnership Expo and Forum in Beijing, after which the Action Plan is likely to undergo further revision.

For the Expo, each Subcommittee has been asked to make specific inputs, for example on identifying projects, developing guidance on project submissions, and suggesting thematic tracks for the sector, which has led to the design of a one and a half day Agriculture Sector workshop..

Overview of methane recovery and use opportunities and descriptions of available technologies and best practices

The primary sources of methane emissions from agriculture are livestock enteric fermentation, livestock waste management, rice cultivation, and agricultural waste burning.

Of these, livestock waste management offers the most viable, short-term opportunities for methane recovery and utilisation. Opportunities in this area can be realised with currently available technologies, and offer additional benefits in terms of improved environmental quality.

Livestock manure accounts for roughly four percent of global anthropogenic (human-related) methane emissions¹. While current estimates indicate that developed countries account for the largest percentage of total methane emissions from livestock manures, emissions from developing countries are substantial, and their share of emissions is expected to rise. Global trends towards more concentrated and commercialised livestock operations will provide increasing opportunities for methane recovery and utilisation from livestock waste management.

¹ Scheehle, E. A. and Kruger, D. (2004). Global anthropogenic methane and nitrous oxide emissions. *Energy Journal* (forthcoming).

Methane released from liquid manure management systems can be captured and used as a clean energy source both for heat and power, and as a transport fuel. This can either be sold or used to produce electricity, either for sale or to meet a portion of the farm's energy requirements. A number of techniques for recovery exist, but the most promising seems to be anaerobic digestion.

In addition to reducing methane emissions to the atmosphere, this technology enables the recovered methane from livestock manure to be used to generate electricity heat or combined heat and power for sale or for use on-site. It can also be upgraded to biomethane and used as a transport fuel or injected into the gas grid. The remaining digestate can be utilised as livestock feed, an aquaculture supplement, or fertiliser. In addition it can help to reduce environmental and health risks, such as ground and surface water contamination or eutrophication from manure runoff, and the spread of pathogens and diseases. Finally, anaerobic decomposition virtually eliminates odours from livestock manure.

The initial phase of work of the Agriculture Subcommittee has therefore been focused on promoting the acceleration of economically viable anaerobic digestion of animal wastes. However, in the longer-term, opportunities exist to further reduce methane emissions from other agriculture-related sources, such as abattoir and food processing waste, and by addressing enteric fermentation in ruminants.

Identification of key barriers and issues for project development

A number of key issues and barriers to development of anaerobic digestion technologies have been identified by the Subcommittee, which can be categorised into the following six categories:

- Awareness,
- Financial and Economic,
- National capacity,
- Policy,
- Project Identification and Development
- Technology

The barriers in each of these categories are listed in Table 1; the proposed actions for each category are listed in Annex 1.

Recent Activities

The international Expo in October 2007 has been the major focus of the work of the subcommittee in recent months. The Expo will provide an opportunity to bring together the key players for discussion and information sharing, and act as a showcase for projects and examples of best practice from around the world.

Ways of Working

The Agriculture Subcommittee is committed to working in as collaborative a fashion as possible in taking forward the activities in this Action Plan to develop and disseminate

information about opportunities for methane reduction from agriculture. The subcommittee will continue to address key barriers to project development, primarily technology, policy, finance and awareness raising/outreach. The Subcommittee will conduct these activities in a way that promotes cooperation among the Partner nations, the private sector Project Network members, and relevant international organisations, including the World Bank, FAO, UNFCCC, and REEEP. The Subcommittee will continue to work to understand the needs and priorities of individual countries within the Partnership. The Agriculture subcommittee will also seek to learn from the experience of other subcommittees and work with them to identify cross-cutting themes and to maximise synergies between the agriculture sector’s work and other sector’s work where appropriate.

Table 1: Categories of Barriers to Anaerobic Digestion Development

Category	Barriers
Awareness	i) Other sectors lack of knowledge and/or involvement in the discussions of agricultural methane is a barrier to the development of a market for AD.
Financial and Economic	i) Upfront capital costs ii) Ability to capture economic co-benefits iii) Markets for energy and co-products, and consideration of wider environmental issues around AD (particularly digestate)
National capacity	i) Proprietary nature of some AD technology ii) General lack of collaboration and technology transfer between countries. iii) Regional nature of AD projects, funding, and technology design
Policy	i) Structure of incentives to farmers to take up methane recovery systems ii) Regulatory issues related to distributed generation iii) Accounting systems
Project Identification and Development	i) A key challenge is identifying project sites that are good candidates for development and working with the owners, investors, and other stakeholders to move them through the project development process.
Technology	i) Problems with the technology itself e.g. equipment availability, national expertise, readiness, reliability, design and ability to replicate, standardisation, scale ii) Cost of the technology iii) Appropriateness of research to support technology development: input to R&D and future research priority setting, e.g. knowledge of new technology breakthroughs in the pipeline?

Annex 1: Action Plan for M2M Agriculture Subcommittee

Theme	Activity	Date	Lead Action	Status
General	Hold international seminars on methane recovery and use from agriculture:	November 2006, in UK May 2007, in Argentina	UK Government/US/ASG Argentina Government/US/ASG	Complete Full report from the workshops are available on the Methane to Markets website
	Contribute to Partnership Expo and Taskforce <ul style="list-style-type: none"> • Develop an agenda for a 1 ½ day Agriculture workshop to be held at the Expo • Develop a template with additional guidance for project submissions • Actively identify, solicit, and promote projects to feature at the Expo using the template 	January -October 2007	Jeremy Eppel will participate in steering committee meeting (Dec 2006) and Expo Taskforce to represent the views of the subcommittee. The Agriculture Subcommittee Co-chairs and US/ASG will work to coordinate the agriculture Expo activities.	Complete
Awareness	Develop and keep up to date information on agriculture section of M2M website	Ongoing	ASG and Partner Countries	In progress
	Identify and translate key documents.	Ongoing	ASG and Partner Countries	In progress
	Member countries to identify and recruit organisations to the Project Network	Ongoing	Partner Countries (Country representatives will share at the next subcommittee meeting.)	In progress
	Consider additional regional and country outreach activities.	Ongoing	Partner Countries	In progress

Theme	Activity	Date	Lead Action	Status
Finance and economics	Explore scope for workshops on carbon trading and AD finance opportunities. After UK pilot consider role of M2M in guidance and advice on finance.	Spring 2007	UK Government to run national pilot and feedback lessons	Finance issues included as part of wider UK workshop on promoting AD in agriculture, Exeter, September 2007; workshop report available
	Each country to identify, support and promote projects/investment opportunities. Notify M2M (ASG) about AD projects and funding opportunities in each member country. Enter projects and project opportunities specifically stimulated by the M2M process into the project database	Ongoing	Partner Countries	In progress
	Member countries to learn from best practice in involvement in energy markets and co-products	Ongoing	Partner Countries	In progress
	Engage in any work which may be undertaken to help capture value from GHG savings and other environmental benefits	Ongoing	Partner Countries	In progress
	Develop Project Network to include energy companies and other sectors who may benefit from AD processing of agricultural waste	Ongoing	ASG and Partner Countries	In progress
National Capacity	Bring together human resources through the Partnership by listing information in country profiles, including AD research, scholarships, and educational opportunities.	Ongoing	Partner Countries	In progress
	Advertise training opportunities and conferences related to AD on the M2M web site	Ongoing	ASG	In progress
	Bring together resources of universities, research bodies and others with knowledge of anaerobic digestion (AD) to exchange information.	Ongoing	Partner Countries (Country representatives will share at the next subcommittee meeting, and eventually add it to the country profiles.)	In progress

Theme	Activity	Date	Lead Action	Status
Policy	Analyse country profiles and identify policy implications	January 2007	UK Government	Completed
	Engage electricity and other utility companies in the Project Network and work with other subcommittees on energy projects where appropriate	Ongoing	ASG and Partner Countries	In progress
	Member countries to identify and report on quality control measures, or work in progress on such measures, of AD products (digestate standards)	Ongoing	Partner Countries to add it to the country profiles.	In progress
	Examine the elements required for a supportive policy framework for AD in agriculture and prioritise for action, in particular legislative or fiscal measures.	Ongoing	Partner Countries to consider and share ideas in light of report on UK workshop	In progress
Project Identification and Development	Record ongoing projects and project opportunities in the M2M Tracking database	Ongoing	ASG	In progress
	Work with farmers, financing organisations, and other stakeholders to fully implement economically viable projects	Ongoing	Partner Countries	In progress
	Identify project development opportunities in interested M2M countries, and if appropriate support feasibility studies for targeted project sites that could be featured at 2007 M2M Partnership Expo	Ongoing	Partner Countries	In progress

Theme	Activity	Date	Lead Action	Status
Technology	Bring together key technology developers and users through the Project Network	Ongoing	Partner Countries need to prioritise expanding and working on Project Network in each of their respective countries	In progress
	Subcommittee Members to collect and share technical information	Ongoing	Partner Countries and ASG	In progress
	Identify and implement technology demonstrations in countries which have interest and infra-structure to do so.	Ongoing	U.S. EPA and World Bank – China U.S. EPA and Mexico	In progress
	Study the present patent protection policies regarding anaerobic treatment processes in different countries	Not started	Partner Country	
	Study technology transfer costs to partners in developing countries in order to establish local entrepreneurs.	Not started	Partner Country	
	Conduct and support technology transfer events	October 2007 - M2M Expo (Beijing, China)	ASG and Partner Countries	In progress
	Develop documents to summarize: <ul style="list-style-type: none"> • An improved methodology for determining leakage rates from AD systems • International Guidance for Characterizing the Environmental Performance of AD systems 	Draft available October 2007;	Kurt Roos, U.S.	Complete

Annex 2: Country Specific Activities

Country	Activity Category	Activity
Argentina	Awareness	There is a great increase of technical assistance requests regarding manure treatment. Most requests come from dairy farms, feedlots and pig farms. There is an increasing concern on air and water pollution and future restrictions implemented in the international markets. Many counties are beginning legal actions against polluting farm facilities near rural towns. Farmers are worried on the stable provision of common energy vectors diesel and propane butane gas.
	Financial/ economic	Argentina needs public and private investments to reduce social and environmental problems. Anaerobic digestion isn't an exception. Farmers and researchers need financial and economic resources to develop pilot plants and research programs.
	National capacity	Several universities (seven) have begun activities relating anaerobic digestion increasing research and human resources national capacity. INTA has reinforced activities related to anaerobic digestion in farms and agroindustrial sector (two AD digesters); there is also research work regarding enteric emissions mitigation and measurement technology.
	Policy	Environmental National Secretary has an Argentinean Carbon Found. This organism works in reducing greenhouse emission in different sectors (agricultural is one). This Secretary received nearly twenty projects that are under analysis. Other governmental agencies have plans to initiate funding on anaerobic production facilities
	Project identification and development	Two demonstrative projects were developed and presented in agricultural activities, and three projects stay in formulation stage. There is no available data regarding number of plants under operation. Most known plants belong to the agroindustrial sector. A national geographic system GIS has been constructed placing all big dairy farms with potential use of AD technology. A complete national capacity of methane capture and treatment was developed.
	Technology	Discovered anaerobic lagoon is the principal treatment in animal production facilities. When methane capture is considered, there is need to implement closed heated tanks for appropriate waste treatment and biogas generation due to low winter temperatures. A small number of companies offer services and technical assistance on AD systems. (three have been detected). Big anaerobic plants with German technology are in operation on poultry farms. Big investors are planning to built integrated systems including manure treatment using AD
Australia	National capacity	The Australian Government and industry research organizations have invested \$2.25 million towards the research and development of methane capture and use technology in the Australian intensive livestock industries. Under the program, a major research project is currently being implemented to identify the elements of a methane capture and use system suitable for operation in a carbon constrained economy. This Program is to be completed in June 2008. The program has elements that fit in all the other activity categories.

Country	Activity Category	Activity
Canada	Awareness	Canadian farmers are well aware of the environmental and long-term economic benefits of biodigestion of animal wastes, however start-up costs and a poor availability of proven technology has limited its adoption.
	Financial/ economic	The Government of Canada spent \$1.3 million between 2002 and 2008 as seed money to establish the ECoAMu (Energy Co-generation from Agricultural and Municipal Wastes) program.
	National capacity	Although anaerobic digestion is growing in Canada, there are still fewer than a dozen farms equipped with this technology.
	Policy	The Government of Canada continues to support research and development of biodigestion for energy production.
	Project identification and development	ECoAMU project and a project to quantify fugitive emissions from biodigesters are underway.
	Technology	Low and high temperature anaerobic digesters are presently in operation across the country.
Italy	Financial/ economic	Green certificate funding for all renewable energy sources in electricity production
	National capacity	Biogas recovery is gradually increasing in the agricultural sector. Anaerobic digestion is operated in several livestock farms (especially pig farms) and cogeneration is widely adopted.
	Project identification and development	Italy has undertaken several international initiatives in the agricultural field. In cooperation with the World Bank and the Chinese authorities, Italy has designed a “stand-alone” project on biogas recovery in a dairy farm in the Heilongjiang province. The project was approved by the Board of Directors of the World Bank at the end of last year and has now entered in its implementing phase. The project was approved by the Board of the World Bank at the end of 2005. In addition, a number of Livestock gas projects (both pig farms and cow farms) are under assessment by Italian experts and investors, for their development as CDM projects in China.
	Technology	New technology options (e.g. co-digestion of agro-industrial waste and manure) are also raising interest.
Mexico	Awareness	Conducted workshop on bio-digester design, installation and operation in swine farms. This also fits into National Capacity. Conduct presentation at the Mexican National Swine Conference to promote and create awareness of M2M efforts to date.
	Financial/ economic	Link credit and financial institutions, companies and agriculture producers in FIRCO’s biodigester development plans.

Country	Activity Category	Activity
Mexico (continued)	National capacity	<p>Conduct technical workshops aimed at swine producers and research/education institutions</p> <p>Develop national technical standards to design and install biodigesters. This also applies under Technology.</p> <p>Develop a certification system for biodigesters design and installation.</p>
	Policy	Develop a Voluntary Mexican Norm (NMX) that will provide incentives to swine farms to use manure management best practices, including the use of biodigesters in their wastewater treatment process.
	Project identification and development	<p>Identified 14 farms where methane capture and use projects could be developed; the farms will be exhibited at the "Methane to Markets Partnership Expo" in Beijing.</p> <p>Identify and develop a significant number of projects in the next 5 years; FIRCO plans to support the development of 50 biodigesters in 2008.</p>
	Technology	Assess two different types of technologies in Mexico: covered lagoons and modular covers.
Poland	Awareness	In agriculture sector awareness concerning possibility of methane production is quite low
	Financial/ economic	There are insufficient economic mechanisms (especially taxes) to gain adequate financial benefits in compare to investment costs for renewable energy sources.
	National capacity	In Poland there are 3040558 Big Units of animals. Each BU can produce 0,7 m ³ of methane per day so total daily production can be estimated on 21283906 m ³ of methane per day
	Policy	Poland is determined to keep action to prevent climate change high on the international agenda. We have made climate change a key priority for national policy.
	Project identification and development	In Poland there are conducting research at the moment which will focus significantly on market issues relating to economic potential for methane recovery systems
	Technology	There are many companies which offer technology of methane production but mostly in other sectors. Those technologies could be easy used in the agriculture sector. There is one methane production plant in agriculture sector
United Kingdom	Awareness	<p>The UK Government is working with stakeholders to develop measures to increase awareness and understanding of anaerobic digestion, e.g. the coordination of advice and the drafting of guidance</p> <p>Government Ministers regularly highlight the important role which AD can play in meeting climate change, renewable energy, waste management and rural development goals.</p>

Country	Activity Category	Activity
United Kingdom (continued)	Financial/ economic	<p>In May 2007, the UK Government launched a consultation on revisions to the market support mechanism for renewable energy technologies – known as Renewable Obligation Certificates (ROCs). Under these proposals anaerobic digestion is among the technologies that would receive additional support.</p> <p>Anaerobic digestion is one of the areas on which the Government will focus funding from the Rural Development Programme for England 2007-2013 (RDPE).</p>
	National capacity	<p>The UK Government is promoting the uptake of anaerobic digestion through the Waste and Resources Action Programme (WRAP) and the Carbon Trust.</p>
	Policy	<p>The UK Government published the UK Biomass Strategy in May 2007. This includes details of how we propose to work with stakeholders to drive a faster growth in the use of this technology.</p> <p>In September 2007, the Government organised a workshop which brought together representatives of key stakeholder groups with an interest in anaerobic digestion. Its aim was to help identify what now needs to be done to achieve our goal of stimulating markets for anaerobic digestion and its products, and to address the administrative and technical challenges which may hamper their development.</p> <p>The Government is developing a standard for digestate. This will help to provide clarity as to when the material has been fully recovered and can be used as a product.</p>
	Project identification and development	<p>The UK Government is supporting the construction of two new agricultural anaerobic digestion plants in the UK under its Bio-Energy Capital Grants Scheme, worth £565k.</p> <p>The UK Government currently has over 70 Clean Development Mechanism (CDM) projects involving methane registered, including in Mexico, Brazil, Philippines and India.</p>
	Technology	<p>A number of projects funded by the UK Government aimed at optimisation anaerobic digestion systems and minimising their environmental impacts are underway or have been completed, e.g. The project ‘Physical assessment of the environmental impacts of centralised anaerobic digestion’ has been completed. The project ‘The optimisation and impacts of expanding biogas production’ is underway. This is part of the EU Framework VI project ‘European Biogas Initiative’.</p>
United States	Awareness	<p>The U.S. EPA’s AgSTAR program provides outreach information to the public to promote awareness of AD.</p> <p>The U.S. EPA promotes AD in its role of Administrative Support Group for the Methane to Markets Partnership.</p>

Country	Activity Category	Activity
United States (continued)	Financial/ economic	<p>The U.S. Farm Bill increased funding of U.S. AD projects.</p> <p>The U.S. also provided grants for international AD projects in Colombia, India, China, Vietnam, Korea, and Mexico.</p>
	National capacity	The government supports AD through the AgSTAR program.
	Policy	The state of California is in the process of developing a mandatory program for GHG reductions, other states may follow the lead.
	Project identification and development	<p>The AgSTAR Program identifies and promotes development of digesters in the U.S.; there are currently approximately 130-135 digesters. Approximately 5 more digesters are expected to be developed in 2007.</p> <p>The U.S. assisted with the development of 5 demonstration projects on swine farms in Mexico.</p>
	Technology	The government provided technical support to 5 methane recovery projects in China, Vietnam, and Thailand. Another 12 projects are in the planning stages.