delivery, improve their quality of life through better lighting, and raise their status in the household and community.

Project participants and their associates now run meetings to discuss prospects and problems in micro-enterprise operations, regional sales and electrification issues. The husbands of the project members offer assistance to the working team of women, especially in marketing and sales. Such interactions have been found to build women's confidence and interest in the project among the men. As a result, the project has been successful in removing some of the social and cultural discrimination experienced by women.

Income generation has been a key motivation for people buying the lamps. Household income was found to rise with electric lighting in the workplace, and adequate lighting was found to be a deciding factor in whether people opened a home-based business that could be managed by family members on a part-time basis to augment household income. Families with school-age children also show significant interest in purchasing lamps with batteries. These families want their children to have better light for studying.

9. Environmental impact

The battery-operated lamps have replaced traditional hurricane lanterns and *kupis* that use kerosene as fuel. Consequently, at the household level, there is significant reduction in indoor air pollution that is known to cause damage to health, as well as in risks of household fires. Large-scale use of batteries instead of kerosene could also reduce overall greenhouse gas emissions. In the long run, charging batteries with solar-powered equipment rather than diesel engines could eliminate emissions altogether. ■

Note

1. Originally published as H.J. Khan, "Battery operated lamps produced by rural women" in Karlsson, G., and Misana, S., (eds.), *Generating Opportunities: Case Studies on Energy and Women,* New York, United Nations Development Programme, 2001. This abridgement has been prepared by Gail Karlsson (E-mail: gkarlsson@worldnet.att.net).

Rural women as agents of improved woodstove dissemination: a case-study in Huluvangala village, Karnataka, India

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1. Introduction to the organizations and people involved

Sharada Swasahaya Sangha is a self-help group of 10 women of Huluvangala village, in Tumkur district of Karnataka state, India. The women in this group are among the poorest in the village and the group consists largely of landless women and widows. The women are barely literate, with the most educated woman having completed two years of schooling. The age group of the women is 35 to 45 years. They work in agricultural labour whenever work is available and are paid subsistence wages.

Huluvangala village is about 30 km from the district headquarters and nearly 100 km from Bangalore. The majority of the population of around 118 households is from backward classes or scheduled castes[1] (66 backward class and 48 scheduled caste households). The village has a primary school and the nearest health centre is 5 km away. Access to the village is by a mud road which is in a very bad condition. Private buses make 2 trips a day to the village and it is not connected by any reliable bus service. The main income-generating activity in the village is agriculture and dairy farming.

Institute for Youth and Development (IYD), a Bangalore-based NGO, has been working in this village for over a decade. IYD is committed to integrated development of society and its area of operation includes Tumkur, Kolar and Bangalore Rural districts of Karnataka and Madurai district of Tamil Nadu. Its activities include strengthening of people's organizations, capacity-building for the disadvantaged sections of society, soil and moisture conservation and NGO networking. IYD is the local NGO and it is assisting the self-help group in the development of its micro-enterprise for the construction of smokeless stoves.

TIDE (Technology Informatics Design Endeavour) is a small Bangalore-based NGO committed to the dissemination of appropriate technology to rural areas. It has positioned itself as a link organization that would bridge the gap between institutions generating technology and the rural population for whom the technology has been developed. In the past TIDE has succeeded in creating local infrastructure for the dissemination through market mechanisms of energy-efficient devices used by informal industries. TIDE has developed the training programme in stove construction and is training rural-based self-help groups and NGOs in stove construction.

This case-study describes the coming together of two NGOs and a self-help group to provide income-generating opportunities for rural women as stove entrepreneurs. This activity has been developed as a part of the TIDE executed project "Technical training of women for income generation" supported by the Technical Training Programme of the Energy Unit within the *ETC Foundation, the Netherlands.* This was TIDE's first experience of diffusion of appropriate technology exclusively to women.

Sarala olé (domestic wood-burning stove): The *sarala olé*[2], developed at the ASTRA (Application of Science and Technology to Rural Areas) Centre of the Indian

Institute of Science, is a simplification of its improved wood-burning domestic stove, the ASTRA *olé*. The ASTRA *olé* (also developed at ASTRA) is a three-pan wood-burning stove having a firebox with a metal door at the side for loading the fuel. The fuel utilization efficiency of the ASTRA *olé* is over 40 %, much higher than the heat utilization efficiency of 25-30 % of the *sarala olé*. In spite of its good design and very high efficiency, the ASTRA *olé* was not very popular because rural households did not require a three-pan stove and the women were not comfortable with side-firing. The *sarala olé* was developed at ASTRA as a consequence of the indifferent response of the rural population to the more efficient ASTRA *olé*. The *sarala olé* is a front-firing, two-pan smokeless wood-burning stove. Recent experiences had shown that the rural women were happy with this stove design and hence it was chosen for dissemination.

Figure 1 shows the *sarala olé* constructed by the members of the self-help group and being used in Huluvangala village.

Figure 1. *Sarala olé* constructed by the trained women in regular use in the village

2. Stove dissemination under the government programme

The stove dissemination programme in India has so far been conceived and implemented by government departments (Ministry of Non-conventional Energy Sources (MNES), Goverment of India, and the Departments of Rural Development and Panchayat Raj of the state governments). The MNES, through a consultative process, decided the number of stoves that would be constructed in every state and allotted targets to the state government, which in turn allotted targets to the district-level administration. The stoves that could be disseminated under this scheme had to be approved by the MNES as appropriate for dissemination and release of subsidy. The sole criterion for approval was the fuel-saving as reported by the technical back-up units (TBUs) of the National Programme on Improved Chulha (NPIC). The cost of the stove was fixed and the government departments, both at the Centre and in the state, subsidized this cost.

The district administration, through the Block Development Officers, created local infrastructure for the dissemination of stoves. They trained self-employed workers (largely men) in stove construction, procured stove components and identified households where stoves would be constructed. Households wanting to own fuel-efficient stoves were contacted by the self-employed workers and they had to pay around Rs. 50 (US$ 1 = Rs. 46) towards the cost of the stove, the rest coming from the government subsidies.

3. TIDE's assessment of the improved stoves constructed

TIDE personnel are frequently in the field and they have used the opportunity to inspect both the conventional and improved stoves in use in rural households. They have also interacted with rural women and understood their requirements from an improved stove. As a consequence of these experiences, TIDE gained the following insights.

- The quality and performance of an improved stove is directly related to the skill of the self-employed worker and the sincerity of the officials in the district administration.
- When the quality and performance of the improved stove is not commensurate with the expectations of the woman of the house, there is no mechanism for initiating corrective action. This leaves her with no option but to dismantle the stove and revert to the traditional one, which is also unsatisfactory, but with which she is familiar.
- Besides the requirement that the stove should be able to cook all the usual dishes, women are looking for two major attributes in improved stoves – smokelessness and faster cooking. Other preferred requirements of lower priority are fuel-saving, clean vessels and versatility in the use of different types of biomass as fuel.
- The woman has no choice about the type of stove that would be constructed in her house as the self-employed worker is trained to construct only one type of stove and usually only one type of stove is disseminated in a region.
- The amount that she has paid for the stove is not very high and as it has been constructed under a government programme, she is reluctant to demand good performance as long as the stove is smokeless. As the stove does not come with a brochure or a user manual, she is unable to define "good performance".
- The government's thrust on fuel-saving alone was not compatible with women's requirements. Women had experienced the harmful effects of smoke, were aware of smoke as a health hazard and sought relief from it.

All the above factors led to the large-scale rejection of the stoves. Clearly a new strategy for the dissemination of household stoves was needed. TIDE has engaged rural women in dialogue about their needs/expectations of an improved woodstove and then attempted to define the words "quality", "performance", "woman's expectation" from the point of view of a rural woman.

4. Rural women design their own stoves

Rural women defined a good-quality stove to mean one

that is robust, sturdy, good-looking, long-lasting, one that requires very little maintenance and can be used with a range of vessels. Good performance has been understood by TIDE to mean that the stove is smokeless, cooks fast, cooks a variety of dishes and consumes less fuel. Women, especially those who had not seen an improved stove, found it hard to voice their expectations. Women who were exposed to improved stoves either in their house or in their neighbourhood were more articulate. They spoke of smokelessness, clean walls in the kitchen, ease in cleaning vessels, comfortable environment in the kitchen, etc.

Selection of a stove design catering for women's needs, and a stove dissemination strategy for rapid penetration of improved stoves without subsidy or government intervention and completely conceived and executed by women, have emerged out of these dialogues. TIDE has been fortunate in obtaining financial assistance from ETC of the Netherlands for converting a concept into a reality. TIDE's experiences in developing a stove dissemination methodology and its implementation are described.

5. Designing a dissemination strategy

As TIDE was proposing to install stoves in households without government support or subsidy, it had to develop and position the smokeless stove as a good-quality salable product. Past experience had shown that rural women were happy to use a well-constructed *sarala olé*. The challenge was to consistently deliver to the consumer a stove that was as close to the original design as possible. TIDE was aware that Murtuza Ali, who was employed in the stove dissemination project of the government in association with Syed Shabbir, a Mysore-based entrepreneur, had developed moulds for the construction of the *sarala olé* and that self-employed workers had used the mould successfully in Mysore district. TIDE purchased *sarala olé* moulds from Shabbir and discovered that unskilled women with no family background in construction were able to use them to mould stoves easily and effortlessly. The stoves constructed by these women were accepted in their neighbourhood. This information enabled TIDE to conceptualize a stove dissemination strategy that had the potential for rapid and large-scale replication.

When evolving the dissemination strategy, TIDE took into consideration the previous experiences in stove dissemination under the subsidized government programmes and was aware of the problems. It believed that a stove construction programme where women were trained in construction was likely to succeed in the long run, although there would be problems in the short run. The logic for the belief is as follows.

- A woman stove constructor would better understand what another woman wanted from a stove. She would either be able to come up with local solutions to a local problem or inform TIDE about the user's needs. (The use of the mould would restrict her creativity in stove construction and ensure satisfactory performance.)
- A rural woman would feel more comfortable and communicate better with another woman in her kitchen and situations such as construction of a stove incompatible with the vessels used daily (sizes and shapes) could be avoided.
- Given the restrictions imposed by society and the poor rural transportation system a woman stove constructor would be able to construct stoves only in her village and the neighbouring villages. Unlike the self-employed worker of the government programme who could not be reached after the completion of stove construction, the local woman would always be available and accountable for the stove that she had constructed. It would therefore be in her interest to construct a trouble-free stove. This also meant that the villages where women would be trained in stove construction had to be carefully selected. The preferred site for training would be a village that had a high density of users of conventional wood-burning stoves within a radius of about 10 km. This would ensure that the market for improved stoves was within reach of the trained women.
- Stove construction was a new income generation option for the trained woman. If she was engaged exclusively in stove construction, she could earn more money in constructing stoves than she would as an agricultural labour. However, TIDE and IYD realized that in spite of training, women would continue to want the security of working as agricultural labourers. TIDE therefore projected stove-training as an income-generating activity that would supplement their income from agricultural labour. This was possible as the stove takes only two hours to construct, and trained women could construct stoves during the lean agricultural season or in addition to working as agricultural labourers.
- The short-term problems that were expected and anticipated were: hesitation to work outside the village boundaries, working in unknown houses, social factors such as women of a lower caste not allowed into the kitchens of higher-caste homes, etc.

TIDE had developed a stove-training programme taking into account all these factors but obviously the training would only sensitize women to a truth they were already familiar with. The training programme consisted of the following:

- introduction to a smokeless stove;
- highlighting convenience and positive impact on health when cooking on a smokeless stove;
- observation of stove construction during construction by the trainer;
- stove construction by women trainees at the training site;
- stove construction by women in houses where the stoves would be used for cooking;
- understanding the stove construction manual and its use;
- maintenance and trouble-shooting;
- response to a quiz on stove construction for the trainer to understand if the women grasped the training;
- open discussion, question-and-answer session; and
- refresher training.

It was decided that the women would not be paid any stipend for attending the training but at its end, the stove moulds (made of mild steel and costing Rs. 800) and a pictorial construction manual would be given to them free of cost. TIDE was now ready to carry out training programmes but it was aware that it was not a rural-based NGO and that although it could conceptualize technology transfer projects and react scientifically to technical demands, it lacked skills that were required to interact closely and meaningfully with village communities and women. Also, as TIDE was a Bangalore-based organization, it needed the interface of a local NGO whom the villagers accepted and trusted.

TIDE therefore sought partnerships with rural-based NGOs who would do the initial hand-holding for women until they felt confident about constructing stoves themselves. Rural-based NGOs suggested that instead of training individual/isolated women in stove construction, a women's self-help group could be trained. Stove construction could be conceived as a micro-enterprise of the group. The women could divide the various activities among themselves.

The first women's group to be trained was Sharada Swasahaya Sangha, promoted by IYD. The training was carried out in Huluvangala village, described earlier. Figure 2 shows women constructing stove as a part of the training.

Figure 2. Practice session in stove construction during training

6. Village meeting prior to launching the stove

Basavaraj, a social worker with IYD, had helped in the selection of the group. He is an employee of IYD. Although not native to the village, he has been working in the region for 7-8 years and is admired and respected by the villagers. The criteria for selection of the group, according to Basavaraj, were the social and economic status of the women and the level of motivation of its members.

The women who were trained in *sarala olé* construction were the following.

- Gangamma, age 38 years: she has studied up to the 2nd standard and is married and her family consists of 4 members. They own 2 *kuntas* of land. (1 *kunta* is 1/30th of a ha.)
- Jayamma, age 40 years: she has studied up to the 1st standard and is married and her family consists of 5 members. They own 1.5 *kuntas* of land.
- Taadamma, age 43 years: she is a widow and has not had any formal education. Her family consists of 2 members and she owns 1.1 *kuntas* of land.
- Leelavati, age 36 years: she has studied up to the 2nd standard and is a widow. Her family consists of 4 members and they are landless. She belongs to a scheduled caste.
- Thimmakka, age 35 years: she is a widow, has not had any formal education and is landless. She belongs to a scheduled caste and lives alone.
- Kamalakshi, age 32 years: she has studied up to the 2nd standard and is a widow. Her family consists of 4 members and they own 0.2 *kuntas* of land.

7. Innovation in stove design during the training programme

Very probing questions were asked by the trainees during the training session. The *sarala olé* is a two-pan stove with a single fireplace under the first pan, with the second pan heated by the hot flue gases as they exit from the chimney. They understood that a stove where, by tending one fire, two dishes could be cooked implied optimum use of fuel and identified this feature as a strong selling-point. Conventional stoves in the region had two pans but the women had to tend two fires while cooking two dishes at the same time. The trainees quickly realized that cooking would be more comfortable using the *sarala olé.*

It was observed that since the household stove which they were trained to construct was a product they were familiar with, it enabled them to bring to the training responses and suggestions that were constructive and helped TIDE modify its training programme. Some of the improvements to the stove suggested by the women during training included the provision of small nails or screws at appropriate locations above the grate to capture maximum heat when using smaller vessels and provision of a niche in the stove where small objects such as a matchbox or a lamp could be safely placed. Women also shared their experiences about working in smoke-filled kitchens during training.

Women were aware that they had to sell their newly-acquired craft of stove construction and were constantly thinking of it during training. They were enthusiastic about the training as it offered them an additional source of income besides agricultural labour. At the end of the training they were able to construct stoves of good quality. However, they were hesitant to formulate a plan for carrying out stove construction in new houses until the stoves constructed in homes during training were tested and accepted by women. TIDE and IYD gave them sufficient time to feel confident of the stoves they had constructed and then broached the subject of micro-enterprise development with the self-help group as a unit. Personnel of TIDE and IYD had to constantly motivate these trained women and help them to get over their initial hesitation.

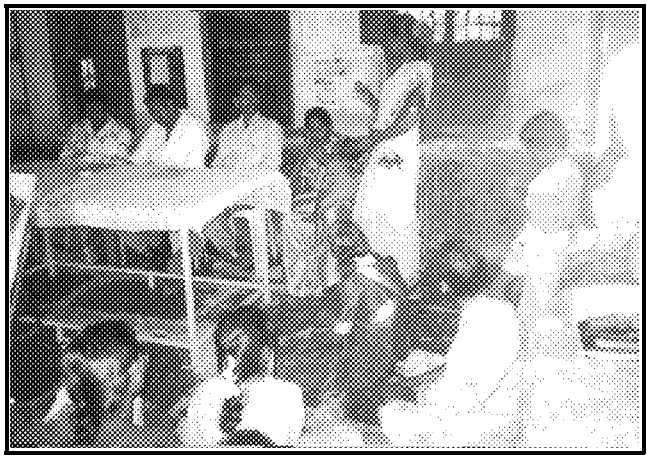

Figure 3. A discussion meeting in the village

8. Becoming energy entrepreneurs

Discussions were held between Sharada Swasahaya Sangha, IYD and TIDE about the assistance the women's group would require to initiate a micro-enterprise and the time-frame for their activities to become self-sustaining. Figure 3 is a photograph of a village meeting at which the idea of women becoming energy entrepreneurs is being discussed. Sharada Swasahaya Sangha indicated that they would require some assistance in publicity so that the neighbouring villages could be made aware of the skills acquired by the women and the services they would offer. IYD, which had a good understanding of the region, believed that in order to give impetus to the stove construction activity, an initial gesture of support had to be made that would also be translated into market development.

It was decided that TIDE would provide whatever financial support was required for promoting the women's group. TIDE would also take responsibility for ensuring that all stoves constructed by the self-help group (SHG) were good and that the users were satisfied with their performance. This was crucial because the women knew that they would not be abandoned after training and had technical back-up at all times. TIDE personnel would carry out routine inspections of stoves constructed in user locations to convince themselves and the women's group that the high quality and performance of the stoves was maintained.

IYD would be the front end and would promote the SHG and give it all local assistance at the time of start-up, and work towards a date for withdrawing it. After about a month of training and confirmation that the stove constructed was good in both quality and performance, IYD asked the women in the group to organize themselves for stove construction. The women's group proposed the following:

- Taadamma and Leelavati, who were skilled in stove construction, would carry out the construction work. They were paid Rs. 40 by the household for constructing the stove.
- Gangamma and Jayamma, who often travelled out of the village and were good in getting orders for stove construction, would be involved in the promotion of the enterprise. They would obtain orders for stove construction and communicate the information to Leelavati or Taadamma (the stove constructors). Gangamma and/or Jayamma were paid Rs. 10 by the stove constructors for every order obtained by them. The women involved in stove construction also made a token contribution to their SHG.
- Thimmakka and Kamalakshi, who had limitations on travelling and were unable to move out of their houses often, would take responsibility for maintaining the stock of stove components (the chimneys and the grates).

The stove construction project of the Sharada Swasahaya Sangha was formally launched on August 15, 2002. At the inaugural function, IYD announced that it would support the programme initially by offering free chimney pipes. Simultaneously TIDE gave the Sangha several pamphlets publicizing the merits of a smokeless stove, especially its impact on the health of women working in kitchens. The orders for smokeless stoves started coming. The women responsible for stove construction requested their trainers to accompany them in their first few stove constructions, not because they had not absorbed the techniques during the training but because they needed someone to boost their confidence. This was done. As the households accepted the stoves constructed by the women and the merits of the stove began to be publicized by word of mouth, the women became confident and occasionally even tried small innovations at user locations to cater for the specific requirements of the users.

The announcement by IYD that free chimneys and grates would be given gave a boost to the programme. As the date of withdrawal of the offer of free chimneys was not specified, there was a rush for getting the stove constructed. The cost of the stove was also low and affordable by an average rural household. The break-up of the materials used for stove construction and their cost are given below.

- Bricks (15) to be provided by the household (max. cost of each brick Rs. 2)
- Mud to be made available locally by the household
- 15 cm × 15 cm cast iron grate Rs. 10
- Chimney Rs. 50
- Labour Rs. 40

It can be seen that the maximum cost of the stove was Rs. 130 even if all components of the stove including bricks had to be bought. Under the scheme proposed by IYD, the household had to pay only Rs. 40 and the cost of the bricks. The stove did not require good-quality bricks and quite often the household provided used or broken bricks, which were accepted.

During the months August to December 2002, 200 stoves were constructed in Huluvangala and surrounding villages. As the construction of one stove took only two hours, women were able to combine stove construction with their work as agricultural labourers. The six women were together able to earn Rs. 3800 in addition to their other earnings in the five months. It is worth noting that every stove met the expectations of the user and no stove

was dismantled or gave rise to complaints.

The stabilization of this project and the confidence of the women encouraged TIDE to carry out similar programmes with other rural-based NGOs. TIDE has trained women's groups in four other locations and has started initiating stove construction activity in these locations as well.

9. Conclusions

It appears that using women as agents for the diffusion of stoves has worked. The fact that there have been no defective or dismantled stoves indicates the acceptance of both the design of the stove selected for dissemination and the quality of construction. The fact that barely literate women who have not had any prior experience in construction labour have not only been able to absorb the training programme on stove construction but have contributed positively to its improvement suggests that the training programme was well devised and well received.

Another notable feature has been that every household has accepted the reality that it has to pay for the stove. Each one of the 200 households has provided the bricks and soil and paid the women for the stove construction. There are several reasons for every household to stand by its commitment but the major one is the fact that every woman is happy with the stove that she has paid for and got.

TIDE is in the process of replication of this model for stove dissemination in four other locations and similar success in other locations would show the way for the large-scale adoption of stoves. This method demonstrates that stove construction is an activity that is best carried out by rural women who, being stove users themselves, understand the needs of other users. It ensures that good stoves that match the expectation of the user can be installed using local skill and resources and without involving any government mechanism or complicated paperwork, approvals, inspections, etc. The income earned from stove construction also remains in the village and in the hands of village women.

The cost incurred in training and provision of free moulds is about Rs 15,000 per training. Social workers with local NGOs can integrate this activity into their other activities with minimal additional effort. Every trained group would have a minimum of 5000 households needing improved stoves within its reach and if each group can construct 1000 stoves, the cost of training would be just Rs. 15 per stove. It is worthwhile to extend this experiment to more locations and observe it over a longer period before it can be standardized and recommended for large-scale replication. ■

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Notes

1. Scheduled castes are castes recognised in the Indian Constitution as historically having suffered intense social discrimination, including untouchability, and therefore entitled to statutory protections including quotas in education, elected bodies and government employment. Backward classes, belonging to castes higher than the scheduled castes, are those that still occupied a socially inferior position and for whom some quotas in education, elected bodies and government employment have been introduced in some states of India.
2. *Olé* is the Kannada word for domestic wood burning-stove; the stove is popularly known as the *sarala olé* and hence this name has been retained for the case-study.

Linking women and energy at the local level to global goals and targets

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1. Introduction

Between 2000 and 2002, the United Nations sponsored three major conferences intended to garner renewed political commitment and support to achieve time-bound, measurable goals and targets for broad-based development objectives. The recent conferences represent a significant new initiative to focus efforts and mobilize resources, actions, and partnerships to implement these commitments and to achieve the goals and targets agreed to by the governments of the world.

In September 2000, at the Millennium Summit in New York, world leaders agreed to a set of time-bound, measurable goals and targets to be achieved by 2015 of combating poverty, hunger, disease, illiteracy, environmental degradation and discriminations against women. Placed at the heart of the United Nations' global agenda, they are called the Millennium Development Goals (MDGs) [United Nations, 2002].

While there is no MDG on energy, it is clear that expanded access to energy services for the third of humanity that does not have electricity or modern fuels is an essential prerequisite to meeting all of the MDGs. The delivery of health, education and sanitation services, as well as value-adding economic opportunities to reduce poverty, requires energy inputs.

In early 2002, the International Conference on Financing for Development in Monterray, Mexico sought to provide a forum for leaders from both developed and developing countries to match these commitments with resources and action and to signal a global deal in which sustained political and economic reform by developing