Environmental Change Institute
UNIVERSITY OF OXFORD

**Cooking and Carbon Expert Workshop, *Generating carbon credits from cooking* 14th November 2005, University of Oxford**

# NOTE OF WORKSHOP FINDINGS

## Background

An estimated 2.4 billion people rely on traditional biomass for cooking, largely using inefficient open fires. Since the 1950s there have been programmes to improve cooking practices with the primary driver being improvements in the health of the women who use the stoves or the conservation of forest resources. The International Energy Agency recognised the importance of improved cooking stoves when it said that 600-700 million people would need access to improved cooking facilities (improved stoves and/or alternative fuels) in order to reach the Millennium Development Goals.

With the entry into force of the Kyoto Protocol earlier this year, we now live in a carbon constrained world. Most improved cooking facilities reduce greenhouse gas emissions, estimated at an equivalent of around 1-2 tonnes or more of $CO_2$ per year. The potential for carbon funding to transform the sector is thus significant. Thus carbon could be a significant source of funding for cooking projects which reduce greenhouse gases, while achieving significantly improved livelihoods and protecting local environments. However, in order to exploit this potential the stove community must become carbon literate and must realise that stoves need to be designed to reduce greenhouse gas emissions, not only remove smoke from the kitchen.

***The Workshop***

Oxford University's Environmental Change Institute facilitated a workshop with the aim of highlighting the issues which need to be addressed if carbon is to become a focus of the stove building community. For the first time experts in the cooking, carbon, health and development communities came together to share their experiences and to discuss which areas should be a focus of research and development.

A number of questions were suggested in advance, which were used to guide discussions in each session, each of which was lead by a different facilitator. The format was an open one, in which all the people present were encouraged to participate. The immediate outcomes of the workshop include this Report which is a record of the day's discussions. At the end of the Report are actions to be taken going forward.

***The Carbon Market***

The formal carbon market centres on the Kyoto Protocol and its flexible mechanisms, the most relevant in this context being the Clean Development Mechanism (CDM). However, the Workshop heard that the CDM Executive Board has made a decision not to allow the use of reduction of $CO_2$ from unsustainable biomass as a valid baseline. If this decision is formalised at the COP11 / MOP1 in Montreal in December 2005, a major opportunity will have been missed.

In addition there is a modest but growing market for voluntary offsets. This is currently unregulated and so operators are running projects that use unsustainable biomass as a baseline. Indeed Climate Care has run three efficient cooking projects, looking to reduce GHG emissions through the reduction of biomass and improvements in combustion. It is essential that The Climate Group, which is currently developing a set of standards for the voluntary market, frame them in such a way as to make unsustainable biomass projects eligible to benefit from carbon funds.

# Cooking and Carbon Expert Workshop, Oxford, 14th November 2005
## *Generating carbon credits from cooking*

## Technical Questions

*Facilitator: Tami Bond, University of Illinois*

***Which gases are important?***
The Kyoto Protocol considers a basket of 6 major greenhouse gases, three of which are produced in cooking: $CO_2$, $CH_4$ and $N_2O$. However, when fuels are burnt inefficiently, other greenhouse gases are also emitted which include CO, NOx and Non Methane Volatile Organic Compounds (NMVOCs). All these species should be considered important when calculating the total climate impact of cooking devices. For unsustainably harvested biomass, 30-50% of radiative forcing from some stoves can be attributed to non $CO_2$ greenhouse gases.

Non-$CO_2$ gases, such as CO, NOx and NMVOCs, all have Global Warming Potentials that are higher than $CO_2$. Some research into emissions from cooking has stated the Global Warming Commitment (GWC) from cooking with reference to a 20 year GWP. However, the Workshop felt that, given current circumstances, a 100 year GWP was more appropriate for stove calculations, firstly because that has become the standard used in the Kyoto process and secondly because the 20 year GWP gives a much higher figure – so the stove community could be accused of manipulating the figures to overstate its case.

Research into the effect of aerosols from cooking has been started and initial results show that they also have a warming effect. Both ozone, which is the result of NMVOCs, and aerosols are location specific and may be associated with nonlinear feedbacks. Some are of the opinion that a holistic view of emissions should consider all gases and aerosols. While such an approach could be appropriate for the voluntary sector, for Kyoto only the basket of 6 gases can be considered.

***How do we design a stove to reduce them?***
It is clear that the design of an efficient stove should not simply rely on improving the transfer of heat to the cooking pot. It must also concentrate on improving combustion efficiency. In the past some "efficient" stoves have reduced the amount of fuel used but increased total greenhouse gas emissions by impeding combustion. In many cases these were stoves with a high thermal mass that takes a long time to heat up, drawing heat from the fire and increasing the amount of time needed to reach efficient combustion. In addition to improved biomass stoves, fuel switching (eg ethanol, bio-diesel, bio-gas, LPG) should also be considered as an option. Further work may be required to characterise GHG emissions in these cases.

Women in different communities want different stoves as their customs and cooking practices vary. A stove must be efficient but people must also want to use it. Laboratory practice can differ from field performance, and some validation measurements would need to be done in each community to see if their improved stove really did reduce emissions in day-to-day use and so could access carbon funds.

Improvements could be made if parts of the stove (such as, say, the combustion chamber or 'rocket elbow') could be manufactured centrally and the rest of the stove was built in an appropriate manner locally. It may also reduce the problem of 'rip offs' which reduce the quality and give all stoves in a community a bad name.

***How do we measure GHG's?***
Should GHG's be measured as they occur in the laboratory, in the field as the stove is designed, or in the field as the stove is built and used? Different answers will result depending on the question asked. It was suggested that the stove community should focus on credible estimation rather than precise quantification. In order to do this, a subset of data would need to be collected to perform an appropriate statistical analysis of the emissions from different cooking practices and different stoves to characterize regional, seasonal and individual variation.

This need may lead us to develop simple proxy measures for total greenhouse gas emissions. It would be useful to identify a subset of species that are straightforward to measure in the field, and for which strong

correlations with the species of interest can be developed through laboratory work. This work could be led by a central "methodology unit." A method for measuring methane is of particular interest because it is recognized under the Kyoto Protocol.

The Partnership for Clean Indoor Air (PCIA) at the USEPA is currently undertaking research into the monitoring of stove projects but is not focusing on GHG emissions. Monitoring presently includes indoor concentrations of CO and particles for health reasons, but work is underway to examine its expansion to other relevant species. Both the Shell Foundation and the USEPA were very keen that the work should be adapted to included GHG emissions and wanted to see the programme adapted to include them.

***How do we sell GHG reductions from stoves in the carbon market?***
Rather than tailor the discussion at the workshop about what could or couldn't be done under the current CDM rules, we should cast the net wider and discuss what needs to be done. The voluntary market could be a viable option for approaches not currently applicable under the CDM.

Ideally, carbon funds would be used for barrier removal at a sectoral level. This would lead to a sustainable market for improved cook stoves and/or alternative fuels. However, this could be at odds with the carbon market as currently developed – where the emphasis would be on getting a large number of appliances in use in a short time period. The easiest way to accomplish the short-term goal is likely subsidising the cost of the stoves directly. However, this could distort the market and is likely to be unsustainable once the funding dries up. A "sectoral approach" would involve a range of phased measures designed to achieve market transformation, including policy, product development, market research, awareness raising, financial, technical and business support to local entrepreneurs etc. It is anticipated that transaction costs can be reduced to a manageable level using a sectoral approach. Government capacity would need to be increased in many target countries in order to allow a sectoral approach to proceed successfully.

At present, the voluntary carbon market offers the main route for use of emissions reductions from a reduction in non sustainable biomass. Methodologies need to be further developed to demonstrate how stove projects be addressed under voluntary projects, including identifying mechanisms for non-distorting market transformation, and developing methodologies for demonstrating reductions in non-Kyoto gases. However, the voluntary market is currently small, although it is growing fast. In order allow improved cooking projects within the larger CDM market, governments should be lobbied to allow the re-addition of non-sustainable biomass baselines.

## Scaling up successful cooking programmes

*Facilitator:Grant Ballard-Tremeer, ECO ltd*

The cooking sector has historically been driven by health (indoor air-pollution) and environmental (forestry) considerations; only relatively recently have GHG emissions been considered. The success of programmes to date has been mixed, with little 'spreading' into the mainstream market of many projects. Care needs to be taken to account for local conditions in programme design: are the markets in the informal sector or commercial? Are cooking fuels paid for or freely collected? Which model of stove dissemination is appropriate, self-build or commercially produced? Are products adapted to the cultural conditions? Which financial mechanisms are most appropriate? Should products be subsidised and if so, how? Scaling up requires targeting different market conditions carefully.

There is much we can learn from existing examples, both of success and failure. Perhaps the most successful carbon trading stove projects in the short to medium term will be those which build upon existing successful technologies and dissemination programmes. Examples of programmes successfully disseminating large numbers of stoves include the national improved stove programme in China, where government subsidies were used to disseminate over 150 million stoves, and Kenya, where a sustainable market for the Jiko stove (KCJ) was successfully developed over a period of 2 decades; a significant element of the Kenyan success was due to ongoing donor support in the early years for market research, product development, marketing

and business support for entrepreneurs. However the Jiko and other similar stove designs were not as successful in rural areas as they were in urban areas where households bought both their fuel and the stove.

Market development and transformation requires financial support in the early stages, and as stove programmes tend to involve low margins and relatively high risk, finance for such is often required of the public sector, donors or philanthropists. Brand development is an important factor in developing markets. Care needs to be taken to ensure that the informal sector does not poison an existing brand by producing poor quality copies.

Opinions vary on the use of capital subsidies to aid dissemination of stoves/fuels; local conditions should dictate practice in this area. If subsidies are employed great care is required not to poison existing markets, as well as to ensure that subsidies are targeted at the required market segment (eg the poorest). On the other hand in many cases real markets can be developed without use of subsidy, especially where cooking fuels are bought and sold commercially, but also in other cases where support is given for initial market development. So far, subsidies have been an important element in several proposed carbon trading stove projects, as a means to divert carbon finance into stove dissemination. These subsidies have enabled stove programmes to justify the signing over of carbon credits from the real 'owners' of these emissions reductions (technically the households that buy improved stoves) to the project itself and hence carbon credit buyers.

Carbon finance is produced for the *additional* GHG reductions achieved through the life of a cooking programme. The 'additionality' criteria implies that the emissions reductions claimed would not have taken place in the absence of carbon finance, i.e. the project is truly additional to what would have happened in the 'business as usual' scenario. Revenue streams from carbon trading cooking projects are not generally gained up-front, but will grow gradually as the number of stoves introduced increases. This is a different revenue stream pattern from the large carbon offsetting projects (such as large renewable energy electricity generating projects), which produce offsets at the maximum value in the first year that the project is fully commissioned.

Thus carbon finance is unlikely to be able to pre-finance cooking programmes, and thus start new markets, except in cases where investors are prepared to deploy *patient capital*. Carbon finance could however have great value in accelerating existing markets, either through actions to address specific market barriers (awareness, entrepreneurial capacity etc) or providing targeted subsidies, or a combination of the two. Carbon finance could be used, for example, to support and build nascent Rural Energy Services Companies (RESCOs), if these could be demonstrated to lead to measurable emissions reductions. In addition carbon finance may be used to encourage product development towards more and more efficient devices.

The production of carbon offsets from cooking is contingent on ongoing high quality production of cooking devices, as well as appropriate use of devices installed. Carbon finance could also be used to fund activities to ensure that both device quality and user practices remained appropriate throughout the life of the project.

While it was generally agreed that the commercial model was the most appropriate for wide scale dissemination of improved cooking technologies and fuels, some were of the opinion that targeted subsidies were appropriate in some circumstances. It was agreed that in both cases carbon finance could have an important role. Further work needs to be undertaken to develop appropriate institutional models, defining the roles of public and private sectors, donors, and those involved in the carbon market, in order to determine risk and benefit sharing arrangements. It was furthermore emphasised that the focus of some carbon trading-motivated stove programmes should not be solely on numbers of stoves disseminated, but on poverty alleviation and health benefits, and on programme sustainability.

## Follow-up actions

*Facilitator: Bernhard Schlamadinger, Joanneum Institute*

The following follow-up action points and items requiring further work were suggested during the final session of the meeting:

***Communication and lobbying***

- Next edition of the bulletin of Partnership for Clean Indoor Air to focus on cooking/carbon (including outcome of this workshop, changes in CDM etc; other information from meeting participants welcome by mid December to be sent to Brenda Dorowski). Lead: Brenda Dorowski;

- Fact sheet to be drafted to inform organisations how to obtain voluntary carbon financing, including lessons learned from cooking/carbon projects to date. This could be distributed through the Partnership for Clean Indoor Air. Lead: Tom Morton;

- In order to gain interest from donors and the development community generally, there is a need for strong simple messages outlining how actions to improve cooking have already helped in achieving the MDGs (e.g., JIKO stoves in Kenya), and how combining cooking and carbon could help accelerate uptake;

- There is a need to raise awareness of carbon finance within the cooking community and support them to plug into the carbon market (how to establish baselines etc). Would a dedicated institution be helpful to achieve this, or is capacity building of existing players more appropriate? PCIA will consider capacity building workshops next year;

- There is a need to spread the word about existing successful improved cooking stoves projects. WHO is publishing a list, and PCIAonline.org also has a list ;

- Lobbying towards environmental NGOs (ENGOs) is needed in terms of their attitude to LULUCF, as some don't understand the linkage between bio-energy and land use. There is a need to help ENGOs understand energy efficiency and / or renewable energy project categories of carbon financed projects;

***Research and technical issues***

- Note to be drafted on which gases should be measured in the lab / field. This should be a list of 6-7 items with some detail on each. What needs to be measured in voluntary vs CDM? (including the land-use effects for carbon). What are the risks and benefits (e.g. financing, waste issues, …) of this? Lead: Tami Bond. Reference could be made to IPCC 2006 Guidelines;

- There was a call for further research into life-cycle analysis of GHG emissions from cooking including supply and use chains (what needs to be measured, emission factors, etc) which will be needed for the CDM approval;

- In order to achieve improved cooking technology, at scale and at least cost, there is a need to synthesise existing experience and develop common core cooking technology modules; this will help reduce the plethora of solutions to a short list of best combustion practice devices, approaches, etc. Shell Foundation plans to fund such an approach in near future, and will be looking for technical partners in 2006.

- Research is needed to on approaches to estimate the non-renewable biomass; this is likely to include techniques for gauging deforestation rates, and the proportional contribution of fuel-wood demand to this deforestation. CDM EB concerns with issues of leakage need to be addressed;

- In order to co-ordinate efforts it would be useful to develop a research position statement on the research needed generally, as opposed to what needs to be done in individual projects.

***Market issues***

- In order to achieve massive upscaling of improved cooking using carbon finance, space and time boundaries need to be extended beyond the project level currently employed by the CDM. The aim should be for a sectoral approach to achieve market transformation, where improved cooking appliances and fuels become the norm rather than the exception. Such an approach could be applicable to the voluntary market at present and for the CDM post-2012.

- Further applied research work is required to understand the application of a sectoral approach to cooking/carbon and to clarify at what stage carbon finance can be used, and the roles of private sector, local entrepreneurs, public sector and donors/philanthropists. A key factor should be the use of carbon finance to leverage new investment in the cooking sector. Work should also include new thinking on how the benefits of carbon finance are divided between the various stakeholders involved;

- Awareness raising and capacity building will be required within the cooking community in order to develop the capabilities necessary to take advantage of carbon finance;

- Market development for cleaner cooking using carbon finance could be demonstrated using the voluntary market; such an approach may be particularly interesting in the US. The voluntary sector has doubled every year recently, although there is a need for government recognition to accelerate this growth; the objective should be to pilot a few of these projects;

- There is a need for a protocol / guide for project developers in the cooking/carbon field. A few such guides already exist for CDM project developers, but there is nothing for cooking. Brenda Dorowski at PCIA is interested in co-working on such a guide.

***CDM***

- The issue of exclusion of non-renewable biomass baselines by the CDM Executive Board should be raised at COP11 in order for the issue to be corrected. Use could be made of a short note by Jonathan Avis, and a letter by Bernhard Schlamadinger. In particular this issue needs to be raised by as many developing countries as possible at COP11;

- New submissions of methodologies to the CDM Executive Board are required by 5 December, because the ruling on non-renewable biomass will take effect from EB22. New methodologies must not credit a net increase in carbon pools. Therefore, land-use effects through reduced biomass consumption are not applicable. COP11 guidance to the CDM EB may be needed;

***Community of practice in cooking/carbon***

In addition to the work proposed by the PCIA above, proposals were made concerning the continuation of the 'discussion' on cooking and carbon initiated at this workshop:

- It was agreed that there was value in taking forward the 'community of practice' following the workshop, including experts from the cooking and carbon communities. This community would include participants at the meeting, as well as others not able to be present at the Oxford workshop, such those working on the Gold Standard;

- An information sheet on a concept for an electronic community of practice (see appendix) was distributed by the participants from HEDON, which is already planning similar groups for: scaling-up cook stove programmes (supported by GTZ); cooking and carbon; ethanol / alcohol groups. Using such a process it is possible to establish small working groups on specific issues. As well as making progress with specific cooking/carbon issues, the community of practice proposed would have the advantage of raising awareness of the opportunity presented by carbon finance to those currently unaware in the household energy community. Lead: Erin Boyd and Grant Ballard-Tremeer, ECO Ltd;

- It was proposed that a repository of information be created on cooking and carbon, to be 'fed' initially by workshop participants. HEDON could be used, although it was noted that there was significant effort involved in filtering information;

- In order to advance an electronic community of practice and information repository, some financial support will be required; possible donors should be sought;

- A further expert workshop should be held in 2006 to review progress.

## Appendix: Cooking and Carbon Expert Workshop Participants

| Name | Organisation |
|---|---|
| | |
| Tom Morton | Climate Care |
| Mike Mason | Climate Care |
| Fred Dumbleton | Climate Care |
| Jeremy Doyle | DFID |
| Philip Mann | ECI, University of Oxford |
| Catherine Bottrill | ECI, University of Oxford |
| Adam Bumpus | ECI, University of Oxford |
| Bernhard Schlamadinger | Joanneum Institute |
| Jeremy Woods | Imperial College |
| Erin Boyd | Eco ltd |
| Grant Ballard-Tremeer | Eco ltd |
| Ottavia Mazzoni | ESD |
| Steven Hunt | ITC |
| Teo Sanchez | Practical Action |
| Liz Bates | Practical Action |
| Jonathan Avis | EcoSecurities |
| Jan Fehse | EcoSecurities |
| Sharna Jarvis | Shell Foundation |
| Kavita Rai | IT Power |
| Nigel Bruce | University of Liverpool |
| Marlis Kees | GTZ (Household Energy in Rural Areas) |
| David Hancock | GTZ-ProBEC |
| John Mitchell | Partnership for Clean Indoor Air, USEPA |
| Brenda Doroski | Partnership for Clean Indoor Air, USEPA |
| Minh Lequen | CFSP, Cambodia Fuelwood Saving Project |
| Dr Tami Bond | University of Illinois |
| Dr David Pennise | University California Berkeley |
| Anne Wheldon | The Ashden Awards for Sustainable Energy |
| Dr Peter Coughlin | EconPolicy, Mozambique |
| Dr Paul van der Sluis | Philips Research Laboratories |

## Appendix: Proposed Community of Practice on Cook-stoves and Carbon

- Members-only website, within the HEDON Household Energy Network, containing:
    - *Knowledge Base:* Collection of knowledge and latest research into cooking stoves, CDM, voluntary markets, and greenhouse gas emissions
    - *Project Development Area:* Short summaries of knowledge needs / calls for research
    - *Road-Map:* Lays out research priorities / tracks status of research projects
    - *Draft Research:* Posting of draft research with ability to post comments
    - *Discussion email list:* Informal "chat-room" where members can discuss and post comments on relevant issues, such as the role of biomass and household energy in the post-2012 carbon trading mechanism
    - *Members Directory:* Directory of members, including contact details and areas of expertise

- Communications / Outreach:
    - *Development of executive summaries* outlining key outcomes of research and need to include cook stoves in carbon trading mechanisms, available on the public HEDON knowledge base
    - *Preparation of press releases* to be disseminated to local papers and relevant journals
    - *Creation of brochures / documents* aimed at indirect stakeholders (e.g., environmental NGOs, aid agencies) detailing relevance of cook stoves and carbon in language understandable to general public
    - *Common platform for lobbying and advocacy*
    - *Dissemination* through the HEDON Household Energy Network

- Interns:
    - *Co-ordinate functions* associated with communications / outreach
    - *Facilitate meetings* of network, including documentation, minutes, briefings, etc.
    - *Attending key meetings* as 'roving reporters'
    - *Oversee and manage Members-Only website*, including posting of documents, updating of information / research, and members directory
    - *Translating key documents* into alternative languages in association with members (*e.g.*, French, Spanish)

Eco, 13 November 2005
Erin Boyd, erin@ecoharmony.com

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*Generating carbon credits from cooking*

## Appendix: Agenda for Expert Workshop

**Date:** **Monday 14th November 2005**
**Location:** **St Anne's College *, University of Oxford, United Kingdom**

**Chair: Philip Mann (Environmental Change Institute, Oxford University)**

**09.30 – Arrival (tea, coffee)**

**10.00 - 11.30: Introductory session. Facilitator: Mike Mason, Climate Care**

- *Roundtable introductions: highlighting initial thoughts of participants on issues.*

**11.30 - 13.00: Technical Questions. Facilitator: Tami Bond, University of Illinois**

- *Which gases are important, how do we design a stove to reduce them?*
- *How do we measure these gases and apply them in the carbon market?*

**13.00 – 14.15: Lunch**

**14.15 - 15.30: Scaling up successful cooking programmes. Facilitator:Grant Ballard-Tremeer, ECO ltd**

- *How do we make large scale cooking programmes successful?*
- *Can we account for sectoral level emissions reductions?*

**15.30: tea/coffee**

**16.00 - 17.00: Follow-up actions. Facilitator: Bernhard Schlamadinger, Joanneum Institute**

- *Further studies/research/advocacy required.*
- *How to develop a community of practice.*

*Philip Mann, ECI, University of Oxford (philip.mann@eci.ox.ac.uk)*