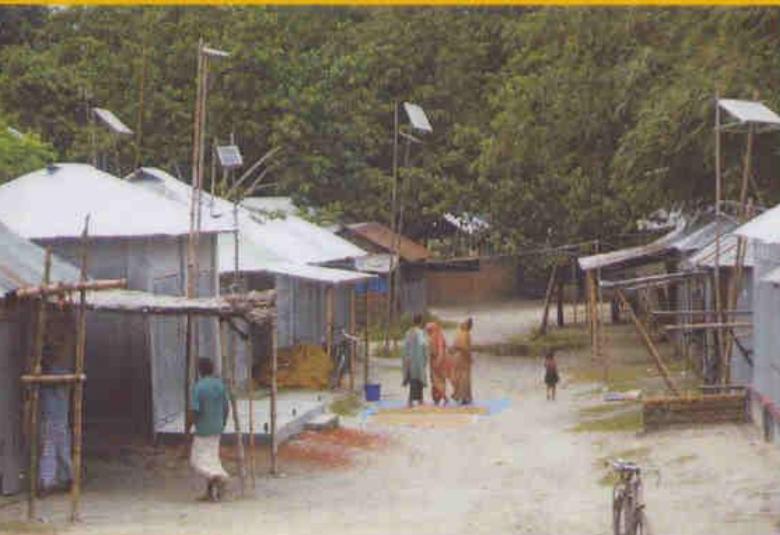


SLE Publication Series - S238 -



SLE

**Impacts of Basic Rural
Energy Services in Bangladesh
An Assessment of Solar Home System
and Improved Cook Stove Interventions**

HUMBOLDT-UNIVERSITÄT ZU BERLIN



SLE Publication Series – S238

Impacts of Basic Rural Energy Services in Bangladesh

An Assessment of Solar Home System
and Improved Cook Stove Interventions

Commissioned by

Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)

Study Team:

Ekkehard Kürschner (Team Leader), Eva Diehl, Janek Hermann-Friede, Christiane Hornikel, Joscha Rosenbusch, Elias Sagmeister



Executive Summary

Improved energy supply is essential for socio-economic development and environmental sustainability. It has a direct impact on the life situation of the rural poor, influencing their productivity, health, education, and gender-related issues. As at least 1.6 billion people worldwide do not have access to electricity and 2.4 billion rely on traditional biomass fuels for cooking, it is crucial to understand how access to basic rural energy services can be improved.

The present report compiles the findings of a study carried out on behalf of the sector project Poverty-Oriented Basic Energy Services (HERA) of the German Technical Cooperation (GTZ) in collaboration with the Sustainable Energy for Development Programme (SED) in Bangladesh. The interventions made by SED include support for the dissemination of Solar Home Systems (SHS) and Improved Cook Stoves (ICS) in Bangladesh through financial as well as technical assistance. The aim is to establish a self-sustaining market for both technologies. The study assessed the impacts and the poverty orientation of both the SHS and the ICS interventions as well as the sustainability of the dissemination structures for these technologies.

SHS are small photovoltaic systems with a peak capacity of between 40 and 130 Watts, and are currently sold at a subsidised price of between 220 and 680 Euros. Hire-purchase arrangements for SHS are offered by all 16 organisations participating in the distribution scheme under the government owned Infrastructure Development Company Limited (IDCOL). SHS are used mainly by middle-class households and micro- and small enterprises (MSE) in off-grid rural locations to operate light bulbs, and small electrical appliances like mobile chargers and black and white TVs. SED provides a 30-Euro grant for each SHS sold, a management fee for IDCOL, financial support for the institutional development of the partner organisations and training.

In contrast to traditional clay stoves, ICS have a closed surface and a chimney. They are designed to burn biomass fuel more efficiently and to reduce smoke pollution in the cooking environment. ICS are presently marketed and sold by 165 partner organisations at a price of between eight and 12 Euros for a typical domestic stove. SED support includes financial support for training, marketing and institutional development of the partner organisations, financial incentives for stove builders, and facilitating an experience exchange between the organisations.

The dissemination of both technologies comprises special approaches to reach poor target groups. Through a pilot project, SED has introduced small, 20 Watts-peak solar home systems (SSHS) into the dissemination scheme. With additional financial support from SED, ICS are sold at a lower price or provided free of charge by some partner organisations to poor households.

The findings of this study are based on qualitative and quantitative assessments, involving a four-week period of field research mainly in the Rajshahi division in North-Western Bangladesh. This was complemented by workshops with stakeholders, literature reviews, and the analysis of information from programme documentation. The field research comprised of key informant interviews and group discussions with partner organisations, intermediaries such as SHS technicians and stove builders, open and standardised interviews in SHS- and ICS-using households and MSEs, and interviews with non-users. In total, around 260 SHS-related interviews and around 450 ICS-related interviews were conducted. In the SHS sample, 75% of the respondents were male compared to over 90% female respondents in the ICS sample, women being the main users of stoves.

Access to solar electricity was found to enhance the general life quality of SHS owners, a great majority of whom named improved lighting as the most important benefit. Improved study conditions for children and more customers are related benefits that were classified as second most important by domestic and commercial users, respectively. Further impacts are improved access to information, better communication options, a perception of improved safety in some cases, and greater working comfort in the household, which is appreciated especially by women. Savings in energy expenditure hardly occur during the hire-purchase period but are expected by users in the long run. However, purchase of a replacement battery after six or seven years constitutes a significant second investment and a critical juncture for sustainability in terms of long-term use. While domestic SHS are rarely used for income generation, the majority of commercial users, e.g. owners of tea shops and small restaurants, reported increased profits since the acquisition of an SHS. The money is invested privately and in business expansion, but rarely to create new jobs. Job creation related to SHS dissemination was found to occur mainly for less poor, male workers in technical and management positions. The most relevant unintended impacts are a risk of debt for comparatively poor SHS users, as well as environmental hazards related to improper treatment of defective batteries.

With respect to ICS, health benefits were the most obvious improvement found, followed by fuel, money and time-saving. A great majority of users reported significantly less smoke in their kitchen and a perception of better health, mentioning positive impacts on their eyes as well as less coughing and respiratory diseases. Reported fuel saving ranged between 14 and 70% with an average of 33%; however, more than one third of the respondent households were not able to quantify fuel saving at all. For a great majority of women, time-saving that resulted mainly from faster cooking was an important impact. Women use a large proportion of the average seven hours of saved time per week for other household work. Money saving due to reduced fuel consumption was stated by one third of the households. In MSE and social institu-

tions, both money and fuel saving are far more pronounced, as expenditure for cooking fuel constitutes a substantial part of their operating costs. Furthermore, ICS dissemination can lead to the creation of low-skill jobs for men working as stove builders and in chimney manufactories.

Poverty distribution in both the SHS and ICS samples suggest that the dissemination of both technologies is currently not pro-poor oriented according to the definition of the German Federal Ministry for Economic Cooperation and Development (BMZ), as the proportion of poor people among the respondents is below the regional average of 48% in the research region. The share of poor people is greater in the ICS sample with almost 40% of the respondents living below the upper poverty line, compared to 23% in the SHS sample. In the cases of both SHS and ICS, poverty-reducing impacts exist, but some of these materialise to a lesser degree for the relatively poorer users. Poor SHS users and SSMS owners benefit from lighting-related impacts only, as they are usually not able to afford and/or operate additional electrical appliances. Poorer households using ICS tend to collect fuel rather than buy it, thereby benefiting from time-saving, but not saving money.

Beyond the distribution of SSMS and solar lanterns, the approaches considered promising to bring solar technology to poorer target groups are extended hire-purchase periods with reduced down-payment and flexible payment patterns, as well as the promotion of sharing SHS between potential users who live in close vicinity to one another. Poverty-reducing impacts could also be created by promoting larger capacity SHS that can be used for income-generating activities.

Of the three approaches surveyed to reach poorer people with subsidised ICS, two gave a positive impression, with the median income among the target groups lying below the poverty line. In a third approach that made it obligatory for Bangladeshi vulnerable group card holders to buy a subsidised ICS for 100 Taka (1 Euro), people among the target group reported to have been forced by local government officials to pay varying amounts of money for the ICS. Nevertheless, only a few of them were then provided with functioning stoves.

The analysis of the technology dissemination structures concludes that SHS dissemination is well ahead on the way to a self-sustaining market, while ICS dissemination is not quite as far advanced. This can be partly attributed to the fact that the development of a market for SHS started in 2003, while the ICS intervention was only introduced in 2007. This study considers the overall set-up of SHS dissemination as a role model for approaches elsewhere due to its quality-assuring mechanisms and other factors. With regard to financial support for the SHS scheme, the management fee for IDCOL is considered to fulfil the most important function, whilst the 30 Euro subsidy is significant for less affluent users, but on the whole shows a small demand-creating effect. It influences the purchase decision of only one fourth of the users.

The study perceives a lack of local technical expertise and good quality after-sales service as the most prominent weaknesses in the dissemination structure. Users are generally more satisfied with the SHS itself than with the providers' services. SED's aim that every customer should be able to choose between at least two SHS providers has been reached for 40% of the customers in the present sample. This leaves room for increasing the market power of users in the future by extending local supply and services within and beyond the current provider structure.

The ICS dissemination structure is found to be characterised by a very large network of partner organisations, which has been created at a high pace, along with financial incentives whose aim is to produce large quantities of stoves. At the same time, insufficient control and monitoring pose a risk of improper development and severe omissions, in the view of the authors. While the installation of impressive numbers of ICS is reported to the SED, different auditing and consultancy reports yield contradictory results on the actual existence and functioning of these stoves. In line with preliminary results from another independent study, this study found a significant number of listed households who had never received an ICS or whose stoves were not working properly. Only 10% of the interviewed households received any after-sales services, and stove builders are usually not being rewarded for providing maintenance. The interviewed stove builders expressed dissatisfaction about low salaries, and only an estimated 10% of trained stove builders actually engage in the business after having participated in the training offered by the partner organisations. Moreover, positive environmental impacts of ICS may be mitigated if inaccurate ICS installation figures and fuel-saving rates are assumed to implement ICS dissemination in the Clean Development Mechanism, as is planned for the future. Yet a demand for ICS and an acceptance of the technology seem to exist, with high levels of satisfaction among ICS users that are functioning.

Recommendations given with respect to the SHS intervention include minor reconsiderations of how grants shall be targeted and phased out, as well as how different local capacity building measures are better geared towards enhancing user satisfaction, creating job opportunities and improving the local availability of SHS supply and know-how. The study suggests the establishment of result-oriented monitoring involving an exchange between SHS users and providers, enabling the latter to assess their own institutional development. Moreover, the study advises the maintenance of the current hire-purchase model but also the development of more flexible pro-poor payment options beyond it. It also recommends the introduction of a hire-purchase system for SHS batteries combined with a strengthening of incentives for recycling.

With regard to the ICS intervention, a critical review and an evaluation of current activities is recommended, to examine the performance of present partners. The study also recommends a shift from financial to more sophisticated technical support, along

with the establishment of a continuous monitoring system involving all stakeholders and ensuring orientation on the goals of SED. Various measures and incentives are suggested to encourage better maintenance of ICS and to motivate stove builders to remain in their job. Further recommendations address poverty orientation and global carbon trading, suggesting that ICS pricing and payment models should be adapted to the needs of poor households and that CDM funding should be used for the benefit of ICS owners, while simultaneously making every effort to mitigate potential negative impacts on the environment.