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The role of donor organisations in promoting energy efficient cook stoves

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ABSTRACT

This article focuses on cooking energy and the role of donor organisations in the introduction and dissemination of improved stoves. After presenting some basic facts on cooking energy, the article discusses the cooking energy–poverty nexus and possible reasons for the often neglect of this topic in the context of development cooperation. Clean and efficient technologies for cooking are presented and a short introduction to different dissemination approaches shows the changes that occurred in the last years. The importance of public sector investments to increase the supply and use of clean cooking energy technologies in developing countries is analysed and underlined by GTZ's experiences in this field. The case study of Uganda finally demonstrates how cooking energy interventions work in the field and points out that investment pays off.

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1. Introduction: Basic facts on cooking energy

Each human being needs food to live. Most of the daily food is cooked, baked, or processed in another way, which requires thermal energy. In industrial countries this need for energy is mainly met by electricity or gas. However, in many developing countries, biomass such as firewood, charcoal, agricultural residues, and dung, is used for cooking and baking. In Sub-Saharan Africa, biomass accounts for about 80–90% of the primary energy consumption of private households

According to estimations from the International Energy Agency (IEA), the number of people relying on biomass worldwide will in the future increase rather than decrease. Massive efforts in electrification and the subsidisation of LPG in the last years have not affected this situation on a global scale (OECD/IEA, 2006). Furthermore, even many grid-connected households still use traditional cooking devices, such as the three-stone fire, since they are familiar with them or can neither pay for the electricity bill nor can afford an electrical stove.

The main advantage of biomass fuels is that they are available in some form almost everywhere and can be burnt directly. They are usually cheaper than other fuels and when collected available at no monetary cost. Biomass is principally a renewable source of energy, if produced and used sustainably.

Very often biomass is burnt inefficiently in open three-stone fires and traditional cook stoves, which causes severe health problems in women and children and affects the environment.

Every year, smoke from open fires and traditional stoves causes death of approximately 1.5 million people according to estimations from the World Health Organisation (WHO, 2006a) (Fig. 1).

The non-sustainable burning of wood fuels is furthermore contributing to climate change through CO₂ and methane emissions. It is estimated that the traditional energy supply and use causes 3% of anthropogenic CO₂ emissions and 5% of the methane flows to the atmosphere (Holdren and Smith, 2000). The role of black carbon is recently stated as playing even a major role in global warming. Between 25% and 35% of black carbon or soot in the global atmosphere comes from China and India, emitted from the burning of wood and cow dung in household cooking and through the use of coal-based household heating (Ramanathan and Carmichael, 2008).

Increasingly, the unsustainable harvesting of trees for firewood and charcoal is contributing to deforestation especially in Africa. Almost 90% of the wood removals are used for fuel. Soil erosion and water loss can be of further consequences (FAO, 2007; The World Bank, 2009).

Dwindling resources lead on the one hand to additional workload mainly for women and children, as they have to spend more time on firewood collection. On the other hand, in regions where firewood has become already a commodity, prices rise and burden the household budget of poor families even more.

There is anecdotal evidence from GTZ Malawi that people stopped cooking food that needs more simmering, such as beans, or that food is only half cooked due to not accessible or affordable firewood. Many times these ailments would provide useful nutrients which are now lacking. Malnutrition is a severe consequence for poor families, and predominantly affects children's health.

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Fig. 1. Woman cooking on a three-stone fire, Uganda (Photo: Tim Raabe, GTZ).

2. Cooking energy and poverty reduction

Considering these disadvantages of traditional biomass use, increased access to modern, affordable and clean energy services, especially for the poorest and most vulnerable groups in society, is absolutely central to sustainable poverty reduction.

The UN Millennium Project takes account of this relevance and calls to “reduce the number of people without effective access to modern cooking fuels by 50% and make improved cook stoves widely available” (UN Millennium Project, 2005). According to GTZ calculations, to achieve this goal by 2015, every day, an additional 500,000 people have to get access to improved cooking energy. A cost–benefit analysis carried out by WHO shows that this is also economically reasonable. Making improved stoves available to half of those that are still burning biomass fuels and coal on traditional stoves would result in a negative intervention cost of US\$ 34 billion per year and generate an economic return of US\$ 105 billion per year (WHO, 2006b).

Households, small enterprises and social institutions benefit from various economical and social impacts of access to clean and efficient cooking technologies (GTZ, 2009b). Furthermore, the efficient use of biomass or the switch to other fuels reduces the pressure on forest resources and can contribute to the decrease of land degradation (GTZ, 2007).

3. Cooking energy—a neglected topic

Despite its relevance in combating poverty, cooking energy remains too often a neglected topic in development cooperation. National energy policies and poverty reduction strategy papers (PRSP) very often focus only or mainly on electrification and do not reflect adequately the energy–poverty nexus (UNDP, 2006).

On the international agenda the topic only recently is gaining momentum, especially under the framework of the carbon market. However, compared to other development topics such as malaria, HIV/AIDS, sanitation or water, access to modern energy for cooking has received extremely limited investment and political backing. In many countries, access to electricity gets much more attention and funding (OECD/IEA, 2006: 444).

Why is the issue of cooking energy so much under-evaluated, taking into account its impacts on the achievements of the Millennium Development Goals?

There are several reasons: Firstly, being a cross-cutting issue is often becoming a disadvantage: in many countries it is not clear which Ministry (e.g. Energy, Environment, Health, or Economy) would be involved, e.g. in setting up a stove programme. The same applies for donor organisations and their different departments. Secondly, in the past, a lot of stove programs failed due to their approach or the technology involved. The domain of cooking is a very traditional one in many societies. Technological change

involves also behavioural change which is not easy to achieve. Last but not least, cooking energy is not considered a “sexy” topic among many politicians in developing countries nor in donor organisations.

The process of developing biomass energy strategies has shown that politicians are too often either not aware of the problems of traditional biomass use and possible solutions, or they simply deny its relevance, considering the use of biomass as a dirty old-fashioned cooking habit of poor people they do not have to deal with (GTZ, 2009a).

This leads to a paradox in the biomass sector. While biomass is used widely as a source of energy and is of high economic importance in many national economies (e.g. Tanzania, Kenya), political frameworks all too often do not reflect these factors sufficiently. Many countries prohibit the production of charcoal or have only an insufficient legal framework. Nevertheless, charcoal is one of the most used sources of energy for cooking in many peri-urban and urban settings. Influential groups profiting from this illegal or semi-illegal status are furthermore trying to keep the status quo (The World Bank, 2009; Mugo and Ong, 2006).

Given the fact that biomass is and will remain the most important fuel for almost one third of the world’s population and considering its negative impacts on people and environment, the challenge is how to make its use sustainable and non-polluting.

Interventions usually focus either on the demand side, e.g. promoting the production and use of efficient cook stoves, or they deal with the supply side, e.g. in reforestation and forest management programs.

The authors will focus in the following on the demand side.

4. Clean technologies for cooking

Efficient and clean burning cookers range from artisanal or semi-industrially produced clay and metal wood fuel stoves to solar cookers, heat retainers as well as cookers using plant oil, ethanol or biogas. Due to the availability of wood fuels, stoves for firewood and charcoal are the most common ones. An industrial production of efficient stoves has just started in the last years. However, in many cases these products are far too expensive for poor people. Little experiences exist with the export to other countries where sales structures for large quantities of stoves still have to be set up. Due to these constraints the authors focus on artisanal or semi-industrially produced stoves.

Improved woodstoves may take many shapes. However, two main technical principals are always the same: improved combustion and improved heat transfer to the pot. The best stoves optimise heat transfer and combustion efficiency at the same time. Increased heat transfer reduces fuel requirements, whereas increased combustion efficiency also decreases harmful emissions (Bryden et al., 2006) (Figs. 2 and 3).

5. Dissemination approaches

During the last decades many development projects have more or less successfully introduced improved stoves that burn biomass efficiently and thus reduce emissions and consumption of resources. However, scaling-up still remains the major challenge.

In the 1980s, dissemination strategies mainly focused on self-help approaches or distribution of stoves for free. Experiences have shown that these approaches were not always supportive for the construction of high quality stoves thus evoking a negative image of stoves that break easily, are not worth spending money on them and in consequence are not used.



Fig. 2. Charcoal stove (*Kenyan Jiko*), made of clay/metal, artisanal production, Kenya (Photo: Marlis Kees, GTZ).



Fig. 3. Wood stove (*Institutional Rocket Stove*), made of metal and insulation material, artisanal production, Malawi (Photo: Andreas Michel, GTZ).

Based on this lesson learnt, the last years have seen a change in the approach of promoting efficient stoves. Commercialisation is considered to be more successful for sustainable stove dissemination. Professional stove producers have more routine in building stoves according to certain design standards, and because they earn money running stove businesses, they have a strong interest in selling their products.

6. The role of public sector investment—the experiences of GTZ

Despite all the advantages, improved stoves do not sell as easy as cell phones or other necessities. Changing cooking habits is not an easy task. Behavioural change takes time and thus needs long term investment. It is only likely to take place if the stoves promoted meet the needs of the users. Experience has shown that the best technological solution is not necessarily the most attractive one for the customer. Even very efficient stoves will fail in the market if they are not affordable for the poor, if they do not allow the cook to prepare the most common dishes or if they are not considered to be “modern” and thus attractive in the opinion of the target group.

Due to weak or non-existing markets, public investment from national governments, international donor organisations or NGOs is needed in the beginning to support setting up a market. On the one side, emphasis has to be put on both, production and marketing of stoves, addressing trainers, producers and salespersons. On the other side, knowledge and awareness raising are important to stimulate at the same time the demand for improved cook stoves. Both will lead to increased use of improved cook stoves and thus contribute to the achievement of the MDG as shown in Fig. 4. Depending on the country situation and the scaling up volume, GTZ is currently counting with costs of 3–12 Euros per person provided with efficient and clean cooking energy. GTZ carries out cooking energy interventions on behalf of the German Federal Ministry for Economic Cooperation and Development (Fig. 4).

Technology research and development, capacity development, and awareness raising do not happen without any interference from outside the system. For successful stove dissemination trainers and stove producers have to be trained in the production of efficient stoves according to quality standards. According to GTZ's experiences, it can be helpful to put a quality control system in place, e.g. together with the Bureau of Standards.

These projects also train stove builders and resellers how to run small businesses and how to attract new customers. In an informal setting, where many people are illiterate and lack basic business knowledge this can be very challenging.

GTZ has also learnt that it is even more challenging to meet the balance between production and demand. To create needs, public awareness is the key. Generally, small-scale producers in the informal sector are not able to make large advertisement campaigns and to raise awareness of potential customers on the general benefits of improved stoves. Thus, donor organisations and the public sector in general are crucial in designing sensitization campaigns to illustrate the problems of traditional biomass use for cooking and for highlighting the benefits of efficient stoves.

GTZ has learnt that very often the public sector and development projects themselves have to be sensitised in a first step. Mainstreaming cooking energy into other areas than energy is crucial for the sustainability of cook stove interventions.

Our experience shows that only if people engaged, e.g. in the health sector realise the relation of cooking energy to health prevention, they will be able to react accordingly and maybe to include cook stoves into their own programme or run awareness campaigns.

Furthermore, the overall policy framework should be supportive. It is the role of national governments to formulate such policies, to integrate cooking energy into research and development efforts, and to promote awareness raising campaigns as well as to provide required public funds. Donor organisations can support these efforts through policy advice and through sensitization of political leaders (EUEI PDF/GTZ, 2008).

To sum up, the role of donor organisations is to:

- Support the development of technologies.
- Support the setting up of research and testing centres.
- Promote improved stoves, raise awareness in population.
- Develop capacities in trainers, stove producers, sellers, etc.

Furthermore, in order to increase the sustainability of cooking energy programs, donor organisations should:

- Create awareness among national governments and the different Ministries.
- Support partner countries in the development of biomass energy strategies,

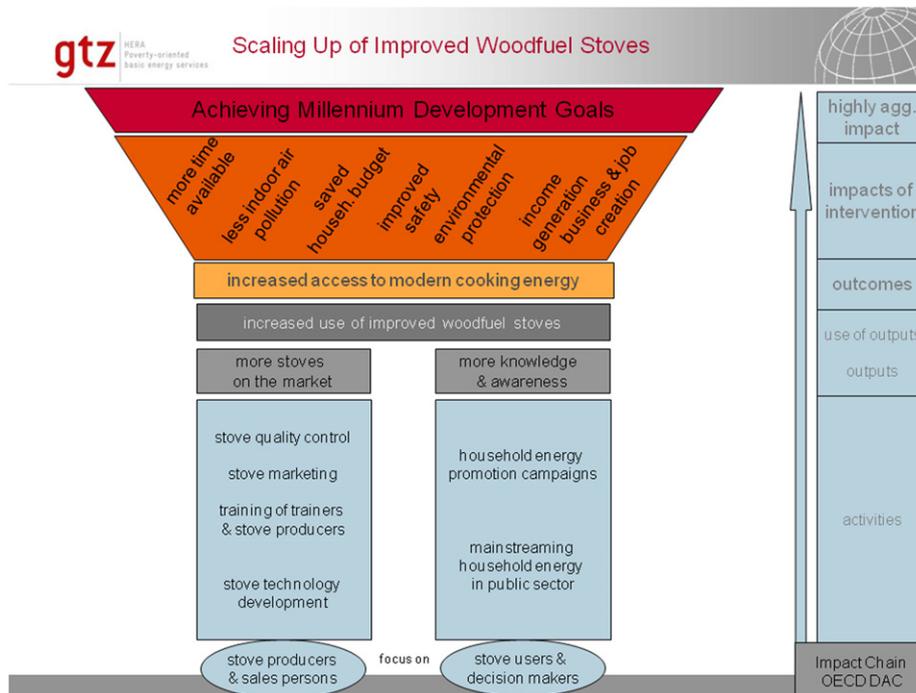


Fig. 4. Scaling-up approach (GTZ HERA).

- Mainstream cooking energy into the public sector of a partner country as well as into the activities of NGOs and other implementing agencies. Show them the relations of cooking energy and the specific topic they are addressing.
- Raise awareness among own organisation and on the international agenda,

7. Case study Uganda

GTZ is currently implementing successfully the Ugandan Energy Saving Stove Project on behalf of the German Federal Ministry for Economic Development and Cooperation. It is co-financed by the Dutch government and part of the wider Ugandan–German “Promotion of Renewable Energy and Energy Efficiency Programme” (PREEEP). The project started at the end of 2004 in Bushenyi District, a rural area characterised by high population density and severe fuelwood shortages. In the last years it has been consequently expanded into other districts. Traditionally, people in Uganda have cooked on the relatively inefficient three stone fires. As most people have access to firewood, and have little income, with support from the project, three stove models have been developed based on the “rocket stove” principle (Fig. 5).

All stoves are made from local materials—except for the portable Rocket stove, which is a metal stove. GTZ has supported the setting up of a testing centre at the Makerere University in Kampala, where research and development of efficient technologies is continuously ongoing.

In rural areas, the project trains trainers from different local NGOs who are then training local artisans to become stove builders. They built the inbuilt stoves on demand, and are paid by the households requesting the service. A monitoring system guarantees that only good quality stoves are installed. Metal rocket stoves and portable rocket stoves made of clay are produced on stock. On the demand side, substantial awareness campaigns are conducted in order to increase orders for stoves.



Fig. 5. Woman cooking on a Rocket Lorena, Uganda (Photo: Ulrich Laumanns, GTZ).

All activities are carried out in strong cooperation with the Ugandan Ministry of Energy and Mineral Development (MEMD). GTZ has also supported the Ministry in the development of its Renewable Energy Policy for Uganda (Ministry of Energy and Mineral Development, 2007) that aims at making modern renewable energy a substantial part of the national energy consumption. Within this framework, clear targets for the scaling-up of modern stoves are set. By 2017, 2,500,000 households shall be reached with efficient charcoal stoves and 4,000,000 households with efficient fuelwood stoves.

Since 2005, around 500,000 households in Uganda have started to use the energy saving rocket stoves; a rate of

dissemination that has not been reached previously in any African country in such a short period of time.

The reasons for this success can be summarised as follows:

- The technology is convenient, modern, and (most importantly), it is affordable.
- The dissemination approach – training local artisans, using local material, employing local service providers and NGOs for training and promotion campaigns – strengthens local value chains.
- An intensive monitoring system from the beginning guarantees product quality.
- The political system acknowledges the relevance of efficient and modern cookstoves and supports a massive scaling-up by setting clear targets.

The evaluation of the project shows significant benefits for individual households. A family using the improved stove saves:

- on average 3.1 kg firewood per day;
- seven hours per week in cooking time and on the collection of firewood;
- 26 EUR per year on fuel, if fuel is bought; and
- every second woman reports suffering less eye irritation, coughs or accidental burns.

A Cost–Benefit Analysis of the project indicates that the cost–benefit ratio of the investment by the project is very positive. Each 1 EUR spent by the project (public funds) for training, monitoring and awareness campaigns yields a return of 25 EUR considering all economic benefits for private households and the public sector: fuel savings, reduced cooking time, reduced costs for the health sector, increased forest conservation, and reduced emissions; calculated over a period of ten years and at a discount rate of 10% (Habermehl, 2007).

8. Conclusions

The UN Millennium Project seeks to halve the number of people without access to modern cooking fuels by 2015. Furthermore, at the MDG summit in September 2010 the importance of energy in meeting the MDGs by 2015 was recognised. Using energy efficient and clean-burning stoves is one of the means that can help to achieve this objective. The commitment of donors and the public sector therefore has a critical role.

Scaling-up the dissemination of cookstoves requires public sector investment—be it international and/or national. Public

finances should be used for capacity development, awareness raising, and for further technology development and researching appropriate scaling-up mechanisms. A supportive political framework is necessary for making the use of biomass both sustainable and renewable.

The case of Uganda has proven that the large-scale introduction of cook stoves is possible. With costs of 3–12 Euros per person reached and a cost–benefit ratio of 1:25, investments in efficient and clean stoves pay-off, both for the household and for the public sector.

If the goal of the UN Millennium Project is to be reached until 2015, and assuming a mean of 7 Euro per person provided with clean cooking energy, costs for the international community would be approximately 1.12 billion Euros per year. This is only slightly more than 1% of the yearly Official Development Assistance.

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