

# **Cookstoves and Markets:** *Experiences, Successes and Opportunities*



*Cookstoves Market Stall in Burkina Faso (Credit: GTZ)*

***December 2009***

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## Acknowledgements

GVEP International's vision to reach millions of men, women and children in rural and peri urban areas by focusing on market mechanisms is a challenge in itself. Energy access for the poor has multi-dimensional facets and this report seeks to illustrate some of these tenets. The report is one of the first that GVEP International will produce to clarify general perceptions of how markets react, and what conditions need to be in place to establish a thriving market within specific energy sectors. We decided to focus on cookstoves, as the potential market reach is extensive, yet the multiple challenges make it a sector that requires deeper insights, especially when taking it to scale.

This report provides a view through the lenses of experts working closely in the development and marketing of cookstoves. Many of the writers chart the struggles and successes of their organisations in reaching (or trying to reach) the market successfully. Through the articles, we walk through their research, achievements, continuing challenges, and the arising opportunities when scaling up cookstoves in the market.

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We hope through these writings, lessons will be read and learnt by many of our partners and eventually translate into greater successes within the improved cookstove industry.

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## Markets and Cookstoves: What works?

**Kavita Rai, GVEP International Programme Manager**

**Summary:** *A brief analysis on the key lessons learnt from the initiatives presented in this report.*

### Introduction

For millions of households in developing countries, cooking is more than just a daily activity; it is associated with long hours spent collecting biomass. Smokey kitchens and the use of high intensity carbon fuels such as charcoal lead to dangerous emissions, which affect health and the environment. Over the past few decades many urban and richer households have been able to step up the energy ladder, away from firewood to kerosene or LPG stoves leaving behind millions of poor households in rural and peri urban areas who continue to use traditional open fires and/or inefficient fuels. There are of course the socio cultural issues associated with the use of fuel wood and charcoal which influence people's choice of fuel; these range from the taste derived from smoked food to religious associations with fire. However despite these challenges, many stove enthusiasts have worked relentlessly to research cookstove products, both household and institutional and bring them to market.

During the seventies and eighties, cookstoves as an energy sector was mainly the domain of those inclined to social and environmental justice. A variety of cookstove products were tried and tested through subsidised social delivery programmes, funded mostly by donors. Over the last twenty years, other institutions including the World Health Organisation have been active in bringing attention to the health detriments of using inefficient cookstoves. By the nineties, only two countries, Kenya and Sri Lanka had managed to commercialise efficient alternatives whilst other countries lagged considerably behind. Recently, a surge of social entrepreneurs in the energy field and the drive towards a 'market model' by implementing institutions and social investors is taking the cookstoves sector to another level. India is leading the way and her challenges and opportunities are well scribed in the articles presented in this report.

The following sections summarise some of the key lessons learnt from the articles presented in this report.

### Scaling up: Getting the Product Right

There is no denying this age old rule of marketing. In many of the subsequent articles, there is a general consensus that the 'product' has to be '*absolutely right*'. However, the development of the right product/s is time consuming, region specific and customer preferences needs thorough assessment. It is clear that research and development require state or donor funds both of which are often hard to come by. The private sector rarely funds stove development for the bottom of pyramid as it is not viewed as an attractive investment proposition. The onus therefore lies almost completely on the non profit sector. It is often only after the right product has been developed and the risks significantly reduced that the private and social investor's will step in.

### **Donor driven versus pure market delivery mechanisms**

Many of the writers in this report agree that donor support for the research and development of stove products and their subsequent implementation has been instrumental to the success of most programmes. Donor funds have been important in the large scale commercialisation process. In Sri Lanka, after more than two decades of product development and testing, government support and donor funds have proved to be significant in the cookstove markets gaining momentum. Furthermore integrated support from various donors and the government led to the success of the highly commercialised ‘Anagi’ stove which has now reached over 3 million households.

### **Subsidy provision is needed for upscaling**

The experience of GTZ in Africa and Latin America clearly shows that subsidies can play an essential role in supporting sustainable markets for cookstoves. Indirect subsidies for product development and promotion, producer training and awareness creation have been to products taking off. However, it must be noted that both direct and indirect subsidies should be applied to countries on an individual basis. Donor driven funds are only effective when applied intelligently and discussions amongst different organisations, including donors need to be better co-ordinated to ensure effective subsidy provisions. For example, while GTZ was emphasising an indirect subsidy driven model of operation, the World Bank started subsidising stoves directly thus distorting market operations. Lisa Feldman’s article ‘*Subsidy schemes for the dissemination of efficient stoves – experiences and lessons learnt*’ provides further details on this matter, clarifying issues and noting important lessons learned.

### **Social entrepreneurs able to reach the bottom of the pyramid**

The recent rise of social entrepreneurship in the energy sector is also responsible for the move towards an active market based model. For example, SELCO India, Prakti Design Labs and Sustaintech are leading the way in reaching bottom of pyramid markets through the promotion of well tested products and their links to micro finance. Engineers from Prakti have been researching products that not only lower costs but are also highly efficient and emit little smoke. Sustaintech promotes commercial kitchen stoves with similar aims. All of these companies are moving away from large donor funds and relying on financing from social investments or micro financing. Most importantly, they believe that there are products which are suitable for market commercialisation and which can help change lives in the process. Furthermore they have a genuine passion and determination to reach the poor and they are through their work bringing change to the cookstoves industry.

### **Establish new supply chains or ride on the existing?**

Establishing a supply chain to reach the end consumers can be a long process. The institutions and companies involved need employees with knowledge of market developments, installation and maintenance processes. This can be difficult and expensive to find. Many developers are now sourcing alternative methods for distribution such as Prakti in India which uses successful chains already established by other institutions. Prakti is currently working with SELCO India who is in turn using a supply chain already established by their solar products. Similarly, Aprovecho and GTZ partnered in South Africa to promote highly efficient cookstoves produced in China. Supply chains are not created overnight and most commercial stove entities rely on traditional subsidy driven supply chains or are forced to try and find more creative methods for distribution.

### **Establish strong partnerships between private sector and civil society**

GTZ's experience with stove dissemination in Africa and Latin America has clearly demonstrated that commercially oriented interventions typically stumble upon market barriers to development. It is only with successful partnerships between the private sector and civil societies, particularly those working in rural areas that there can be greater success. Using the Sri Lanka experience as an example, the state institutions had a wide reach and therefore proved to be an important partner in the commercialisation process.

### **Lastly, user motivation, affordability and engagement required**

Research on cookstove business models by the Programme on Energy and Sustainable Development (PESD), Stanford University has clearly shown that cookstoves are adopted well by users if three principle dimensions are effectively addressed: motivation, affordability, and the level of engagement required. Firstly, prospective customers need to see concrete and observable benefits, motivating them to buy and use the product. Price is important and many cookstove developers, especially social entrepreneurs are conducting further research on how to sustainably reduce the cost of cookstoves in order to make them more affordable enough to reach the bottom of the pyramid. Finally the level of engagement required from users may come in different forms, depending on regions and countries, and importantly concerted action through partnerships.



## Market Solutions to Combat Indoor Air Pollution: Shell Foundation and Envirofit International

**Richard Gomes, Shell Foundation<sup>1</sup>**

**Summary:** *Shell Foundation and Envirofit International are creating a commercially viable model for the distribution of clean cookstoves and by doing so, proving that market-oriented solutions to the problem of Indoor Air Pollution exist.*

### Introduction

More than three billion people rely on open fires and traditional stoves to cook their daily meals, burning biomass fuels such as wood, crop waste, and charcoal. Smoke from inefficient fires in poorly ventilated homes kills 1.6 million people each year, 85% of them women and children under 5. One death every 20 seconds makes Indoor Air Pollution (IAP) the fourth biggest killer in the developing world. In addition to devastating health and social impacts, growing evidence points to IAP smoke as second only to CO<sub>2</sub> in contributing to global warming and climate change.

The most effective, internationally-recognised way to tackle IAP and reduce carbon output is through affordable 'clean cookstoves' that reduce emissions and fuel use. Shell Foundation realise that in order to tackle this wide spread, a market-oriented approach is required, one which works along the entire improved stove supply-chain – from research & development through to the end-user, creating a viable large scale stove industry.

### Developing an Improved Cookstove solution

From 2002 to 2007, the Foundation committed more than US\$10million to nine pilot schemes to test sustainable, commercially focused cookstoves. The pilots operated across seven countries (in South East Asia, Latin America and East Africa) and involved partners with significant experience in the field, aimed to learn what worked, what didn't and then expand the best approach. This resulted in the sale of more than a quarter of a million stoves.



*Woman preparing food to be cooked using Envirofit's Generation III Stove*

Alongside its pilots, the Foundation worked with Accenture Development Partnerships (ADP) to develop a toolkit to guide regional and national scale-up strategies for the successful projects. They worked with several academics to develop techniques for monitoring and evaluating both the impact of IAP and the

<sup>1</sup>Shell Foundation is an independent, UK and NL registered charity operating with a global mandate. Its mission is to develop, scale-up and promote enterprise-based solutions to the challenges arising from the impact of energy and globalisation on poverty and the environment.

programme. Their market analysis led them to choose Envirofit International, a U.S. non-profit corporation, as their strategic partner in the fight against IAP. By providing seed capital and business expertise through its staff, the Foundation helped Envirofit create a global cookstove enterprise with the capacity to scale development and dissemination to meet global demand. The partners aimed to achieve significant, verifiable, long-term reductions in global IAP by deploying engineered clean cookstoves through market-driven, commercially-sustainable enterprises.

### Launch of Cookstove Products in India

Envirofit launched their cookstoves business in India in May 2008. Since then the Foundation has helped them to develop market strategies which focus on rural villages across South West India and to ensure the sustainability of their supply chain. One of the challenges was to make the stoves affordable to users at the bottom of the socio-economic pyramid with incomes as low as US \$2 a day. The key to overcoming this problem is in the stoves design. The latest range of Envirofit cookstoves reduce smoke and toxic emissions by up to 80%, but importantly the improved stoves also use up to 60% less fuel compared with traditional stoves. With each base unit costing ~1399 Indian Rupees (US\$28), users are able to pay for the stove within six to eight months through fuel savings alone. This self-financing loop makes it possible to scale-up the initiative over time impacting millions across the globe.

### Reaching new heights

Since the launch last year, over 80,000 cookstoves have been sold, improving the livelihood, health, social and economic status of over 300,000 people in Southern Indian states. Over the 5 year lifetime of the stoves, these benefits will add up, with over 500 million rupees of savings for India's lowest-income consumers and over 10 million hours not spent gathering fuel. This is money kept in the hands of the poor and hours saved that can be better spent on education, family time or personal enterprise efforts. The 80,000 cookstoves alone could keep over 580,000 tons of CO<sub>2</sub> and over 114,000 kg of black carbon from entering the atmosphere. Envirofit cookstoves' combustion technology reduces 1 ton of greenhouse gasses per stove annually and requires 50% less biomass fuel.



*Envirofit Generation III Stove*

Envirofit now plan to leverage Shell Foundation's investment to secure \$25 million in funding which will enable them to expand their operations. The current aim is to sell at least 10 million stoves into emerging markets over the next five years. This achievement is the result of a long journey which began in the research laboratories of Colorado State University. Shell Foundation provided continuous business development support to help get the business off the ground and to find the right strategic model to reach poor communities at greatest risk from IAP. The Foundation also used its links with Shell Group offices in India to build in-house expertise within the new venture by advising on recruitment, stakeholder engagement, safety guidelines, local

business practices and the manufacturing and distribution landscape.



The Foundation recently began a social-marketing awareness campaign in the rural villages of southwest India, explaining the dangers of IAP and promoting the clean cookstoves solution. The campaign is set to go nationwide in 2010. To reach consumers in lower income brackets, the partners are working with several microfinance groups to extend credit to consumers that don't have access to formal financial services.

This issue of Indoor Air Pollution has moved to the forefront of the news agenda in the past few months, particularly in the United States of America. Envirofit and Shell Foundation are achieving radical reductions in emissions and energy consumption through their new stoves. By establishing a financially viable solution that can be replicated in new markets, there is a good chance that this positive impact will be extended to a high percentage of the poor communities that are most at risk from the damaging effects of IAP, and become a major contributor to halting the march of global warming over coming years.

## The Commercialisation and Scale Up Success of Improved Cookstoves in Sri Lanka

*This article is compiled by GVEP-International from two sources<sup>2</sup> provided by Practical Action Consulting, UK*

### Improved cookstoves in Sri Lanka: Achieving scale

Sri Lanka's success with the commercialisation of improved cookstoves (ICS) and in particular the 'Anagi' stove has been continuing since the inception of the first programme in the 1970s. It is estimated that 3 million Anagi stoves have been commercially produced and marketed throughout the country since 1991. An extensive commercial network drives the distribution of approximately 300,000 stoves annually. If used without insulation, the lifetime of an Anagi stove is about 1 year and with insulation, 3 years or more.

The market chain is well established. Approximately 185 trained potters spread over 14 districts manufacture the Anagi stove. Distributors and wholesale buyers visit production centres to buy the stoves in bulk, thereby guaranteeing the producers a regular and guaranteed market. The stoves are then distributed to retail shops throughout the country; to distances of over 200km. Small producers often sell their products locally.

With a population of over 20 million (World Bank estimate 2008), and with more than 70% using fuel wood for cooking, mostly due to economic reasons, the need for efficient stoves is ever present<sup>3</sup>.



Anagi Stove

### The first two decades: Product development and mass distribution

During the first half of the 1970s, to counteract rapid deforestation and fuel wood use, many institutions developed various types of energy efficient cookstoves. The key ones were the Industrial Development Board (IDB), Ceylon Industrial and Scientific Research Institute (CISIR) and Sarvodaya (an NGO) supported by the Intermediate Technology Development Group (ITDG), now called Practical Action. Various products were designed, tested and piloted with small scale distribution. Table 1 provides a list of the various models developed.

<sup>2</sup> Amarasekara R.M and Atukorala Karunatissa. *Historical Timeline from Subsidy to Commercialisation of Improved Cookstoves: The Path Leading to Sustainable Stove Development and Commercialisation Activities in Sri Lanka*. Integrated Development Association (IDEA), Kandy, Sri Lanka; and Nissanka, Ramani. 2009. *Scale-Up and Commercialisation of Improved Cookstoves in Sri Lanka: The Anagi Experience*. Working Paper. Prepared for PISCES by Practical Action Consulting

<sup>3</sup> Practical Action Consulting. 2009. *Bioenergy in Sri Lanka: Resources, Applications and Initiatives*.

**Table 1: Stove Models Designed by Various Institutions**

Year	Stove Models Designed	By Whom
1952	Herl Chula- mud/chimney	Social Workers
1972	Two pot brick and cement	Industrial Development Board (IDB)
1978	Two pot pottery with chimney	Ceylon Industrial & Scientific Research Institute (CISIR)
1978 to 1983	Lorena, Dian Desa/ Chimney & chimneyless stoves, Sarvodaya 2 piece pottery liner	Sarvodaya/ ITDG
1983	Single pot/clay/ grate stove	CISIR
1986	Anagi two pot clay stove	CEB/ ITDG
1987	1988 Large Institutional Stoves/brick/ iron grate/chimney	CEB/ Hoffmann Consultants

Source: Amarasekara and Atukorala

By the mid 1980s, the state owned Ceylon Electricity Board (CEB) had entered the ICS space and prompted a shift towards a new phase of development. The CEB strategy was to find the best product before distributing it on mass. They selected the two pot mud insulated ICS with a pottery liner developed by Sarvodaya as field studies had shown that it was better received and more socially acceptable than the others. Between 1985 and 1991, with support and subsidy from government and donor agencies, mainly the Dutch Ministry of Foreign Affairs (DGIS), over 400,000 ICS were disseminated within 12 districts. In addition the services of government personnel were used to assist with the project promotion. The programme was extended into urban areas, produced in tile factories (formal sector) and sold commercially through the existing private sector networks of middlemen and retail outlets.

In 1986, the CEB and ITDG modified the product into a two pot single piece clay stove naming it the *Anagi*, meaning 'excellent'. The stove which was targeting an urban market, could be bought directly from the vendor without the need for any installation, could cook food much faster and had a lifetime of up to 3 years. It could cater for a family of six members, including their cooking habits. About 70,000 stoves were produced and sold within the project period of two years. However the CEB initiative lacked longevity and was terminated in the late 1980s. Nevertheless its work was fundamental in laying a foundation for the future as well as sowing the seeds for commercialisation.

### **The next two decades: Scaling Up the 'Anagi'**

In 1991, the non governmental organisation Integrated Development Association (IDEA) began a rural programme with financial and technical support from ITDG and several donors, with the freedom, mandate and commitment to focus solely on the ICS. The initial success of the *Anagi* in urban areas prompted promoters to select it as the sole product for commercialisation in rural areas. Later, the Asian Cookstove Programme (ARECOP) supported the programmes extension into remote areas where access to commercial networks was limited.

The Anagi works with a variety of biomass products; medium sized hard or soft wood and other loose biomass residues such as coconut shells, fronds and leaves, all of which

are easily obtained from home gardens or can be purchased commercially. The success of the stove prompted IDEA to continue the work of scaling up the commercialisation process despite several difficulties that were experienced.

### **How was commercialisation of the Anagi achieved?**

The achievements of the commercialisation of *the Anagi* are not due to any one single factor. Below are a few of the key factors that led to it becoming one of the greatest global successes in ICS commercialisation.

### **State and donor support critical.**

In their report, authors Amarasekara and Atukorala write, 'It should be noted that without local and foreign donors the commercialisation of ICS might have been a dream. From the very beginning both state agencies and foreign donors gave sufficient attention to ICS program. The commitment of the donor community resulted in the materialisation of ICS commercialisation'. The Sri Lankan Government's Ministry of Power & Energy (MPE) and Ministry of Environment and Ministry of Plantation were key players. Donors ranged from DGIS (Dutch), NORAD, SIDA, ODA (currently the DFID), ITDG and ARECOP. In addition, the RWEDP/FAO Bangkok provided valuable technical assistance and international exposure for ICS activities in Sri Lanka. Their support enabled continuous activities regardless of the implementing institute or organisation at the time, keeping up the momentum necessary to reach commercialisation and scale.

### **Uninterrupted linkages of activities**

For four decades large scale ICS programmes connected one with the other in terms of timescale. Activities relating to promotion, dissemination, distribution, potter training, networking and market development were carried out without interruption. The most common linkage was the continued facilitating presence of IDEA, detailed below.

### **Focus on product and a longstanding promoting institution**

As mentioned above, a product that was easily adapted, locally manufactured, supplied and branded was key to the commercialisation process. In addition, the shift from government organisations to NGOs such as IDEA enabled a more sustainable programme to develop, one that was deeply committed to the ICS cause, and not based on political orientations or unstable financial cycles. Throughout the last 18 years IDEA has provided a link to sustain ICS activities throughout the country during periods when there would otherwise have been a vacuum. In addition, by maintaining links with similarly-focused international organisations, IDEA was able to develop the quality of their services and maintain and increase their reach.

### **Subsidy for initial phase/s key for testing products and demand**

The manner in which the ICS programme was implemented was an influential factor in the programmes success. An initial subsidised programme allowed people to 'try before they buy', leading to an increased awareness of the benefits of using ICS which in turn allowed low income families to be sure before investing out of their own pockets. This led to an easier transition in the psyches of potential customers when the programme became more commercially orientated. Also, targeting an urban market first, created a product which poorer, more rural communities could aspire to obtain.

**Focus on the social aspects**

One of the reasons for IDEA's success was the extensive focus on the social aspects of the improved cook stove programme; improving cooking conditions under which women cooked, creating additional incomes for families, improving cooking convenience as well as all of the traditional environmental concerns. Over a thirty year period the ICS evolved from being simply an efficient cooking tool to a mechanism for tackling a variety of important social issues.

**Assisting large scale producers**

The provision of assistance to large clusters of potters living in close proximity was more effective than training individual potters. This strategy achieved scale by lowering the cost of production and enabling a large number of dealers to visit the potters' villages to buy stoves. Today, the two villages of Kumbukgate and Nungamuwa, produce nearly 50 percent of the total production. Sustained efforts and assistance to these producers up to the point that they became self sufficient, was a major factor in the success of ICS commercialisation. It must be noted that this had the additional impact of demoralising small scale competitors whose production costs were higher, unless they were able to sustain themselves by meeting local demand.

A further study is thought to be necessary to more accurately assess how the *Anagi* stove contributes to reductions in indoor air pollution, wood consumption and carbon emissions but in the meantime, sales continue to rise in the Sri Lankan markets.



## Product Development for the Bottom of the Pyramid Market: The Prakti Example

Cyrile Rollinde,<sup>4</sup> Prakti Design

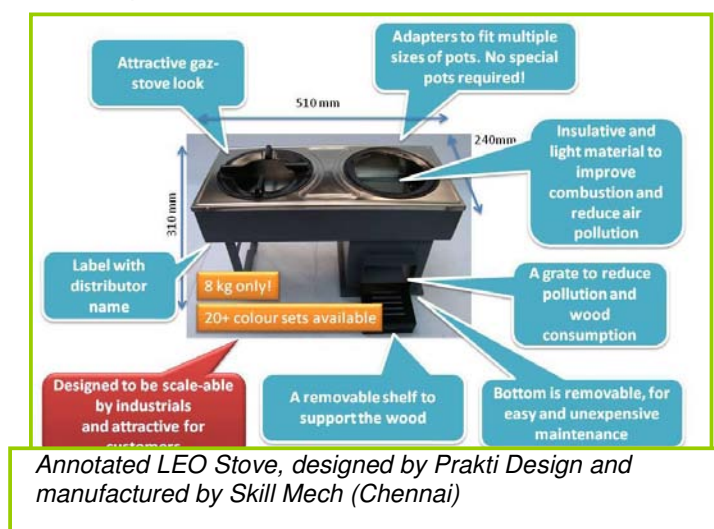
**Summary:** *Prakti Design, a new product development company based in Pondicherry, India rigorously tests stove products and then markets them via the established supply chains of other organisations. Prakti's approach to their product development is particularly needs focused. Read about their lessons so far.*

### Introduction: Prakti's Vision

Prakti Design, a company conceived in 2007, is based in Pondicherry, a small former French colony in southern India, administered by India's federal government. Formed by an international team of engineers and designers, the philosophy behind the company is to apply state-of-the-art design and engineering processes to the design and manufacturing of ecological products that will serve the basic energy needs of India's poor. The team's hope in doing so is to combat indoor air pollution, desertification and deforestation as well as to provide a range of adapted stoves to rural areas. By late 2009 Prakti had built up a portfolio of low-cost improved cooking stoves for both household and institutional users

### Targeting 'Bottom of the Pyramid' Customers

More than three billion kilograms of raw biomass are consumed by wood burning stoves on a daily basis. Prakti engineers are currently testing an increased efficiency, easy to use stove which they have named LEO. They hope that LEO will not only reduce wood consumption but also the levels of soot emitted in the burning process.



Prakti has taken on a huge task using a shoestring budget which includes the personal savings of the seven company members. The team believes there is a market for products aimed at satisfying the needs of the "bottom of the pyramid" (BOP). Improved cookstoves have traditionally been difficult products to promote. One of the main reasons is competition with the widely used three stone fired stoves - that are free. In addition, end users are not yet

concerned enough by indoor air pollution or global warming to change their habitual practices and prices of new improved stoves are also an issue. Prakti seeks to try and

<sup>4</sup> Cyril Rollinde is Business Developer with Prakti Design Lab, 55 François Martin Street - 605012 Pondicherry – India. Please visit website at: [www.praktidesign.com](http://www.praktidesign.com)

tackle these problems and is currently trying to develop a high technology, durable stove for less than \$3 each.

### Lessons Learnt By Prakti

In India, the market is dominated by two large players, Envirofit and Oorja, both have been financed with the aim of achieving sales on a large scale. Their common objective is to sell millions. In comparison, Prakti is relatively new to the market and has a laboratory oriented approach to product development. Prakti has not adopted any expensive communication strategies nor developed a national brand. The team's experience and values have driven the company towards a local based model working with different manufacturers and supply chains in the hope of achieving scale.

Currently at the end of various pilot schemes Prakti have learnt several lessons, detailed below:

#### First: Develop a range of products

From the initial phase, Prakti decided to have a range of products on the basis that stoves are connected to local habits and thus all customers cannot be served with only one model. The teams wanted to position themselves as cookstove developers over and above anything else. A variety of cookstoves were developed: double pot, single pot, institutional and household stoves, those with and without chimneys. Although Prakti decided to focus on a range of products they did rely upon the same technological principle of the rocket stove in order to limit research and development costs. The team members were also inspired by their mission to Africa where they saw the success of artisanal mud stoves and decided to replicate the model for factory stoves.



*Annotated MOBY Stove designed by Prakti Design and manufactured by Skill Mech (Chennai)*

#### Second: Decentralise product distribution networks

Prakti decided that they would focus on expanded distribution but rather on developing products and listening to client needs. No funds were spent on TV ads, or magazine promotions but the team remained upbeat about distribution as other NGO's already working within the sector had created a base of potential users. The business model Prakti is working on requires that they develop the product first and collaborate with an organisation or local company later who then brand the product as their own but provide Prakti with a share of the profits.

### **Third: Collaborate with local partners when designing products and rolling them out.**

Following from the lesson above, Prakti believes that the product design is best worked at in close collaboration with local partners to enable higher rates of adoption by users. These partners are involved through focus group and pilots, before becoming distribution partners. SELCO India became the first collaborating company and the product is currently distributed in the states of Karnataka and Gujarat. CCD/Adharam (Covenant Center for Development and its energy branch Adharam), SEVAI, Pitchandikulam Forest, AVAG (Auroville Village Action Group), IFMR Trust are also involved in the pilot phase. They are identifying end user needs, adapting Prakti designed stoves and commercial material, organising training and awareness sessions and providing feedback on the needs of the users as well as the constraints they are facing when distributing.

*A pilot was recently launched with Covenant Center for Development (CCD), a local partner in Madurai. The organisation suggested that the double pot stove initially meant for households would be better suited to small restaurants. They also asked that a specific stove be built which was smaller than the institutional stove but bigger than the double pot. After some collaboration a specific 10 litre stove was produced that would fit the need of the clients. All these adjustments were carried out within 15 days, primarily because of the manufacturer's skills and experience.*

### **Fourth: Make products easily available by consumers**

Prakti is aiming for a low carbon footprint, for which it relies on national partners. All the manufacturers that they use are from within India and the materials selected are sourced locally. Most of the stoves are made of metal and Autoclave Aerated Cement (AAC) and can be found in many regions in India.

### **Fifth, select a local and flexible manufacturer**

Prakti formed a strong partnership with a manufacturer from Chennai. The manufacturer was able to develop and add new features, make quick adaptations and keep costs low enabling quicker stove dissemination.

#### **Example: Experimentation with a loan model**

*In partnership with CCD in Madurai and IFMR Trust in south Tanjore, Prakti is planning to experiment with a loan model for their stove products. The main product is the institutional MOBY stove, which has proven to be 80% efficient in terms of fuel wood use. Most restaurants buy a large quantity of wood for their cooking and with loans from the partnership, they could invest in new stoves. Furthermore the loan can be easily repaid by offsetting it with the cost of woods which would have otherwise been bought. It is expected that the reduction in smoke as a result of the use of a MOBY stove would lead to an increase in commercial activities from clients who prefer smoke free restaurants.*

*Above all, through the provision of loans, Prakti expects to monitor stoves usage, something that many public and private sector initiatives have failed to do. Providing loans with the stove product will be a way to enable regular follow ups and ensure maintenance issues are addressed. It will also enable Prakti to gain an understanding of the client's actual usage of the stove over a period of time.*

*There are still issues which remain; borrowing from financial institutions is not common in many regions and wood is now and is likely to remain a free resource – well at least until it runs out!*

## Channelling Cookstove Products Through Existing Solar Supply Chains: SELCO India Experience

Prasanta Biswal<sup>5</sup>, SELCO India

**Summary:** *Integrating cookstoves products into SELCO's solar product supply chain, this article outlines the initial lessons learnt from the SELCO experience and emphasises the importance of creating strong market chains - but only with tried and tested products that will be adopted by the underserved populations.*

### Diversification from Solar to Cookstoves products: Optimising choices for the poor

The pace of technology development has made super computers and flat screen televisions a thing of the past, but the choices of products for the poor remains limited. When it comes to a simple process such as cooking, this lack of choice is even more apparent as millions of people, especially women and children in the developing world suffer daily from indoor air pollution (IAP). In addition, trees from hundreds of hectares of non-sustainable forest are being cut every year to fuel the cooking needs of the under privileged population in the world.



*Smoky kitchen of a SELCO lighting customer (using traditional cook stove)*

SELCO, India a social enterprise providing sustainable solar lighting solutions to the underserved in India understands the difficulties the poor face in meeting their household energy needs. SELCO started its journey in 1994-95 with the aim of providing basic energy solutions to the rural communities in the poor with a special focus on the very poor.

In the last few years, SELCO as an organisation felt the need to expand its services and started working on providing solutions for improved and clean cooking for customers. Though there have been many experiments by Governments and

NGOs on energy technologies and their dissemination, the problem of clean cooking (from a technology and economical point of view) for the poor still remains. By leveraging

its experiences promoting solar lighting systems, SELCO India is taking a bottom up approach to promoting cookstoves – matching need (demand) with the appropriate technologies (supply).

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## The Journey

SELCO India started working on its improved cook stoves program mid 2008. Prior to this SELCO experimented with cook stoves developed by a variety of technical and academic institutions. The official launch of products through its supply chain was carried out after two years of trials and field tests. SELCO was determined that the technology must match the needs of the clients and that developers should be ready at short notice to improve their stove design based on the customer feedback.

## Getting the Product Right

The pressures of creating scale through numbers emerged as one of the biggest barriers for manufacturers and distributors when developing appropriate products. Many of the stoves in the market did not meet the needs of the clients or the type of cooking required. Thus SELCO had difficulties forging partnerships that could focus on product development appropriate for a specific client base.

SELCO's experiences indicated that clients prefer stoves which match their current fuel supply, cook faster, save fuel, emit less smoke and are portable. In many cases people asked for a stove which could fit their family size and which lasted longer with minimum maintenance.

SELCO has come up with products that fit these descriptions such as improved biomass stoves with a double burner and the single burner which can cook for a family of ten and five members respectively. SELCO is also providing a charcoal cooker to its customer in



*A SELCO improved cook stove during a testing workshop*

Gujarat where, charcoal is the primary fuel and easily available. Work is going on to find a suitable solution for institutional cooking stoves to cater for larger needs.

Irrespective of these challenges, dissemination should always focus on need, regardless of the fact that this is sometimes time consuming and frustrating. SELCO's approach is to test each and every type of stove that potential customers may use in accordance with their food habits, the type of fuel, fuel availability and cultural behaviours. The testing of

cook stoves has involved internal experts and engineers assessing efficiency, pollution levels, ruggedness, willingness to pay and financing options.

## Some of the challenges of marketing cook stoves:

- Convincing a potential end user to 'buy' a stove in comparison to current stove (three stone/traditional) that costs nothing is still a barrier.
- Educating end-users about efficiency and indoor air pollution (IAP) is a big task especially when many end-users collect wood for free (though they spend a significant amount of their productive time to collect it) and are not aware of the health risks related to IAP.



- Many of the decision making lies with the males, often the head of the household and women, who are the most affected do not have much choice with regards to cooking equipment.
- Many financial and micro-finance institutions do not like to finance stoves. There is a lack of innovative financing solutions for the poor.

### **The SELCO Solution: Piggybacking on the established Supply Chain for Solar products**

Establishing an appropriate supply chain up to the door step of the poor in an affordable manner is critical for the diffusion of cookstoves. SELCO has a reliable supply chain, built over 15 years that provides reliable solar lighting solutions to the poor. Taking a cue from its solar lighting experience, SELCO tried to get the stoves financed by financial institutions, which proved to be difficult as the cost of the product does not fully justify the transaction costs. SELCO therefore promotes the cook stoves by creating a package with a solar home lighting system wherein the stove products piggy backs on the supply chain and credibility of solar lighting systems. The idea has worked very well so far financed by banks and the stove comes with a very low additional principal instalment.

The existence of microfinance institutions (MFI) and women self help groups (SHG) prompted another dissemination plan for SELCO, where the end users can be reached via these SHGs and financed by MFIs. This process provides additional income to the SHG and new clients to the MFI. By October 2009, SELCO had been fairly successful in disseminating approximately 2000 stove to its clients but it is a 'work in progress'. Developing a supply chain is easier provided the technology is truly what the customer need. Unfortunately a wide number of cooking technologies in the open market are not needs based and at times lack certain practical aspects as a result of not being tested beyond the laboratory. SELCO is taking it one step at a time, trying to create success with stove dissemination as it has done with its solar products.

## Modernizing Traditional Energy: From Small Scale Approaches to Large Scale Manufacturing and Marketing

Dean Still<sup>6</sup> and David Hancock, Aprovecho Research Center, GTZ/ProBEC

**Summary:** *Aprovecho and GTZ has launched into a partnership for the trial of a superior efficient cookstove product mass produced in China, to be rolled out on a commercial scale in Africa. This article notes the process whilst also stressing the continued need for traditional donor support for the artisanal cookstoves supply chain.*

### Background

Aprovecho and GTZ have spent decades trying to bring improved cookstoves (ICS) to scale in numbers that address deforestation, the adverse health effects of indoor air pollution, safety, poverty, and global warming.

From their research and experience in the sector they have found that there are two major categories of “improved cook stoves”.

- Category one - stoves that only reduce the amount of fuel used to cook. Larger scale projects are often within this category.
- Category two – stoves which are generally more expensive and difficult to construct but which reduce harmful emissions. In recent years the emphasis has been on this second category of stove.

The artisanal approach to low emission stove production has been beset with difficulties. Trying to bring small shops up to speed in the techniques needed to make components such as refractory ceramics, high quality stove bodies, and long lasting stove tops with tolerances measured in millimeters has been challenging whilst simultaneously the need for change continues to be pressing.

Climate change has turned the ‘energy ladder’ upside down. The use of sustainably harvested biomass offers one of the best carbon neutral cooking methods. Burning propane, other liquid fuels, coal or natural gas for cooking and adding copious amounts of CO<sub>2</sub> to the atmosphere is certainly not seen as acceptable within the ‘green’ sector. The proliferation of climate change on national and international agenda’s is bringing alternative solutions to the forefront. Burning sustainably harvested wood now appears in a new light, as the easy, natural, affordable, and right thing to do, resulting in the modernization of a traditional energy form.

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<sup>6</sup> Dean Still heads the Aprovecho Research Center, USA and in 2009 this work was awarded the Ashden Awards in the UK ([www.aprovecho.org](http://www.aprovecho.org); [www.stovetec.net](http://www.stovetec.net) ). Email: [dstill@epud.net](mailto:dstill@epud.net)

### **The expansion of ICS dissemination through mass manufacturing**

In 2006, while working for the Partnership for Clean Indoor Air in China, Dean from the Aprovecho Research Center<sup>7</sup> (ARC) became aware of the Shengzhou Stove Manufacturers (SSM) factory. SSM were making and selling millions of coal burning stoves. The stoves had all the component parts needed to make excellent wood or wood/charcoal stoves. On this basis ARC sought to collaborate with them in the manufacture of high quality 'Rocket' stoves which met the proposed Shell Foundation benchmarks of performance for fuel use and emissions.<sup>8</sup> The product developed by ARC in partnership with SSM was officially launched in September 2007.

The Chinese factory invested more than US\$ 1 million during 2008-2009 to improve tooling and machinery. This brought production capacity up to 50,000 stoves/month. From May 2008 to March 2009, 65,000 stoves were sold and shipped in containers to eight countries. The partnership between ARC and SSM was recognized by the Ashden International Awards in 2009.

This experience has expanded the ICS approach for Aprovecho and GTZ/ProBEC. Instead of trying to create large scale supply and distribution chains from the ground up, the decision was to concentrate on utilizing existing channels.

### **Relying on existing distribution chains for up scaling markets**

There are multiple advantages in collaborating with and using existing distribution chains. It is possible for products to reach wider networks, existing governmental programs, large retail chains, NGOs, shops, international distributors, micro-finance organizations, and a range of other interested parties that would have traditionally been quite difficult.

Recent experience has also shown that a more beautifully finished product (that works well) has a considerable commercial appeal. Market tests in Uganda and South Africa have been very positive. Third party testing in Uganda resulted in 40% fuel savings without the use of the pot skirt and a 95% customer preference. These results challenged the developers thinking and moved Aprovecho and GTZ ProBEC towards a new approach in modernizing traditional energy.

For perhaps the first time the mass production of high quality rocket stoves manufactured and sold through a reliable supply chain developed for the 'bottom of the pyramid' lower end market was working. Coupling the supply chain to an alliance of large commercial projects on the ground created a distribution system in Southern African countries which resulted in many routes to market. Exploring the existing supply chains certainly seemed a business-like and direct way to achieve the long held goal of

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<sup>7</sup> The Aprovecho Research Center (ARC), based in Oregon USA, has pioneered the design of efficient stoves since the 1970s

<sup>8</sup> The proposed Shell Foundation benchmarks defining a improved cook stove suggest that stoves without chimneys should use less than 850 grams of wood fuel, make less than 20 grams of carbon monoxide and 1500 milligrams of particulate matter to complete the UCB revised Water Boiling Test in which five litres of water is boiled and then simmered for forty five minutes. See: [www.aprovecho.org](http://www.aprovecho.org) for full details. See [www.Stovetec.net](http://www.Stovetec.net) for stove details, costs, testing results.

improved cook stove scale up. Successful scaling up was absolutely necessary to address deforestation, indoor air pollution and climate change.

### **The need for partnerships**

Aprovecho and Shengzhou stoves have been fortunate in their partnerships with GTZ/ProBEC who has located existing distribution chains in South Africa. GTZ is now creating for the first time an on the ground inventory of distributors for improved ICS to those that need them. In terms of a division of labour, Aprovecho designed the stoves, coordinated the marketing and managed the project. SSM manufactured the stoves and GTZProBec distributed them throughout South Africa.

GTZ has a long history within the stove making sector and was uniquely positioned to assist in the distribution process through:

- The purchase of containers of stoves to be used as samples
- Contacts with distributors
- Providing market test stoves on consignment
- Continued provision of consignment stoves until the distributors with less capital can afford the first purchase of a container
- Assistance to distributors with marketing

GTZ manages two programs in Southern Africa that will be providing stoves for both the rural and urban markets. These are Basic Energy Climate Change Alleviation Project (BECAP) which targets South Africa and the Programme for Biomass Energy Conservation (ProBEC) focusing on the other countries in the Southern African Development Community (SADC). The long term goal of the partnership is to create and verify a successful template that Shengzhou, Aprovecho, & GTZ can spread worldwide.

## Subsidy Schemes for the Dissemination of Efficient Stoves: Experiences and Lessons Learnt

Lisa Feldman<sup>9</sup>, GTZ, Germany

**Summary:** *An analysis of GTZ's global experience in the provision of direct and indirect subsidies for cookstove promotion is the focus of this article.*<sup>1011</sup>

### Introduction

This article focuses on the use of subsidies in stove dissemination programmes and experiences from four stove projects implemented by the Deutsche Gesellschaft für Technische Zusammenarbeit (German Technical Cooperation, GTZ) within the Dutch-German energy partnership Energising Development (EnDev).

Developing programmes aiming at a sustainable dissemination of improved cooking stoves are facing a number of barriers which have to be overcome and which, in one way or another all deal with the maintenance and replacement of free of charge or self-produced stoves. Commercially oriented interventions also typically stumble on market barriers. Subsidies can play an essential role in overcoming the aforementioned barriers by supporting sustainable market development. Typical areas which are targeted by direct or indirect subsidies are technology research, the set-up of supply and marketing chains, financing of stoves, and awareness raising.

### Direct vs. Indirect Subsidies

In general, there are two subsidy approaches, which are often applied in the promotion of improved stoves: direct and indirect subsidies. Direct subsidies are used to reduce the selling price or to distribute stoves for free. They involve a direct cash transfer to the stove producer or consumer. The use of indirect subsidies on the other hand helps to establish a market through activities such as product promotion, free of charge training for producers, and awareness creation. Essentially indirect subsidies refer to public financing without direct cash transfers to the consumer or producer.

The questions 'if' and 'what' type of subsidy should be used relates to the issue of sustainability: What will happen after the project intervention has come to an end? Will producers continue to produce stoves? Will stoves still be accessible and affordable? Will users continue to cook on efficient stoves?

Whilst there is certainly a consensus on the positive effects of indirect subsidies, the use of direct subsidies provokes much debate among those working in this field. In cases where a 100% subsidy is applied market development can be inhibited as beneficiaries continue to expect free products in the future. This approach has shown to have the

<sup>9</sup> Lisa Feldman is working for GTZ's poverty-oriented basic energy services program (HERA). ([www.gtz.de/hera](http://www.gtz.de/hera))

<sup>10</sup> Bates, Liz et al *Smoke, Health and household energy Volumes 1 & 2*. Practical Action (2005 & 2007) [http://practicalaction.org/energy/smoke\\_book\\_1](http://practicalaction.org/energy/smoke_book_1)

<sup>11</sup> Rehfuss, E *Fuel for Life, Household Energy and Health* WHO (2006) [www.who.int/indoorair/publications/fuelforlife.pdf](http://www.who.int/indoorair/publications/fuelforlife.pdf)



consequent impact of a lack of ownership on the part of the user part in relation to the stove. Direct subsidies can also be exploited by political parties that favour their own clientele and the additional transaction costs of direct subsidies are often underestimated. On the other hand, there are cases where direct subsidies are favoured e.g. insufficient market power, facilitating external effects on public goods such as health, and targeting the poorest.

## Experiences of GTZ

A recent study<sup>12</sup> focused on the applied subsidy schemes and experiences of four household energy interventions in Bolivia, Burkina Faso, Ethiopia, and Mali. The projects have all been implemented by GTZ and carried out on behalf of the Dutch-German energy partnership Energising Development (EnDev). In contrast to the three market oriented cases in Africa, the project in Bolivia follows a non commercial approach for mud stoves in rural areas by training local families to self-construct their stoves. The study shows that projects, even when following a strong direct subsidy strategy, still spend most of their budget on indirect subsidies.

## The use of direct subsidies

With the exception of Burkina Faso most projects have used direct subsidies with varying experiences. In Bolivia, a high quality and expensive metal Rocket stove for peri-urban areas was promoted. The project faced difficulties due to direct competition with subsidised LPG and increasing metal prices. Stove producers were supported with a decreasing subsidy rate, from US\$26 in 2005 to US\$15 in 2007. The complete subsidy withdrawal, as it had originally been planned, was hampered by increasing metal prices. Thus by mid 2008, a loan scheme was put in place to complement subsidy in the short term, eventually substituting it altogether in



*Rocket Stove in Bolivia*



*Malena Stove in Bolivia*

the long term.

Putting together loan schemes via the involvement of microfinance institutions (MFIs) proved to be challenging as the financing of consumptive goods was typically refused, mainly because improved household stoves do not create income related activities. The credit risk becomes even higher considering the clients in question who are usually not able to provide any physical assets as guarantee. Another difficulty found is the fact that most of the households which need an alternative financing scheme for stoves live in remote hard to reach

areas. This raises operational costs. The smaller the amount of a credit the more expensive it is to handle as the diligence process is the same up to a certain credit amount.

<sup>12</sup> See end of article for full reference.

For poor rural families, EnDev Bolivia has promoted the dissemination of a Malena mud stove made of unfired mud/clay bricks mixed with straw and dung. The stove has a metal chimney and a grate provided for free by the project. The Malena stoves are disseminated following two different approaches: a commercial approach (training of professional producers who build stoves for a fee) and a self-build approach, where technicians and promoters of NGOS are trained and paid to train households in the construction of stoves. This approach has proved to be only partially successful as construction requires certain skills and practice to ensure efficiency and quality of the stove.

In Ethiopia, direct subsidies have been used to speed up market development. Customers could buy a coupon at local banks or local agencies which they exchanged for a stove at the producer's workshop. The producer then cashed the coupon at the bank. Whereas the customers paid only two thirds of the market price, the producers got reimbursed the whole price. The sale of the first 100,000 stoves were subsidised in this way. However, experience with this system showed that a boost in stove sales was followed by a sudden drop in sales figures when the subsidy was removed and cement prices increased rapidly. The coupon based subsidy had not led to the development of a self-supporting market. Based on these experiences, the project has started to use the coupon system as a promotional tool with a clear exit strategy by informing the consumer about its duration. It is hoped that this initial promotion over a short time period stimulates the market. The share of the direct subsidy on the product price is approximately 24%.



*Baking Injera on a Mirt stove (GTZ Ethiopia)*

In Mali, the EnDev project started without a direct subsidy on the stoves. Instead, a start up subsidy was given to the local craftsmen association that provided producers with material on a credit base. The problem in this case was that the World Bank started another stove subsidy programme. Their project subsidised stoves directly by 50% in the first year, planning to reduce its subsidies to 25% and 0% in the second and third year. Thus, the non-subsidised EnDev stoves were more expensive and customers no longer bought them.

### **The use of indirect subsidies**

All projects have supported research and development activities to different degrees and have trained producers or trainers of trainers in the production of efficient stoves. Activities have also included promotional campaigns and awareness creation. The projects have supported the development, introduction and institutionalisation of quality standards and certifications.

The stove project in Burkina Faso has only used indirect subsidies, mainly for promotion, training of producers, and quality control by an independent institute and the producers themselves. Strong marketing campaigns have been one of the key activities carried out by the project and the successful outcomes of this can be seen through the large increase in stove production as the total financing costs for each stove disseminated dropped from Euros 18 in 2007 to Euros 9 in 2008. Some challenges continue, one of

which was the “project mentality” of many local stakeholders who were used to receiving direct subsidies and taking profits from stove projects for granted. This has meant that the project had to actively seek new partners which were willing to accept the approach of indirect subsidies only.

The question of whether direct or indirect subsidies should be applied or avoided must be decided on a case by case basis after assessing the specific conditions of each intervention area. In general it is not a question of whether to use subsidies or not but rather how they should be used, to what extent, at what cost, to whom and with what kind of exit strategy. Answers to those questions vary from country to country and also depend on the dissemination strategy pursued. The way in which the use of direct and indirect subsidies affects the sustainability of respective interventions can only be assessed in the long run.

This article is based on the study “Subsidy schemes for the dissemination of improved stoves. Experiences of GTZ HERA and Energising Development”. Mirco Gaul/GTZ HERA (2009). The full report can be accessed at: [www.gtz.de/hera](http://www.gtz.de/hera)

Direct access: <http://www.gtz.de/en/themen/umwelt-infrastruktur/energie/20674.htm>

The sectoral programme for poverty-oriented basic energy services (HERA) is carried out by GTZ on behalf of the German Federal Ministry of Economic Cooperation and Development. It is the predecessor of GTZ's household energy programme.

## Market Entry for Commercial Wood Burning Institutional Stoves: Initial Lessons from Sustaintech, India

**Svati Bhogle<sup>13</sup>, Technology Informatics Design Endeavour (TIDE) and Sustaintech India Pvt. Ltd.**

**Summary:** *This article describes the experience of setting up a social enterprise to market institutional wood burning cook stoves in the state of Tamil Nadu in India.*

### Introduction

Market based approaches to development assistance seem to be the most recent strategy among development agencies, including cook stove dissemination. Where and how this approach has been conceived is not important, but the limited success of dissemination efforts so far begs the question will it work, and if so, how?

Product developers, donors and social investors are shifting the focus for design and diffusion of clean burning, off the shelf cook stoves towards a market-based approach. However there are higher than usual risks involved when using market mechanisms to disseminate unsubsidised, improved cook stoves. In order to make this approach a long lasting success current barriers need to be anticipated, understood and overcome. Whilst there has been much interest in the past about market-based diffusion of improved cook stoves, action and results have been slow to materialise. Many commercial enterprises have been hesitant to get involved with the cook stove industry, a fact that was unanticipated by those firmly in favour of market based dissemination.

### Understanding the failure of stoves dissemination efforts: Markets vs. Non Market efforts

An understanding of the past efforts in cook stove dissemination within India provides valuable learning opportunities for those involved in the design of a suitable market driven strategy. In many cases the 'end user' or 'beneficiary' is familiar through many development oriented programmes, with the process of installing domestic wood burning stoves, the type of which are constructed by trained masons from locally available materials. However these stoves are prone to problems, masons are apt to changing the stove design and omit key performance indices such as fuel efficiency and indoor air quality, characteristics central to the idea of an improved stove. This resulted in large scale rejection by users of what was essentially a cheap but badly constructed stove. Rejection of the stoves had no direct financial implications for the consumer, as they had either received the goods free or at a nominal cost. If the consumer had purchased the stove themselves at full price, one can assume that they would have demanded performance, warranty and other after sales services. In short, the lack of personal investment in the stoves due to the subsidies available created profound issues of indifference on the part of the user in terms of valuing and maintaining their stoves.

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<sup>13</sup> Svati Bhogle is the Secretary of TIDE and also a promoter of Sustaintech India Pvt. Ltd (SIPL). She and her team at TIDE have developed the stove designs that would be disseminated through SIPL.

In a market driven approach the reasons for non-acceptance of an improved stove would therefore be totally at variance with the rejection of the highly subsidised or public sector driven models. For a stove to be sold through market mechanisms i.e. supply and demand, the stove would need to meet the needs of the customer, be aspirational and affordable. The supplier would also need to be a delivery mechanism in place with the scope to reach the majority of customers, who live in rural areas.

### **Challenges for market driven wood burning cook stoves**

There are pertinent reasons which need to be considered when looking at failures in stove dissemination and some challenges are presented below.

- The availability of well designed portable or transportable wood burning stoves. Often, the commercial stoves are traditionally heavy and difficult to transport.
- Presence of several manufacturers with the capacity, ability and willingness to produce stoves of a consistent quality at several locations.
- The lack of experiences of marketing commercial stoves leading to the non availability of a distribution channel that can take the stoves to customers.
- Gap in knowledge of marketing commercial stoves, leading to higher risks and restricted investments.
- A marketing and sales strategy that communicates the product benefits and its availability to all interested consumers.
- A mechanism by which the customer can pay for the stove in comfortable instalments (or an end user finance scheme which can be accessed through micro finance institutions).
- An investor who visualises attractive returns (financial, social, environmental) when investing in such a product and distribution mechanism.

The foundations to successfully implement a market driven cook stove industry exist. At several locations in the country stove manufactures exist and competent individuals can be found who can devise and implement communications strategies. The key challenge is not to build business acumen or technical knowledge; the main obstacles to diffusion are financial.

Finance is needed at three levels; in manufacturing, distributing and also for the end user. The initial costs for a fuel efficient stove for commercial applications are at least twice those of a conventional household stove. A survey conducted by TIDE shows that whilst there is a clear need and wide spread interest in fuel efficient stoves there is little willingness to pay the market price for such products, particularly not in full and upfront. There is a clear need for tailored loans available not only to end users but also to manufacturers, which cover all elements of the supply chain.

### **Creation of Sustaintech**

TIDE (Sustaintech), a not for profit organisation which provides linkages between technology providers and poor consumers, has sought to overcome the challenges mentioned in the section above by creating Sustaintech India Private Limited (SIPL). SIPL created a delivery mechanism for improved cookstoves and hope to expand their work to other sustainable technologies in the future. An agreement was put in place whereby stove designs developed by TIDE remain their intellectual property but SIPL is able to use the designs for a small fee (3% of the cost of production of the stoves). TIDE also provides quality assurance and technical support. The objective of this agreement is



to create two mutually dependent organizations. While TIDE will focus on product development, SIPL will focus on enhancing markets.

As a result of the obstacles to address consumer finance and lacking investor commitment, SIPL were forced in their strategy to by pass individual consumers and focus on commercial kitchens. Generally in commercial kitchens heavy duty cooking takes place for 8 to 10 hours a day on high power stoves resulting in large amounts of wood being consumed. As these commercial kitchens need to purchase firewood on a continuous basis there is a clear incentive to purchase increased efficiency cookstoves. Increased efficiency means less wood purchased and more money saved, which ultimately leads to higher profit margins. Additionally, beyond the commercial benefits, the use of improved cook stoves means that food can be served in a smoke free environment.



*The Kriya Tava stove is a multipurpose stove and can be used to prepare dosas, chapattis, parothas, omelettes etc (terminology for local Indian cuisine). It comes with folding legs which help in moving the stove. It has well designed fins on the lower surface of the tava (flat plates) which ensures a uniform tava temperature.*

Hence it would seem as though an enterprise catering to the needs of commercial kitchens makes great business sense. The improved stoves have a pay back period of less than one year due to fuel savings. The volume of fire wood saved is at least 30 percent in comparison to conventional stoves. The number of commercial kitchens in the market means that there is a steady stream of demand and there are clear benefits for carbon finance companies which wish to become involved in such an enterprise. In spite of the lower risks associated with a business venture for energy efficient stoves for commercial kitchens than domestic stoves, Sustaintech has continued to experience road blocks.

### **Accessing finance for stoves**

Institutions which have traditionally invested millions of dollars supporting charities are wary of investing in commercial stove ventures. The prevailing perspective of the green business investors continues to be that of an entirely profit focused enterprise. However, the returns on investments on cook stoves go beyond profits to the use of technology as an instrument for social transformation and must be measured as such. Green or social entrepreneurs bring a different vision of development. They focus on relatively short time period; identify an exit route and leaving behind an institutional mechanism that can deliver both profit and social good without donor dependence. It is yet to be seen whether this approach is more efficient and effective.

Microfinance institutions (MFIs) looking for project ideas are generally slow when taking decisions to lend to commercial kitchens running profitable businesses. This is mainly because MFIs are comfortable with their existing lending patterns which mostly target women's groups. There is a need for MFIs to move from group lending to consumer lending and build up energy portfolios. They have the infrastructure and capabilities to

adapt to new challenges and if they do not reach out to all types of consumers requiring microfinance, the commitment to their cause may be questioned.

### Strategy adopted by SIPL to market Commercial Stoves

SIPL as a start up venture supported by the development sector faced large challenges when making the transition away from a grant based approach towards a more sustainable, enduring institutional mechanism. The initial strategy was cautious, enabling SIPL to learn how to run a socially responsible enterprise. SIPL surveyed and analysed the potential of its business before choosing the most user friendly, fuel efficient, economically attractive products that would appeal to a large consumer base (targeting street food vendors). These were wood burning stoves designed for special applications such as tea making, frying, and cooking on *tavas* (flat plates). The stoves have the potential to be in operation for more than 330 days in a year, 8 hours a day and yield high fuel savings.

SIPL is aiming to create a mechanism for rapid acceptance and adoption of fuel efficient stoves. The company's target for dissemination is set at 400 stoves in the first year moving rapidly to over 30,000 stoves in the fifth year, aiming at total sales of about 77,000 in southern India alone within a 5 year time span. There has been a conscious decision to remain focused on the task of creating distribution infrastructures and linking manufacturing, transportation and consumer finance. As a result, the costs of stoves may be slightly higher but at the same time, consumers will be provided a sustained support chain for their products.



*The Kriya kadai stove is designed for user convenience when frying wadas, bajjis, bondas, murukkus (terminology for local Indian cuisine). It can be used when standing or sitting because it has detachable legs and can also be embedded partially in the ground. The lower surface of the kadai (similar to a wok) has fins which help heat the oil quickly.*

There are three challenges which SIPL still needs to overcome:

- Creation of a viable distribution network for sales: This is currently visualised to be dedicated stores currently called 'Sustech Centres' with staff equipped to carry out tasks such as market development, installation, and maintenance.
- Obtaining firm and stable links with microfinance and other commercial lending institutions for consumer finance.
- Finding investors who would be committed to support the vision and aims of SIPL.

"Be the change you want to see" is an often quoted Gandhian quote. Easier said than done some may say but surely the time, effort and money spent on the creation of a stove enterprise is a pioneering way of implementing exactly such a change. All that is needed is passion, commitment, hard work and importantly, investor interest.

## Making LPG Stoves Accessible for Low Income Communities in Kassala, Sudan

Liz Bates, Independent Household Energy Specialist, UK<sup>14</sup>.

### Introduction

Kitchen smoke leads to more than 1.5 million deaths each year globally. Over the last few years serious efforts have been focused on reducing this major health hazard (Rehfuess, 2005). To achieve any meaningful impact, approaches must alleviate smoke in millions of low-income communities in ways that are acceptable and desirable. The INGO Practical Action (funded by the UK government DFID, WHO, and several smaller Trusts and donors) conducted research in Kenya, Nepal, and Sudan, to find approaches that would be sustainable (Bates et al, 2005 & 2007) and thus provide a mechanism for growth in the adoption of such technologies in the longer term. This article discusses the introduction and scaling up of LPG stoves in Sudan.

### Research rationale

Many people using rudimentary stoves are unaware of the high risks of respiratory illnesses caused by smoke. For people living in poverty, prioritising their needs is a part of life. Making people aware of the dangers of smoke to their health and that of their children, it is hoped will increase the priority that they place on alleviating kitchen smoke. Alongside this awareness-raising, acceptable smoke-alleviating technologies have to be made affordable. If people understand the risks, and are involved in technology selection, they may be willing to buy affordable cooking technologies, and to use them on a regular basis.

### Methodology

The research comprised two projects:

- Project 1: Working participatively with communities to identify appropriate 'interventions' (technologies or behaviour changes) that would alleviate smoke. In Sudan, the project worked with a displaced community outside the town of Kassala, demonstrating different fuels, such as biomass, charcoal and LPG in stoves (and also for large flat hotplates for making the local *kisra* – a type of pancake).
- Project 2: Finding sustainable pathways to introduce these technologies to larger numbers of people, whilst ensuring that they continued to be used, and that continued to alleviate smoke. The second project worked over a wider geographic location, in districts around Kassala, and the New Halfa area. Practical Action had developed Women Development Associations (WDAs) to train women in various aspects of entrepreneurship. These groups were keen to take on selling LPG 'sets' (stove, gas bottle, connectors, and hotplates). Although the government supports its use, for those living in poverty, the upfront costs made it appear an impossible aspiration. Fears surround the use of LPG, due to

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a lack of understanding on the safe use of the fuel, and accidents from substandard equipment.

The WDAs organised demonstrations on safe cooking, and raised awareness of the dangers of smoke. They were trained to sell the stoves (and hotplates) using micro-finance, and to ensure safe use of stoves. At the same time, levels of growth in the market were monitored, alongside socio-economic factors such as health and well-being, time and money saving, and reductions in levels of indoor air pollution.

### **Revolving finance in Sudan**

#### *Management structure - branch level:*

- Each new customer had their name, types of interventions purchased and total cost recorded.
- A schedule showing all customers and their loans was updated monthly
- A signed receipt was issued to each customer
- A matching card was given to the customer showing their repayments

#### *Management structure - Central WDA level:*

- Records of each branch, number of customers, size of loan and number of appliances was recorded
- A loan agreement between central WDA and branch WDAs was made based on number of appliances delivered for sale, their cost, down payments expected and loan value.
- Once goods had been delivered, a monthly record was kept of total payments and down payments expected each month for each branch
- A record showing all branches, actual repayments, the planned repayments and the differences.
- All these were compiled into totals for each month of what had been paid against scheduled payments.
- Similar arrangements were made for the gas bottle repayments, as the loan for the cylinders had to be paid back to the gas company.

### **Findings**

By demonstrating the benefits of LPG alongside other technologies, and providing safety information, and micro-finance, all thirty households opted for LPG. Once the technology had been demonstrated, demand increased very rapidly, and the rate at which staff could be trained to meet the demand was the limiting factor.

Early management structures proved unable to cope satisfactorily with the numbers wishing to join. A new structure, highlighted in the box, describes the current situation.

By the end of the second project, around 1500 households had purchased LPG equipment, and there was a waiting list for those wanting to join. More importantly, the infrastructure for continuing distribution beyond this project had been set up.

At the time when post-intervention monitoring was done, a peace treaty had been signed and many households went home, taking with them their stoves. There was a glut of charcoal, with consequent drop in price, and many households had reverted to this fuel during this period. However, sales of stoves continued to grow, and now most households are using LPG again. As a direct result, a programme in Darfur, using carbon finance (CarbonClear) to subsidise the stove cost, is now successfully operating. Over 1100 stoves had been disseminated by May 2009.

## **Conclusions**

The rapid growth in demand for LPG sets reflects the comparative ease of disseminating a technology which is highly desirable. By making people aware of the dangers and providing an approach that allowed the upfront costs to be spread over time, a rapid growth in the market resulted. The high cost of repaying both fuel cylinder and burner and buying fuel proved problematic for those with little money whereas ways of reducing the upfront costs support market growth and allow many more people to benefit. Working with the fuel companies to make the fuel easily accessed, and having them realise that their profits are in the fuel, not in the price of the fuel canister, can make them amenable to selling the bottles either at a subsidy, or using soft loans.

People will often opt for the cheapest fuel, and/or the most convenient, so this type of project works best where the fuel price is comparable to the one in use, and where access to refills is convenient.

## The Growth of Ugastoves

Ruth Kuteesa, Acting Marketing Manager and Public Relations Officer, Ugastoves<sup>15</sup>

With inputs from Kavita Rai, GVEP International<sup>16</sup>

**Summary:** *Ugastove, a stoves company based in Uganda's capital city Kampala started out as a small family run stoves business and rapidly up-scaled with the assistance of carbon finance. This article is a snapshot of the products they developed and the growth of the company.*

### Introduction

Wood-fuels marketed in Kampala are sourced from forest areas hundreds of kilometres away from the city. As these sources become depleted, it is reasonably expected that forests from more distant areas of the country will be used. To counteract this, a pilot project was started in 2004 by the Urban Community Development Agencies Ltd (UCODEA), an organisation funded by a US EPA grant until 2006. Under this project, the production infrastructure was constructed, stove designs perfected, Indoor Air Pollution (IAP) monitored, and business development enhanced to support the commercialisation of the stoves. In 2007, the project won an award for stove design and improvement at the 3<sup>rd</sup> Biennial PCIA Workshop in India. The success of UCODEA led to its transformation into the stove manufacturing business, Uganda Stove Manufacturers Ltd (Ugastove) based in Kampala which produces both household and institutional stoves. The company's motivation when changing their name was mainly to re-brand itself and patent the product.

The company engages in the production and dissemination of the different kinds of energy technologies that include improved energy saving stoves for households, stoves for institutions (both fixed and portable), baking ovens, incinerators, fireless box cookers, charcoal briquettes, and rocket stoves.

### The Products

The two main Ugastove products are the improved charcoal stove and the institutional stoves. The improved charcoal stove reduces fuel consumption through the introduction of an insulated combustion chamber. The chamber increases combustion efficiency and retains heat. The wood stoves use the well-proven rocket technology, which consists of an insulated elbow jointed combustion chamber which also increases combustion efficiency and retains heat whilst also raising the cooking pot to the hottest point above the flame. The institutional rocket stoves further increase heat transfer by having the cooking pot rest within a skirt. Test results showed that the improved charcoal stoves reduced the consumption of fuel by 36 percent and institutional woodstoves reduces fuel wood by 47 percent compared to traditional stoves. Successful IAP monitoring conducted according to the Centre of Entrepreneurship in International Health and

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<sup>15</sup> <http://www.ugastove.com/>

<sup>16</sup> Discussions with Muhammed Kawere, CEO of Ugastoves, October 2009



Development (CEIHD) monitoring protocols showed that the wood burning Ugastove's reduced CO<sub>2</sub> by 54 percent. In addition, there was continued use of the stoves; 94 percent after 1 year and 86 percent after 2 years.

All products are well insulated thereby reducing the heat loss and doubling the energy transfer from the charcoal to the cooking food. The company is expecting to raise quality through centralised production and mechanised cladding as it is currently done manually.

### Market reach

As of 2009, Ugastove was the leading manufacturer of the efficient energy saving stoves in Uganda, approved by Gold Standard. When tested the products were found to reduce emissions up to 60 percent.



*Insulation process*

Ugastove currently supply stoves to a large number of districts and towns in Uganda and also targets international markets. Since 2006 the total amount of stoves sold numbered approximately 40,000 with a particularly large increase in sales during 2008-2009. Each Ugastove product has a one year warranty and they are sold in three sized (1, 2, and 3). In October 2009, roughly 3500 stoves were sold a month, the most common size sold being 2. The retail price of the stoves is lower than the costs of production, mainly due to subsidies of 54 percent through carbon financing. In addition, four more sizes (4-7) have been brought into production, however as they are larger the sales figures have remained low. In the future, Ugastoves aims to produce stoves that would retail at US\$5 and provide a longer warranty.



*Ugastoves marketing*

In Uganda, educating the public in order to change cooking habits is perceived as extremely important and is done through door to door campaigns. Ugastove products are sold through supermarkets, organised groups, and schools as well as in open air markets. Marketing is carried out via radio, flyers, and TV. The results have been positive, people now know the Ugastove product and recognise the brand. In distant regions, large trucks carrying the Ugastoves logo are being used, resulting in increased sales.

Market research done by the company showed that charcoal and firewood are the two main sourced of fuel supplied within the country. Thus, the company still designs wood burning stoves in an effort to match products to need and general customer realities. Ugastove works hard to ensure the quality and affordability of the woodstoves it makes, particularly with the high costs of production in mind. Demand is high and with the recent

addition of the carbon financing element, the company has been able to bring the stoves to scale.

In addition they have also been involved in the training of Artisans across the country. These artisans are on the whole young people, who on completion of the training courses are given certificated that enable them to be retained at the factory or join similar companies. This has reduced the number of the unemployed youth in this area.

## Challenges

Inefficient and polluting cooking regimes are deeply established in the culture. In addition, the challenge that Ugastove faces is that the competition lies in the low cost or free mud stoves. The project aims to break this mould and move large populations away from practices which result in unacceptably high emissions of GHG and negative, bordering inhumane health effects for the women and children that spend long hours in the kitchen.



*Final product*

Another challenge for Ugastove is that the VAT absorbs 18 percent of the cost of each stove. The company is keen to push government to provide tax exemptions that would enable them, to lower the price of stoves in rural areas.

## Scaling with Carbon Finance

The carbon credit program was launched in February 2005 at UC Berkeley, with the intention of registering the credits on the Gold Standard (GS) for Voluntary Emission Reduction (VER). While Ugastoves started to scale production, CEIHD and JP Morgan Climate Care joined forces to develop the carbon project. The GHG emissions tests were carried out at UCB

laboratories enabling the drafting of the Project Design Document (PDD) based on the scientific data gathered from surveys. In March 2007, the first consultative meeting was held in Kampala as required for Gold Standard projects. Further, in partnership with CEIHD, a monitoring plan was drafted and forwarded for approval on the Gold Standard. The Gold Standard-VER Methodology '*Improved Cook-Stoves and Kitchen Regimes*' developed by Dr. Adam Harvey, JP Morgan Climate Care; Sectoral Scope:3, was approved in 2008 leading to the registration of the project in 2009 as the first GS cook stove project. The basic premise was that the project would reduce green house gases (GHG) emitted through the production and use of charcoal and firewood as cooking fuels by replacing them with efficient charcoal and wood burning stoves primarily in Kampala with sales expanded to the rest of the country.

With the help of the carbon funds, Ugastoves aims to break the mould and move large populations away from conditions under which GHG emissions are unacceptably high and health effects are inhumane for the women and children.

## Three Key Obstacles to Cookstove Adoption (And How to Overcome Them)

Xander Slaski and Mark Thurber,<sup>17</sup> Program on Energy and Sustainable Development, Stanford University

**Summary:** *Commercial stove programs have the potential to dramatically boost dissemination of improved cookstoves, but only if they skilfully address the vexing challenges of user motivation, affordability, and level of engagement required.*

### Introduction

Despite the potentially huge health benefits of programs to disseminate improved cookstoves in the developing world, such programs have struggled to make an impact. The entrance of commercial players into the cookstove space in recent years has the possibility to bring innovative and hard-headed thinking to the question of how to scale cookstove adoption. Entrepreneurship in supplying cookstoves meshes nicely with the idea that serving the urgent needs of millions at the “bottom of the pyramid” can be profitable (and thus sustainable and scalable) as well.

At the same time, if new cookstove business models (whether purely for-profit or not) are to be successful, they must take into account a critical and often-overlooked fact: not all “bottom of the pyramid products” are created equal. Some are very readily adopted by the poor—examples include Coca-Cola, TVs, and malaria nets. Other products, like cookstoves, present many more obstacles that must be overcome for successful dissemination.

### Three Dimensions affecting adoption of new Cookstove Products

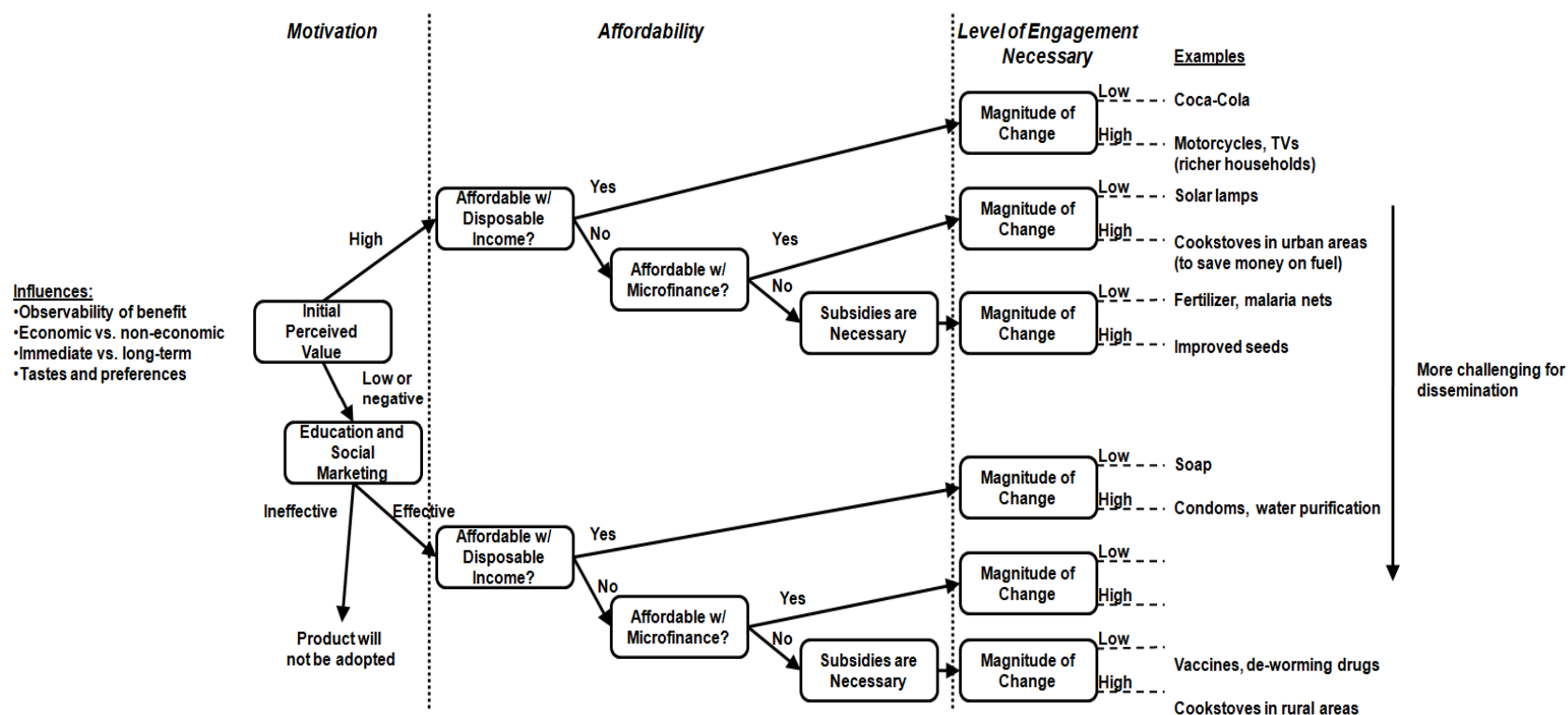
We suggest that there are three principal dimensions affecting adoption of any radically new product or service by the poor: motivation, affordability, and the level of engagement required. We describe the role of these different factors in the form of a stylized decision tree in Figure 1.

**Figure 1** [See next page] A stylized decision tree describing challenges to adoption of new technologies for the poor. Key obstacles are low motivation, low affordability, and high amounts of engagement required by the user. On the right of the diagram, we suggest some example products or services with different combinations of these characteristics; as one moves down the list of examples, dissemination becomes more difficult because more obstacles are in play.

The first and most important determinant of adoption of a new technology is *inherent motivation*, which is connected with the perceived value of the new product or service. Cookstove programs are most successful when the cookstove is seen by prospective customers to provide concrete and observable benefits. In urban areas, where fuel wood is often purchased, users are motivated by stoves that save money. In rural areas where fuel is scarce or in refugee camps, people similarly see the value of fuel-saving stoves,

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**Figure 1**



which help reduce long or dangerous trips to collect wood. The value that outside observers usually see as paramount - the improvement of health through elimination of indoor air pollution - rarely ranks highly in the calculus of purchasers. Education about this benefit has for the most part been ineffective; even when informed about health benefits, users do not seem to value them highly enough to overcome preferences for traditional cooking methods. What have worked better are efforts that actually create and market a newly perceived value associated with the stove. A stove could be seen, for example, as contributing to a cleaner kitchen, adding new cooking functionality, or providing a status symbol associated with modernity. (Note that these other forms of value may hold more appeal to those who are already living above a subsistence level, pointing to the inherent challenge of dissemination to the very poor.) The commercial players who will be most successful in the cookstove space are those who are most innovative in creating these kinds of observable values for their customers.

Motivated customers will overcome many obstacles to purchasing a product, but real barriers can still remain, the most important of which is **affordability**. Some products can be sold in small volumes to bring them within the reach of the poor, but this strategy is not applicable to cookstoves. For most low-income consumers, stoves are simply not affordable with disposable income. Stoves can be made affordable to some with credit and financing, especially in urban areas or anywhere where fuel wood is purchased. However, people at the absolute bottom of the pyramid, those living on less than US\$1 to \$2 per day, will not be able to afford a stove even with financing. In such cases, subsidies are necessary. The challenge is to ensure that such subsidies do not destroy nascent markets and are targeted as effectively as possible to the very poorest. In the health sector for example, mosquito nets to prevent malaria have demonstrated that subsidies can be effective in encouraging widespread uptake of a product. On the other hand, various studies have shown that subsidized stoves turn into little more than scrap metal if target customers do not value the product to begin with.

A final barrier to adoption of a new technology by the poor can be the **magnitude of the change** entailed. Public health interventions such as vaccinations demonstrate that education plus subsidies can yield results at scale. However, the level of user engagement required in receiving a vaccination is fundamentally different from that needed to change one's approach to cooking. Cooking touches on an entire lifestyle, which can include gathering wood (an activity with a strong social component) as well as cooking (an activity heavily influenced by tradition). Changes in lifestyle may bring significant benefits—the ability to replace wood gathering with productive economic activities, for example—but they are not undertaken lightly. In addition, products like improved cookstoves that are more complicated than traditional technologies may require training and ongoing correct use to reap their benefits. Once again, even extremely complicated products with significant associated lifestyle changes may be successfully adopted by the poor where significant inherent motivation exists. Motorcycles and electricity are examples among the somewhat higher income groups. Where such motivation is lacking, however, the spread of products requiring significant user engagement and change will be doomed from the start.

What has made rural cookstove programs particularly difficult is that they face all three of the challenges described above. They are expensive, imply a significant change in user habits, and, worst of all, are usually not highly valued by potential users at the offset. For entrepreneurs to fully succeed in the cookstove space, they will need to be creative in addressing all three of these obstacles, not to mention the generic but nonetheless very difficult challenges of developing cost-effective supply chains to remote rural areas. Most important are efforts to create compelling perceived value for



consumers which goes beyond outsiders' perceptions of the value that should already exist, such as for health. Because of the significance of the lifestyle change presented by a change in cooking methods, deep motivation on the part of consumers is required. Skilful design can be a key part in making the stoves as easy to use, robust, and highly valued as possible. The extent to which companies can profitably provide stoves to the poorest of the poor will then depend on how creatively they can apply tools of credit and financing where possible and make subsidies available where necessary through partnerships with governments and NGOs.

### **About the Program on Energy and Sustainable Development**

The Program on Energy and Sustainable Development (PESD) is an international, interdisciplinary program that studies how institutions shape patterns of energy production and use, in turn affecting human welfare and environmental quality. PESD research examines issues including effective policies for addressing climate change, the role of national oil companies in the world oil market, the emerging global coal market, business models for carbon capture and storage, adaptation of wholesale electricity markets to support a low-carbon future, and how modern energy services can be supplied sustainably to the world's poorest regions. The Program, established in September 2001, includes a global network of scholars—based at centres of excellence on six continents—in law, political science, economics and engineering. It is part of the Freeman Spogli Institute for International Studies at Stanford University.

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## About GVEP International

GVEP International is an international non profit organisation working to reduce poverty by accelerating access to affordable and sustainable energy services. GVEP International links more than 2,000 organisations worldwide and seeks to support and grow small Partners from the bottom up to become viable energy service providers.

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