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Scaling up and commercialisation of household energy initiatives

Boiling Point

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We would like to extend our thanks to the Shell Foundation for financial support towards this edition of *Boiling Point*

Back issues of Boiling Point

49 – Forests, fuel and food
48 – Promoting household energy for poverty reduction
47 – Household energy and enterprise
46 – Household energy and the vulnerable
45 – Low cost electrification for household energy
44 – Linking household energy with other development objectives
43 – Fuel options for household energy
42 – Household energy and the environment
41 – Household energy; the urban dimension
40 – Household energy and health
39 – Using biomass residues for energy
38 – Household energy in high cold regions
37 – Household energy in emergency situations
36 – Solar energy in the home
35 – How much can NGOs achieve?
34 – Smoke removal
33 – Household energy developments in Asia
32 – Energy for the household

In this edition . . .

Firstly, welcome back to our colleagues in GTZ who are once again co-producing and helping to fund this edition of Boiling Point. I am sure everyone will be happy to see the centre pages outlining the work done by GTZ worldwide.

This edition is a real celebration of success. Many of our authors have achieved major positive impacts, and I am grateful that they have taken the time and effort to share their knowledge with all of us. The differing (and sometimes conflicting) approaches seem to reflect how important it is for the solution to be locally appropriate to the need. Mass production and commercialisation, until recently considered 'not quite suitable' for NGO activities are now recognised as key aspects of poverty reduction – I hope you agree….or let your opinions be known by writing to me.

Finally, welcome to Jon Rouse, our theme editor, who informs me that it was 'hard work but enjoyable' – many thanks Jon, for all the time you spent working on this edition.

Contributions to Boiling Point

- **BP51: Sharing information and communicating knowledge** This edition follows closely from BP50, with its theme of 'Scaling up'. How can people share what they 'know' about household energy? What are the routes, both formal and informal, which can be supported and strengthened in order to allow knowledge to be shared more freely? Are there ways for distributing information on household energy which you have found successful – locally? nationally? internationally? What factors inhibit people from sharing their knowledge? or from disseminating useful information? How can those barriers be overcome? These routes could involve local participatory approaches, educational programmes, local theatre, books and journals, media, electronic networks, exchange visits etc. If you have successful strategies, *Boiling Point* would love to share your knowledge and provide information so that others can benefit from your experience.
- **BP52: Health, safety and household energy** *Boiling Point* last looked at health in BP40, and much has happened since this edition. What have we learnt? What can we tell policy-makers when they ask how to remove smoke from millions of households in their country? What are the dangers associated with fuel-gathering, particularly in crisis situations – assault, land-mines – we need to hear from anyone taking positive action to reduce these risks. Safety of children – what can be done to reduce the number of burns for children – and also women? If you can share your knowledge, this is a vitally important issue.

We're on the ITDG website too www.itdg.org/boilingpoint.The good news is that the journal is visited by around 200 people per month, with over a third to a half of those people downloading articles, in addition to the 2000 copies which we send out each edition.

Articles should be no more than 1500 words in length. Illustrations, such as drawings, photographs, graphs and bar charts, are essential. Articles can be submitted as typeseripts, on disc, or by email.

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Cover photo: Retailers in Accra market (photo: Alan Brewis)

THEME EDITORIAL

Scaling up

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A few years ago I was rather shocked by people's enthusiastic reaction to a small project undertaken in India. It had produced some very interesting findings, developed and tested a technology in the field and challenged a few 'project norms'. However, the project came to an end, had no chance of being scaled up, and ultimately had no impact on indoor air quality in a single house. As it happens, the project was my responsibility. While the methodology and lessons learned may have contributed to the success of subsequent projects, I felt uneasy that as a community of development professionals, we were too easily satisfied.

The place of pilots

Small projects and pilots are vital in developing effective, sustainable household energy interventions. They can help us determine whether interventions are safe, effective, appropriate, demanded and saleable in 'real life' conditions. We have a responsibility to ensure these in household energy interventions so that we do not damage people's health, waste their time and money, and lose their trust. However, without scaling up they only ever stand to benefit a few people.

The Millennium Development Goals require us to take scaling up seriously and measure our successes in terms of reducing child mortality, improving maternal health, aiding access to education, reducing hunger and malnutrition and so on. What indicators do we use to measure the success of our interventions? Testing or proving a technology in the field may be very important, but are not enough. These goals challenge us to be braver in our objectives. Success should ultimately be measured by the (direct or indirect) contribution made to sustainable, widespread self-expanding benefits to the quality of life of the poor.

Scaling up in *Boiling Point* 50

The papers in this issue of *Boiling Point* describe many different situations, present many (sometimes opposing) opinions, and tell diverse stories from around the globe.

Brewis describes developing a strong marketing strategy, brand building and paying commissions to sales staff, while Dutta describes how grant money is *invested* rather than just expended. With all its benefits, taking a business approach gives us the responsibility to ensure we are not merely delivering goods that waste people's money.

O'Neal presents a case for capital-intensive mass production of stoves in factories, which contrasts interestingly with Brewis' findings that small workshops and a labour-intensive approach give a good compromise between quality and price. Karve also describes success through supporting entrepreneurs.

Provision of finance and health impacts as advocacy messages are described in Acharya's description of Scaling up biogas in Nepal, and Cecelski explores the impact of women's status and the value of their labour.

The theme of partnership emerges strongly:Brewis and Dutta stress the importance of embracing the skills of different partners, whilst Palit describes complex institutional partnerships. Mazzoni describes public–private partnerships as a vehicle to affordable electricity for the poor.

Scaling up elsewhere . . .

The following outlines some of the recommendations for scaling up resulting from research recently undertaken at WEDC:

- Form partnerships and get people focusing on what they do best:
- NGOs for community mobilisation
- Businesses for rigorous financial viability and marketing strategies
- Municipalities and governments for resources and a conducive policy environment
- Financing institutions for responsible credit
- Poor people, as experts on their own needs, resources, limitations and aspirations.
- Ensure a market exists, and if not, develop one – employ marketing specialists,
- Respond to the legislative environment; if supportive – work with it, if not work around and/or try to change it
- Speak to people. Speak to people. Speak to people.

This project involved pilot composting projects, but the themes shared are striking.

Communication

There is considerable scope for cross learning between the energy, water, hygiene and sanitation sectors

The value of communication within the energy sector is highlighted in Owala's paper. Honest communication is key to upscaling: no one can learn anything useful from a failed pilot described success, or from lessons learned in a project which are never shared.

Boiling Point is an invaluable vehicle for sharing lessons learned, experiences and contributing to successful scaling up of household interventions for the benefit of the poor.

Jonathan has both a technical and social science background which he applies to a range of activities. Since developing stoves with villagers in India in 2000, he has been applying and teaching what he learned at the Water, Engineering and Development Centre (WEDC) UK

Theme

Scaling up biogas in Nepal: what else is needed?

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Introduction

Biogas is the mixture of gas produced by methane-based bacteria acting upon biodegradable materials in an environment that is lacking air. Biogas is mainly composed of 60–70% methane, 30–40% carbon dioxide and some other gases. Biogas is colourless and burns with a clean blue flame similar to that of liquid petroleum gas (LPG) allowing for virtually smoke-free combustion. Biogas can be used for cooking and lighting, refrigeration, engine operation and electricity generation. To date, biogas is used mainly for cooking (80%) and lighting (20%) in Nepal.

The technology has been available in Nepal since the mid 1970s, but it was not until the early 1990s that the number of installations was substantially scaled up by the Biogas Support Program (BSP). This program was established in 1992 by the Nepalese, Dutch and German governments.

The biogas plants being constructed under BSP has following characteristics:

- Fixed dome – individual plant per household
- Sizes: 4, 6, 8, 10, 15 and 20 cubic metre
- Feed materials: Cattle dung and water
- Feasible up to 2100 metres

Current status

Table 1 shows the number of biogas plants installed in Nepal since 1992:

Table 1 Biogas plants installed in Nepal since 1992

Phase	Biogas plants installed
First phase (1992–1994)	6824
Second phase (1994–Feb. 1997)	13 375
Third phase (March 1997–June 2003)	91 196
TOTAL	111 395

Source: BSP, 2004

Nepal is divided into three east–west bands running the full width of the country; by the end of the third phase, more than 111 000 plants were installed – more on hills and Terai regions as shown in Figure 1.

Livestock plays an important role in the Nepalese farming system, with 2.7 million households owning cattle and buffalo (estimate 2001). The technical potential of biogas plants in Nepal is about 1.9 million: 57% in the plains, 37% in hilly areas and 6% in mountainous regions (BSP 2004).

Currently, the Biogas Support Program has a target of increasing the number of quality biogas plants by an additional 200 000 by 2009 in at least 70 out of the 75 districts of Nepal. BSP has given special attention to developing appropriate biogas plant designs, especially for remote and high altitude areas.

Existing practice

The challenge is to achieve 200 000 new installations in just 6 years; more than the total biogas plants installed since the 1970s to date, and ultimately to reach the total technical potential of biogas in the country. It is thus important to understand the current practices and modalities of the BSP.

Key elements of the sectoral approach adopted by BSP include:

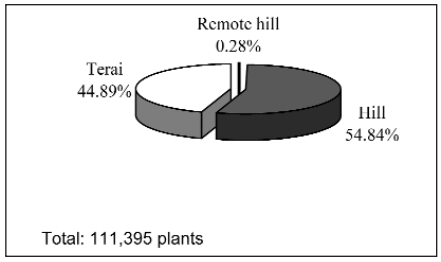

Figure 1 Geographical distribution of biogas production

- A uniform technical design for all biogas plants
- Thorough quality control and monitoring of production, installation and after-sales services
- Continuous R&D efforts to meet the needs of end-users
- Outreach and awareness programmes
- Financial support for end-users through a government subsidy of US$70–US$150 (5000–11 000 Nepali Rupees per plant)
- Stimulation of financial support mechanisms such as micro-credit facilities

Biogas construction companies are responsible for marketing and installing biogas plants and providing maintenance and after-sales services guarantees for at least three years following installation. BSP provides operation and maintenance training to all households on day-to-day maintenance and minor repairs. BSP's policy of regular quality control and supervision of newly constructed plants, as well as after sales service of plants, ensures the quality of plants and services.

According to BSP, around 97% of the total plants installed since 1992 are operational. About 80% of the total plants are of four cubic metre and six cubic metre sizes; a six cubic metre plant requires around 36 kg of cow dung per day in hilly areas (mixed with an equal amount of water) to get a stove burning for 3.5 hours. This

Theme

increases with altitute because of the retention time (average duration that dung remains in the digester). Around 60% of the biogas consumed is used for cooking.

Annually, each biogas plant can save more than four tonnes of firewood and 32 litres of kerosene. The annual time saving for firewood collection and cooking averages 1000 hours in each household with biogas plant. Each biogas plant produces about five tonnes of organic, fertilizer annually, which can replace chemical fertilizer. A recent study by Winrock Nepal and others found that each biogas plant can mitigate about five tonnes of carbon dioxide equivalent per year (1,5). The credits thus earned could provide alternative financing for the sustainability of biogas program in Nepal. More information on biogas can be obtained from www.bspnepal.org.

What else is needed?

The existing practice has focused on environmental benefits, subsidy, quality control, awareness creation etc. as the main drivings. There are other pertinent issues which need attention to scale up biogas in Nepal but this article focuses on two aspects: micro-financing and health benefits.

Micro-financing

The average plant costs about NRs. 25,000 (NRs.74~US$1), which is too costly for some potential users to pay upfront in a country where 38% of the Nepalese live with US$ 1 per day (11). The government of Nepal currently provides subsidy through the BSP and the Alternative Energy Promotion Centre (AEPC). This clearly indicates that the poor, who do not have the cash to pay for systems upfront, cannot benefit from biogas and access these government subsidies.

Micro Finance Institutions (MFIs) could provide loans to those wishing to purchase biogas plants who cannot pay the upfront cost. MFIs are strategically located in the rural areas and have enabled easy access through their simple procedures. The total membership of MFIs in Nepal comprises more than 500 000 rural customers (12% of the total households in Nepal), receiving financial as well as non-financial services. Table 2 shows the outreach of MFIs in Nepal.

Additionally, it is estimated that there are around 330 000 dairy farmer households (Winrock 2004) who are potentially significant users of biogas. Winrock estimates that more than 800 000 farmer households in Nepal are potential customers of micro-credit for the installation of biogas plants. It may not be technically or economically feasible for all dairy cooperative members to install biogas plants, but with a large proportion of dairy cooperative member households without biogas plants, there is a potentially huge market.

Winrock International Nepal, in collaboration with AEPC/BSP, is mobilising MFIs in order to achieve the set target of 200 000 additional installations by 2009, with plans for further scaling up beyond that date. Winrock International has developed manuals and has already trained more than 80 micro-finance institutions MFIs to finance biogas.

II. Health benefit aspects

Biogas can have significant health benefits. According to the Integrated Environmental Impact Analysis carried out by BSP for 600 biogas users (Figure 2) and 600 non-users, four percent more non-biogas users have respiratory diseases than those who own biogas plants (3). Qualitative information from various household surveys carried out by BSP has revealed that problems like respiratory illness, eye infection, asthma and lung problems have decreased after installing a biogas plantn (Tables 3 & 4).

According to the Biogas Users' Survey conducted in 2000 with 100 households, biogas can have positive impacts on the health of its users. Out of 42 respondents who had respiratory problems in the past, it was reported that the problem has improved for 34 of them. Similarly, those who had problems like asthma, eye infections and lung problems found that their problems had decreased after displacing dirtier fuels with biogas.

Table 2 Total membership of MFIs in Nepal (as of December 2003)

SN	Type of MFIs	Number of institutions	Number of members
1	Development Banks	9	253166
2	Savings and Credit Cooperatives	1786	258195
3	Financial Intermediary NGOs	30	18391
Total		1825	529752

Source: Directory of MFIs, Center for Micro-finance

Figure 2 Nepali woman cooking with biogasSource: BSP/Nepal

Theme

Table 3: Health benefits of biogas

Disease	Problems in the past (HHs)*		Present status of HHs	
	Yes	No	Improved	Remained same
Eye infection	72	18	69	3
Cases of burning	29	71	28	1
Lung problem	38	62	33	5
Respiratory problems	42	58	34	8
Asthma	11	89	9	2
Dizziness/headache	27	93	16	11
Intestinal;/diarrhea	58	42	14	44

*HHs = households
Source: Biogas Users' Survey 2000, BSP

Table 4 Health benefits of biogas (2)

	Decrease	Increase	No disease
Disease	20	–	80
Cough	53	–	47
Headache	33	3	67
Nausea	5	–	95
Chest pain	15	1	85
Lethargy	11	–	89
Respiratory disease	41	–	59
Malaria	8	2	92
Typhoid	10	4	90
Total (%)	22	1	77

Source: Biogas Users' Survey, 1999, BSP

Theme

Unfortunately, these health benefits are included under 'other benefits' in the reports and the health community seems not to have recognised the importance of such impacts.

During the preparation of the 'Status Report for Nepal on Household Energy, Indoor Air Pollution and Health Impacts' conducted by Winrock International Nepal in 2003–2004, no quantitative information available was found on the indoor air quality impacts of biogas plants in Nepal. However, a comparative study carried out in India by Kirk Smith et al in 2000 (4) shows that in terms of net concentration of total suspended particles (flue gas level concentration minus background concentration), biogas has values comparable to those of LPG, with the lowest values compared to other common cooking fuels. This has positive impacts on reducing indoor air pollution level and the corresponding health impacts (Table 5).

Thus, it would benefit the BSP programme (and/or other parties) to measure indoor air pollution improvements following biogas installation, and promote the health benefits. This will both encourage biogas installation and attract the attention of health programmes, motivating them to include biogas in their own programmes. The health benefits of biogas should be delivered by advocated by communities and departments.

Conclusion and recommendation

Specific and target-oriented approaches like subsidy, quality control, private sector involvement etc. adopted by the Biogas Support Program have lead higher additional targets of 200 000 being set. To date, environmental benefits have been the driving factor of biogas promotion, while important health benefits are underemphasized. Existing successful approaches, including quality control, subsidies and information dissemination, should be continued.

Since many of the accessible and more affluent, potential biogas areas are already supplied, it is anticipated that a much higher percentage of future plants will be sold to the poorer and more remote communities. Since His Majesty's Government of Nepal has a strategy to phase out the subsidy gradually, an appropriate credit mechanism for poor farmers is vital if BSP is to successfully meet its target of 200 000 plants. In addition to increasing access to credit, the health benefits biogas offers should be communicated to users, and to health and energy communities.

Table 5 Net total suspended particles' concentrations in flue gas of some cooking fuels

Fuel	Total suspended particle (mg per m3)
Biogas	0.25
LPG	0.32
Kerosene	0.48
Crop residue	5.74

References

1. Integrated Environment Impact Study 2002, BSP and Carbon Benefit Study of Winrock International Nepal and EcoSecurities
2. Integrated EIA Report, 2002 Biogas Support Program
3. Annual Biogas Users' Survey, 1999 and 2000, Biogas Support Program
4. Smith, K. et. al. 'Greenhouse Gases from Small Scale Combustion Devices in Developing Countries, India' June 2000, Environmental Protection Agency
5. Winrock International Nepal 2004 'Financing Renewable Energy Technologies: A Guidebook for Micro-finance Institutions in Nepal
6. Winrock International Nepal, 2004 'Annual Report 2003', Kathmandu, Nepal
7. Winrock International Nepal, 2004 'Status Report for Nepal on Household Energy, Indoor Air Pollution and Health Impacts' Kathmandu, Nepal.
8. Biogas Sector Partnership Nepal: www.bspnepal.org
9. Biogas Sector Partnership Annual Report – 2003, 2004, Kathmandu, Nepal.
10. Directories of Micro-finance Institutions, Center for Micro-finance, Nepal
11. National Planning Commission, 10th Five Year Development Plan, His Majesty's Government of Nepal, 2002

Ten top tips for successful scaling up

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In November 2002 EnterpriseWorks Ghana launched the 'Gyapa' improved charcoal stove—a variant of the Kenya ceramic Jiko – with funding from USAID and the Shell Foundation. By July 2004, over 36 000 stoves had been sold. This equates to an annual savings of charcoal worth $1 250 000 USD, a total of 3500 hectares of forest preserved, and around 28 000 tonnes of carbon dioxide emissions averted. With sales now climbing beyond 3000 per month, Alan Brewis, Country Director for the EnterpriseWorks Ghana office, gives us a few tips for successful scaling up.

- **Never tell your customer you are from an NGO:**

If the scale-up is going to be successful, then an independent, *profitable* supply chain must be built. Successful projects generally work with existing manufacturers and retailers; these are the project's clients, and they will be supplying a new product to their customers (the project's target group). The primary motive of the manufacturers and retailers for scaling up will be – and should be – profit. If the customers realize that the stoves are being promoted by a funded organization, then sustainable scaling up becomes much more difficult. Handouts or subsidized pricing should be avoided even in the early stages, since no customer will want to pay the full production and distribution price if their neighbour was given a stove for less.

- **Know your customers and their habits:**

When it comes to charcoal stoves, most of the customers will be urban women with a family. There will be times during the day when the majority of such women are listening to the radio; they probably like to listen to certain local dramas, or they might have favourite DJs or talk shows that they tune in to at specific times of the day. Get to know their daily routine by asking some of the following questions: Do they tend to shop in the afternoons or mornings? Do they read a newspaper and, if so, which one? Or do they get their news from the local chat on the minibus they take to the market, or by socializing after a religious gathering or maybe at the clinic? Does someone else hold the purse strings? Is it their husband and, if so, do they sit together in the evening watching TV? What do they watch and when? With this sort of information, much of which can be collected during baseline surveys and verified during on-going project monitoring, an effective marketing strategy can be designed.

- **Copy the private sector:**

Okay, we are not going to copy all of their devious tricks, but many companies have been successfully selling products to your customers for a long time. EnterpriseWorks projects build strong brands for the products they are promoting; they develop brand names, design logos (see Gyapa, above), and even compose memorable jingles that will capture the attention of consumers. In Ghana, entertaining computer animated stove images were developed for TV adverts (you can view them on the Ghana Household Energy page of www.enterpriseworks.org); these were a great success. Many of the kids in Accra and Kumasi will now spontaneously sing out the jingle when they see Gyapa events in town. Social marketing will be essential: cooking and eating competitions at local markets are great fun, and an effective method of raising awareness and selling stoves. The project should never sell stoves directly at these events, instead invite local retailers, help them to set up a stand and refer all sales to them. It may be worth hiring the local FM radio DJ to be the emcee at these events – they really bring in the crowds. Use t-shirts, caps, pens, printed balloons etc. as advertising support. In Ghana, the sponsoring of local evening TV dramas has also been a good value for the money. If possible, have the stove and its benefits featured in the script. This type of product placement, especially when it involves well-known and well-liked actors, is very effective.

- **Give the stove status and style:**

Affordability is important but it isn't the only factor that will lead to large sales volumes. Although the Gyapa stove is aimed at households that cannot afford LPG or kerosene, it is still sold as an up-market product with emphasis placed on the stove's modern appearance both in advertising and the design of the logo. It is important not to market the stove based on project goals alone; many Ghanaian cooks have more pressing issues to worry about than deforestation up-country, though they will appreciate the message of charcoal savings and reduced smoke. The Gyapa is marketed using attributes such as being modern and stylish, easy to light, cooking quickly and saving money. As a starting point, many of the features that are important to the target group can be gleaned from careful design of the baseline questionnaire, and then modified later as monitoring results are collected.

- **Balance demand creation with supply:**

There is little point in creating a healthy demand for your smart new improved stove if they aren't available at the local market (cover picture). This sounds obvious, but when building both supply and demand together from zero, it can become quite a tricky balancing act. Turn up the marketing to stimulate demand but be prepared to back off while the manufacturers and retailers catch up. Both will be sceptical at first, but as demand picks up and they notice your marketing efforts (you should be inviting them to local sales events and informing them of advertising schedules), they will become more willing to take on bigger orders and consignments.

Figure 1 Factory yard full of stoves ready for dispatch

Figure 2 Stoves need to be manufactured to a high quality

- **Pay attention to quality control:**

The early adopters that will buy the new stoves in the first months are often a little more affluent than the typical customer that will eventually make up the bulk of total sales. These early adopters are sometimes local characters and can be quite vocal; it is important that they have something positive to say about the new stove. In Ghana, our target was to train 25 manufacturers; in the end we trained – and re-trained – a total of 76. Of these, only 31 are reliably producing satisfactory quality stoves, and it is only these manufacturers that we link to retailers (Figure 2). The remaining ex-trainees may make a few low quality stoves now and then for sale directly from their workshops, but these account for less than 1% of total sales. EnterpriseWorks generally promotes and assists small-scale informal sector manufacturers. Mass production through larger scale engineering firms has been tried in the past and while this does result in a high quality product, mechanized production requires a feed of consistently high quality and expensive new raw material, which results in a more costly stove. In most stove projects EnterpriseWorks has found that well organized, small workshops with a production line system using hand tools and recycled materials, gives a good compromise between quality and price.

- **Treat your retailers well:**

For the first few months retailers won't be interested. Stoves are usually heavy and they take up a lot of valuable shop space compared to nesting buckets, basins and other kitchen equipment. Nevertheless, using established retailers is an essential component of successful *sustainable* scaling up.

Ideally you could try supplying retailers on a buy back basis: whatever they don't manage to sell, you buy back from them. However, the retailer has to pay up front for the stoves, so this rarely works in the early stages since they are uncertain that the stove will sell. Providing initial stock on a sale or return basis seems to be the best compromise. With sale or return a small batch of stoves are delivered, if they sell them then they pay full wholesale price, if they can't sell them then they give the stoves back. Some chasing around for cash from sales made by less reliable retailers is inevitable, but consider it as self selection: any retailers that cause more than minor problems can be dropped early, and you can concentrate your efforts on the more reliable ones.

Supplying retailers with an initial stock for free is to be avoided at all costs—there will be no way to judge the reliability of the retailer, stoves will be sold far below cost price, and the market for stoves in that area will be spoiled. It will also be necessary for the project to collect from manufacturers and deliver to retailers in the early stages, but as sales build, it will be possible to link good retailers with manufacturers, allowing them to sort out their own transport arrangements.

Retailers should be visited regularly and rewarded for high sales with t-shirts, caps and other promotional items. They are your link to customers, and you will need to cultivate a good relationship with them so that they will assist during monitoring exercises. During the first year of the project in Ghana we were working with 261 retailers in Accra and Kumasi; however, as project assistance in the form of sale or return supply and transport was removed this dropped to only 62 retailers. Interestingly, total sales dropped by only 31% and after 3 months it had returned to previous levels.

If a good foundation of committed manufacturers linked to dynamic retailers has been laid, and a strong demand created, then sales – and, more importantly, benefits – will grow without further subsidy.

- **Pay your sales agents on a commission basis:**

This is not a normal NGO approach but it is essential. Do not hire staff with NGO experience for these posts; choose sales staff from the commercial sector with extensive and successful commission-based sales experience. Give them targets and bonuses if they reach them.

- **Beware of projects bearing (your stoves as) gifts**

It is very tempting to boost sales by supplying batches of stoves to not-for-profit organizations; unfortunately most of the stoves will then be distributed free or at a subsidized price. This short-term surge in sales does nothing to build the commercial supply chain that is essential for sustainability. In the long term, distributing stoves in this way will weaken the supply chain since it does not incorporate retailers, and does not build linkages between them and manufacturers.

- **Use it!**

Cook a variety of meals with the stove at home and in the office from time to time. You will then become more familiar with its performance, and better able to interpret, and respond to, any feedback from users.

Rocket stoves for Sub-Saharan Africa

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Background

Since Aug 2003, my partner, Jayme Vineyard, and myself have been working with GTZ ProBEC (Program for Biomass Energy Conservation), EAP (Energy Advisory Project), World Food Program and several small businesses to introduce the Rocket Stove principle to a number of countries in Sub-Saharan Africa (Uganda, Lesotho, Mozambique, Malawi, and Zambia). Most of our work has focused on building institutional stoves (stoves for boarding schools, tea estates, prisons etc. . . .) but we have also built bread ovens, household stoves and kilns.

In March, one of our project partners in Malawi (Eastern Produce Tea Estates) asked us to help them design a new stove that would be more fuel-efficient then their existing open fire. The estate cooks for 40 000 people per day so their choice of stove has far reaching impacts on the health of the workers and the forests. The tea estate's open fires use 170 kg of wood to cook Nsima (corn porridge) for 55 people. Using Rocket stove principles; we built a new 100 litre cook stove that uses only **13 kg of wood** to cook the same amount of food.

We also built them a 200-litre stove that uses 9.5 kg–13 kg of wood to cook enough *Nsima* for 220 people; this is approximately 160 kg less wood to cook twice as much food. Yes, it does seem counterintuitive that the larger stove uses less wood. Write me if you would like more info on how this works.

Less fuel *and* less smoke

These two stoves have cut the estate's fuel consumption by more than 90% as compared to the open fire. The stoves produce almost no visible smoke, and yet they have no chimney – a fact that amazes people each day, all around the world (Figure 1). Devoted readers of *Boiling Point* know that Dr Larry Winiarski and Aprovecho Research Center developed the Rocket Stove – a unique system for cleanly burning biomass (see *Boiling Point* 47 page 36) in the early 1980s – but it wasn't until the last few years that the Rocket Stove has gained widespread recognition and acceptance.

One of the keys to producing a smokeless Rocket stove is to find inexpensive, local, and durable materials for the combustion chamber. In Malawi, we have been blessed to work with Dedza Pottery. They have helped us produce an insulative refractory brick that is light (0.67 g/cc) and durable (Figure 4). In other countries we have also used pumice blocks, vermiculite and non-insulative ceramic surrounded with insulation.

If you would like more info about any of these stoves, please contact me at apropeter@hotmail.com or http://solstice.crest.org/discussiongroups/resources/stoves/Scott/subsahara.htm

Figure 2 Quantities of fuel used by open fire and rocket stove to cook equal quantities of food (*photo: Peter Scott*)

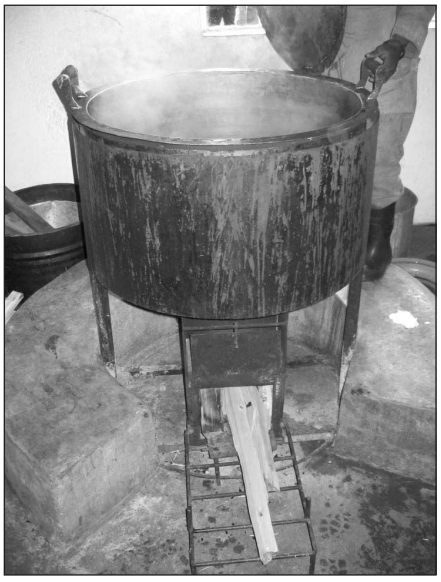

Figure 3 200 litre stove for cooking *Nsima* (*photo: Peter Scott*)

Figure 4 Combustion chamber in rocket stove being made (*photo: Peter Scott*)

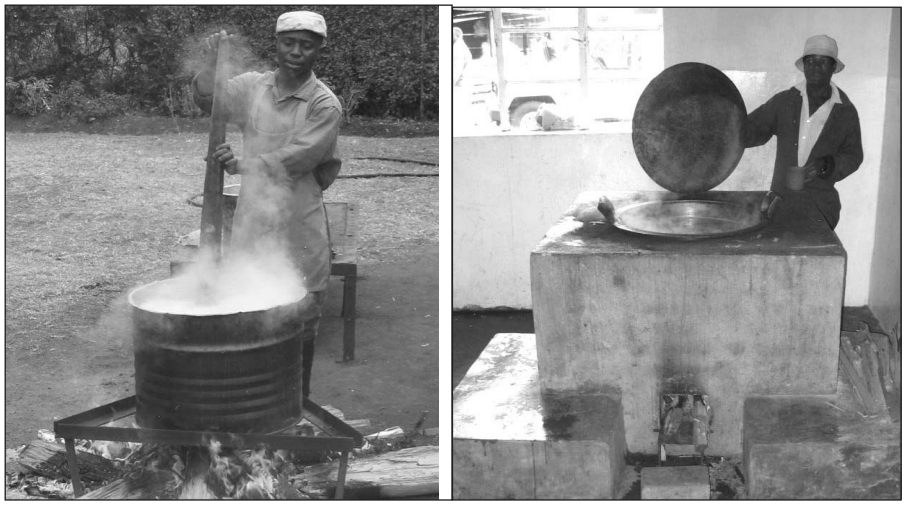

Figure 1 Open fire using 170 kg and rocket stove using 13 kg of wood to cook equal quantities of food – note the absence of visible smoke with the rocket stove. (*photos: Peter Scott*)

Theme

Designing stoves for mass production

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Introduction

It has been estimated that there is a current need for over 600 000 residential cooking stoves in Guatemala alone and that the need will double in the next 25 years. If Guatemala is indicative of other developing countries, the world's need for stoves is enormous and becoming more acute. How do we focus our money, time, and energy to derive the maximum benefit and ensure the people most in need are not left out? Mass-production, commercialization, sustainability, and subsidies are tools and goals but different people have different ideas on their use. The HELPS stove project in Guatemala (Figure 1) has uses the principles described in this article.

Background

Commercialization

In this paper, *commercialization* is a steady state in which the needs of the manufacturer, the distributor, and the consumers are all met simultaneously; there has to be sufficient difference between the manufacturing cost and the price the consumer is willing to pay. Both the manufacturer and the distributor must make a reasonable profit, and the product must be sufficiently valued that the consumer would rather have the product's benefits than the money he/she must pay.

Commercialization, when achieved, is good for everyone. Unfortunately, in rural Guatemala, 90% of the population lives in poverty, and 75% live in extreme poverty. No matter how good the solution is, or how low the price, in rural Guatemala and much of the world, they cannot afford it.

Poverty reduction

If our goal is only to have a commercial operation supplying the somewhat affluent, that can be done today. If we are to solve the problems confronting the poor, then our programmes must include poverty reduction components that will 'lead' to commercialization with time. If we rush to commercialization without first reducing poverty, the poor will still be without solutions. Poverty reduction programmes are needed which address health, education, and economic development. Such programmes will increase the purchasing power of those now poor to a level that they can, in the future, pay for a commercial stove as well as paying for better housing, food, health care, and education. But, poverty reduction takes time.

HELPS has been working in poverty reduction in Guatemala for more than twenty years and is focusing on the following:

- Curative and preventative health
- Education
- Economic development
- Community development
- Infrastructure construction
- Cooking stoves (Figure 2)

All of these items must be addressed simultaneously.

Partnerships

Partial subsidies, usually thought of as being negative, have a positive role when attempting to solve the problems of the poor. Partial subsidies should be used as a bridge between the poverty condition and a self-sustaining, healthy economic condition. Once the bridge is crossed, the need for them will no longer be needed, but without the bridge, there is no way across. In addition to the compelling humanitarian motivation, major funding groups understand that all of us who live in the more affluent countries derive a benefit when the developing countries are stable. If we derive a benefit, then we should be a partnerpartners in providing the bridge. It would be more constructive if we thought of this as partnerships rather than as subsidies.

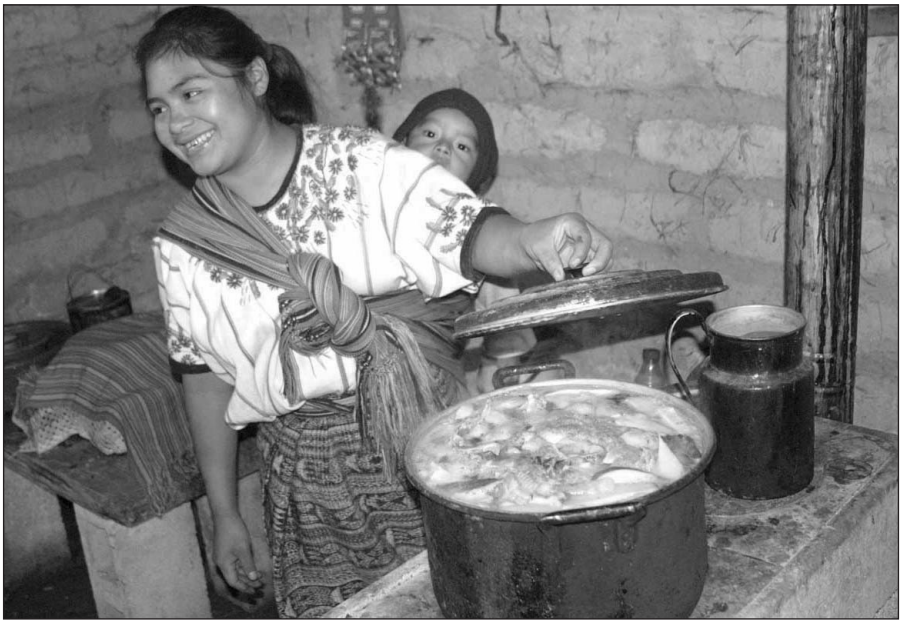

Figure 1 Woman cooking on a HELPS stove

Designing stoves for mass production

Mass production is a manufacturing technique. It does not imply a complex factory or even a building. This technique implies only that a group of identical products are manufactured. This can be a run of 100, or 1000, or more.

Mass production is independent of commercialization. A product can be mass-produced for use in a subsidized project or for a commercial project. In the case of the HELPS stove project,

Figure 2 Impact of stove installation on kitchen

stoves are sold to other NGOs for use in their community development projects. Some of these NGOs elect to part-subsidize their installations; others use micro-credit, while others sell at full price up front. All NGOs and end users receive in-depth training and follow-up inspection.

Stove design

Since one of the major poverty reduction functions of the cooking stove is to provide improved health and safety, the selection of the stove design must be tailored to provide those benefits. If the stove solution is tailored only to what people can now afford, the maximum health benefit will not be derived and one of the major poverty reduction factors will be missed.

There is not one stove that meets everyone's needs and it not practical for one supplier to supply all the various specialty stoves required. However, the vast majority of household stoves share common requirements. Any solution that can make a significant impact on a problem with the magnitude of the world's stove needs must be mass-produced. *The provision for mass production must be designed into the product and into its distribution, marketing, installation and maintenance*.

The benefits of mass-produced stoves are:

- Consistency – Each stove is manufactured identically – thus, if maintained, its performance should be consistent. This allows the manufacturer to know if it is working properly by making a quick test – the temperature rise of a standard amount of water which should match the results from a laboratory stove – otherwise something is wrong.
  Consistency is good from a community standpoint. No one feels he/she paid more than necessary for the stove or that someone else received better treatment. A consistent product is the only way an organization can have a standard price.
- Maintainability – Through consistency comes maintainability of a broad base of stoves. Businesses dealing in large quantities must have a stockpile of standard replacement parts and trained local repairmen.
- Quality control – Quality of manufacture can be controlled in the factory. An artisan stove, built on site, requires that a person return to each house for quality inspection. If the artisans themselves check the stoves this is unsatisfactory, as they will be judging themselves. A good industrial requirement is that a separate person is responsible for quality control and he / she reports to a more senior person than the people making the stoves.
- Transportability – A mass produced stove can be designed so that it can be moved when the family moves or builds a new room on the house.
- Fast assembly and fire-up – Assembly and fire-up of a mass produced stove can usually occur within an hour. The stove is then ready to use. The alternative, building on site, impacts the family because the stove needs to cure for several days. By then, training may be forgotten and the builder is

Figure 3 HELPS Rio Brovo stove factory

Theme

not there for the initial fire-up. Alternatively, it requires the builder to go back to retrain and fire-up.

- Training – Training materials and courses can be specific to the stove installed. Pictures in the training material can be identical to the stove the family receive. Training local trainers is easier with a consistent product.
- Volume – Greater numbers of stoves can be produced in any given time. For example, Guatemala is expected to double its population within twenty years. To provide the required volume of stoves will require a mass-produced, consistent stove that is quickly and efficiently distributed.
- Cost reduction – A mass-produced product can be supplied at the lowest possible cost for a given design.
- Distribution – A stove designed for mass-production allows for efficient distribution through normal distribution channels (Figure 4).

Project phases

There are several specific phases relating to designing for mass production. Each phase has a specific objective. These include:

Research

The objectives of research (within the scope of the design process) are to generate principles that could apply to many designs within the bounds of the project goals. An example of this is Dr Larry Winiarski's stove guiding principles (see *Boiling Point* 47, page 36).

Conceptual design

During the 'concept phase', the designer is aiming to solve a problem or group of problems. Obtaining advice from potential users is absolutely necessary at this stage (Figure 5). However, even at this early phase, one must think about how the product is to be mass-produced, marketed, and distributed. The output of this phase generally consists of a design on paper and specifications that are to be used to guide the project. It outlines the customer needs as well as mass marketing, training and distribution strategies.

Prototyping and laboratory testing

Once the project concept is well defined, prototypes are constructed and are typically tested in a laboratory environment. The goals of the laboratory testing are to determine if the design meets the objectives, and to establish performance specifications that can be used to ensure consistency in performance characteristics that have been designed into the product.

Field testing

This is the first real customer-based test of the design. Without exception, there will be things that the users will find that could be done better or new features that could be incorporated with minimum cost that would result in a better product. *However*, it is counter productive to omit the prior phases thinking that the users will find all the problems so why bother with the laboratory testing. If the user finds many problems, his/her confidence in the product can be destroyed and the project marginalized before it is started.

Design review

Following a solid field test, there will be a need for a design review and for changes to be made in order to incorporate what has been learned during the field test.

Pilot production

At this phase, a factory will be built and the tools necessary for limited production will be constructed. Since this requires considerable expense, it is extremely important the all the above steps have been taken and that the product and its marketing and distribution techniques have been established prior to starting the pilot production phase.

Hard production

This is the scaling up phase. The tools produced for the limited quantity of a pilot project must be re-thought for higher production quantities since different types of manufacturing technique may be more economical. For example, sheet metal parts that have been previously cut by hand might be produced more economically in a stamping press even when the cost of a stamping die is included. It cannot be over emphasized that all parts of the project must be scaled-up at the same time. It does not do any good to scale-up production if distribution or

Figure 4 Trained stove promoters with their certificates

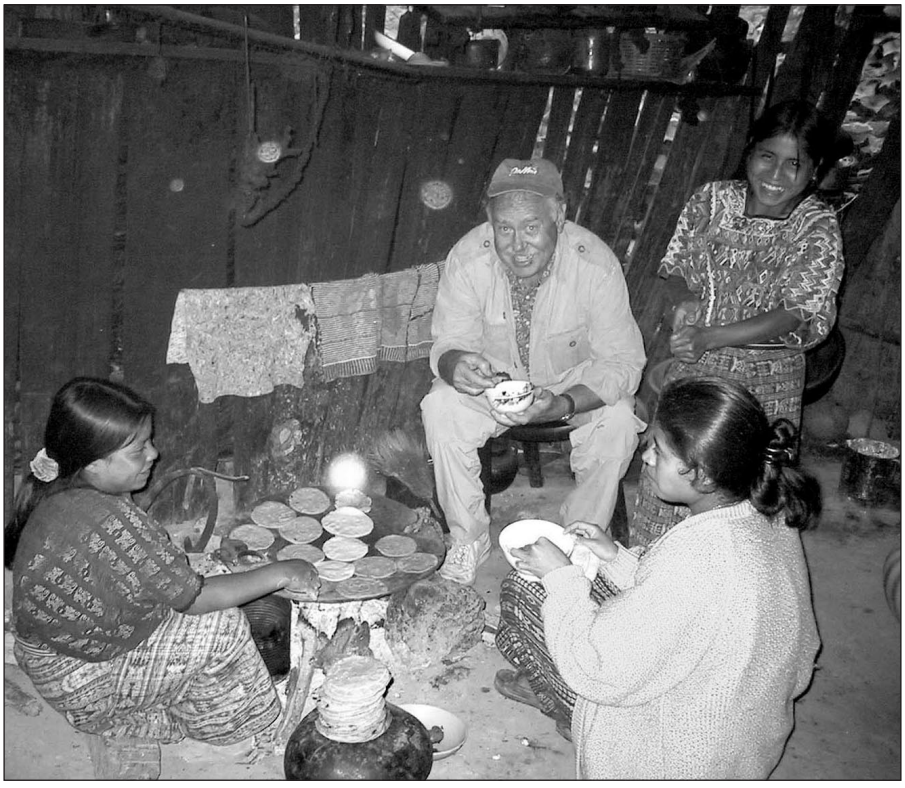

Figure 5 Discussing needs with potential stove users

marketing lags behind. Spare part depots and maintenance strategies must be in place to accommodate the increased production.

Engineering for mass production

Engineering roles and responsibilities

In the design of the overall project, it is important to understand the differing roles of the *production* engineer and the *design* engineer, although in a small project, one person may have both of the duties..It is the responsibility of the *design* engineer to design the 'product' while it is the responsibility of the *production* engineer to design the 'process' used in producing the product. Each must be aware of, and understand, the other's needs.

Handover of project control usually occurs during the pilot production phase. Before handover, the design engineer has primary responsibility and consults with the production engineer about production issues. After handover, prime responsibility is with the production engineer, though even after handover, any changes that affect form, fit, or function should be signed off and documented by the design engineer.

After handing over primary responsibility for a product, the design engineer will typically be designing the next model. This new model must not be introduced before it is ready to be delivered or the customers will wait for the new model thus destroying the market for the current product.

Quality

In any organization engaged in mass production, someone must be responsible for maintaining quality. This individual is responsible for the quality of the product shipped as well as the quality of incoming purchased parts.

To prevent the pressures of delivery schedules from compromising quality, quality control should not be the responsibility of the production engineer or anyone in his/her organization and should report at a higher level in the organization than the manufacturing function.

Cost considerations

The ability to determine manufacturing costs and to estimate future costs is vital to the success of the project. If one were to set the selling price based on the cost of producing in limited quantity, it would be difficult to find sufficient customers to justify the scaling up to production quantities. Therefore, it is necessary to make an educated estimate of costs for the quantities projected. Typically this is done using a 'manufacturing learning curve'.

Experience gained from doing repetitive tasks increases efficiency in proportion to the number of repetitions. This technique has been in use since the mid 1930s and has been used extensively by NASA. For those with access to the web, a 'Google' search on "Manufacturing Learning Curve" will produce several articles on this technique.

Each product or manufacturing type will have its own learning curve. Experience during the pilot phase can be used to determine base (initial) cost and to estimate the percentage reduction for each doubling of production quantities. Typically, each time the production volume doubles, the cost will be 80–95% of the cost before the doubling. It should be pointed out that this holds only if the production process is continuous. Starting and stopping of production will interrupt the learning process.

Conclusions

The need for cooking stoves in Guatemala is large and is growing faster than stoves are being distributed. If we are to solve the problems associated with IAP, this trend must be reversed. The majority of these stove needs can be met by a few stove designs that can be mass-produced and mass production is our only hope to produce stoves in sufficient quantity, quality, and at the lowest possible cost for a given design.

Don O'Neal is a retired corporate executive with 30+ years in engineering management. His last post in industry was as Senior Vice President of Engineering for a public corporation. Previous assignments in industry have been as Vice President of Manufacturing and Vice President of Marketing. Don now serves as the project manager of the HELPS stove project and is on the boards of both HELPS International and ETHOS.

HELPS International is a non-profit corporation that has been working in poverty reduction in Guatemala for over 20 years.

Theme

The Ecostove – getting rid of nearly 90% of kitchen wood smoke

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Theme

Introduction

In the developing world, exposure to Indoor Air Pollution (IAP) is the second most dangerous environmental health risk after dirty water and is estimated to kill 1.6 million people each year, most of them children under five. Increasingly, international donors want to know that the technologies they support are combating this deadly 'kitchen killer'.

During the 1990s, Rogerio de Miranda, as the director of the NGO PROLEÑA, had witnessed the stifling conditions within households cooking on traditional wood fires (Figure 1). PROLEÑA personnnel were convinced that the Ecostove (see *Boiling Point* 47 – page 3) made families healthier; their homes looked, smelled, and felt cleaner. PROLEÑA had been manufacturing, distributing, and selling the energy-efficient Ecostove (an offspring of Aprovecho's Rocket Stove with a chimney), in Nicaragua and Honduras for several years. PROLEÑA needed proof to show policymakers and funders in order to secure the grants and loans needed to expand its woodstove enterprise.

Evaluating the Ecostove

In January 2002, John McCracken, a technical advisor from the Center for Entrepreneurship in International Health and Development (CEIHD), arrived in Nicaragua with an oversized suitcase full of sampling equipment to help find this proof. Initially PROLEÑA envisaged having a medical team visit homes with and without Ecostoves to collect health information and symptoms like coughing and wheezing and children's health data, but making the links between health benefits and installing a specific stove requires hundreds of families and many weeks worth of data and is hugely expensive.

Figure 1 Typical house without vented woodstove in Nicaragua (photo: Rogerio de Miranda)

Linking reductions in IAP with health impacts

Instead, the team chose to assess the health benefits by measuring exposures to IAP in households with and without Ecostoves and assessing how the reduction in IAP would affect their health . (The combined results of several studies support the use of IAP exposure as an indicator of health risk.) The PROLEÑA study could link reduced exposure to smoke with reductions in illnesses affecting both children and adults. However, since the relationship between the amount of wood smoke and the levels of ill-health is not well documented, the study would not be able to calculate how much of each disease had been avoided.

Design methodology

CEIHD designed a study that compared the performance of two different Ecostove designs – 'closed' (Figure 2) and 'semi-open' (Figure 3) – in reducing indoor concentrations and personal exposures to IAP. PROLEÑA believed that the 'semi-open' model would increase energy efficiency and affordability, but might increase IAP. The 'closed' model has a completely sealed steel griddle, while the slightly less expensive 'semi-open' model, offered a smaller griddle and one open pothole providing direct contact between the fire and the pots. Both stoves had metal tube chimneys open above the roof. The team decided to measure very small particles ($PM_{2.5}$) in the wood smoke, as these have most consistently been associated with negative health effects involving the lungs and heart.

Figure 2 Ecostove with completely enclosed cooking surface (photo: Rogerio de Miranda)

Figure 3 Ecostove with partially open cooking surface – pothole under pot (photo: Rogerio de Miranda)

Implementation

This project had a very limited budget – around USD $12,000 – so sampling equipment was borrowed from the University of California, Berkeley, laboratory analysis facilities were donated by Harvard University, while CEIHD and PROLEÑA provided a lot of staff time at no cost. The study was funded by the Energy Sector Management Assistance Program of the World Bank.

The stove comparison study took place in a village of 1000 homes approximately 15 Km from Managua. The residents relied exclusively on wood burned in open fires for cooking. We were fortunate to recruit a Nicaraguan environmental scientist with a masters degree and a Guatemalan fieldwork supervisor with IAP-monitoring experience to conduct the monitoring with assistance from two residents of the study village. The study team recruited families whose kitchens had walls on all four sides so they would be able to detect the influence of stove type where emissions would be more concentrated and where the houses were all of similar design.

Thirty pairs of houses were 'matched' according to street block and kitchen type. In each home, the cooks were asked to wear particle monitors for 24 hours of monitoring (Figure 4). The same devices were hung on kitchen walls at a height of 1.5 meters and 1 meter from the stove to obtain 24-hour average particulate concentrations.

After the first round of measurements, in each pair of households, PROLEÑA staff installed the closed stove in one household, while the other received the semi-open model. In addition, each family received a set of three new pots, since the Ecostove for optimum performance requires flat bottom pots. The cooks participated in PROLEÑA's standard training session on recommended ways for using and maintaining the stoves. The study team did not require the families to use only the improved stove, as they wanted to imitate real-life conditions and determine how many people would use the Ecostoves in reality.

Figure 4 Personal exposure monitoring setup with filter unit in breathing zone and monitor pump inside backpack

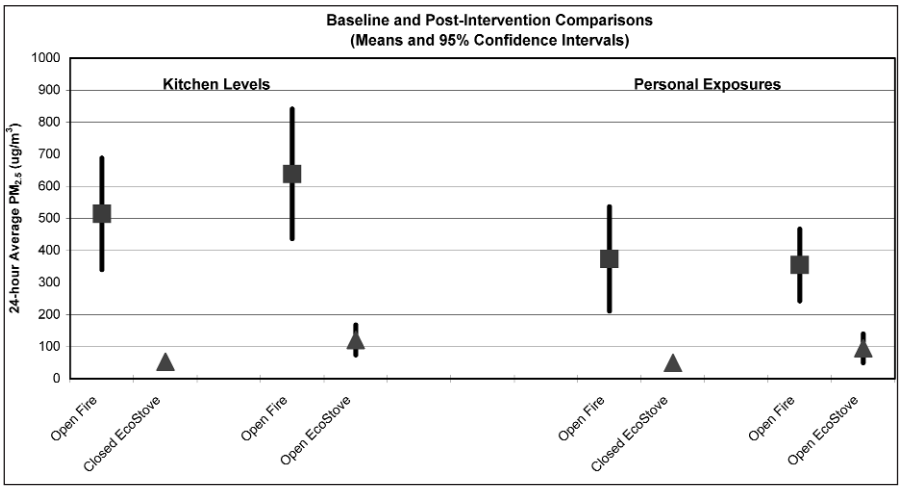

Figure 5 Reductions in indoor air pollution and exposure

One month after installation, the study team repeated the same air pollution measurements. Data collection included observations and questions on time / activity patterns and housing characteristics. This helped control any effect these variables had on IAP exposures, so that any reduction in pollution level could be attributed to each stove type.

Analysis and results

Results showed that the two groups were very similar for the household variables and time-activity data collected. Differences between them once the stoves were installed were unlikely to have been caused by differences in kitchen volume, duration of stove use, or other sources of smoke (such as cigarettes).

The study showed that both Ecostove models achieved large reductions in indoor air pollution and exposure among the cooks in the study (Figure 5 & Table 1). The closed Ecostove model reduced kitchen $PM_{2.5}$ levels significantly more than the semi-open model (p-value = 0.028), though there was not a significant difference in personal exposures. The data showed that very little time was spent at the fire after the stove was received. Given the magnitude of the exposure reductions, CEIHD concluded that both Ecostove models would offer strong health benefits to Nicaraguan families.

The study proved to be a success, and PROLEÑA has since used the results to promote the Ecostove to policymakers and funding agencies across Latin America. It is hoped that further studies will determine whether these improvements continue after the stove has been installed for a longer period of time.

Table 1 Per cent reductions in personal exposures and kitchen levels of $PM_{2.5}$

Model	Mean %reductions (95% CI)	
	Personal exposure	Kitchen levels
Closed	**87** (76, 90)	**94** (83, 97)
Semi-open	**82** (66, 90)	**87** (67, 94)

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CEIHD offers monitoring and evaluation services and equipment for household energy interventions worldwide

Theme

Programmes promoting improved household stoves in China

China Improved Stove Program Review Team with participants from the University of California, Berkeley and San Francisco; Tsinghua University; Renmin University; and the Chinese Centers for Disease Control.

For information, contact Prof. Zhang Xiliang, Tsinghua Unversity (xiliang@dns.inet.tsinghua.edu.cn) or Professor Kirk R. Smith, Institute for Global Health, University of California, San Francisco and School of Public Health, University of California, Berkeley.(krksmith@berkeley.edu).

Introduction

In rural China, crop wastes and wood are the main household fuels. The use of these fuels burdens rural residents and ecosystems in many ways. This is one of the reasons why China has undertaken programmes to improve the welfare of rural residents, including several aimed at household stoves. In the early 1980s, the Chinese government organized the world's largest publicly financed initiative to improve stoves – the National Improved Stove Program (NISP). It aimed to provide rural households with more-efficient biomass stoves (Figure 1) and, later, improved coal stoves, for cooking and heating. The Ministry of Agriculture (MOA) ran the NISP, supporting 860 of the country's approximately 2,100 counties.

The Ministry of Agriculture (MOA) claimed that, in 1998, 185 million of China's 236 million rural households had improved biomass or coal stoves. In recent years, the MOA has turned towards integrated household welfare programmes. Other agencies also have improved-stove programmes, including the Ministry of Health (MOH) and the State Development Planning Commission.

A qualitative review of NISP implementation done in the early 1990s showed that the programme has succeeded in putting stoves in the home (Smith, *et al*. 1993). However, the impact on air quality and health were not assessed. Now, nearly a quarter century after the programme's inception, the question remains, 'What have been the benefit of NISP?'

This independent multidisciplinary review, funded by the Household Energy and Health Programme of the Shell Foundation, and carried out by a multidisciplinary team from the University of California and several Chinese institutions, had three major objectives:

1. to evaluate the implementation methods used to promote improved stoves;
2. to evaluate the commercial stove production and marketing organizations that were created during the same period; and
3. to measure the household impacts of the programmes.

To address the first two objectives, the team implemented a *facility survey* of 108 government agencies and enterprises at different levels. To address the third objective, a *household survey* of 3476 households was undertaken that included measures of:

- health
- stove performance
- socioeconomic factors
- indoor air quality – in a sub-sample of the households

Three provinces were chosen to represent, respectively, high, medium, and low adoption rates of improved stoves and improved fuels. They also represent a significant range of income and climate conditions.

Figure 1 Improved stoves for biomass – chimney built into wall (*photo: Kirk Smith*)

Summary of major results

Stoves and fuels

- China implemented broadly successful programmes that delivered better stoves to majority of households in targeted counties. That success was based on strong administrative, technical, and outreach competence, and resources situated at the local level, motivated by sustained national-level attention.
- Based on the household survey, it appears that claims for penetration of improved stoves were somewhat overstated, partly due to unclear definitions for improved stoves. On this limited survey, it would seem reasonable to adjust official figures downward by around 20%.

Theme

- Although most biomass stoves now in use have flues, grates, and other 'improved' aspects, most coal stoves lack flues and cannot be considered improved from the standpoint of indoor air quality and health.
- Field tests indicate improved stoves built some years ago are probably not now reaching the 20% to 30% efficiency levels targeted by government programmes, but they are on average somewhat more efficient than existing traditional stoves.
- Efficiency of hand-built improved stoves may deteriorate over time due to materials, construction techniques, and maintenance practices. Commercial, mass-produced stoves that retain improved efficiency and emissions characteristics over time have begun to appear in many rural areas.
- In most areas, where stoves in the marketplace would once have been called 'improved' they are now accepted as the normal conventional stove – people now expect 'improved' stoves and do not regard them as special.
- A wide variety of stoves and fuels are used in rural areas (Figure 2); in winter in the three provinces surveyed, 28 different fuel combinations were used in the kitchens, and in summer, 34 different fuel combinations were used. This made comparisons difficult among many combinations within the sample size of this study.

Indoor air quality

- For nearly all the household stove/fuel groupings, the levels of health-damaging particles were higher than the national standard for indoor air (150 μg PM10/m3) – sometimes more than twice as high.
- Even in summer, many households using coal experienced levels of carbon monoxide several times the national indoor air quality standard of 10 mg/m3 (equivalent to 9 ppm), and in winter the situation was worse, particularly for households also using biomass.
- If these results are typical of rural households using solid fuels, then a large fraction of China's rural population is currently chronically exposed to levels of pollution significantly higher than those determined by the Chinese government to harm human health.
- Because many households use multiple fuels (Figure 3) in multiple stoves for both cooking and space heating, improved biomass stoves alone may not result in reduced indoor air pollution in all seasons. Improved stoves in the surveyed households, however, did result in reduced concentrations indoors of the very small and most dangerous smoke particles for biomass fuel combinations.
- Since many households change fuels daily and seasonally, health implications from fuel use are difficult to assess. Further research is needed to analyse health impacts, as well as other effects such as regional and global air quality impacts in more depth. Larger sample sizes would also be needed.
- The contribution of tobacco smoke to indoor pollutant levels in houses using solid fuels seemed to be small compared to the magnitude and variability due to stove use. As contributions from stoves decrease the relative contribution of environmental tobacco smoke will increase.

Figure 2 Unvented stove with bellows (*photo: Kirk Smith*)

Health

- In general, clean (gas) fuels and clean-fuel stoves improved health although these results were not always statistically significant; possibly due to the small number of cases.
- Coal use was associated with increased levels of carbon monoxide in people's breath, and improved biomass stoves with lower levels of breath carbon monoxide, once the analysis was adjusted for age, sex, smoking status, income, and education.
- Household-reported childhood asthma and adult respiratory disease increased with coal use and, in general, went down with use of improved stoves and good stove maintenance.

Major recommendations

Based on measurements in three provinces and two seasons, indoor air pollution levels in rural households are substantially above the new Chinese indoor air quality standards set to protect health. Because of the dozens of combinations of stoves and fuels, a larger study would be needed to determine which combinations work best. In general, improved biomass stoves with flues produce substantially lower indoor pollution levels, but still do not meet standards. The widespread use of coal stoves without flues is associated with high levels in many households.

Although NISP did not have indoor air quality improvement as a major objective, the health impacts of indoor air pollution should be central in future efforts. It would therefore be beneficial to:

- initiate public education programmes about the health hazards of indoor air pollution from solid-fuel cooking/heating systems that do not reliably vent smoke to the outside
- conduct studies within communities to evaluate specific health impacts of indoor air pollution,.
- conduct before and after studies to evaluate the indoor air quality benefits and the cost-effectiveness of interventions. (Smith, 2002)

Support is also needed for Ministry of Health-led programmes to better sort out the persistent problems of fluorosis related to coal use. In addition to the expertise and experience of the MOA in stove dissemination, outside resources could be crucial:

- to develop stove systems, including building modifications, that serve all household needs,

Theme

Figure 3 Woman using multiple fuels – coal briquettes, straw and wood, in a rural kitchen

– to create a business model that enables a local manufacturer to supply affordable improved stove systems, and
– to apply experience gained in other countries for designing outreach programmes.

It would be valuable to support the China Association of Rural Energy Industry (CAREI) , and the stove manufacturers it represents, to pursue initiatives that would foster the market for better coal stoves with flues by:

– creating a public-private research and development partnership to create inexpensive coal-briquette stoves with flues that can compete with the currently popular portable stoves,
– protecting intellectual property rights of stove manufacturers, and
– building consensus with key government departments to design and enforce standards for stove manufacturers that will help to eliminate the worst stoves from the market and promote improvement in stove designs.

Such support would be most valuable if integrated into a larger policy of promoting improved coal stoves for rural households. Without this government-led initiative, it is likely that the large number of unvented coal stoves will continue to be sold, creating dangerously high levels of indoor pollution and consequent ill health. There is a need for a new policy interventions to encourage entrepreneurs to provide new low-cost coal stoves. Such a programme would, ideally, involve the cooperation of the Ministries of Agriculture and Health, in coordination with other government agencies, stove manufacturers and research and development organizations, with the aim disseminating improved coal stoves using a similar approach to that used for improved biomass stoves. Ways to promote use of higher-grade coal need to be found as well. Since rural electrification is now nearly universal, targeted promotion of high-efficiency electric appliances for common tasks such as water heating and rice-making could also be effective.

While coal stoves should be the focus of attention, some work remains to be done on the introduction of more advanced models, and on maintenance and repair of older biomass stoves to retain their heat efficiency and indoor air quality. This should be encouraged through promotion of self-supporting commercial ventures. Both indoor air quality protection and fuel efficiency ought to be included within the goals of this effort. As the body of older stoves is often in good condition, development of relatively inexpensive but high-quality inserts for home installation into existing stoves to improve their combustion and efficiency characteristics could be pursued.

China's experience – its relative success with biomass stoves and less-successful effort with coal stoves – demonstrates what can be achieved with a well-conceived and well-run programme that is tailored to local needs and evolves as conditions change. It also shows how continued progress in achieving rural development goals may necessitate a shift in policy focus to different fuels, actors, and mechanisms. Providing a better stove is rarely enough to achieve interlinked policy goals, as socio-economic, ecological, and fuel-supply conditions change.

Goals of programmes may include improving public health, improving safety, reducing fuel demand, and raising overall welfare levels, while continuing to serve culturally conditioned livelihood and other activities. To build long-term support for intervention programmes that may span more than a decade, it is desirable to establish clearly which goals are to be served by an improved-stoves programme, map out its relationship to other programmes with overlapping goals, and provide a means for independent tracking of programme performance in terms of changes in fuel use, indoor air quality levels, health outcomes, and other policy endpoints.

References

Peabody, John W., *et al*., 2004. The Chinese National Improved Stove Program and Rural Health, in preparation.

Sinton, Jonathan E., Kirk R. Smith, John W. Peabody, Rufus Edwards, Meredith M. Milet, Gan Quan, and Zheng Yin. 2004a. *Programmes to Promote Improved Household Stoves in China: An Assessment of Programme Performance*. Report to the Shell Foundation Sustainable Energy Programme. Available at the website of the Breathing Space Programme of the Shell Foundation: http://www.shellfoundation.org/breatheeasy/latest.html

Sinton, Jonathan E., Kirk R. Smith, John W. Peabody, Yaping Liu, Xiliang Zhang , Rufus Edwards, Quan Gan, 2004, 'An Assessment of Programmes to Promote Improved Household Stoves in China,' *Energy for Sustainable Development* **8**(3):33–52. Available at KR Smith website http://ehs.sph.berkeley.edu/krsmith/page.asp?id=1

Edwards R, *et al*., 2004, The Chinese National Improved Stove Program and Indoor Air Quality, in preparation.

Is gender a key variable in household energy and indoor air pollution interventions?

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What makes a successful household energy programme?

Household energy interventions are generally seen as beneficial to women, affecting many aspects of their lives (Klingshirn, 2000; HEDON, 1995). Many such programmes have involved women as staff and entrepreneurs as well as beneficiaries. Despite this, many more household energy programmes have failed than have succeeded in reducing wood fuel consumption and indoor air pollution. Past research has identified success factors, such as focus on likely adopter groups, financial sustainability, interaction between stove designers, producers and users, mass production, minimal subsidies, and meeting consumer needs (Barnes et al 1992). But this research did not consider attention to gender analysis as a factor in success or failure.

Gender equality

One possible factor could be the degree of *gender equality* in the project area – both equality of treatment under the law and equality of opportunity. One relevant measure of gender equality could be the value of women's labour to the household. Could this be key in predicting the type of household energy intervention that will be successful in a given area?

Different approaches dependent on status

This idea draws on discussions at the Regional Workshop on Household Energy, Indoor Air Pollution and Health in New Delhi (ESMAP, June 2002). During this workshop, the author presented a model on different approaches to household energy issues, depending on women's status and labour.

Table 1 Alternative household energy approaches based on the status of women

Level of commercialisation of fuel	Labour input into the subsistence economy by women	
	Low	High
Low	Integrate household energy and indoor air pollution components into sectoral programmes targeting women's development (e.g., Ethiopia – GTZ)	Provide information and technical assistance in stoves construction and kitchen design (e.g. Kenya-ITDG)
High	Household energy and indoor air pollution programmes include components to improve women's status/quality of life (employment, education . . . e.g. Nepal REDP, Kenya-Mandaleo, Mali)	Provide access to affordable improved fuels and stoves (Thailand, China)

Commercialisation versus inter-sectoral programmes

The table suggests, for example, that where both commercialisation of fuel and women's labour input are high, a commercial approach to marketing improved cook stoves may be perfectly appropriate and successful, as witnessed in Thailand and China. Where commercialisation of both fuel and women's labour is low, however, a market approach may not be effective and, indeed, may be catastrophic, because there is no incentive to purchase improved stoves – people will gather fuel 'for free'. Here, household energy/indoor air pollution programmes may be better integrated into inter-sectoral programmes in health, agriculture, etc., that already target women and men separately, as for example in the GTZ-HEP approach in Ethiopia. In intermediate situations, where fuel commercialisation is high but women's status and access to income is low – as for example in the Nepal REDP programme or the Mandaleo stoves programme in Kenya – separate household energy/indoor air pollution programmes may be justified. To be effective, these might need to include components to improve women's status and quality of life, such as employment and education. Low commercialisation of fuel but high input into the subsistence economy of women's work (even without high access to income) may favour programmes such as the ITDG approach in a Maasai area of Kenya, where providing information and technical assistance in construction (Figure 1) has helped promote smoke hood dissemination. Even here, though, the cost of smoke hood materials has been a problem.

Factors affecting transition to improved technologies and fuels

Women's employment

Further light is shed by a comparison of the China and India experiences with dissemination of improved stoves, by Nathans and Kelkar (1997), which asserted that rural commercialisation and women's employment

Theme

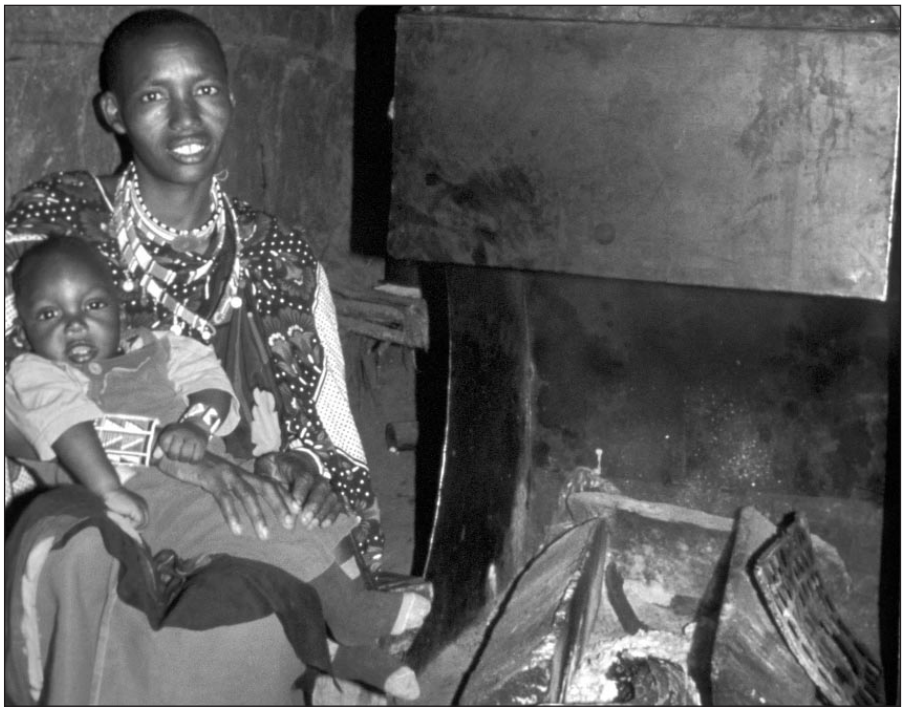

Figure 1 Smoke hood promoted in Kajiado, West Kenya (photo: Nigel Bruce / ITDG)

have been key factors in the differences in improved stove adoption in China and India (Nathan et al). Where fuel is gathered by unpaid labour, there may only be an incentive to use improved stoves if economizing on the labour of fuel collection is attractive, that is, if alternative (paid or unpaid) employment opportunities exist:

> *Consequently, a gender disaggregated analysis of household labour time, would lead to the conclusion that it is the availability or otherwise of women's unpaid labour time that is the crucial factor in determining the extent of wood fuel use, or the extent of economizing on wood fuel use. Further, that even if income were to increase without any reduction in the availability of women's unpaid labour, then there is not likely to be a reduction in the use of wood fuel, either through using more fuel-efficient stoves or through moving onto other fuels.*

If women (or girls) had a cash income earning opportunity, then there would be pressure for the household to economise on their time, e.g. through labour-saving innovations or the transfer of tasks to other household members. Kelkar and Nathan admit, however, that the analysis would only hold for farm households that collect, rather than buy, their own fuel, (which is the case in many rural areas today).

The authors use this analysis to explain the absence of a transition to modern fuels, and the continued high use of wood fuels, in many rural areas, across all income groups. In Pakistan, for example, women's free labour, rather than income levels, is an explanatory factor for patterns of use of different fuels. Higher incomes in China than in India have been credited with accounting for the difference in success rates in improved stove dissemination. It could be, however, that the low participation in cash income activities by women in farm households in India could be an important factor. Availability of modern fuels is not necessarily an explanation either, since areas with a high level of mechanization of agriculture (Punjab), do not always have a high adoption rate of labour-saving modern fuels. (Ibid.).

Status of child education

The authors believe this logic would hold good even with respect to the labour of children, for example, if the education of girls is not valued, then again there would be no pressure to economise on their labour in fuel collection.

Technologies other than stoves

The question of labour as a factor in the adoption of energy technology applies not only to improved stoves, but to other energy technologies as well. Sanogo and Skutsch (2001) make the point, for example, that the cost-effectiveness of improved charcoal kilns is always done of the basis of returns on capital investment. But their case study of two women charcoal makers in Mali shows that it is the impact on *their labour* that may be the basis of decision making by the charcoal makers themselves. The improved kilns require a lot more labour input, even though the output of charcoal is higher for the same amount of wood.

Researching gender and energy

Under DfID KaR research project R8346, ENERGIA is currently collecting examples of linkages between gender and energy project success and failure, not only in improved stoves and indoor air pollution projects, but throughout the energy sector. We look forward to being in touch with any projects or researchers who can provide project reports, studies or anecdotal information with a bearing on gender as a key variable in energy interventions.

Reference

Nathan, Dev and Govind Kelkar, 1997, "Wood Energy: The Role of Women's Unvalued Labour", *Gender, Technology and Development*, Vol. I No.2, Sage, India, 1997.

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HEP

gtz news

Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH

Household Energy Programme (HEP)

Editor: Agnes Klingshirn

News from Headquarters

International Conference for Renewable Energies – Bonn 2004

Introduction

In June 2004, Bonn played host to 3600 participants attending the International Conference for Renewable Energies – *renewables 2004,* invited by the German Government. The intergovernmental conference, which was organized by GTZ, was attended by delegations from 154 countries, including 121 ministers responsible for energy, the environment and development, alongside many representatives from the United Nations and other international organisations, non-governmental organisations, civil society, the private sector and other stakeholder groups.

Two central issues were addressed:

- How can the proportion of renewable energies used in industrialised and developing countries be substantially increased?
- How can the markets for renewable energies be better developed?

Political declaration on renewable energies

The outcome of these discussions lead to a Political Declaration that signals a worldwide turning point, according to the international press. The Political Declaration embodies a new consensus: that renewable energies are the energies of the future and thatenergy efficiency, is of key importance. The declaration reaffirms the Millennium Development Goal to halve poverty by 2015.

Commitment to action

The International Action Programme consists of almost 200 voluntary commitments and actions. Reaffirming the Millennium Development Goals means that efficient, affordable and clean energy technologies have to be made available to the poor. In terms of action this means:

- Making primary schooling accessible for all children, boys and girls alike
- Reducing child mortality by two thirds
- Halving the proportion of people without access to safe water,
- Improving the lives of at least 100 million slum dwellers.

All this needs one thing: access to energy.

Developing countries need to expand energy services massively to reach these goals, and for this they need international co-operation. Through expansion, the poor could gain direct access to modern energy services for cooking, lighting, and productive activities that generate an income. With additional energy, they could build and operate schools allowing all boys and girls to receive basic education; they could run hospitals that will help reduce child mortality; they could pump and convey water to those who are presently denied access.

Voluntary pledges

Among the voluntary pledges compiled are ambitious national targets for the expansion of renewable energy by more than 20 countries, financial commitments by governments and financing institutions, commitments in the area of research and development and initiatives for increased cooperation with developing countries in the field of renewable energy. The implementation of the International Action Programme will save more than 1.2 billion tonnes of CO_2 per year by 2015. Also by 2015, it will have provided about one billion extra people with access to modern energy. The success of *renewables 2004* was based on its new approach of building a bridge between multilateralism, bilateral cooperation and the more unilateral approach. In contrast to many previous international meetings, *renewables 2004* did not aim to achieve uniform commitments for all countries. Instead, the outcome of *renewables 2004* combines voluntary actions with Policy Recommendations and a Declaration containing a review clause.

While participants could decide freely on their own input to the International Action Programme, they accepted that measurable steps should be reported to the UN Commission on Sustainable Development and that progress should be reviewed. All key players will pave the way towards a sustainable energy future. In the follow-up of the conference, the task remains to ensure that the conference outcomes are put into practice worldwide. Only if this is achieved can we truly speak of *renewables 2004* being successful.

Policy recommendations for renewable energies

The document 'Policy Recommendations for Renewable Energies' is one

of the key conference outcomes. Ministers and Government Representatives reached agreement in the following key areas:

1. To build upon the results and agreements reached at the major Global Summits, reaffirming their commitment to substantially increase with a sense of urgency the global share of renewable energy in the total energy supply.
2. To reaffirm their commitment to achieving the United Nations' Millennium Development Goals. It is estimated that up to one billion people can be given access to energy services from renewable sources, provided that market development and financing arrangements can be enhanced as intended through the Conference's 'International Action Programme'.
3. To endorse the need for coherent regulatory and policy frameworks that support the development of thriving markets for renewable energy technologies and recognise the important role of the private sector. They noted with appreciation the 'Policy Recommendations for Renewable Energies', which provide a menu of options to decision-makers.
4. To enhance international cooperation for capacity building and technology transfer, effective institutional arrangements at all levels, corporate responsibility, microfinance, public-private partnerships, and advanced policies by Export Credit Agencies as crucial to expanding finance for renewable energies.
5. To support strengthening of human and institutional capacities for renewable energies through building capacity for policy analysis and technology assessment, strengthening education, gender mainstreaming, raising awareness of government decision-makers and financiers, promoting consumer demand, supporting development of marketing, main-tenance, and other service capacities, and strengthening regional and international collaboration and stakeholder participation.
6. To increase targeted research and development, especially by developed countries, emphasizing particularly affordability and cost reduction, innovative business and financing models and cost-effective, consumer-friendly cost-recovery models.
7. To work toward these objectives, individually and jointly, by undertaking the actions they have submitted for inclusion in the 'International Action Programme' and through other voluntary measures
8. To work together within a 'global policy network' with representatives from parliaments, local and regional authorities, academia, the private sector, international institutions, international industry associations, consumers, civil society, women's groups, and relevant partnerships worldwide.
9. To achieve tangible progress, as well as substantive follow-up and therefore to continue the high-level political dialogue begun in Bonn.

The representatives complimented the Government of Germany and the German people for organising the Conference and for the opportunity it represented to stress the importance for advancing in the implementation of the commitments of Johannesburg on renewable energies to reach sustainable development worldwide.

We have reported on the outcomes of this conference fairly extensively in the hope that this will motivate development agencies, civil society and the private sector worldwide to join in the task of monitoring the implementation of the International Action Program agreed upon at the conference. If you want more information on the commitments of your government, the national target is available from the relevant energy ministry of your country.

Latest ProBec news

Marlis Kees – www.probec.org

renewables 2004

ProBEC was actively present at the Bonn Conference engaging in three different activities: Mr Freddie Motlhatlhedi, Coordinator SADC, Energy Programmes presented ProBEC under best practices at the Plenary Session. The presentation 'Biomass energy – fulfilling energy needs for today and tomorrow?' caught the grip of the audience from all over the world. His contribution can be seen on www.renewables 2004.de under 'contributions of participants'. ProBEC staged a side event on the Day of Biomass. It was titled 'Getting Biomass Energy fit for the Future!' and had a short scenic introduction and a panel discussion. Last but not least, ProBEC also manned a stall and exhibits for interested visitors.

European Union Energy Initiative (EUEI)

has adopted ProBEC under para 8 as part of its action plan (www.renewables.de). Marlis Kees and Mr Freddie Motlhatlhedi from SADC had a meeting in Bonn with EUEI representatives. A proposal has been submitted for upscaling BEC activities in 5 countries namely Namibia, Botswana, Lesotho, Mozambique and Zimbabwe.

Launch of ProBEC SADC-North

The Ministry of Foreign Affairs of the Netherlands (DGIS) has signed the contract with GTZ-ProBEC on the expansion of ProBEC activities into Tanzania, Zambia and Malawi. The duration of the program will be from 01.07.2004–31.12.2006. The regional office of ProBEC SADC-North shall be

in Lusaka, Zambia. The first planning workshop for ProBEC SADC-North was held from 12–13 August 2004 in Lusaka. The first national planning workshop for Tanzania is taking place from 10–11 Nov. in Dar-es-Salaam.

UNDP/GEF proposal on barrier removal

A planning workshop for finalising the UNDP-GEF proposal on removing barriers to BEC in SME and institutions in 5 ProBEC-South countries ((Nam, Les, RSA, Moz, Zim) shall be held in South Africa in January 2004. In order to prepare for these planning workshops, impact assessment has been the focus of the regional office.

The Rocket Stove is rocketing!

The Rocket Stove technology for large scale cooking has been developed to a point where widespread dissemination can start. It has been tested in schools in Lesotho with promising results on efficiency and ease of handling. It has also been adapted to cooking situations in Malawi and Mozambique. Now we can proudly state that:

- WFP (World Food Programme) has ordered more than 100 stoves in Lesotho and Malawi,
- Prisons in Malawi will improve their kitchens with the Rocket stoves and
- Teacher Training Colleges in Malawi have expressed an interest to do the same.
- Various stoves have been displayed at the 'Blantyre Trade Fair 2004' in Malawi and have attracted many visitors. The stand won the Silver Prize for the industrial/manufacturing category!

Our congratulations to the VESTO!

The VESTO Stove developed and produced by New Dawn Engineering has won a prestigious award. The Design Institute of South Africa Award 2004 for Design Excellence has been bestowed on the VESTO Stove. The judging criteria included: innovation, cost/value relationship, performance, environmental impact, ease of maintenance and installation, manufacture and assembly.

Energy-efficient stoves in developing countries

A Master's thesis with the above named title has been completed by Andreas Michel at the RE studies program at the University of Oldennburg, Germany, where you can find a detailed description and evaluation of the Rocket and VESTO stoves, among others. You can find this at the ProBEC website.

GTZ

Experience exchange on low-cost clay and ceramic stoves

Mrs Joyline T.M Tawha, ProBEC National Co-ordinator, Zimbabwe

Workshop participation

A nine-day GTZ-Programme for Biomass Energy Conservation (ProBEC) experience exchange workshop on low cost clay and ceramic stoves was held in Mulanje, Malawi from 28 June to 08 July 2004. Participants included stove promoters and builders, field facilitators and extension officers from governmental and non-governmental organisations from some of the ProBEC partner countries including Malawi, Mozambique, Tanzania, Zambia, and Zimbabwe. Although not one of the ProBEC partner countries, Kenya was included, due to the country's wide experience on sustainable dissemination of clay and ceramic stoves.

The workshop offered the opportunity for promoters of various fuel-efficient household stoves to:

- Share production, marketing and dissemination experiences
- Enhance their capacities to control the quality of stoves produced.
- Discuss and exchange experiences on predominant issues relating to energy work such as food security, HIV /AIDS, indoor air pollution (IAP), and kitchen management.

Training in manufacturing

Some of the major components of the training included

- Discussions ranged around heat transfer principles governing efficient combustion, modes of heat transfer and finally how to improve on the combustion and heat transfer efficiency of the cooking system (including stove technology, pot, fuel, and fire management).
- Insights into the experiences from different countries, included information on the type(s) of stoves being promoted, dissemination strategies, numbers disseminated, results of efficiency tests, promotional methods, and challenges faced.
- Quality control issues explained that improved stove technologies need to be of sufficient quality for users to realise the benefits of saving energy, money and time:
  - Clays with the right properties have to be selected and prepared
  - Correct dimensions have to be maintained for critical components: fire chamber height , pot rests, door openings and stove wall thickness
  - Fixed stoves have to be correctly positioned in a well-ventilated kitchen to allow for good air circulation and smoke removal (Figure 1)
  - The drying and firing process have to be well monitored
  - The user needs to maintain the stove and apply improved kitchen and firewood management techniques (cutting, splitting and using dry firewood, extinguishing firewood when cooking is finished, maintaining a small hot fire directly under the pot, soaking dry food, cutting food small,

Figure 1: Stove installed in kitchen

having all necessary ingredients within reach etc).

Participants were given practical field experience in addressing quality control issues in stove production (Figure 2) , installation and use, packing, firing and off-loading of an improved kiln and on the production and use of a retained heat cooker – commonly referred to as a fireless cooker.

Training in marketing

An introduction to marketing defined it as 'the process that is aimed at improving on the quantities of the products sold and profit accrued by concentrating on satisfying customers' needs'. The marketing concept thus entails determining the customers' needs/wants and adapting and supplying these in a more efficient and effective manner than competitors.

The four major steps involve identifying and understanding customer needs, (4Ps of marketing) were discussed and participants agreed on key issues to be considered for each component. These components comprise:

Figure 2 Newly constructed stove

- **Product** – item on sale
- **Price** – setting price to make a profit
- **Place** – finding the best way to get the product to the customer
- **Promotion:** creating ways to persuade customers to buy your product

Pricing

More time was allocated to the pricing aspect in response to participants' request for a pricing formula. Since clay and mud are normally collected and not bought, the pricing for mud and clay stoves involves costing the time spent collecting the clay, firing and distribution costs + losses for clay stoves, promotional costs and profit margin. In general, the prices the promoters were charging were lower than the ones they calculated at the workshop, mainly because of some time cost elements that they were taking for granted. The promoters agreed on the need for constant review of prices to keep in line with prevailing conditions but still considering their customers' ability to pay.

Monitoring

An introduction to monitoring defined it as a process involving the collection and analysis of data to ensure that the programme meets the objectives and needs of the users. The participants were introduced to participatory impact monitoring – monitoring by different players including; users, promoters, installers, facilitators, extension staff, project management team, and the donor at different impact levels. Participants agreed that to facilitate the monitoring process survey should include: numbers produced and/or installed, dates produced and/or installed, sales figures and problems encountered and the solutions that had been found.

Workshop outcomes

- An introduction to impact assessment: this gave participants an opportunity to assess the effectiveness of the work they are doing. This helped them to identify strengths and possibilities for improvement.
- **Commercialisation**: participants agreed that for sustainability of stove projects, efficient stove technologies and techniques should be introduced through a commercial or semi commercial approach. For mud stoves, commercialisation is mostly through the provision of installation services while ceramic stoves can be commercialised through both selling and installing in houses. The group identified key stakeholders for support in such an approach including producers, artisans, stockists, promoters and users. Governments and the donor community are essential in training and awareness raising.
- **HIV/AIDs:** this session raised the awareness of participants on prevention, Voluntary testing and counselling (VTC), home based care and nutritional needs of patients and how stove projects can alleviate the effect of HIV/AIDs including a better cooking environment (reduced exposure to smoke and excessive heat), well cooked food, boiled water and less money or time spent in acquiring firewood.
- **Monitoring systems**: At the end of this session a recommendation was passed by the participants, that it would be desirable to come up with a more comprehensive monitoring system, which involves the different players themselves in the monitoring process (after appropriate training), as it is through this process that they get a better understanding of the interlinkages that exist between them, which all contribute to a successful dissemination. It was further suggested that ProBEC should take up the development of such a system as soon as possible.

Strengthening community partnerships

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Introduction

ITDG-East Africa recently completed a successful biomass energy project on commercial production and marketing of fuel efficient stoves. The lessons learnt have been shared with various partners sharing a common interest, including the GTZ-funded ProBEC (Programme for Biomass Energy Conservation in Southern Africa). This paper describes two key findings that came out of the study;

- The need for ongoing support to local promoters (Figure 1)
- The impact of sharing information through an exchange visit between ITDG-East Africa and the GTZ-funded organization ProBEC.

Ongoing support to local promoters

One key lesson is that local stove promoters should be identified and supported if they are to sustain the promotion and dissemination of stoves in their communities after the projects ended. If this is happens:

- Communities are able to build their own linkages with the promoters for longer-term commercial promotion and dissemination of technologies and services that are having a positive impact on their own lives.
- With well-communicated participatory training, communities are able to raise their own capacities and train other people on those technologies.

Figure 1 Stove promoters in West Kenya (photo: Vincent Okello/ITDG)

Impacts of information sharing

In July 2003, ProBEC facilitated the visit of 13 stove promoters from Malawi and Zimbabwe to West Kenya to join with the stove promoters in West Kenya to exchange ideas. The key objectives for this visit comprised:

- Building linkages at grassroots level to initiate partnerships
- Sharing knowledge and skills on stove production and marketing
- Initiating promoter-to-promoter training

Achievements of the visit

- There was promoter-to-promoter training on quality control of ceramic stove products, clay preparation, moulding, and firing.
- The Malawi team learnt about many aspects of the kitchen improvement activities promoted by ITDG
- The teams shared the idea of setting up a promoters' network in Kenya.
- The visit to the Provincial Commissioner was aired on television and thus the stove promoters had the opportunity to promote their activities on the Kenyan media.

Impact of the exchange visit

- Based on this visit, together with previous input from ITDG-East Africa, the promoters from Malawi have constructed six 'better bonfire kilns' thus improving their firing technologies (1).
- One stove promoter has improved her production and marketing skills and has since increased her income as a direct result. She is now providing training in other areas on production and marketing of the improved ceramic stoves
- Fireless cookers (hayboxes) were promoted and have received significant attention from the communities from which the promoters came (2). These cookers conserve fuel and reduce the time spent with the fire alight, thus reducing the amount of smoke generated as well.
- The IFSP (Integrated Food Security Programme) in Mulanje has built linkages between their food security work, and their work on household energy and health, thus broadening the impact of stoves.

As a result of the impact of this meeting, further meetings have been arranged in Malawi for promoters from Mozambique, Zambia, Tanzania, Zimbabwe and Kenya. They are exchanging new ideas, and receiving follow-up training on production and marketing of improved stoves.

Conclusion

Sharing lessons learnt is very important for both sustaining development activities and for scaling up of activities.

References

1. Agumba, M. & Abbott, V. (1996) How to Build, Use and Maintain a Better Bonfire Kiln, IT Kenya
2. Still, D. (1999) The Haybox for energy conservation: *Boiling Point 43,* ITDG, UK

[More details on the work done by PRoBEC can be found in the GTZ pages]

Theme

Dissemination of solar home systems in Vietnam: a case study of successful partnership

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Introduction

The Vietnam Women's Union (VWU), a women's NGO, in partnership with the Solar Electric Light Company (SELCO), a commercial company and the Vietnam Bank for Agriculture and Rural Development (VBARD), a development finance institution, has been disseminating solar home systems in Vietnam since 1995. The arrangement makes use of a credit scheme where VWU markets SELCO's systems and administers consumer loans provided by VBARD, while SELCO provides systems and is responsible for service.

Background

Ten million people in Vietnam do not have access to grid electricity, especially in mountainous and rural areas, which directly affects women and children, who have no chance to study, a key factor in the low status of women. The Vietnamese government has encouraged non-governmental organizations to play a role in providing access to electricity to rural populations. Solar home systems (SHSs) are a logical technological solution, particularly in South Vietnam, where solar radiation is abundant.

The organizations

SELCO-Vietnam

This is a commercial company, chosen to be the recipient of the "Award for Corporate Excellence 2001" by the U.S. State Department. The company, (then called SELF), was the first solar energy company licensed to produce sell and service solar electric lighting systems in Vietnam.

Vietnam Women's Union

The Vietnam Women's Union (VWU), founded in 1930, represents more than 11 million women in Vietnam, working towards their equality and development. The VWU is a key part of the district and provincial governmental structure. VWU has several businesses such as sale of seeds, fertilizers etc. Its interest in promoting solar home systems stems from the potential of solar home systems in improving women's lot, reducing pollution and protecting the global environment.

Vietnam Bank for Agriculture and Rural Development

The Vietnam Bank for Agriculture and Rural Development (VBARD) is wholly owned by the Government. VBARD's outreach extends to 70% of the rural households served by the formal financial institutions. In absolute terms, it provides about three quarters of rural credit in the country.

The Solar Home System initiative

In 1996, SELF installed 200 systems on credit, with a credit recovery record of 85%. Aware that rural Vietnamese women make decisions on most domestic issues, SELF reached a joint agreement for a solar project in support of rural women and children.

Phase 1: Pilot project

Between 1995 and 1998, a pilot project was implemented. This included an innovative model used in Phase 2. This model works as follows:

- VWU, operating with local authorities at the commune/ward, district, city and national level, promoted awareness of solar energy and solar home systems in four target areas selected on the basis of: no grid electricity, high solar radiation, demonstrated people's need, and economic development potential.
- SELF provided necessary equipment (panels, batteries, controllers, lights etc.) and assisted in installation, repairs and maintenance; the Rockefeller Fund facilitated credit. Equipment was installed in households with 20% of the system cost paid in advance by households, and the rest paid over 3–4 years, interest-free.
- The VWU was responsible for collection and management of funds.

Important achievements of this phase were: 600 solar home systems installed in five pilot communes providing lighting, access to radio and television, improved cultural activities; 20% utilized solar electricity to sew, make handicrafts and sell sundries – generating income.

The key lesson learned was that communication and education activities were key ingredients for successful promotion of solar home systems.

Phase 2: Commer`cial expansion

Phase 2 begun in 1998, is similar to Phase 1, but the advance payment by households has been raised to 25% (from 20%), with the remainder paid over 3–4 years. Monthly interest is charged:

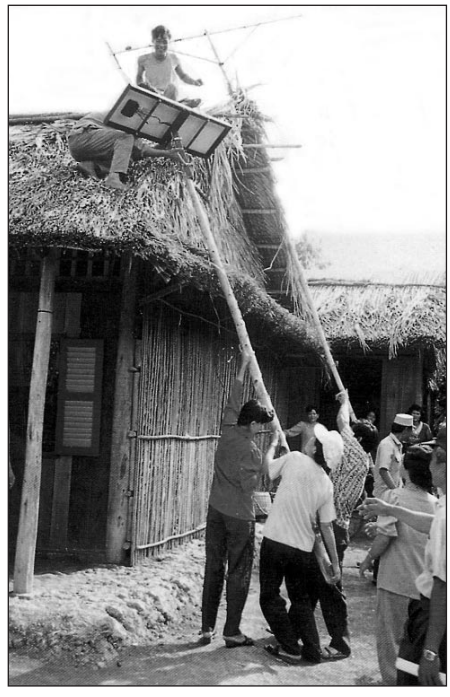

Figure 1 System being installed

Theme

- VBARD provides loans of up to 75% of the system cost at 1.15% interest per month
- SELCO provides financial and technical assistance for management, training, consumer credit, marketing, and technical areas including installation, repair and maintenance of solar home systems. It pays the bank US$50 as security for each system, which is covered through IFC/GEF financing. If a purchaser defaults on payment, he/she is issued a notice to pay within 60–90 days or SELCO repossesses and refurbishes the system, and VWU finds a new buyer. VBARD has access to the SELCO guarantee for any resulting losses.
- VWU is in charge of marketing; motivating households; developing material on basic maintenance; and conducting solar home demonstrations in co-operation with SELCO. It is also responsible for reporting problem areas that require troubleshooting, seeking support of government bodies, and identifying new project implementation sites.

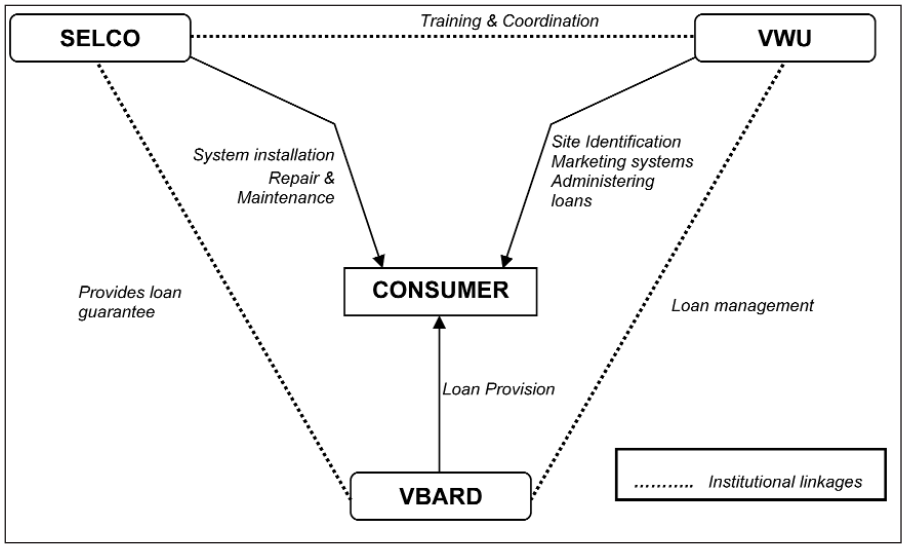

Figure 2 Institutional arrangements

The roles of the three organisations are summarised in the Figure 2.

The revolving credit system has been highly successful. Ninety-five per cent of the payments are made on time and there has been no problem with defaults. Households have started coming forward to buy solar home systems on a cash basis. In some specific areas, the local government offers 50% subsidy for people buying solar home systems. In these areas, VWU communes identify the households for subsidy, and provide support for processing these applications.

Impacts

Nearly 2000 households and commune centres have installed solar home systems under the project. Solar home systems are used for lighting, accessing information, and generating income to improve living standards in rural areas. About 10% of the families involved in the electrification project have independently purchased black and white televisions. In addition, street lights installed in the village markets provide an element of safety that has extended trading hours.

VWU has effectively put solar energy on the agenda at local and national government level and several local authorities have started financing households for purchase of solar home systems.

Lessons learnt

Building on the pilot project

Setting up demonstration units resulted in creating awareness, which was followed up with targeting opinion leaders and progressive farmers first. The pilot project was instrumental in effecting key changes in strategy, including fine-tuning the technology and addressing problem areas.

Focusing on core competence

By focusing on key competencies, the strategy allows each party to focus on its strength area.

Creating local presence

VWU operates through its commune offices, allowing it to respond better to consumer needs. Its presence instils confidence in rural customers. By setting up local sales and service centres, SELCO has involved local people and created jobs both in supply and quick and effective repair.

Judicious use of grant money

As in its India operations, SELCO treated grant money as investments into its venture. SELCO used the IFC/GEF financing to cover its collateral guarantee to VBARD, thereby ensuring their interest and involvement in the operations.

Conclusions

This programme demonstrates how photovoltaic systems can contribute to sustainable development in remote rural communities. Contrary to popular belief, the experience shows that even in poor rural areas, commercialisation of solar home systems may be possible. This initiative harnessed the core competencies of partners, minimizing risks and keeping overheads low; developing financial mechanisms appropriate for consumers and posing little risk to lenders; creating a local presence and responding to the operating environment. Perhaps the single most important lesson is identifying untapped, potential markets and nurturing them. It also demonstrates that a mass organization such as VWU can play a key role in attracting the support and assistance of local authorities.

Sources

1. SELCO, the Solar Electric Light Company website [online] http://www.selco-intl.com. [accessed: 4 August 2004]
2. E & Co Energy Through Enterprise website [online]: www.energyhouse.com [accessed: 4 August 2004]
3. Solar Electric Light Fund website [online] http://www.self.org [accessed: 4 August 2004]

A model for dissemination of improved biomass fuels and cooking devices through rural enterprises

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Abstract

Appropriate Rural Technology Institute (ARTI) is conducting a project entitled 'Commercialisation of Improved Biomass Fuels and Cooking Devices in India' under funding from Shell Foundation, UK. The project was launched in January 2003 in Maharashtra state, soon after the National Programme on Improved Cookstoves ceased to operate in the state. The project is being implemented through grassroots level non-government organizations. The aim is to establish at least 100 rural enterprises manufacturing and marketing improved biomass fuels and cooking devices, by the end of 2005. It is also expected that by the end of this period, there would be at least 100 000 rural households in the state routinely using these fuels and devices. At the half way stage, the project appears to be heading towards overachievement of the target.

Introduction

India produces annually about 600 million tonnes of agro-waste. Although it is more than sufficient to satisfy the cooking energy requirement of the entire country, the low-density biomass is a highly inferior fuel. Rural poor, not having access to better fuels, use it in inefficient cooking devices and in poorly ventilated houses, leading to harmful levels of indoor air pollution, and increasing health risk to themselves.

Technologies exist for converting agro-waste into superior fuels like charcoal, biogas, etc. Improved cookstoves using traditional biofuels in cleaner and more efficient ways are also known. During 1984–2002, the Ministry of Non-Conventional Energy Sources (MNES), Government of India, implemented the National Programme on Improved Chulha (NPIC), to introduce improved cookstoves into rural households. Overall, this activity failed to make a significant impact. However, in the 1990s, Appropriate Rural Technology Institute (ARTI), the Technical Backup support Unit (TBU) of NPIC in Maharashtra and Goa states, introduced commercialisation of improved cookstoves through rural micro-enterprises. As a result of this, by 2000, about 50 rural enterprises, based on improved cookstoves, were reporting an average annual turnover of Rs.150–200 thousand each (Rs.1000 ~ $22). More importantly, they had created a culture of using improved cookstoves in small areas of the two states. The National Programme ceased to operate in the state from 2002, however, some of the entrepreneurs continued to sell improved stoves in the open market.

From January 2003, ARTI launched a new initiative promoting improved stoves as well as improved biomass fuels through commercialisation, through funding from Shell Foundation, UK. The specific objectives of the project are to:

(a) Create a self-sustaining entrepreneurial network of at least 100 rural micro-enterprises for delivery of improved biomass fuels and cooking devices in Maharashtra.
(b) Establish use of improved biomass fuels and cooking devices as a common practice in at least 100 000 rural households in Maharashtra.

Methodology

Maharashtra state can be divided into five socioeconomic regions. Two grassroots level non-government organisations are selected as associate NGOs in each region. The project is being implemented through the following phases:

Market testing

Through its work as Technical Backup support Unit for NPIC, ARTI had the technical know-how for production of a range of improved stoves (fixed as well as portable) to satisfy the diverse cooking needs of the various communities in the state. At the same time, ARTI had developed a complete chain of technologies for converting agricultural waste into char briquettes and using the briquettes as household fuel. In this phase, the associate NGOs selected volunteer households in their areas of operation. These families were requested to try out various models of improved cooking devices, as well as char briquettes as improved biomass fuel. Periodic feedback was collected from the test users. Simultaneously surveys were conducted to assess availability of biomass fuel, and to document traditional cooking practices. By the end of this phase, a clear picture emerged regarding users' preference in the area of operation of each NGO.

Entrepreneurship training & finance

The project is currently in this phase. NGOs have selected potential entrepreneurs for training in fabrication technology for the devices that are in demand in their area of operation. ARTI is providing the technical know-how as well as basic entrepreneurship training to these candidates (Figure 1). ARTI and the associate NGOs have constituted a revolving fund to provide seed money to the new entrepreneurs. Local banks are also being encouraged to support these new businesses.

Promotion & marketing

This phase too has been started almost simultaneously. The NGOs are organising promotion campaigns in their areas of operation to create awareness

Figure 1 Training entrepreneurs in stove manufacture

among the people, and to generate business for the trained entrepreneurs.

Monitoring & expansion

In this phase (to start from January 2005), the performance and sustainability of the existing enterprises will be closely monitored, and efforts will be launched for the programme to each and every village in the state.

Lessons learned

Feedback from users

During the market-testing phase, the test users' feedback from all over the state was generally in favour of the improved devices and fuels. Some of the common observations were as follows.

(a) The most significant point for the users was that the improved stoves produced no or less smoke compared to traditional stoves, leading to significant increase in cleanliness and comfort in the kitchen.
(b) Fuel saving, time saving and ease of operation were cited as benefits.
(c) Some of the stoves were favoured due to their aesthetic appeal and also as a status symbol.
(d) Cost was a deterrent for some sections of the rural society.

Finance through revolving funds

Halfway through the project period, more than 50 entrepreneurs are active in different regions of the state. Village level awareness camps and programmes are being organised to create marketing opportunities for the fledgling enterprises. Entrepreneurs are currently being financed through a revolving fund. ARTI as well as the associate NGOs are encouraging local banks and financing institutes to support the new businesses.

Self-help groups

The strong movement of women's self help groups (SHGs) in the rural areas of the state is proving highly beneficial to the project. The SHGs are involved in the project in a variety of ways.

(a) In some locations, they are financing the cost of the stoves for their members. In this case, the entrepreneur gets a bulk order for all the members of an SHG (about 50–100 households). The member households get improved cooking devices of their choice for a nominal down payment. The entrepreneur is paid through the SHG funds, and the members repay the money to the SHG in mutually-agreed-upon instalments.
(b) In some locations, the SHGs themselves have taken up the business of manufacturing and marketing improved cooking devices. The members operate this business collectively and share the profits in accordance with their individual contributions.
(c) In some locations, the SHGs have shown willingness to finance the local entrepreneurs. Some of the potter–entrepreneurs are ineligible to obtain bank loans, due to a variety of reasons. But the local SHGs with their experience of 100% loan recovery are willing to take the risk in view of the profitability of the new business.

Clean village contests

Although, the state or central government is not directly involved in the project, some of the existing government and non-government welfare schemes are proving useful in reaching the products to the poor. One such noteworthy scheme is the 'Clean Village Contest' being implemented by the Department of Rural Development of the state government. In this contest, one of the parameters for judging the villages is number of

Theme

households using clean cooking devices. In order to score well on this parameter, the village administrations are looking for improved stove suppliers. The families in the average income group are urged to buy the stoves, whereas the administration is willing to pay for stoves to be installed in poor households.

Village-level awareness camps

Village-level awareness camps are emerging as a successful promotion tool. The NGO representative (who is already known and respected in the village) explains the benefits of the improved cooking devices and fuels. Laminated photographs and/or models as well as promotional video films are displayed. The effectiveness of an awareness camp is enhanced by the presence of the local entrepreneurs to accept orders. The new entrepreneur can be immediately financed by the NGO through the revolving fund to meet the sudden surge in demand. This strategy is proving most successful everywhere.

People-centred approach

Already more than 20,000 cooking devices have been sold through the entrepreneurs, the associate NGOs and ARTI. The current users are fast becoming promoters, and the demand is on the rise from all parts of the state. The project is generating enthusiastic positive response from the rural people. This may appear surprising in the light of the failure of the NPIC. We believe that our success is due to a people-centric approach in the promotion strategy, range of models available to suit varied needs, and ready availability of the products in the neighbourhood market through the local NGOs and entrepreneurs. All these vital ingredients were missing in the subsidy-driven government programme.

Future strategy

A massive publicity and awareness generation campaign is currently being planned to give more impetus to the promotion campaign. ARTI and the associate NGOs will organise a 'Smoke Free Week' throughout the entire state during November 1–6, 2004. Simultaneously, awareness camps will be conducted in hundreds of villages throughout the week. The NGOs will also organise live cultural programmes based on local traditions, on the theme of improved biomass fuels and devices for healthier kitchens during this week. As a build up to this Week, a series of radio programmes will be aired from 12 radio stations in the state covering 24 of the 33 districts. The NGOs will publish articles and announcements in local media. A special issue devoted to 'environmental pollution and health' of an education-based bimonthly (distribution: 3000+) is being sponsored. It contains articles about IAQ and the project. Copies will be distributed to rural schools and voluntary organisations during the Week. Additional publicity material is being produced in the form of laminated photographs, video films, pamphlets, posters, etc.

Considering the momentum gained by the project and the overwhelming response coming from the rural population, it is estimated that the project would overachieve its target. Once the minimum target of 100 enterprises and 100,000 households is achieved, the emphasis will be on:

(a) Conducting refresher courses for successful entrepreneurs.
(b) Conducting training courses for new entrepreneurs wherever required.
(c) Continuing with promotion and marketing activities.
(d) Ensuring quality of the products through continuous monitoring and evaluation.

According to the statistics published by Ministry of Non-conventional Energy Sources and the Planning Commission of Government of India in 2000, the total potential for improved biomass cooking devices and fuels in Maharashtra state alone is approaching ten million households. Obviously the number of entrepreneurs will have to increase substantially if the entire potential is to be converted into market demand. The project outcome so far demonstrates that the right strategy for achieving this goal is in place. However, the publicity, promotion and training activities will have to be continued beyond the project period. More NGOs will have to be involved to reach the concept to each village in each district of the state. In view of these possible long-term activities, a tri-monthly newsletter 'Blue Flame Bulletin' has been launched to enable the project partners to share their thoughts and experiences with each other, and with other interested persons and organisations.

Conclusions

It is noteworthy that the total annual budget of the project is less than the amount annually spent on subsidy in NPIC. The major difference in this case is that the entire amount is being spent on entrepreneurship development. The ten associate NGOs have independent styles of operation, and ARTI has allowed them to follow their own mode of implementation within the framework of the project. We believe that we have put in place a dissemination model that shows great promise of success not only in the state but also in other parts of the country. We also feel that many features of this model are universally applicable, and therefore invite the readers of Boiling Point to try out these strategies in their areas of operation.

Institutional partnership in improved cooking stove dissemination: Experiences from West Bengal, India

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Introduction

In India, rural households mostly use biomass for their cooking and heating needs. The biomass is burnt in traditional cooking stoves resulting in high fuel consumption and significant levels of indoor air pollution causing poor health of women and children. Biomass collection is linked with drudgery for women and children. To reduce the firewood consumption, the Ministry of Non-Conventional Energy Sources (MNES) launched the National Programme on Improved *Chulha* (NPIC) in 1983, to disseminate improved mud stoves, equipped with chimneys, and portable metallic stoves. Later on, the West Bengal Renewable Energy Development Agency (WBREDA), and the Khadi and Village Industries Commission (KVIC), Government of India, also began stove dissemination under NPIC in the state.

Overview of NPIC in West Bengal

West Bengal recorded one of the highest improved cooking stove penetrations under NPIC. Nearly four million stoves were disseminated in the state by the end of March 2003 – 38% of the total improved cooking stove potential in the state and well above the national average of 29% [MNES 2004]. Table 1 describes the breakdown of the improved cooking stove programme in the state.

Table 1 Improved cookstove dissemination in West Bengal

Items	SWD	WBREDA	KVIC
Year of initiation of IC dissemination	1983	1993	1988
Districts covered	18	17	10
Total ICs installed (by 2000)	849 847	237 809	1 006 079

Source: TERI 2001

Institutional partnership: Experience from West Bengal

The main feature of the programme in West Bengal is implementation entirely through a vast network of NGOs. West Bengal enlisted about 150 NGOs for stove dissemination throughout the state. In West Bengal, a combination of 'top down' and 'bottom up' implementaton was adopted, with the installation target being based on the capacity and demand from the respective NGOs (Figure 2). The Ram Krishna Mission Lokasiksha Parishad (RKMLP) NGO adopted a unique cluster approach for IC dissemination. To coordinate, implement and monitor dissemination activities, cluster organisations were formed comprising a number of village youth clubs. Forty such cluster organisations and 1500 youth clubs, spread over 4000 villages in 12 districts of the state, were involved [Chakrabarty 1999]. KVIC encouraged its NGOs to adopt a cluster approach to facilitate effective monitoring, stipulating coverage of 100% of households in at least one village of every target block for creating model 'smokeless' villages.

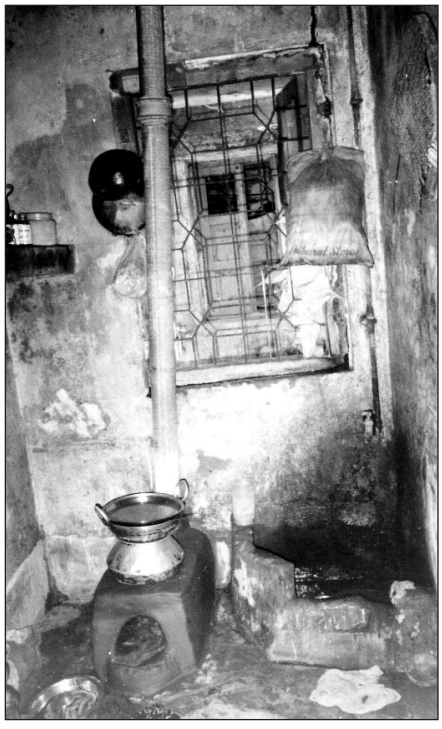

Figure 1 Sohini Seva one-pot mud stove

The success of the programme highlighted the crucial role played by village level institutions, involving village level institutions such as village *panchayat* members, school-teachers, youth clubs, women's groups etc. for motivating, monitoring, and evaluation of improved cooking stoves. (A *panchayat* is a rural local self-government or village council comprising of five democratically elected members.) In some districts, the programme was linked with the state sponsored rural sanitation programmes and the *Indira Awas Yojana* (a rural housing scheme, named after the former Prime Minister of India, Late Indira Gandhi) – to affect both health and sanitation benefits.

A network of trained stove builders called Self Employed Workers (SEW) working under respective NGO projects carried out the stove installation. The NGOs concentrated more on covering the maximum number of households in a village than encompassing a larger number of villages. The NGOs installed very large numbers of stoves through good marketing, a semi-commercial approach and providing work to stove builders – mostly youth and women.

Frequent interaction between the users, stove builders, NGOs and the implementing agencies was encouraged, resulting in custom-made stoves at affordable prices by the NGOs. Though modification reduced the designed thermal efficiency to some extent, it facilitated higher

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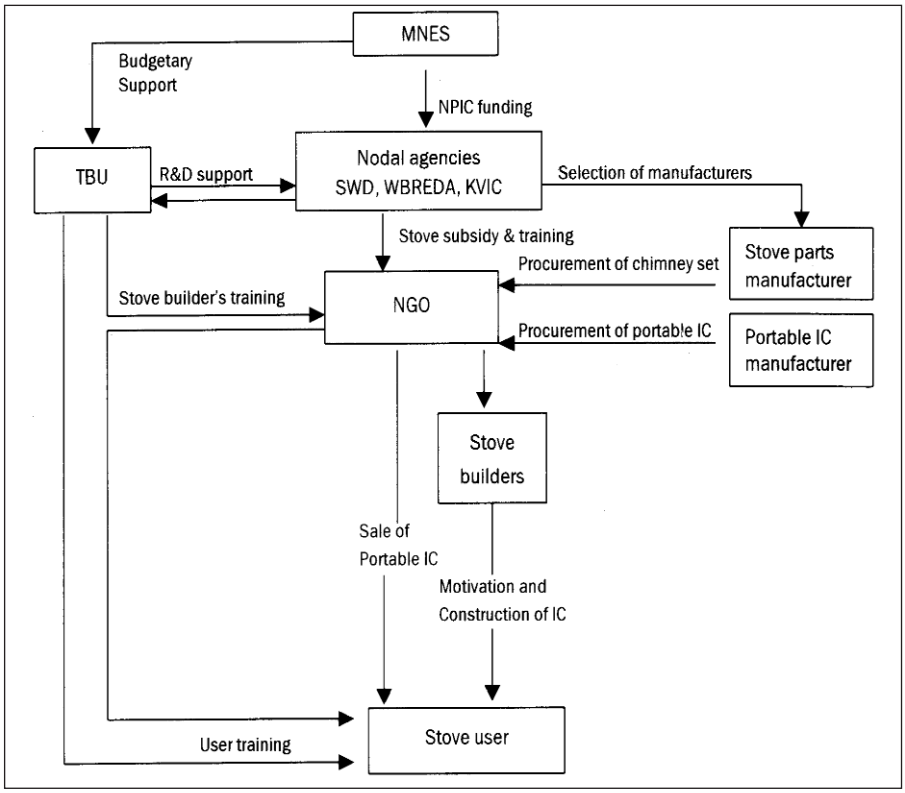

Figure 2 Institutional set up of NPIC in West Bengal

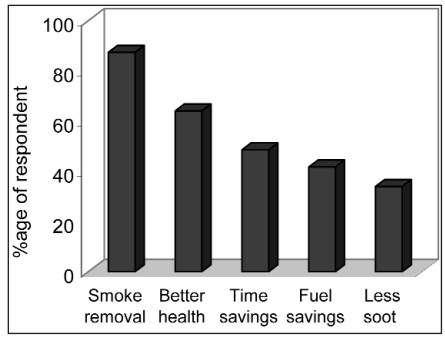

Fig 3 Perceived benefits of improved cook-stove (more than one benefit recorded per household)

penetration and sustainability of the stoves.

Empowering women

Involvement of a large number of educated youths as stove builders helped to achieve success for the programme. Many NGOs tried to empower women by training them as stove builders and assigning stove-building activities. Notwithstanding the prevalent social customs, particularly those applicable to widows, stove building allowed many to become financially independent.

Stove pricing and functionality

NGOs were able to disseminate the programme by building stoves in user's kitchen and charging the requisite stove building fee from the users. The Technical Backup Unit (TBU) suggested a recommended price but, without formal fixed prices, NGOs from different districts fixed the price to match the local situation. The beneficiary contribution in West Bengal of around 60% of the recommended stove cost was one of the highest among the Indian states [Barnes and Kumar 2002]. In some areas with a fuelwood deficit, or where wood is purchased, stove builders set a higher user contribution. The higher user contribution assisted limited commercialisation and marketing, helping stove builders to develop their market. Flexibility in pricing allowed stove manufacture with superior quality raw material for people with more money.

During 1995–2000, the percentage of households using the stoves varied from 75% [TBU 2000 to 90% average [TERI 2001]. The TERI figures may be higher because the survey was carried out in three districts with the best success rate, whereas the TBU feedback surveys covered the whole state. The ICs were the main stove in the surveyed household. The TERI study indicated that the primary benefit perceived by the users is cleanliness of the kitchen because of smoke removal through the chimney, followed by health benefits, timesaving and fuel wood savings (Figure 3). Though the users were unable to qualify the health benefits, most of them mentioned elimination of eye discomfort while cooking. Fuelwood savings featured lowest in rural areas, owing to easy access to supply of firewood and agriculture residues from the homesteads and fields.

Conclusion

The key to success in West Bengal is the institutional partnership and significant interaction between stove users, builders, promoters and designers. The NPIC in the state has shown that support of village institutions and innovative marketing efforts by the implementing agencies and NGOs can achieve the desired success and the users are also willing to pay for the product, if the design is tailored according to the user's requirements.

References

Barnes and Kumar 2002. 'Success factors in improved stove programme: Lessons from six states in India'. Pp 99–112. *Journal for Environment Studies and Policy* 5(2); New Delhi: The Energy and Resources Institute

Chakrabarty S S 1999. 'Endeavour of Ramkrishna Mission Ashrama Loksiksha Parishad towards promotion of Renewable Energy systems in West Bengal'; In *proceedings of Renewable Energy Congress* (eds. C P Dutta, S P Das and P Haldar) pp 1–7. Kalyani, West Bengal, India: University of Kalyani 205pp.

MNES 2004. *National Programme on Improved Chulha*. <www.mnes.nic.in>; New Delhi: Ministry of Non Conventional Energy Sources.

T E R I. 2001. *Evaluation of successful practices for improved stoves in India: A case study of West Bengal*; Guwahati, Assam, India: The Energy and Resources Institute 105 pp.

TBU 2000. *National Programme on Improved Chulha Annual Report 1999–2000, 1998–99, 1997–98, 1996–97, 1995–96*; Kalyani, West Bengal: Technical Back up Unit, University of Kalyani

Project Gaia: Commercializing a new stove and new fuel in Africa

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Project Concept – A stove *and* a fuel

Project Gaia first appeared in *Boiling Point* No. 43 in 1999 when the concept, pioneered in discussions with the Government of India in 1995, was taken to governments and development practitioners in Central America, the Caribbean and Africa.

The concept involved bringing alcohol-powered appliances, available in Europe and North America, to the developing world, powering them not only with ethanol, when available, but also with methanol, an alcohol produced worldwide on a vast scale from natural gas primarily for sale into world chemical markets.

The opportunities driving this concept were several-fold:

- Availability of high quality alcohol appliances adapted for use in the developing world
- Some 35 million tonnes of methanol are produced annually around the world, principally from natural gas. Much more methanol will be produced as countries and multilateral development agencies such as the World Bank find ways to reduce the flaring of natural gas associated with the exploitation of oil in developing countries like Nigeria and Bangladesh, or seek to commercialise gas fields that exist in countries like Ethiopia and Afghanistan.
- Methanol can be produced much more cheaply than ethanol or kerosene, and in theory could be sold to the consumer at a lower price. Initial research showed that it could be marketed at about half the cost of non-subsidized kerosene and in most instances on a par with or under the cost of subsidized kerosene.
- Where methanol can be produced in a country that has to import petroleum products but nevertheless possesses natural gas, the imported products could be replaced by indigenously produced fuels.
- Eventually methanol, like ethanol, could be produced from a biomass crop, through gas synthesis rather than fermentation. Methanol, unlike ethanol, would come from the inedible portion of biomass crops, lignin and cellulose, rather than from the starches and sugars required for ethanol.

The response we invariably received from policy makers and consumers, was: 'We like the stove, but how do we know there will be fuel to run it?' Thus we learnt that to prove the stove, we would have to prove the fuel, particularly the availability of the fuel. In any market where we wished to introduce the stove, we would have to develop a fuel source, fuel packaging and transport, and fuel retailing – in short, a supply chain for an entirely new fuel (Figure 1).

Figure 1 Project Gaia poster

The Production of alcohols in Africa

Ethanol is known because where it is produced it is usually produced within the economy, at a local distillery or at the sugar mill. Small amounts of it enter the local economy for beverage and medicinal use. Molasses distillation plants exist in such countries as South Africa, Mozambique, Tanzania, Zambia, Zimbabwe, Malawi, Kenya, Angola, Uganda, Egypt, Ethiopia and Mauritius. Although there are only two methanol producers in Africa, over twice as much methanol is produced in Africa than ethanol. This is a tiny fraction of Africa's potential capacity. Almost all of Africa's ethanol and methanol are exported.

Natural gas can be converted by synthesis to methanol, handled at room temperature like ethanol or kerosene, through a simple and inexpensive process – less than 4US cents per litre. Once accepted as a household fuel, methanol can be delivered to market, as a liquid, for sale in small quantities. Conversion to methanol makes it possible for natural gas sourced in Africa to remain in Africa and be put to use by the peoples of Africa – the process is cheap and easy, requiring no costly and complex infrastructure. In contrast, ethanol produced by distillation will vary in cost between 12 and 25 US cents.

Current projects

The project is not like traditional stove projects as it deals with new fuels and stoves supplied on an industrial scale. Though fuel may ultimately be

Theme

derived from biomass, it is an improved liquid fuel, virtually unknown for household energy use in Africa. Can it address the problem of scarcity and poor quality household fuels on a scale equal to the size of the problem? Is this achievable? How to get it started?

Key questions for commercialisation

Dometic is an appliance manufacturer that has recently started looking at markets in the developing world and is currently developing partnerships with those with capacity to supply fuels. Studies are under way in Ethiopia, Nigeria and South Africa

A key output for the Shell Foundation (which is supporting a pilot project in Ethiopia) is a business plan that will create the blue print for the commercialization of the Origo alcohol stove (the 'CleanCook' stove) and its fuel in Ethiopia. A key purpose of the pilot study is to map opportunities and problems, and advance as far as possible prior to crafting business agreements and commitment of investment capital. Fundamental questions seek to determine: 'Are these suitable stoves/ suitable fuels for the environment in which they are to be placed?'

Case study: The project in Ethiopia

In 2003, Dometic was granted Shell Foundation funding for matching funds for a pilot study with 1000 stoves. Dometic teamed with the ethanol producer, Finchaa Sugar Factory, and a local metal goods manufacturer, Iacona Engineering, which has an interest in making alcohol stoves.

At the time of writing, the Ethiopian pilot study has been running for 10 months – some important lessons have been learned and milestones achieved. Four hundred stoves are to be installed in homes in Addis Ababa and 400 additional stoves are ready for placement in institutional settings (offices, hospitals, clinics, shelters, refugee camps).

Field staff were recruited from Addis Ababa University, with quality control staff members who are Masters graduates to lead the field team (Figure 2) . The team has been trained in the use of the stoves and the fuel, mainly by the quality control staff, particularly in safe handling and operation. Key partners have been involved in the implementation: district administrators from the Addis Ababa city government; representatives from the City's environmental works office; a stove commercialization expert from the Ethiopian Rural Energy Development and Promotion Center; a technical agency of the government; a former the head of Ethiopia's Science and Technology Commission; a plant manager of Finchaa Sugar Company; the general manager of Shell Ethiopia.

Selection of 500 homes in which to place study stoves was accomplished in close collaboration with the city administrators to provide a representative sample of lower and middle income homes. Selecting from the whole city population has promoted the stove widely and encourage more people to buy the stove once it becomes commercially available.

Baseline studies of each home involved an extensive survey questionnaire with the family and also by personal observation in the family home – this delicate process requires respect for the family and its privacy. Next steps include introduction of the stoves with the fuel to the households. This will be an exciting moment in the project, the central focus of this project – that it is not simply a stove project, but a stove *and* fuel project.

Stoves will be monitored and safety training given. After four weeks of free fuel delivered to the home at a rate of seven litres per week, the fuel will be sold to the study participants at cost price. Later, a selling price for the fuel will be charged, allowing project staff to observe how much fuel is consumed when purchased rather than given.

The field staff will conduct consumer research which will answer our questions about the readiness of the stove, the fuel and the fuel distribution system, and provide data on marketability of the stove and fuel.

Though several ministries within the federal government have been helpful and supportive, the government itself appears hindered by conflicting regulation and policy that inhibit investment in Ethiopia. However, relationships have been forged with district government officers, with the UN High Commission for Refugees to place stoves in two refugee camps which they manage (Figure 4), with the Ogaden Welfare and Development Association to place stoves in both villages and displaced persons camps, and there are discussions with a charity mission for placing stoves in their 14 orphanages spread throughout Ethiopia.

Figure 2 Field monitoring team with Project Gaia shirts and caps

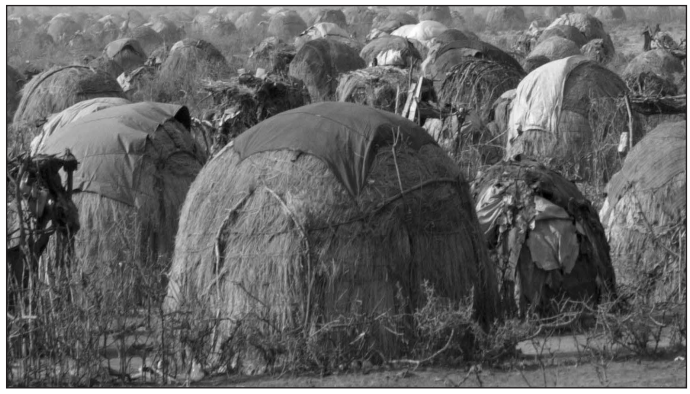

Figure 3 Refugee camp into which the Ogaden Welfare and Development Association is introducing stoves

These projects provide valuable lessons, and have a commercial objective that could make the difference for this project. If a market involving institutional users is developed as a consequence of the pilot study, these institutional buyers with their larger orders and ability to pay could justify a business start up that otherwise might seem too risky with only the consumer market.

The pilot study is scheduled to be concluded by June of 2005 with a business plan in place to guide the establishment of a commercial project. The likelihood of a commercial project and what form it will take are still too early to predict.

South Africa

Dometic had been encouraged to test its alcohol stove in a small consumer study in South Africa in the year 2001 by Mr Sten Danielsson, a visionary South African entrepreneur who saw the need for improved stoves that could be powered by methanol. The positive outcome of consumer study, conducted by NOVA Institute – a small NGO specializing in household energy, led to the emergence of a working group comprising the entrepreneur, methanol producer, the consulting NGO, and interested agencies within the South African government. Now 300 stoves are in South Africa awaiting funding for a full-scale pilot study.

Dometic has created a technology partnership with the world's leading small-scale gas synthesis process company, HydroChem, a division of Linde AG – the leading supplier of small, modular gas synthesis plants worldwide, and has developed a modular methanol plant with a capacity of 50 or 100 tonnes per day.

Nigeria

Dometic and HydroChem went to Nigeria to seek opportunities to address gas flaring in the Niger Delta. They teamed up with a local Nigerian NGO experienced in biomass stoves and household energy issues, the Centre for Household Energy and Environment (CEHEEN). This team approached the Nigerian federal government, and state and local governments in the Delta. Delta State is the most productive oil state in Nigeria with the largest impact from gas flaring. Ninety eight percent of its people are completely or partially dependent on traditional biomass fuels, and of those who use improved fuels, most use kerosene in cheap wick stoves on an occasional basis.

A 'mini-pilot' study of 20 stoves, assisted by Winrock International's Nigeria office, was conducted in Delta State in 2003. A study of 300 stoves is soon to begin in Delta State, funded by the Government of Delta State and the U.S. Environmental Protection Agency Partners for Clean Indoor Air (PCIA) programme. The project in the Delta demonstrate to policy makers that Nigerian energy resources can be put to use in rural communities using appropriate appliances with methanol fuel.

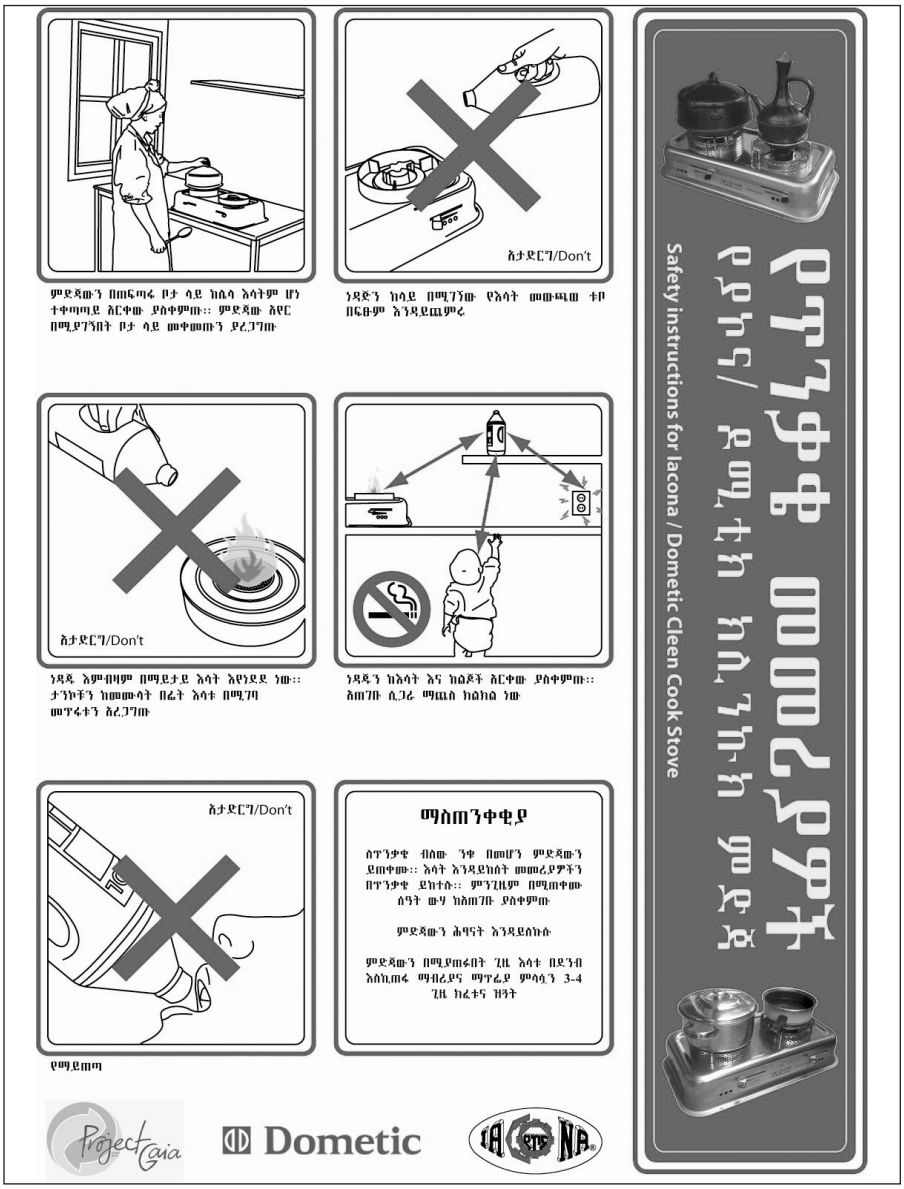

Figure 4 Safety manual in Amharic language (photo: Project Gaia)

Public private partnerships for accessing electricity in rural areas

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This document is an output from a project funded by the UK Department for International Development (DFID) for the benefit of developing countries. The views expressed are not necessarily those of the DFID.

Introduction

Energy for Sustainable Development (ESD) Ltd has recently co-ordinated work in Ethiopia, Nepal, Sri Lanka and Uganda to investigate how public-private partnerships can lead to affordable electricity for the poor both at a community and household level in rural areas. This innovative study, funded by The UK Government Department for International Development, sought to resolve the following questions:

- How can development efforts widen access to electricity on a sustainable basis?
- How do livelihood impacts of electricity reach down to the poorest in society?
- What are the different roles for both private and public entities in achieving this?

Over a period of eighteen months, in the four project countries, the Partnerships for Access to Community Electricity (PACE) project has examined what has happened in a number of rural villages that have been electrified in the last 10 years or so. The work only looked at electricity as one of a number of energy services, and involved studies at village level to find ways of maximizing the benefits of electricity access. The study also involved interviews with the principal actors in national government and the private sector to determine the social and political framework in which public-private partnerships could operate most successfully in bringing benefits to the poor.

Background

Over the last 50 years, and particularly since the late 1980s, there has been a general global trend towards the private sector delivery of services that had traditionally been delivered by governments. Although service improvements have been apparent in many sectors such as telecommunications, the electricity sector in developing countries presents developers with a new set of challenges. This is mainly due to the presence of large rural populations that are far from the grid, and to a relatively limited ability of those communities to pay for the service. Some of these issues are being addressed by the nature of decentralised generation, and by innovative ways of paying for electricity.

Another challenge is that the private sector will tend to target wealthier households, ignoring the poorest, most vulnerable parts of the population. Where there is a public-private partnership, the government, especially through the social agendas of local authorities, can focus on people's wellbeing and reduce this problem. Thus partnerships have an important role to play in addressing the concerns of both public and private entities engaged in financially viable electrification projects for the poorest rural communities.

Surveys on electrification projects

The project team surveyed a set of electrification projects owned: privately; by communities; and by local authorities. These included:

- diesel off grid generators;
- micro-hydro schemes; and
- solar photovoltaics (PV) home systems.

Information was collected about both successful and unsuccessful activities, and their impacts on livelihoods were measured through collection of primary research data. Livelihood impacts of the projects were compiled from interviews with consumers (both household and institutional) who were asked to provide feedback about how the introduction of electricity had affected their lives. Table 1 shows a summary of the projects surveyed, with a rating of their sustainability and their impacts on people's livelihood.

This categorisation was based on an assessment of each project in terms of access to electricity (direct and

Table 1 Summary of case studies carried out

	Livelihood benefits	Sustainability
ETHIOPIA		
Private diesel off-grid, Bonna	X	X
Municipality owned diesel off-grid, Bonosha	X	X
Community owned off-grid micro-hydro, Yaye	XXX	XX
NEPAL		
Micro hydro scheme, Ghandruk	XXX	XXX
Small hydropower, Tehrathum	XXX	XXX
SRI LANKA		
Micro-hydro in Hettikanda and Athulauda Villages	XXX	XXX
Solar PV home systems, Uva Province	XX	XXX
UGANDA		
Mini-grid from diesel Genset, Magale Village	XX	X
Micro hydro system, Kisiizi	XXX	XXX

[KEY: X – weak, XX – medium, XXX strong]

indirect) and performance of the system (reliability, safety, etc.). These two characteristics must be considered jointly. Otherwise, even when projects deliver wide access to electricity, this can be counteracted by a project's overall failure.

The **sustainability** of the projects in the case studies was measured in terms of whether the projects were able to attract sufficient revenues to ensure that systems were well-maintained. Issues such as mismanagement leading to mistrust and thus failure to pay, or customer withdrawal as a result of an unreliable electricity supply.

Measurement of **livelihood impacts** was based on levels of access to electricity, taking into account both the uses of electricity and the numbers served. Those projects which received a high rating in terms of livelihood benefits were those that were able to supply electricity for communal use, such as for hospitals, schools and income-generating activities, rather than those that were restricted to the supply of electricity for lighting to a limited number of homes.

Lessons learnt

Among the projects analysed, the most successful case studies were those with a good balance of public and private partners since their inception. Both private and public entities have specific roles to play in delivering electricity. For example, the planned expansion of the micro hydropower plant in Kisiizi, Uganda (Box 1) sees the involvement of numerous partners including the Uganda Government, multilateral organisations like the Global Environment Facility (GEF), the local community and the private sector through the Kisiizi Power Company. Local authorities too, can play a leadership role in mobilising communities for sustainable energy planning, financially supporting projects that deliver social benefits, and monitoring private sector service delivery. This was seen in the case of Sri Lanka – Uva Provincial Council (Box 2). This helps to avoid the situation that arose in Bonna town, in Ethiopia (Box 3) where poor service delivery from the private sector led to mistrust and disillusionment of the community.

Box 1 Uganda – Strong public private partnerships can enhance project success

The Kisiizi Power Company, which is a partnership between the local community, the hospital, government and donors has attracted much interest and support from the different stakeholders, and is likely to be one of the first companies to receive a subsidy from the Uganda Energy for Rural Transformation (ERT) programme.

The company aims to upgrade the current 60KW capacity hydropower plant to 294KW so that there is enough electricity to supply the Kisiizi Hospital and the village community. Regular supplies of electricity are expected to accelerate development of local businesses. 194 small businesses will benefit from the micro hydropower upgrade, including milk and food processing, wood working and welding.

Box 2 Sri Lanka – The role of *local* planning in ensuring wide access

Uva Provincial Council has initiated an active solar home system programme but recognises that there are limitations for livelihood improvement. For this reason, the Council is also undertaking a strategic plan to assess local hydro, wind and biomass resources and identify potential sites for further electrification projects.

Combining the technical aspects of planning with consultation work on local needs and aspirations will be an important step to identifying appropriate systems that respond to the needs of individual communities.

In some cases, solar home systems prove to be the adequate way of meeting local energy requirements, whilst in other communities the need to improve education, health or employment opportunities may justify additional investment in higher capacity systems to bring electricity to schools, hospitals and local businesses.

A sustainable planning process is the first step in ensuring that the benefits of electrification reach the poorest in communities. Figure 1 shows a PV panel on the roof of a private house roof in Uva Province.

Figure 1 Solar panel on house roof, Uva Province, Sri Lanka

Box 3 Ethiopia – Lack of access to information can make finance availability purposeless

Bonna town is located in southern Ethiopia (Figure 2) and has little prospects of getting connected to the national grid due to its remoteness. Almost US$18,000 was raised by the local population in the hope to finance a local electrification programme. Nine years down the line and the local community has not been able to make use of the money because of limited access to information on how to proceed. Despite this a short term solution was found when a local business man agreed to electrify Bonna using his privately owned diesel genset.

The people connected complain of the poor standards of the service they receive as well as of the lack of transparency in the way the tariffs are set. Although the original tariff was set in conjunction with the community at US$1.4 per light bulb, the genset owner has subsequently almost doubled it without consulting its clients. Despite the involvement of both public and private sector the electrification process has mainly been dominated by the private party, leading to a very unsatisfactory situation for all, especially because the electricity available is barely enough to power light bulbs and nothing else.

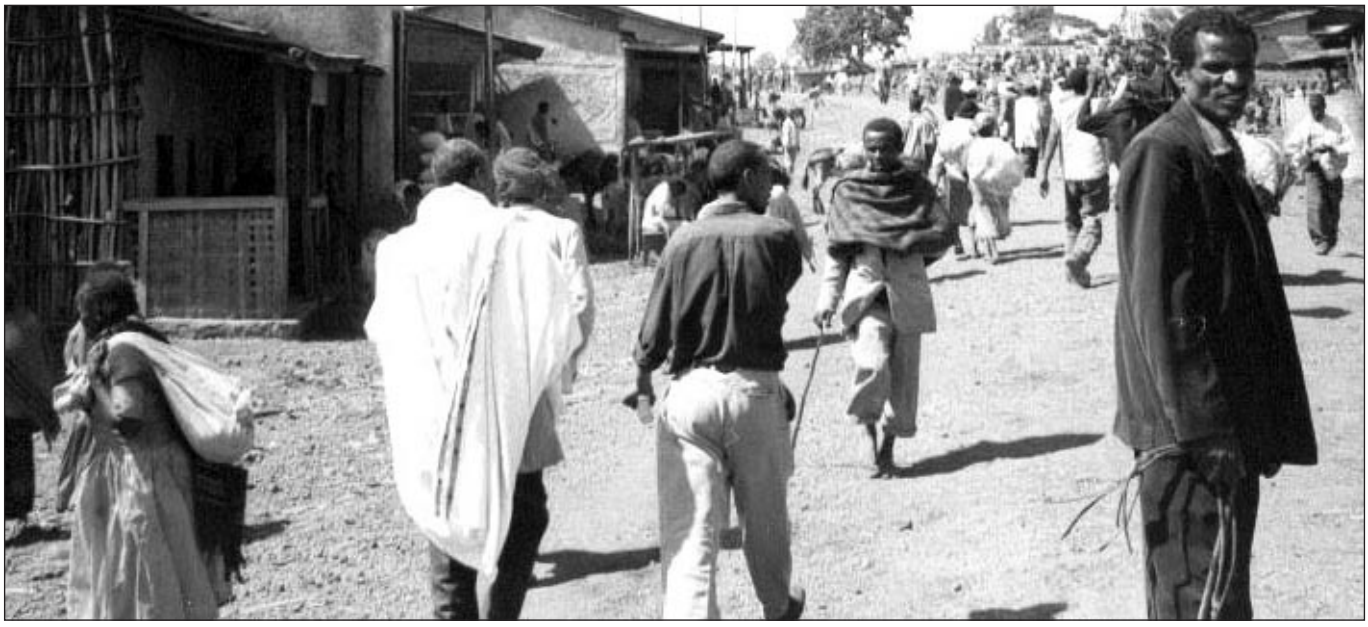

Figure 2 Street in Bonna town, Ethiopia

Other lessons include:

- Projects must first be sustainable before they can deliver significant livelihood benefits;
- Adequate planning is required if the economic and social benefits of electricity are to be maximised. Planners need to be aware that demand for electricity rapidly increases as users become more accustomed to the range of possible uses.
- Electricity can alleviate the pressure on local forestry resources for cooking and heating water. However, the shift from biomass to electricity must be supported by efforts to promote the appropriate end use technologies – described in Box 4;
- There needs to be a clear policy for rural electrification at country level to set common standards and regulations. A policy of 'light-handed regulation' (where the regulator leaves much of the decision-making powers to local authorities, and/or designated agencies etc.), would ease the uptake of rural electrification projects;
- A co-ordinated effort is required at national level to make rural electrification projects financially viable and thus able to attract private investors;
- Donors and other institutions should specify pro-poor measures when funding electrification projects. They should also support specific flagship projects that include public-private partnerships that could be models for further replication.

Box 4: Nepal – Strong institutional support made all the difference alongside community efforts

Electrification of Ghandruk village in Nepal was spearheaded by the NGO Annapurna Area Conservation Project (ACAP) which joined hands with local leaders in 1990 to mobilise financial resources for the construction of a 50KW hydropower plant. The organisation gave the community a loan for the project, and also provided training in the design and management of electricity projects. In general, ACAP provided technical, financial and administrative assistance to the project, and also contracted a resident engineer for two years to assist people when utilising electricity for cooking.

Apart from improving quality of life through providing private customers with electricity for cooking and water heating as well as lighting, the project was expected to boost ACAP's efforts to combine tourism with sustainable resource management through reducing fuel wood consumption by tourists. Commercial users, especially hotels and restaurants were able to improve their services thanks to water heating and the use of low wattage electricity cookers which were promoted by ITDG.

International lessons

In addition to valuable country-specific lessons, by working in four such diverse countries as Ethiopia, Nepal, Sri Lanka and Uganda, the project team could identify some issues with trans-national implications.

- Key to a successful rural electrification programme is the political and administrative power of local authorities and their capacity to engage developers and investors. Increasingly public-private partnerships that develop are no longer initiated at national level, but increasingly at a local authority level.
- The most significant livelihood benefits were in projects that provided electricity for institutional and commercial use as well as to households, e.g. in the case of Yaye, Ethiopia – rather than limited to household electricity only.

This project has produced material that includes a set of useful case studies and a guidelines document entitled: 'Partnerships for Community Electricity: Policy Guidelines' (Dec 2003)

For more information see: http://pace.energyprojects.net

ITDG energy news – Sparknet conferences

Announcing the second Sparknet conference:

Topic: Policies for Sustainable Household Energy in Southern and Eastern Africa

Date: February/March 2005

How to participate:

Sign up online at www.sparknet.info (select 'online conferences'), or email Grant Ballard-Tremeer on <grant@ecoharmony.com>

The conference is 100% online using email and a conference website.

More information and updates can be found on the Sparknet website **www.sparknet.info**

Conference 1: Household energy scenarios September 27–October 8 2004

This e-conference focused on the key areas of health, gender and household energy within the Sparknet countries; Uganda, Kenya, Zimbabwe, Tanzania, Zambia, Mozambique and South Africa. Each member of Sparknet presented papers looking at worst case, business-as-usual, best case, the Southern partners within their countries, and the Northern partners within their specialisms of health, gender and forestry.

Email discussions followed incorporating ideas from around 140 e-mail participants where these issues were discussed in detail.

Key areas included:

- Which groups are most affected by changes in economic growth and regional co-operation? – does it impact on health, cleaner fuels, such as tariffs, or cross-border deforestation? What are the gender dimension to these changes?
- Will changes lead to more rural migration? What impacts will this on the key areas? Could urban planning or legislation reduce some of the problems? – how?
- Will people be forced to move back down the energy ladder to more polluting fuels
- What is the role of energy in moving people out of poverty? Health effects of changes in fuel access or cost – indoor air pollution, transport costs; how are they affected by gender?
- What financial policies should be adopted? – improved supply chains for fuel? - subsidies on improved cooking / lighting products? – micro-credit? Are these appropriate for women? How can one factor-in women's time when looking at fuel choice?
- How could education reduce the impacts of a worsening situation? What policy action could lead to improved regional information-sharing? What are the best ways to 'package' this information?
- Are women represented in decision-making at policy and household level?
- How are the use, production, provision and distribution of energy services organised? Will a change in energy affect how it is used and the person who decides? – and who benefits?
- Will fuelwood and charcoal remain the dominant sources of household energy source? How will more market based approaches affect low-income households? – should action be taken to mitigate the associated risks?
- What environmental issues are important to men? – and to women? Are these the same? How can we alleviate the barriers to fuel switching to cleaner fuels – for cooking? – for lighting? – for labour saving? especially for the very poor
- Which regions are characterised by acute firewood scarcity? What policies would be needed to trigger areas with a surplus to supply those with a deficit? – could they be mapped and policies agreed? Is natural forest management an option?
- What are the direct causes leading to deforestation, both nationally and regionally?
- What policies can be introduced to make fuelwood utilisation more efficient?
- Does the 'cost' of fuel gathering reflect the replacement cost?

All documents from the conference, including presentations and proceedings are available on the Sparknet website under the conference section: http://lists.sparknet.info/wws/info/conference

Theme

WHO and UNDP highlight indoor smoke as the killer in the kitchen

Marc Lopatin – Shell Foundation, Shell International Ltd, Shell Centre, London, SE1 7NA, UK.
Email: Marc.Lopatin@shell.com

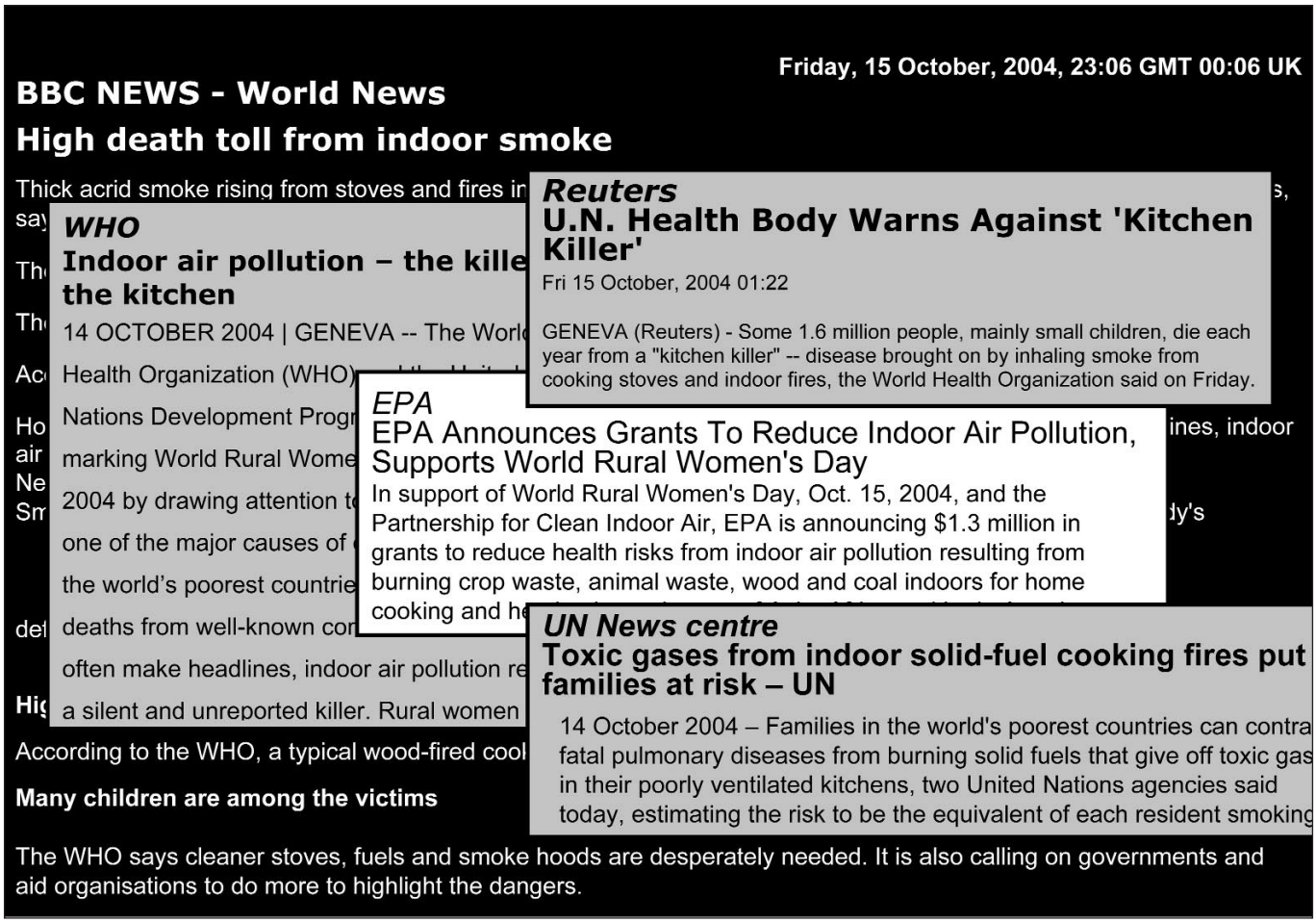

Figure 1 News compilation

It's not every day that Indoor Air Pollution makes global headlines. But on Friday 15 October 2004 – World Rural Women's Day – the UNDP and the World Health Organisation took the unprecedented step of issuing a joint statement calling for world to wake up to this 'silent killer' (1).

The boldly worded statement described 'how thick acrid smoke rising from stoves and fires inside homes is associated with around 1.6 million deaths per year in developing countries – that's one life lost every 20 seconds to the killer in the kitchen'.

The news was picked up by Reuters and Associated Press and was reproduced around the world. Online newspapers across continents including the Washington Times and the China Daily carried the story alongside the Financial Times. The United States Environmental Protection Agency (USEPA) reacted to the news by issuing a supporting statement of its own.

During the course of the day, the WHO was interviewed by the BBC World Service and United Nations radio. Meanwhile, global news channel BBC World devoted an entire edition of its flagship daily news show, Asia Today, to discuss IAP with the Shell Foundation, an Indian entrepreneur and the UNDP.

Commenting on the day's success Eva Rehfuesse, who led the awareness raising initiative from the WHO's headquarters in Geneva, said: 'The combined action by the WHO and UNDP highlighted the magnitude of the indoor smoke problem and the plight of those most affected: rural women and their children. It was a day to demonstrate not just the issue but also the solutions being worked on by readers of *Boiling Point* all over the world. In a few years' time, the WHO is planning to present lessons learnt to governments based on innovative local and national projects'.

The sentiment was shared by Karen Westley, programme manager of Breathing Space™ at the Shell Foundation – a $10m commitment to scaling up sustainable solutions to IAP in six countries. 'The October 15th publicity drive is great news for the Partnership for Clean Indoor Air. It's great to see the partnership's biggest members front up the issue before a

Figure 2 Woman cooking using biomass stove

Indoor air pollution toolkit

For the past four years, the Shell Foundation has been running Breathing Space™ – a $10m investment to promote solutions for reducing IAP that can be scaled up to reach the two billion people we know are at risk.

Breathing Space will shortly enter a scale-up phase for successful pilot programmes and the Shell Foundation will be summarising and disseminating its approach through a commercialisation toolkit. It will be designed to provide a framework for the development of demand driven, financially viable models for delivering improved household energy solutions.

The toolkit is being compiled in India by Accenture Development Partnerships – a charitable organisation that brings business, technology and management skills to the developing world. On completion, it will help to better understand the market and its size; understand consumer behaviour; decide who produces and provides products and services and how they are distributed; and identify potential sources of local financing for businesses.

Commenting on the toolkit, Karen Westley, Shell Foundation programme manager, said: 'It's part of our overall aim of infusing development thinking with 'business DNA' to ensure solutions are both financially sustainable and scalable. In terms of IAP, our ultimate goal is to export the final methodology to other parts of India as well as Asia and Africa, where IAP remains a major health hazard.'

Household Energy Monitoring and Evaluation Consortium

The Shell Foundation and The Center for Entrepreneurship in International Health and Development (CEIHD) invite you to join the Household Energy Monitoring and Evaluation Consortium in 2005. A cross-section of NGOs, researchers, policymakers and funding agencies will be participating in this new forum to share knowledge and technologies for assessing household energy solutions. The consortium's activities will include:

- Distributing high-quality equipment including the new UCB particle monitor
- Training for indoor air pollution monitoring and stove performance
- Developing a network of regional providers offering on-site assistance with monitoring and evaluation activities
- Convening an annual meeting where participants can discuss shared performance indicators and standardized metrics
- Offering funds and support to research institutions to improve existing or invent new monitoring and evaluation tools
- Creating an accessible, global, electronic library of monitoring and evaluation results from household energy interventions around the world

CEIHD already offers assistance with intervention monitoring and evaluation to NGOs. For more information visit the CEIHD website (4) or contact Dana Charron at dana@ceihd.com or +1–510–643–6432

mainstream media audience around the world. We face a tough challenge bringing attention to our cause in some parts of the world but at least now we have some something to build on.'

Cowan Coventry, ITDG's chief executive, and Kurt Hoffman, director of the Shell Foundation, issued a statement ask whether there is the political will to match the solutions being implemented across the developing world (2) and (3).

The case for raising the importance of IAP received a second boost just two weeks later. In late October, the Paris-based International Energy Agency (IEA) released its authoritative World Energy Outlook (2004) which again drew attention to solving IAP.

In a chapter entitled Energy and Development, the report pointed out that 'the achievement of the Millennium Development Goals would most likely require a substantial reduction in the use of traditional biomass for cooking and heating'. The IEA estimated that if poverty alleviation targets were to be met, the use of modern cooking and heating fuels would have to be extended to 700 million more people by 2015.

Further information

1. WHO: http://www.who.int/mediacentre/news/statements/2004/statement5/en/
2. Shell Foundation: http://www.shellfoundation.org/latest/151004.html
3. ITDG: http://www.itdg.org/?id=iap_who)
4. CEIHD: http://ceihd.berkeley.edu/ ;

What's happening in household energy?

HEDON

www.hedon.info

Ashden Awards for Sustainable Energy

The Ashden Trust is inviting submissions for the Ashden Awards for Sustainable Energy 2005. We hope to offer five first prizes of up to £30,000 each, for outstanding sustainable energy projects (three for developing countries and two for the UK). The awards are for community-based renewable energy. Overseas applicants will be asked to send a concept note by the end of November (concept note forms are on the website).

Full details of criteria and application instructions can be found on the website: *www.ashdenawards.org*.

Inheriting the World: the Atlas of Children's Health and the Environment

A useful atlas on child health can be found at: <http://www.who.int/ceh/publications/atlas/en/>. The map entitled 'Indoor Smoke: Breaking Down Respiratory Defences' can be found on the web at: http://www.who.int/ceh/publications/en/09indoorsmoke.pdf ; it is also be available as a poster from the WHO website. Another map highlights how indoor air pollution and poverty are linked can be found at: http://www.who.int/ceh/publications/en/02richpoor.pdf

Vesto Stove wins major design award

The Vesto stove, a multi-fuel biomass cooking stove, has been given the Chairman's Award as an outstanding example of design excellence by the Design Institute of South Africa (DISA). This is a new type of stove, with a number of innovations intended for use in low income communities.

The Vesto is produced by New Dawn Engineering (Swaziland and South Africa). It is the result of a two year project to find increase the efficiency substantially, to reduce significantly the amount of fuel required to cook and simultaneously reduce fire emissions, increase the stove life and offer a measure of controllability of the fire's intensity. Made mainly of stainless steel, the Vesto cuts fuel consumption typically by 70%. The Vesto is already being marketed in several countries. It contains design innovations including pre-heated primary and secondary air, and it makes charcoal as it cooks. It can use woods normally considered to hard to burn well, compressed sawdust logs and low density biomass briquettes.

Figure 1 Vesto stove

Information: Crispin Pemberton-Pigott; Email: crispin@newdawn.sz or Rina King; Email: rking@infodoor.co.za Website: www.vesto.co.za

Partnership for Clean Indoor Air

The first electronic newsletter for the **Partnership for Clean Indoor Air** is now online. If you would like to receive it automatically via the Partnership, complete your partner profile online at http://www.PCIAonline.org. PCIA would love to highlight your household energy and health achievements,events and news in the next edition of the PCIA Bulletin. Please send your contributions to pciaonline@yahoo.com by January 5, 2005 for the next edition of the Bulletin.

Information: Brenda Doroski, U.S. Environmental Protection Agency, Partnership for Clean Indoor Air, www.PCIAonline.org, Phone: 202–343–9764

PEER Africa – Energy and Environmentally Costs Optimised EECO™ development

PEER Africa has been active mainstreaming the Energy and Environmentally Costs Optimised EECO™ development concepts to address integrated low-income human settlement/energy management government policy and strategy initiatives. Two

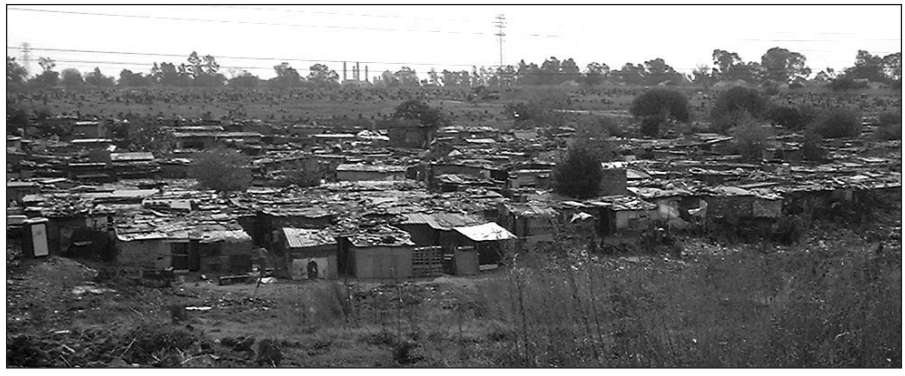

Figure 2 Low-income settlements, South Africa

model projects are underway in South Africa, in Johannesburg (Alexandra) and in Cape Town (Atlantis), sponsored by the Provincial or Local Government Departments of Housing. The programme involves two separate pilot projects involving about 9,000 beneficiaries. The programme focuses on reduction of space heating and lighting demand via extensive capacity building programmes with local community leaders. The second area of focus is based on applied research linking energy and fire prevention management. The third aspect of the projects being considered is based on the long term strategy to look into sustainable ways to obtain bridging finance for small scale contractors via loan guarantees and support.

Information: D. Mothusi Guy PEER Africa (Pty) Ltd. Email: dlguysr@wn.apc.org, Tel: +27825796032

Cremasco bioheater combustion system: high efficiency biomass conversion for a sustainable future

A small-scale, high-efficiency, low emissions biomass thermal processor has been designed that can accept a wide variety of biomass feed materials as fuels to generate heat or combined heat and power (CHP). the Cremasco Bioheater processes low-grade biomass fuels, some with very high moisture content, in some cases approaching 70% by weight water. From such wet fuels, the bioheater has demonstrated that it can sustain combustion at temperatures of 1000C to 1200C with no visible smoke emissions due to incompletely combusted organics. For example, the Cremasco Bioheater consumes coffee pulp as fuel to generate heat for drying wet green coffee beans, eliminating polluting coffee pulp and reducing pressures on forestry.

Further information: Frank Scott , Email: Frank Scott [franks@q-net.net.au]

Solar PV Electricity for Poor Communities

A technique has been developed so that small solar-pv panels can be easily self-assembled by NGOs to power low cost devices such as radios, torches, etc. New ultra-bright LEDs give light for 10 years continuously and their price keeps falling so oil lamps and candles can now be replaced by these devices which, with the solar panels, last for many years.

DIY Solar powering is quite unlike Solar Home Systems (SHS) as it just intended to make a little electricity affordable for those without mains electricity and has no other use – for example, a radio can be powered for as little $1.We also give information about self-assembly solar cookers.

Information: BioDesign, 15 Sandyhurst Lane, Ashford, Kent UK TN25 4NS biodes@bigfoot.com. Tel/Fax 44–1233–626677

Innovative renewable energy application initiative in rural Tanzania

Rural Tanzania is targeted in a research project that a Sokoine University (SUA) lecturer, Dr Joseph Mpagalile, is pursuing in the US together with a team of US researchers led by Professor Milford Hanna of the University of Nebraska-Lincoln. The research, funded by Fulbright African Research Scholarship and administered by the U.S. State Department's Bureau of Educational and Cultural Affairs, looks into ways of using solar (PV modules) to power vegetable oil presses. It is expected that the effort to improve small-scale oil processing in rural areas of Tanzania will enrich its scientific and technological development and contribute to worldwide technological development. The project will help rural area communities conserve the environment by using solar energy and vegetable oils.

Information: Dr J. J. Mpagalile, Nebraska University-Lincoln
Department of Biological Engineering Systems, Industrial and Agricultural Products Center
228 L.W. Chase Hall, Lincoln, NE 68583–0730. Tel: (402) 472 1758; Fax: (402) 472 6338

Energy services in urban poor livelihoods

A research study, begun in 2003, funded by the UK's Department for International Development (DFID) Knowledge and Research Programme (KaR) is aiming to provide a clear understanding, based on micro-level gender-disaggregated data, of the issues around urban energy supply and use for poor people's livelihood strategies. The team is headed by Joy Clancy from the University of Twente in the Netherlands working with partners from Nigeria, Brazil and the Philippines and ENERGIA (the international network on gender and energy). The study will collect data on the role that energy plays in enabling poor urban women and men's strategies to create sustainable livelihood strategies and outcomes. The three country partners will disseminate the results through national workshops and a final international workshop will be held in London in June 2005, which will be followed by a special issue of ENERGIA News.

Information: Joy Clancy, TDG, University of Twente, Enschede, The Netherlands. j.s.clancy@tdg.utwente.nl

Domestic Use of Energy Conference 2005 The Cape Technikon, Cape Town 29–31 March 2005

Issues addressed include: sustainable energy provision; aspects from the Johannesburg World Summit on Sustainable Development; implications of the Kyoto protocol; environmental legislation; the role of renewables; off-grid electricity supply and subsidised tariffs.

Information: DUE 2005, Nickey Amsterdam, CAPE TECHNIKON, Room 3.09, Engineering Building, Tennant Street, CAPE TOWN, 8001.
Email: due@ctech.ac.za; Tel: +2721 – 460 3658; Fax: +2721 – 460 3701

Indoor Air 2005: The 10th International Conference on Indoor Air Quality and Climate Sep. 4–Sep. 9, 2005, Beijing, China

The conference will provide opportunities to exchange new ideas on indoor air sciences, to hear the state-of-the-art technologies, to identify solutions for problems related to indoor air, and to build partnerships within and between sciences such as engineering, medicine, chemistry, microbiology and architecture.

Information: www.indoorair2005.org.cn

Boiling Point is a technical journal for those working with stoves and household energy. It deals with technical, social, financial and environmental issues and aims to improve the quality of life for poor communities living in the developing world.

Contents

Theme articles

GTZ

Theme articles

ITDG
PRACTICAL ANSWERS TO POVERTY

Our mission is to build the technical skills of poor people in developing countries, enabling them to improve the quality of their lives and that of future generations

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