Energy and Street Food
DFID KaR Project R7663

Final Project Report

Leonard Tedd
Susil Liyanarachchi
Satya Ranjan Saha

Intermediate Technology Development Group

Disclaimer
The views represented in this report are the views of the Intermediate Technology Development Group, and not necessarily those of the funder DFID.

Executive Summary
This report presents the findings of an ITDG project titled Energy and Street Food Vendors. The project was active in Bangladesh and Sri Lanka. In Sri Lanka the research and pilot interventions were conducted in Colombo. In Bangladesh, the initial survey and in-depth survey work was conducted in Dhaka and Bogra, and the pilot interventions took place in Bogra and in four other centres of population in northern Bangladesh. An extensive literature review (annexed to this report) reveals that no study has previously investigated the energy needs of the street food sector

The project purpose was *to improve the livelihoods of street food vendors and the health of consumers by identifying and improving energy efficient technologies and fuels.* The research was aimed at understanding the links between energy and income generation for one significant sector of the urban informal economy. Several key documents were produced at different milestones of the project. These are synthesised in this document.

The main findings are that street vendors are a diverse group, they have little or no recognition from municipal authorities. It is predominantly a family based activity, with very few vendors paying any other employees. Food is often prepared at home as well as on the street. Although the activity is profitable, there is a very low financial return on labour, in Sri Lanka 53% of respondents spent more than 15 hours a day on the street vending activity.

With regards to the energy aspect, street vendors use predominantly biomass fuel for domestic preparation and kerosene for preparation at the point of sale. A higher proportion used kerosene in Sri Lanka and in Bangladesh both dung and agricultural residues represented a significant portion of the biomass. In both countries a relatively wealthy minority of street vendors used LPG. The project pilot tested improved biomass stoves with a selection of street food vendors. In Sri Lanka laboratory was undertaken with the following three stoves: improved rice-husk burner, biomass gassifier, and double-mouth chimney stoves. The average overall efficiencies were found to be 29%, 29% and 35% respectively. In Bangladesh the project piloted four types of biomass stove: single mouth, double mouth, bucket-type and institutional stove. As these were more established the pilot focussed on a method for reaching a larger number of beneficiaries, people were trained to make stoves in their own and in others' houses. Five workshops were held and over 540 stoves were built. Impact assessment exercises were undertaken in both countries.

With regard to future work it is proposed that there should be a stoves programme with the partner NGOs in Bangladesh, and an urban livelihoods programme with street food vendors in Colombo, Sri Lanka. The latter should have an emphasis on enhancing profitability, through business development support, and a strong advocacy component.

Project Team

UK Project Staff
The early stage of the project was managed by Simon Dunnett. The following people had input into the central and latter stages of the project: Leonard Tedd manager, Smail Khennas, Alison Doig, Liz Bates, Sue Azam-Ali, financial liaison with DFID was through Ken Cooper. The DFID advisor was Dr. Gill Wilkins.

Sri Lanka
Susil Liyanarachchi, Team Leader; Chamindra Weerackody, Consultant Sociologist; Wimal Nadeera, Consultant Engineer; Midantha Immaduwage, Hemantha Chitrasena, Field Coordinators. Partner organisations were Resource Management Associates (Pvt.) Ltd., Energy Conservation Fund, NERD Centre, Colombo Municipality Council.

Bangladesh
The initial phases of the project were managed by Shaheeda Azimi and Naved Ahmed Chowdhury. The project team for the latter stages managed by Satya Ranjan Saha, with Mostafa Haider Chowdhury as coordinator. Ahmedul Ghani was involved in a consultative capacity. The project partners were TMSS, Institute of Fuel Research and Development BCSIR, and the following grassroots NGOs: PBKS, Gana Unnayan Kendra, ATDP-Bogra, Bandhan Society, Kishoreganj, Samaj Kallyan Sangstha, SS-Rangpur, VIEW-Kurigram, SAPNO, PEP-BRDB-Faridpur.

Contact Details:
Leonard Tedd
Intermediate Technology Development Group
Schumacher Centre for Technology and Development
Bourton Hall, Bourton on Dunsmore, Rugby
Warwickshire CV23 9QZ
Tel: +44 1926 634400
Email: leonardt@itdg.org.uk

Satya Ranjan Saha
ITDG Bangladesh
House # 32, Road # 13/A, Dhanmondi R.A.
Dhaka-1209, Bangladesh.
Tel. +880 2 8111934
Email: satya@itdg.bdmail.net

Susil Liyanarachchi
ITDG South Asia
5 Lionel Edirisinghe Mawatha
Kirulapone, Colombo 5, Sri Lanka
Tel: +44 1 829412
Email: susill@itdg.slt.lk

Contents

1. Introduction

Urbanisation has resulted in a proliferation of street food vendors and hawkers as the movement of people from rural to urban areas has led to the need to feed large numbers of working people away from their place of residence. In many countries, street vendors prepare the first meal of the day for low-income workers. The FAO (Food and Agriculture Organisation of the United Nations) estimate that up to 30% of household food expenditures were devoted to prepared food purchased outside of the household, and Tinker (1993) also reports at least twenty percent of the household food budget spent in this way.

Street foods have been considered as an important element in the urban food production and consumption and employment sectors for the past 15 years or so. The FAO held an expert consultation on street foods in Yogyakarta, Indonesia, in 1988 (FAO, 1989). The FAO expanded work that was initiated by the Equity Policy Center (EPOC) of Washington, USA. Of particular interest to EPOC is the employment generated in the street food sector, particularly for women (Tinker, 1997). Street food vendors can earn a reasonable income, in some countries well above the minimum wage. For consumers street foods are also a dependable source of cheap foods, often economies of scale in preparation mean that they can be cheaper than food prepared at household level and thus constitute a significant portion of nutritional intake for the urban poor.

Street vendors often operate from the household, providing income at household level with few start-up costs. The research has found that it is rare for street vendors to employ others so direct job creation cannot be assumed. Women play a very vital role in the street food sector through their direct and/or indirect involvement in the business. Additionally a significant number of street vendors are woman-headed households, see Case Studies 1, 2, and 4 in the appendices.

Street foods are seen and perceived from different/perspectives by various stakeholders. Street foods are a problem, an opportunity and a challenge at the same time. The problem is the control and maintenance of the quality and the safety of foods offered for sale. The opportunity lies in employment generation through small enterprise development and its role in the promotion of traditional and local food habits. The challenge is the provision of various support services including infrastructure and utilities by government and municipal authorities to encourage the formal development of the sector while maintaining and assuring the safety and the quality of the street foods. The challenge is mainly due to the need for official recognition of this very large segment of the informal sector. Very often street foods are looked down upon with scorn by different agencies for a variety of reasons, mainly for being sources of possible food poisoning and disease outbreak and at the same time causing traffic problems and environmental pollution and in the Sri Lankan context even a potential threat to the security of the institutions and life in cities.

Socio-demographic and entrepreneurial characteristics of street food vendors

Street food vendors for the purpose of ITDG studies were defined as "Vendors who prepare and/or sell food on street/public property for which the labour input is exclusively from an individual or from the members of his/her immediate family" However, street food vending, as both a social and economic phenomenon is much more complex and defining 'street food' and giving it a comprehensive meaning is difficult. The diversity that exists among street food vendors is reflected in the type of food they prepare/sell, the scale of their business, the mode in which they are operating, the locations in which they prepare and sell food, the type of clients to whom they sell food, etc.

The street food vendors of Sri Lanka and Bangladesh are not enumerated in the formal sector of either country's economy. They are identified as those belonging to the informal sector where their businesses are conducted as a form of irregular, unstable and marginal economic activities. As such there is no systematic documentation of the numbers of street food vendors, their scale of businesses or the viability of their pursuits. However, observations indicate the existence of a substantial number of street food vendors particularly in the urban centres. A glimpse of the socio-economic background of the vendors is presented to help understand who the street food vendors are.

- Both males & females and married & unmarried operate as street food vendors. They cut across different nationalities and religious faiths in the country. Their age range is between 25-60 years with a majority being in the age group of 30-40 years.
- Many street food vendors and their families have their origin in rural backgrounds or have moved to urban centres at a later stage or else live in rural areas and travel daily to the city for their business operations.
- The level of education achieved by the street food vendors is comparatively low and in the case of a majority, education levels varied between grades 5-8.
- Many street food vendors are constrained by the unstable socio-economic backgrounds in their families.
- Employment history of the street food vendors shows their previous involvement in several urban-based, irregular and low-paid income generating activities, which required hard manual labour, prior to their involvement in the street food business. Their engagement in such activities was not sufficient for their sustenance. The result was that the vendors moved from one work place to another.

Street food vendors are a self-employed category of small entrepreneurs who are not dependent on any institutional structures to find their livelihoods. Their enterprises evolve exclusively around their own individual strengths and the support extended to them by their immediate social networks such as family members and other close associates. The earnings from their business enterprises are a means of living for the vendors themselves and their dependent family members. As such, these economic activities of the street food vendors have not only provided a source of livelihood to the vendors and their dependent family members but also have reduced the plight of their becoming an economic and social burden on the State.

Street food satisfies the food consumption need of a significant section of the population. The food sold on the streets is relatively cheap and readily available. It is sometimes brought to the doorstep of the customers and sold on credit as done by the vendors operating at the Manning Market in Colombo. Street food, therefore, not only meets the food requirements particularly of those of the low income categories but also the busy

customers who do not have much time either to prepare their own food or to go to other eating houses where probably the food is more expensive and servicing is time consuming. Thus, street food is of greater concern because it effectively meets the food requirements of a significant section of the economically active urban population.

Street food vendors do not have much support from the formal institutional set-up either to improve their enterprises or to protect them from undue external forces despite they being a significant cross-section of the economically active population and service a relatively large section of the urban population. The usual attitude from different formal institutions towards street food vendors is that they sell unhygienic and low quality food to the customers, encroach on public property, largely contribute to environmental pollution by dumping garbage on the streets, engage in criminal activities under cover and are a nuisance to maintaining law and order. The street food vendors are perceived as an unreliable category of people with whom formal institutional transactions are considered to be impossible. The vendors claim that they are frequently being victimized by the formal institutions such as the Police, the Public Health Institutions, Local Government Authorities, etc., particularly at times of outbreak of epidemics and civil disturbances resulting in the loss of livelihood sources and economic difficulties to the vendors and their families. Given the growing numbers of the street food vendors and the customers who patronize them, the issues and problems the vendors encounter need special attention of the authorities concerned.

Social networks comprising of kinship and friendship ties have been extensively used and activated in entering the business by the vendors. These social relations have been useful in finding their initial capital as well as in entering their respective markets.

The support from the family members particularly from the wives of the vendors is significant and is one of the key factors determining the success of their enterprises.

The street food vendors though they are recognized as those belonging to the informal economic structure and are not given any institutional support generate a comparatively high income from their respective business ventures. In Sri Lanka, the average daily income of a street food vendor is around RS 1,250/- while the average daily profit generated by him is approximately RS 575/-. Most street food vendors operate for an average of 25 days a month. This means that they are able to generate a monthly average income of RS 31,250/- and an average profit of RS 14,375/-. The financial contribution that street food vendors make to the country's economy, therefore, cannot be under estimated despite the fact that they operate within the informal sector of the economy, receiving no recognition or attention from the formal institutional sources for the uplift of their ventures

2. Results

There were several distinct pieces of research within the project. The main reports of the project are as follows.

2.1 Literature review
2.2 Enumerative Survey and Case Study material, Bangladesh
2.3 Results of twenty-five case studies, Sri Lanka
2.4 International workshop report (October 28/29th 2001, Bangladesh)
2.5 Laboratory efficiency testing in Sri Lanka
2.6 Impact assessment, Bangladesh
2.7 Pilot testing, Sri Lanka
2.8 National end of project workshop, Bangladesh
2.9 End of Project Workshops in Sri Lanka

They are synthesised in the following pages. The reports have been edited to avoid duplication.

2.1 LITERATURE REVIEW

Energy and Street Foods , Simon Dunnett

Street Foods – General

Urbanisation has resulted in a proliferation of street food vendors and hawkers as the movement of people from rural to urban areas has led to the need to feed large numbers of working people away from their place of residence. In many countries, street vendors prepare the first meal of the day for low-income workers. In Thailand, for example, 20% of households eat most or all of their meals outside or bring the cooked food home. In many countries, street vendors prepare the first meal of the day for low-income workers. The FAO (Food and Agriculture Organisation of the United Nations) estimate that up to 30% of household food expenditures were devoted to prepared food purchased outside of the household. Approximately two thirds of these expenditures were made outside of the household. Tinker (1993) also reports at least twenty percent of the household food budget spent in this way.

Street foods have been considered as an important element in the urban food production and consumption and employment sectors for the past 15 years or so. The FAO held an expert consultation on street foods in Yogyakarta, Indonesia, in 1988 (FAO, 1989). It identified and recommended measures to improve the quality and safety of street foods. Since then a number of activities have been developed and implemented in different parts of the world. One of these was the project 'Improving Street foods in Calcutta', managed by the All India Institute of Hygiene and Public Health (AIIHPH) in 1992 (Chakravarty, 1996). The two year study was carried out with the Calcutta municipal Corporation and the FAO Technical Cooperation Programme to improve conditions in the street food trade. A street food survey was undertaken in 1993 to provide information about the main socio-economic, nutritional, legal and sanitary characteristics of the sector. The project encouraged a strong relationship among authorities and the hawkers' representatives, which led to the preparation of policy guidelines for the regulation of street foods in Calcutta.

In a follow up meeting in 1993, it was concluded that measures were necessary to control the growth in numbers of street food vendors in Calcutta to improve the safety of street foods, particularly with respect to the provision of clean water, rubbish disposal and upgrading of pavements. Improved kiosks and other measures were field tested, as well as training materials developed. Guidelines on rules and regulations covering licensing and inspection procedures on street foods were developed by local authorities in conjunction with hawkers. The advisory and technical committees regularly assess the implementation of the policy. The policy resulted in the establishment of a dialogue and cooperation between the vendors of street foods and their representatives, the consumers' representatives, the municipal authorities, the police and the AIIHPH.

The FAO convened a meeting in 1995 to provide a new set of guidelines to stimulate new and enable continuing improvement. The 'FAO Technical Meeting on Street Foods' was held in Calcutta. The meeting considered socio-economic aspects of street foods; role of municipal/national authorities; regulatory aspects of street foods; development of appropriate technologies; consumer perceptions; role of women and children; educational programmes and guideline action plan. The meeting made several recommendations (detailed later in this document) which included action at the local, national and

international level. One recommendation concerned further technical development for the improvement in the preparation of foods and improvements at maintaining foods at the correct temperature (FAO, 1997).

Bangkok's street food project (Dawson, 1996) also shows the importance of cooperation between vendors and the authorities. National and local authorities in Thailand, with FAO assistance, developed a project to improve the safety of street foods. The project assessed food quality and safety factors such as storage and protection of food and drinks; use of approved ingredients; cleaning of equipment; food preparation; disposal of garbage; and personal hygiene of food handlers. With this information, Thailand's department of Health developed a ten-step code of practice for street food operators which is used comprehensively by local authorities.

The vendors, primarily women, were trained and assisted to comply with the code. To motivate vendors to improve their operations, regular inspections by field officers were required. While the project staff gave technical advice, the strategy relied on the resources and energy of the vendors themselves. Improvements in cleanliness and orderliness attracted consumers, which generated additional resources for vendors and encouraged them to make additional, more difficult changes to reduce health risks. However, the number of feasible corrective actions to improve the safety of street foods is limited by the socio-economic situation of the vendors, the inability to control the environment and the lack of consumer awareness.

A 'Regional Seminar on Street Food development' again organised by the FAO, was held in Bangkok in 1999. The purpose of the meeting was to share experiences amongst participants of the street food control systems established in their countries and improvement brought about since the Calcutta meeting. The final report of the seminar (FAO, 1999) produced two sets of recommendations, as well as a draft manual for trainers in the street food industry. The recommendations concerned street food regulation and control and education and infrastructure improvement. Experiences from Bangladesh, Cambodia, China, India, Indonesia, Laos, Malaysia, Myanmar, Pakistan, Philippines, Sri Lanka, Thailand and Vietnam were included in the report. The meeting concentrated on improving the street food sector with the aim of improving food quality. Benefits to vendors are as a result of these efforts, rather than the purpose behind them.

The aim of protecting consumer's health and ensuring fair trade practices was also behind the Codex Alimentarius Commission's (a subsidiary body of the FAO and World health Organisation) guidelines for the control for street vended foods in Africa (CAC, 1997). The code of practice is intended for use by field personnel to reduce risks of food contamination.

Street foods in Africa are also considered by Canet (1996), where the sector has come to symbolise street life, but behind the scenes its operators live in an unstable and precarious state because the sector lacks legal recognition. This explains the poor sanitary conditions, lack of hygiene, disregard for environmental conservation and the use of force and even violence among the sector's practitioners. The paper highlights the need for a multisectoral approach to tackle the problems associated with street foods.

The FAO expanded work that was initiated by the Equity Policy Center (EPOC) of Washington, USA. Of particular interest to EPOC is the employment generated in the

street food sector, particularly for women (Tinker, 1997). Street food vendors can earn a reasonable income, in some countries well above the minimum wage. For consumers also street foods are a dependable source of cheap foods; rather than banning street foods and driving them off the streets, local authorities are now working with vendors to improve quality and conditions.

The FAO suggests that some of the first steps to be taken in recognition of the informal street food sector would be to enumerate and classify street food vendors and foods. Consideration could then be given to levy a nominal license or registration fee with a view to raising some resources that should be specifically utilised for upgrading the hygienic standards and handling practices of street food vendors. Chakravarty (1995) states that vendors that were licensed in Calcutta welcomed the fact as it meant that they had access to water and fuel.

Urban Energy – General

This section deals with energy use in urban areas with reference to cooking in particular. There is a lot of literature concerning urban energy usage and it is increasingly becoming an area focused on by researchers and policy makers. A study that looked at energy in urban areas (ITDG, 1999) concluded; 'providing access to basic urban services is not merely a social investment that can help enhance the health and nutrition of large segments of the population and thus reduce expenditure in the health sector, but also a productive investment that can intensify economic growth through the creation of income-generating activities. Furthermore, concentrating on the productive aspects, along with the social aspects, improves the possibilities of recovering costs and sustaining infrastructure investments.'

The urban poor are not a homogeneous group and neither are their energy use patterns. There are several factors identified by the European Commission (1986) which complicate the picture: average income and the distribution of income, the relative abundance and price of traditional and modern fuels, the extent of the gas and electricity distribution network, cultural preferences, and demographic and physical factors. Cooking and water heating and lighting are the primary energy-consuming activities at the household level; the choice of fuel depends upon many factors, but predominant among them are the availability of fuel, appliances and income (Sathaye and Meyers, 1990). For example, in Orissa State in India, the domestic sector derives almost half of its energy used for cooking and heating from biomass sources (Misra, M., 1995). Firewood is the only fuel used by all income groups and almost all occupations. Other traditional fuels such as dung cake, agricultural waste and leaflitter are used in the town with different degrees of dominance in various occupation groups and income classes. The inequality of income distribution is reflected in the fuel consumption structure of the rich and poor with greater dependence on non-biomass in the high income group and biomass in the low income group. Family size is an important determinant of biomass fuel use. For the urban poor, there is a relationship between income and fuel consumption. There exists scope for enlarging the biomass base by utilising the available biowastes and developing a green belt around the town. This requires some rural features in the urban area using new technologies.

In Botswana, for example, of the 3443TJ of wood energy used in urban areas it is estimated that over 15% is used to heat water, the bulk of it in an inefficient manner

(BRET 1985). The availability of fuelwood is an obvious factor influencing the extent of its use. In areas where the resource is not available at close hand (in this context that can mean anything up to 100km away) kerosene or other substitutes are used. The use of coal in China has been well documented (Energy and Environmental Analysis Group, 1996). In Fiji, kerosene is the most frequently used cooking fuel in both electrified and non-electrified households, although most households use more than one fuel. Only 2.6% used electricity as the exclusive energy source. As income declines reliance on firewood increases (Siwatibau, 1987). In Sudan, urban households use predominantly charcoal across all income groups (El Faki Ali, 1992). Fuelwood and electricity have a limited role. The electricity supply is unreliable and limited to those in close proximity to the grid. Costly imported electrical appliances also prohibit its widespread use. As forest resources decrease, wood becomes more expensive and its use is more or less limited to that which can be gathered for free.

The 'Three-Stage Model' described by Barnes *et al* (1998) also suggests a hierarchy of fuel preference develops as a city expands and develops economically. The first stage is typified by cities in which households use wood as the primary source of energy due to abundant wood resources nearby, low fuelwood prices, limited availability of modern fuels, and low household incomes. New migrants continue to use their traditional cooking habits. Higher-income households switch to using kerosene, charcoal or LPG. The second stage sees consumer demand exceeding the rate at which trees are being regrown and wood is rapidly being cleared from around the urban areas. The combination of decreasing supplies of wood and increasing demand causes the price of fuelwood to rise and become uncompetitive. Charcoal and kerosene may be substituted. Which fuel is used in this second stage appears to depend largely on the government's policies towards taxing or subsidising fuels, along with the fuel's availability in the marketplace. The third stage is characterised by broad switching away from charcoal and kerosene to LPG or electricity due to rising incomes and more mature fuel markets. Within these broad bands there are distinctive stages; there is also evidence that the progression from stage one to three may not occur in that order.

Bennett and Newborough (1999) offer a methodology for analysing energy flows in an urban conurbation. An audit methodology is presented which addresses the key questions: Who needs to be involved in the audit? How should the city be divided? What data are required? How might these data be obtained then analysed? Which are the areas of significant consumption? A basis for setting local targets for reducing future energy consumption and CO2 emissions is presented.

An important contributor to the costs of cooking enterprises is the cost of cooking. A financial analysis of cooking energy options is given by Gupta and Ravindranath (1997). In the urban situation, the subsidy on kerosene distorts the so-called energy ladder. Kerosene is the low cost fuel option, and fuelwood in the traditional stove is among the most expensive options. The existing subsidies on kerosene, LPG and electricity seem to benefit middle and high income groups. Low income households are forced to use fuelwood in traditional stoves, which is not only a low quality fuel but is also a high cost cooking energy option. The efficiency of a device is a crucial factor in determining the cost of using a fuel.

Demand management to improve energy efficiency is a common theme amongst many papers. Jaber and Probert (2001) present some insights into the prime problems of energy and related environmental issues as well as urbanisation in Jordan. Energy consumption in the residential sector accounts for about one quarter of the kingdom's fuel consumption. Kerosene, LPG, diesel and electricity are the main forms of energy used by households, but kerosene is still the dominant fuel because over 80% of households depend on it for space and water heating. The urban poor, who rely on dirtier and less efficient fuels, are exposed to high levels of pollutants. The authors point out that energy savings are almost impossible to achieve within a society that takes for granted cheap energy. However, while there may be little incentive for industry and commerce to conserve energy, the urban poor, who actually need to reduce monthly electricity bills, may be more responsive to energy thrift and demand-side management. The paper concludes that a set of standard specifications for manufacturing LPG and kerosene stoves is urgently needed.

The importance of energy efficiency is highlighted by Tyler (1996). Gains in household income and urban development in many countries in Asia have led to significant shifts in household use of fuels away from the traditional, biomass-based household fuels to modern, fossil fuels. Rapid demand growth in the urban household sector is contributing to huge increases in thermal electric generating capacity needs in Asia. Improving technologies of electricity use in the household sector could be stimulated through market and policy mechanisms which have been used elsewhere.

Energy efficiency in the context of urban planning with reference to China is explored by Sadownik and Jaccard (1999). Community Energy Management is a sustainable energy strategy which looks at how purposely shaping the built environment and designing urban services in consideration of energy production, distribution and use could affect both the long-term demand for energy and the type of energy supplied. The model focuses on how energy demand, residential energy technology penetration and transportation mode choices are affected by factors of density and mix of use in neighbourhood development. As far as energy supply and delivery systems are concerned, several strategies are proposed, including encouraging the interaction of industrial energy provision with residential uses, a faster introduction of new fuels and technologies (such as district cooling, waste heat) and increased gas penetration for cooking and heating.

Street Foods and Health

Street foods are an important source of economical and nutritious food, particularly for the urban poor. The health of a substantial number of urban dwellers is affected when food prepared in this way is contaminated due to the lack of a constant, sufficient heat source. One of the major contributors to bacterial contamination is the cooking of foods that are supposed to be served hot, but are made up in advance and stored for long periods of time before being served. When served, they are often not reheated to a sufficient temperature to kill the harmful bacteria. The Food and Agricultural Organisation of the United Nations (FAO) suggest that several cited food poisoning outbreaks in cities of the developing world, often leading to fatalities, could be traced back to the consumption of street foods. There is a 'lack of infrastructure at the local level to provide assurances that street foods were safe and of good quality'. This was due to a number of factors that included the lack of official recognition of this very large segment of the informal sector. The same can be said of the energy inputs into the processes of processing and preparing street foods.

In Zaria, Nigeria, (Umoh, 1999) it was found that most street vended foods were prepared in bulk and displayed for a whole day for sale at ambient temperature without rewarming. Holding foods at warm outside temperatures for this period of time presents a risk and the risk increases substantially with every additional hour of holding. The authors conclude that there is a need to reduce the problems of street food contamination, growth of microorganisms and intoxication through education of street food sellers and the public on the importance of environmental sanitation and safe practices in the holding of cooked foods.

A study in Doula, Cameroon (Befidi-Mengue, 199?) concluded that good hygiene practices and knowledge amongst street food vendors is a function of educational level and the length of experience on the job. Vendors with more than six years' experience had significantly better hygiene practices and were knowledgeable compared to those with less experience.

A simple inexpensive system consisting of plastic vessels, chlorine, soap, and education can significantly reduce faecal contamination of street food beverages (Sobel, 199?). In this project, some vendors were given narrow-mouth plastic vessels with spigots for disinfecting and storing water and for preparing and storing beverages, as well as instructions for hygiene improvement. During the intervention period, the proportion of contaminated beverage samples fell from 50% to 30%. This shows the potential for targeted interventions.

Mossel, Jansen and Struiik (1999) further contend that the difficult task of ensuring microbiologically safe products at the moment of ingestion can be tackled by using the 'Ten Commandments of Safe Catering' as a tool to focus attention. The natural occurrence of pathogens on raw materials of animal and vegetable origin is often compounded by unreliable water supply, poor temperature control and lack of even a rudimentary knowledge of applied food microbiology. One of the 'Ten Commandments' concerns monitoring and adjusting the temperature of the food to ensure the lethality of heat treatments.

Street Foods and Gender

Urban livelihoods in general are characterized by a dependence on cash incomes, often earned in the informal sector. A high proportion of women can be in the informal workforce. Child care responsibilities, combined with women's lower education and skill levels may force women into informal sector work, or jobs in which they can work at home, according to Levin (1999). In Accra, Ghana, low-income working women and female household heads are among the most vulnerable groups. They are generally able to meet caloric consumption needs, but are very vulnerable to income or price shocks, and sacrifice investment in health and education in order to meet consumption needs. The best options to reduce women's vulnerability is to increase their income earning potential through access to credit, through skills training, and through improving the regulatory environment.

Women are often owners or employees of street food businesses, in certain regions representing 70 to 90 percent of vendors. A majority of women interviewed in FAO studies (FAO, 1997) said that they sold food in the street primarily to improve the food security of their household and for a degree of financial independence.

Street Foods and Small Enterprise

When talking of the aspect of the commercial sector with relevance to the urban poor it is likely that the 'informal sector' is being considered. The commercial aspect of the informal sector comprises a variety of services, retail and wholesale trade. It tends to produce goods and services that are affordable to the masses and its connection or control by government is minimal. Energy is used in the informal sector in three ways, according to the European Commission (1986):

- to cook food sold on the street, using mostly fuelwood, charcoal and kerosene;
- to manufacture implements such as charcoal cookers, implements and utensils; and
- to drive grain mills or food mixers of some description.

In Kenya, the main fuel used by the urban poor in small enterprises is charcoal, which is used for smelting, welding and baking, although street food sellers also use saw dust and wood and kerosene. The larger and more formal the enterprise, the more likely it is that electricity will be used. Electricity is the preferred energy source, although it is not easily accessible to small enterprises. Many of the fixed enterprises are located in informal settlements that are viewed as illegal by the electricity utility. A general problem for those who use fossil fuels is the problem of consistency in the quantity and quality of the supply. The South African enterprises in which the poor are most likely to be involved in are cooking and selling food. As electricity is expensive, poor communities mainly use fuelwood for energy intensive income generating activities. Improving access to energy services for the poor is only a recent priority and has concentrated on electrification. This may not be sufficient by itself. Securing fuelwood supplies in urban areas is important for the poorest. In Peru, high electricity prices as a result of the removal of subsidies are a major constraint on the development of small entrepreneurs.

Of the more than 40 000 estimated micro and small unregistered enterprises in South Jordan, over half are involved in the supply, distribution and trade of food. A large share of the smallest enterprises are run by women, and the majority of owners have low incomes (FAO, 2000). At a workshop organised by the FAO in Jordan, the participants identified several constraints to the development of micro to small enterprises in the food sector, including lack of marketing awareness, low labour quality, lack of business management skills, resistance to training by business owners, small and overly price conscious markets, lack of formal recognition for street food traders, and a multiplicity of regulations. The workshop concluded with recommendations concerning the improvement of information flows to food small and medium enterprises, improving the legal and administrative environment, introducing finance and credit to food enterprises, improving training and business counselling services and institutional development. Further, Dajani (2000) suggests that constraints to growth can be grouped into internal and external constraints. Internal constraints are those inherent to the micro and small enterprises themselves whilst external constraints arise out of the multiple environments in which the micro and small enterprises operate. With regard to the internal set of constraints, the popular misconception about small and micro enterprises in the food sphere is that they require low levels of entrepreneurial and management skills and low levels of capital. As most micro to small enterprises are born out of necessity this misconception often leads to the wrong assumption that entry barriers into this type of business are low. Underrating the levels of initial capital requirements also leads to capital

deficiency in many micro enterprises. Another inherent constraint is the generally low quality of labour available.

With regard to the external set of constraints, these can be divided into: physical urban planning and/or infrastructure; absence of finance and credit; impaired market transparency; the high costs of business; fraud and sharp practice; Municipal rules, regulations and administrative orders; unfair enforcement agencies.

In the context of Jordan, Dajani (talking of the food industry as a whole) goes on to recommend that a strategy to improve performance and competitive potential be adopted. This strategy must cover five basic elements:

- Support and encouragement of the existing industries to improve and upgrade the quality and reduce the costs of food products,
- Development of the regulatory and macro-environment of the food industry,
- Emphasize training and development of manpower,
- Provide access to information,
- Support and encourage association with international business, export and marketing institutions and associations.

Street Foods and Energy Technologies

Overall, households that prepare and sell foods consume twice as much energy as ordinary households do: 25% more electricity, twice the amount of fuelwood, twice the amount of gas and four times the amount of charcoal (Tyler, 1990).

Technologies used by street food vendors are often the same as those used in the household. This is not surprising, since these small enterprises are commonly an extension of the household. Whilst it is true that energy technologies available to the household are also available to the vendor, so access to them is no more difficult than for the household, there are few technologies that are specifically designed for micro entrepreneurs such as street food vendors. There have been several programs over the years which have attempted to tackle the problem of rural household energy needs by promoting and introducing fuel-efficient wood and charcoal stoves (Stewart, 1987; Baldwin, 1987). Whilst this has been well documented, there is less on the use of stoves for community cooking purposes, primarily because the demand for larger stoves appears to be lower than for household-sized stoves. The literature concerning commercial cooking technologies is even less common. Some of the literature concerning technologies that are used for small scale community or institutional.cooking are relevant in part and are reviewed here.

Quadir (1995) looks at barriers to the dissemination of renewable energy technologies for cooking. They can be grouped into four categories: technological inadequacy; realistic assessment of resource potential; correct identification of potential users; inadequate consideration to the needs of the users.

Ayoub (1995) describes the performance of large portable metal woodstoves for community kitchens. The stoves were designed for use in community kitchens in the city of Salta, Argentina, where spending on fuelwood by community organisations in poor neighbourhoods was too high. Thirtyfive community woodstoves were fabricated locally

and distributed to community kitchens in the city. Considerable savings in wood consumption, from 50 to 75%, were achieved. Real savings in fuel costs as well as in time for fuelwood collection were also noted. These findings confirmed laboratory tests.

The steps to the commercial production of energy efficient biomass stoves for the commercial and institutional sector is described by ESD (1999) in the 'Manual for Producers, promoters and Users'. The manual looks at market assessment, producer surveys, product design, stove testing, production, marketing and promotion, financial issues, role of government and donors, and business planning. The benefits of using such improved stoves are stated as:

- Savings out of the 15 to 20% of the kitchen budget spent on fuelwood.
- Removal of smoke and gases
- Reduced risk of burn injuries
- More control of the cooking temperature
- Reduced kitchen air temperature
- Improved kitchen layouts and working positions for staff.

On a larger scale, Tripathi (1997) looks at the financial aspects of biomass gasifier based institutional cooking. The unit costs of thermal energy obtained from gasifier-based systems have been determined and compared with that obtained from coal and liquefied petroleum gas. For small thermal ratings, LPG appears to be the cheapest, whilst biomass gasifiers are more financially attractive for larger thermal loads.

Rana (1997) reviews the economic performance of energy efficient devices for cooking and lighting in rural areas of Madhya Pradesh, India, using Life Cycle Cost (LCC) analysis. It is observed that the replacement of existing devices by new systems is very economical. In particular, the use of improved chulas where fuelwood is a market commodity (as in urban areas) shows high internal rates of return. In most cases, cooking with improved chulas is more economical than using kerosene. The question of subsidies for improved woodstoves is analysed using a mathematical model by Das (1995). The use of direct subsidies is not shown to be the best way to promote such stoves where the availability of fuelwood is sufficient, except in the case where there may be multiple uses for fuelwood, such as cooking and gasification.

Solar cooking gets some attention in the literature. Sharma (1999) describes the design and development of a latent heat storage unit for the cooking pot of a solar cooker to store solar energy during sunshine hours. The stored energy was used to cook rice during the evening. From the experimental results, one can conclude that the storage of solar energy does not affect the performance of the solar cooker for noon cooking and cooking would be possible at night with the correct design. Nahar (2000) also describes the design, development and testing of a hot box solar cooker. The performance of the improved cooker is very good, even in extreme winter. The payback period varies between about 1.5 years and 3.75 years depending upon the fuel it replaces and is in increasing order with respect to the following fuels: firewood, coal, electricity, kerosene and LPG.

For references please see Annex 1.

2.2 Enumerative Survey and Case Study material, Bangladesh

A survey of 114 Street Vendors was undertaken in Dhaka and Bogra by project field staff in 2001. The survey areas comprise of two locations, one within the Dhaka Metropolitan City Corporation and other in the peri-urban areas surrounding Bogra town. In Dhaka, a total of 60 street food vendors were interviewed in various parts of the city. The respondents were selected at random while they were carrying out their business operation.

2.1 Socio-Economic Aspects
In Dhaka, equal numbers of vendors are male and female respectively. In contrast, 96 percent are male and only 4 percent are female in the peri-urban Bogra area. A vast majority (86%) are married. The divorced widow and separated respondents account for 7 percent. 48 percent of the 114 respondents are illiterate.

As for their residency status, none of the Dhaka respondents own any residences of their own. 97% reside at rented houses (shanties) mostly in the slum areas and the remaining ones live on the streets. The situation is different in Bogra. 93% of the Bogra respondents live in their own houses and the rest in the rented houses. 30 percent of the respondents have less than 4 dependents; 57% have 6 and 13% have more than 8 dependents. Distribution is more or less evenly distributed in both locations.

2.2 Business Operation
75% of Dhaka respondents claimed that they have permanent locations in the sense that they operate their business at the same location on the road side, until driven away by law enforcing agencies. The other 25% move around in the process when selling.

The respondents reported a variety of problems faced. Major problems faced by Dhaka street vendors as reported by them are natural calamities (63%), paying bribe/subscription (53%), oppression by police (47%), rainy/dull season (40%) and interference by local 'mustans'/muggers (17%). In Bogra, the respondents listed shortage of capital as the major problem (70%), followed by dull season (22%). Some respondents from the Bogra town area reported oppression by police as a problem.

As for the average daily sale proceeds, 57 percent of the Dhaka respondents said that they sell below Tk.400[1]. In contrast, 78 percent of the Bogra respondents claimed their sale proceeds above Tk.400. For the average daily profit, 70% of Dhaka respondents reported an amount below Tk.150. In contrast, 57% of the Bogra respondents said that they had profit above Tk.150.

2.3 Fuel Use
Use of kerosene and kori/twigs as fuel source is extensive in both Dhaka and Bogra. These two sources account for 97% in Dhaka. Additionally, another 37% also use wood/logs (*guri*) in Dhaka. In addition to *khori*/twigs and kerosene, the Bogra respondents also use '*ghuta'* dry cow-dung balls (20%) and briquette (11%). Briquettes are increasingly popular with small enterprises manufacturing these condensed biomass fuel from paddy husk.

[1] In 2001 £1 = 83Tk.

Almost all the respondents (93%) procure their fuel sources from the local market or from nearby shops. Daily expenditure on fuel is below Tk.50/- for 68% Dhaka respondents and 69% Bogra respondents. As for the problems relating to fuel procurement, 41% of Bogra respondents mentioned rainy season (dampness of twigs) as one major problem for them. In respect of any problem that they might have faced while using fuel for cooking, 18% of Dhaka and 13% of Bogra mentioned smoke and eye burning.

An overwhelming majority of the estimated 20 million households in rural Bangladesh use traditional cooking system, 'chula' for cooking their foodstuffs. This comprises a pit dug into the ground see Figure.1, and is similar to the Indian Hara stove.

Figure.1 Lady using a Traditional Stove in Northern Bangladesh

They are frequently installed outside, but during the rainy season one will be dug inside the kitchen, causing health concerns due to indoor air pollution.

Table-22: Distribution of the Respondents by their Opinions about Efficient fuel:

Opinion	Frequency		
	Dhaka	Bogra	Total
Gas	28	-	28 (25%)
Kerosene	25	17	42 (37%)
Khori (twigs)	-	22	22 (19%)
Coal	-	1	1 (1%)
Briquette	-	3	3 (2.5%)
Wood of Saw mill	-	3	3 (2.5%)
Ghuta (cowdung)	-	8	8 (7%)
Not known	7	-	7(6%)

The results of table 22 are interesting because it shows a clear difference in perception as to efficient fuel. The lack of availability of LPG in Bogra is one reason why awareness of this fuel is low. Addtionally the respondents in Bogra preferring twigs mentioned that they could use them whenever they needed and at other times, they can put out the fire and can use it at a later time. In other words, they can control energy use for maximum utilization.

2.4 Institutional Support:

As of now, the street food industries in Bangladesh are operating of their own, with no institutional support from either the government agencies or the NGO/private sector. In spite of the sector's importance, in respect to providing cheap food to millions of working people as well as creating countless employment opportunities both at individual and family level, there has been no specific effort from any quarters to look into the interests of this sector. No regulatory rules have been framed for the sector so as to ensure the health and hygienic and environmental aspects of the foods served. Neither there is any effort towards ensuring efficient use of energy by the food vendors, as has been done in other developing countries such as India.

2.5 Concluding Remarks

The respondents prepare and sell a wide variety of food items, from mostly temporary and mobile locations. They have all types of customers, however their main customers are from the lower section of the working class. The urban-based vendors, particularly in Dhaka city faced constant threat and extortion from law-enforcing agencies and local mustans/muggers, as they have operate their business under no institutional legal coverage.

Compared to those from the Bogra's peri-urban areas, the Dhaka vendors run a small scale business with a capital investment of less than Tk.400. Their daily sale is also small (below Tk.400) and so is their profit (less than Tk.150). The situation with the Bogra respondents is marginally better.

Use of fuel by the vendors is conditioned by local availability. Whereas in Dhaka, vendors use kerosene and wood for cooking purpose, the vendors in Bogra's peri-urban areas use twigs and kerosene. Bogra vendors prefer twigs as these are available locally at a cheaper rate. The stove that they use in both Dhaka and Bogra are mostly the earthen and tin stoves. Their average daily expenditure on fuel is below Tk.50/-. Most of the vendors reported to have faced little or no problem in using fuel.

From discussion with the Street Food Vendors both in Dhaka and Bogra, it was very much evident that the vendors are enthusiastic about adopting new and improved version of the cooking stove, as the one developed by BCSIR. This cooking system has been found to be popular with the rural households for its efficient use of the energy. Such improved stove can be provided to the street food vendors through collaboration with BCSIR, who also provide necessary training to the customers of their products.

In conclusion, it can be said that while this baseline survey on energy use by the street food vendors have revealed interesting information about their socio-economic condition, their business operation and use of fuel therein, there is a scope for further broad-based studies in this very important sector of the economy. The pattern of fuel use by the vendors and other related issues deserve to be further investigated, in view of its implication into the environmental aspect of the country. It is time for the concern government agencies to take up appropriate regulatory measures so that the street foods taken by millions of people are safe and healthy for them, in addition to minimizing the environmental degradation by indiscriminate use of biomass energy by the vendors.

The following case studies were gathered in Bangladesh:

Case Study 1: Monju Ara

Monju Ara is from Kalikapara village under the district of Madaripur. She came to Dhaka with her parents when she was a minor girl. She grew up in Dhaka and then one day, she was married to Abdul Halim, who also hailed from their neighboring village in Madaripur. Halim was the only earner of his parent's family. Their family was living in hardship but within a year of her marriage, Monju became the mother of a sweet baby. Monju got worried about the future of her baby. She dreamt of providing education to their only child.

One day she decided that she would start cloth business. She arranged some money and started the cloth business. She was earning a good amount of profit from her business. But she was a woman with high ambition and she dreamt of earning enough money to lead a good life. Finally she decided that she would go abroad with employment. Accordingly she contacted a manpower agent, who promised to send her to Malaysia, but that would cost her Tk.80, 000/-. Monju sold all her possessions and handed over an amount of Tk.80, 000/- to the agent. But luck did not favor her and the agent ultimately betrayed her, once she arrived at Kualalampur airport. She was left alone and then picked up by the Malaysian police and was taken to jail, where she spent 3 months together. She was subsequently deported back to Bangladesh.

She came back to her family home located in the Badda area of Dhaka city and got a job in a hotel. After working for a few months in the hotel, Monju decided to start food selling business herself independently and that, she would sell 'Pithas' on the roadside. She borrowed Tk.200/- from one of her neighbors. With this little capital she started the 'pitha' business on the roadside in the Badda area. She earned a modest profit of Tk.50/- a day. She could repay her loan within days.

Monju Ara uses traditional earthen stove and twigs as fuel for preparing 'pitha' . She gets her twigs supply from local traders, but she complained about irregular supply and scarcity of twigs. She also infomed that she faces a lot of problem during therainy season when twigs are wet and damp, creating a lot of smoking hazzards for her. Although her income from the business is modest, she has no other alternative but to carry on this for supplementing her family income. She has not much idea about alternative cooking system which can save fuel, but she said that she heard about such thing. However, she showed her liking for LP cylinder gas use, but by her own adnission, it was beyond her reach to afford such a costly system. She also showed her interest to buy even the improved cooking stove she once saw another women using, but here again she was hesitent as to how she could afford this. She said that she would love to buy an improved cooking stove on instalments basis.

Case Study 2: Saleha

Being the only doughter of her parents, Saleha was brought up very affectionately from her childhood. They are the residents of Barpur village under Bogra district. Saleha was very industrious from her very childhood. When she was only 9 years, she got involved with the food business along with her mother, Amina, who used to prepare and sell 'piaju', 'dalpuri' and 'fullari' and such other traditional food items very popular in rural areas. Amin's sale-point was on the roadside near the Barpur market. Working with her mother over the years, Saleha became experienced in this type of food business.

When Saleha was 14 years old, she was married to a rickshawpuller. Her mother kept Saleha and her husband at her place. Within 7 years of her marriage, Saleha gave birth to two boys and one girl. After birth of her daughter, her husband Fulmiah went to Dhaka to work as a rickshawpuller for earning more money. From that time onwards, Saleha is on her own way, living alone with her three children. Her husband never turned up. But Saleha did not lose heart. She educated her two sons --Yasin and Shirajul – up to class–V. Now they are employed in a jewellery shop where they earn Tk.50/- each week.

Saleha meanwhile started her own food business alongside her mother's one. Her daily investment in the business amounted to TK.150/-. From selling the food items, she got around TK. 250/-. So her net profit was about TK.100/- a day. Saleha took a loan for TK. 4,000/- from TMSS for the first time and invested this in her business. Her business gradually expanded and with it, her profit, too. With expansion of her business, she again took a loan of TK.10,000/- from TMSS. With this loan, she bought 9 (nine) rickshaws, both old and new. She used to get Tk.15/- as daily rent for each of her rickshaws.

Saleha had both good and bad times in her life. But during bad time, she did not lose heart and continued her food business as usual. By dint of her perseverance and hard work, she has been able to survive well. Her satisfaction lies in her ability to provide some education to her children. For long 30 years, Saleha has been struggling. However, she never gave in to any adversity of life. She continues her business as usual.

She does not have much idea about efficient fuel use, but thinks that a good stove could help her avoid eye-burning smoke. But she added: “How can I get one that you are talking about?”

Case Study 3: Salahuddin

Salah Uddin, the eldest son of his parents, comes from a poor family of 8 members. His father was a daily laborer and he could hardly feed such a big family. Due to poverty, Salah Uddin could not prosecute his studies beyond primary level. One day he left his home village of Mehendigonj under Barisal district without anybody's knowledge. He got up in a Dhaka-bound launch from Barisal, not exactly knowing where he was going. He had no money with him, even to buy a breakfast. Next morning, he arrived at the Sadarghat station.

But he was lucky enough to land in a job on his arrival to Dhaka. He got a job of dishwashing in a restaurant but with no pay. He would only get meals free of cost from his employer. Within a few days, he became 'table boy' and but this time his pay was fixed at Tk.5/- in addition to his meals.He worked in the same hotel long 5 years and was able to save Tk.3000/- during all these years. Equipped with this capital money, he decided to start a hotel business. He rented a roadside 'TONG' to start the business but there was no gas facility. He had to use fuel wood at exorbitant price everyday. His profit from his hotel was thus less than what he hoped for. He contacted some young boys in the locality to procure twigs for him in exchange of money but the cost for fuel did not decrease.

One day he came to know about the 'Improved cook stove' produced and marketed by Bangladesh Council for Scientific And Industrial Research (BCSIR) from one Mr. Jashim, the Council's district supervisor. Salah Uddin got interested to procure one such improved stove and bought one from the supervisor. He had to spend Tk.1000/- for installing one commercially viable improved cook stove in his stall. Immediately afterwards, Salah Uddin started getting dividends from his investment. Earlier to installation of the stove, he had to spend at least Tk.375/- everyday for fuel. But with the new system of cooking, his daily expenditure on fuel came down substantially to Tk.240/- only. With decrease in the daily fuel cost, his profit margin has increased. With the improved cook stove, he is also saving his cooking time by 25 percent. With a sense of satisfaction writ large on his face, he also boasted about the smoke and heat-free environment that he is now operating his business. A happy and contented Salah Uddin added: "If we were a little bit aware about efficient fuel use, we could save not only our operating cost for a higher profit margin, but also could contribute our little mite towards maintaining a pollution-free environment around us to enjoy a good life".

Case Study 4: Mukul Begum

Mukul Begum, woman in her early forties lives in the village Meherhat under Bogra district. At the age of 18, she was married to one Jahangir, a rickshawpuller by profession. Her husband was very irregular in his profession and had not much earnings to feed his family members three meals a day. Mukul suffered a lot in her conjugal life and hardship was a regular phenmenon in her life. Her two children dropped out of school because of poverty.

One day, her husband got acquainted with a sweet-maker and over the days, he built up a good relationship with him. Gradually Jahangir learnt from the sweet-maker how to prepare sweets. He decided to leave his earlier profession and start the sweet business. He arranged Tk.500/- and used it as capital for starting the business himself. On the first day of his business, Jahangir earned a net profit of Tk.200/-. Mukul's husband was very happy. He continued his new business with full enthusiasm. Mukul and her husband's life was turning for the better. After a long time, they saw a ray of hope for a better life for the family members. Now they could readmit their children to school.

One day, Mukul was introduced with one Morzina, a field worker of the Thengamara Mohila Sobuj Sangha (TMSS). Mukul told Morzina about her husband's new sweet business and wanted to know if she could arrange some fund from her organization so that they can invest more capital for the sweet business. Morzina arranged a loan of Tk.3000/- for Mukul. She then took the money and invested the whole amount in their business. This new capital enabled Mukul and her husband to avoid exorbitant borrowing from private sources. Their business expanded and so also the profit. They added tin on the roof of their house. Life was going on rather smoothly.

A couple of years later, Mukul's husband fell sick and suffered for long two years. But Mukul herself continued their family business and did not allow it to be closed owing to her husband's illness. No doubt, she felt tired of running the business but did not give up the hope of prosperity. With their business running profitably, Mukul started dreaming for a nice house for her children, their future and to spread business. Their two children, Manik and Shima, are now studying in class IX and class V respectively. Mukul is now a confident women as well as a successful businesswoman. The daily sale of her sweetmeats now amounts to Tk.1000/-. Their business has expanded to such an extent that she is now even ready to take a loan of TK. 10000/- from TMSS and invest the amount for her business. Her only dream is to see her son and daughter educated.

Although Mukul has been running her business successfully, she does not have much idea about improved cooking stove. She did admit that from one of her customers she heard about improved stove available in Dhaka, but never had an opportunity to see it. She also admitted about facing smoke problem from her traditional stove, but does not have any idea as to how an improved stove can help her save fuel. However, she showed her interest to buy an improved cook stove, if it is made available to her.

2.3 In-Depth Study, Sri Lanka

RESULTS OF TWENTY-FIVE CASE STUDIES OF STREET FOOD VENDORS

Susil Liyanarachchi
Chamindra Weerackody
September 2001

1.0 INTRODUCTION

The inter-relationship between energy and street food was the subject matter of an explorative study carried out among street food vendors in Bangladesh and Sri Lanka. Its main focus was to identify the type of energy used by the vendors for preparation of street food, their access to such energy sources and the economic and environmental implications to the users in particular and to the community in general. The study had two major phases. Phase 1 was to carry out a baseline survey among 100 selected street food vendors with a view to identifying their basic socio-demographic features, significant features associated with their businesses which have a bearing on energy use and the energy use patterns of the vendors. The results of the survey are documented separately in the report " Energy and Street Food – Results of a Baseline Survey (April-May 2001). Phase 2 was an in-depth analysis of a selected number of street food businesses particularly focused to assess the energy use patterns and the devices used in terms of its efficiency and its impact (sensitivity) on the profits generated by the vendors. This report presents the results of the Phase 2, which are the case studies conducted with 25 street food vendors in the city of Colombo in Sri Lanka.

2.0 METHODOLOGY

2.1 Sampling

The baseline survey was conducted with 100 street food vendors in the city of Colombo served as the basis for the selection of twenty-five street food vendors for in-depth analysis. The sample selected for the study was a ***purposive sample*** based on a set of identified criteria. As the objective and the focus of the present study was to understand the relationship between energy usage and street food, following criteria were used in identifying the sample of twenty-five vendors. They were;

- ***Street food vendors using firewood, kerosene and LP gas*** – the baseline survey identified that the three major sources of energy used by the vendors are the firewood, kerosene and LP gas. The sample selected, therefore represented vendors using all three types of energy.
- ***Patterns of energy use –*** the baseline survey further revealed that some vendors have been using a single source of energy while others a combination of sources in the process of preparing and selling their food. Thus, among the twenty-five vendors selected were vendors demonstrating these different patterns of energy use.
- ***Energy used in cooking -*** the baseline survey pointed to a variety of purposes for which street food vendors have been using energy. Among them were cooking, heating, cooling, grinding, lighting during cooking and selling, transport etc. However, in identifying the sample of vendors for the in-depth study, emphasis was placed primarily on vendors using energy for cooking purposes (including heating) and lighting at the point of selling their products. Grid electricity used for cooling and

grinding purposes as well as for lighting during cooking was not analyzed in the study. The reason is that the electricity component used exclusively for preparation of street food could not be isolated from other purposes for which it was used and required a complex analysis to do so. Similarly, energy used for transporting food was excluded from the study as a majority of the vendors used either public transport or carts to carry food to their respective market places.

- ***Food types*** **–** the 100 street food vendors covered in the baseline survey represented a variety of foods, which they prepared and sold. The energy consumption of the vendors had a direct link to the type of food that they sold and varied according to food types. Therefore, in identifying the vendors for the sample, it was ensured that vendors selling different food varieties are included in the sample.
- ***Place of cooking*** **–** it was observed in the baseline survey that food preparation had taken place either at the home of the vendor or on the street. Yet in some other cases, food preparation was partly done at home while the rest was done on the street. The place of preparing food had a direct bearing on the source of energy and type of devices used by the vendors. For example, a majority of the vendors who prepared food on the street were exclusively dependent on kerosene and used wick-type kerosene stoves to prepare/heat their food. The sample selected constituted food vendors who represented this diversity as well.

The sampling frame used to identify the twenty-five vendors appears in **Annex 1**.

2.2 Methods/Tools

The case study approach was adopted to generate information required for the study. However, it was focused and directed to identify and analyze the relationship between energy usage and street food. Personal interviews with the selected vendors were conducted using a questionnaire, which contained both open-ended and closed-ended questions (A copy of the questionnaire is annexed – **Annex 2**). The questionnaire consisted of five parts. They were;

- General information of the street food vendor
- Economic background of the vendor and his family
- Description of the street food business
- Energy usage in street food
- Income-expenditure and profits of the street food business

The duration of a single interview with a vendor ranged between 2-3 hours. Interviews were pre-arranged and conducted at the homes of the vendors during times convenient to them. Information gathering process was carried out in the months of May and June 2001 while data and documentation was done in August.

3.0 RESULTS OF THE STUDY

This chapter presents the findings of the in-depth study conducted with the twenty-five street food vendors.

3.1 Socio-demographic characteristics

Of the twenty-five street food vendors participated in the study, 92% were males while 8% were females. Almost half of the vendors (48%) were in the age group of 40-50 years while another 16% were over and above 50 years. The percentage of vendors who were in the age group of 30-40 years was 28%. It was only 8% of the sample that was below 30 years of age. 52% of the vendors were Sinhalese while vendors belonging to Tamil and Muslim ethnic communities represented 24% respectively. All the twenty-five vendors were married. The educational attainment for a majority (72%) of the vendors was between grades 5-10. 16% had reached only grade 5. The vendors who completed the GCE OL examination were only 12%.

The street food vendors in the sample came from relatively large families. In a majority of the cases (68%), vendor families had more than three members. The average number of family members was observed as six. In such families, the household consisted of the spouse and children as well as parents and/or in-laws of the vendor. One of the observations made among those families was the sharing of labour by the family members in the process of food preparation. 28% of the vendors had three members in their families while 4% had only two members. As the majority of the family members were dependents of the vendor, the income that the vendor generated from his/her street food business was primarily used to satisfy their consumption needs. However, in return the vendor was reciprocated by these family members with free labour, which they shared during the production process.

The housing conditions and the facilities available for a majority of the vendors were observed to be quite satisfactory. 72% of the vendor families lived in permanent structures while 8% in semi-permanent housing structures. The balance 20% lived in temporary houses. Individual toilet facilities were available to 92% of the vendor houses. Sewage systems were observed in 64% of the houses. 76% of the vendor families had grid electricity to their houses. All the vendors had access to potable water either through a private well/tap or from a common source. 56% of the vendors had outright ownership to the houses they lived in while 36% lived in rented out houses. 8% had occupied houses belonging to their relatives and did not pay a rent for their occupancy.

A majority (56%) of the vendors lived in the suburbs of the Colombo city and traveled daily to their market destinations using either public or private transport. However, the balance 44% lived in the City itself. 40% of the vendors who lived in the City had their dwellings located in the slums of Colombo. The vendors whose residences located in rural and peri-urban environments represented 24% respectively. It was only 4% of the vendors who lived in urban residential areas.

3.2 Economic background of the vendor families

Street food business was the main source of income for all the twenty-five vendors and it was conducted on a regular basis. Many vendors viewed it as an independent economic activity, which provided them with a relatively stable income in spite of the difficulties they had to experience during food preparation, food transportation and marketing. As pointed out in the earlier section, the businesses were supported by the family members of the vendors with their labour particularly at the point of food preparation. It was only in 16% of the cases that vendors carried out business without any support from their immediate family members. The spouse, children and relatives who lived in the house always helped the vendors.

16% of the street food vendors in the sample received government welfare assistance under the Samurdhi Poverty Alleviation Programme. The monthly allowance they received in the form of food subsidy was in the range of Rs.350/-. 20% of the vendors had a supplementary source of income to support their families. This supplementary income came from family members who had engaged themselves in self-employment activities such as dress-making or had been working in garment factories or in the Middle-East countries.

All the twenty-five street food vendors perceived their present living standards as 'average'. 68% of the vendors observed a remarkable 'improvement' in their current socio-economic situation compared to the situation that they experienced five years ago. However, 20% observed 'no change' situation in their families. A 'deterioration' of the family socio-economic situation when compared with the earlier situation was observed by 12% of the vendors. The comparatively high cost of living was seen by the vendors as one of the major factors constraining them from achieving a reasonable living standard. The reasons for the 'improvement', 'no change' and 'deterioration' in the family socio-economic situation were perceived by the vendors as follows;

TABLE 1: PERCEPTIONS OF STREET FOOD VENDORS ON THEIR PRESENT SOCIO-ECONOMIC SITUATION COMPARED TO FIVE YEARS AGO

IMPROVED	REMAINED SAME	DETERIORATED
• Our incomes have increased significantly • Earlier we lived in a rented out house. Now we have our own house. • We have electricity. • We were able to purchase household goods such as televisions, cassette radios, cabinets, jewellery, furniture etc. • We feel that street food business is a stable economic activity. • We live happily. • Earlier we lived in a house that belonged to a friend of mine. But now we are able to live in a rented out house paying Rs.3000/- a month. • We were able to buy a sewing machine for Rs.20000/- and my wife is able to earn an additional income through sewing. • We have some savings. • We are now able to spend for children's education. • Earlier we had a black and white television. Now we have a colour television • We were able to buy the piece of land on which we live now	• Earlier I worked with a friend of mine. Today I work alone. But there is no change in the income I receive. • My income is hardly sufficient to meet our daily needs. No savings. • Earlier we lived in a rented out house. Today it is the same. • Earlier I sold 300 wades. But now I can sell only 200. • Cost of raw materials increases daily • My wife had to go to the Middle East to work as the income we receive is not adequate • Even though we earn, cost of living is high • Children's expenses have increased • Earlier we used all our earnings exclusively for consumption purposes. This situation has not changed.	• My husband earlier worked in the harbour. But now he has lost his job. • Earlier our two unmarried brothers helped us. Now they are married and such support does not come our way any longer. • We live in our parental home. There are four families living there with 21 members. We do not have our own house. • Earlier I had no problem in selling my food. But today almost ¼ of my food remains unsold daily. Even I sold everything in the evening, my profit margins are very small. • My children have now grown up. The expenditure for their education has increased. • My husband is now heavily addicted to alcohol. He spends Rs.50-60 of my earnings daily to consume liquor. • Earlier I worked in a garment factory and I had a permanent income.

• I was able to put up a small hut to operate my business with the permission of the Municipal Council • I was able to buy a motor cycle • We were able to access bank loans • I am able to pay Rs.3000/ a month as instalment for the bank loan • I was able to buy a cart worth of Rs.13, 000. • We were able to buy a van using part of the income we received from street food • Now we do not have scarcity of food at home • We now receive an income to meet out daily consumption needs • Earlier we did not have proper clothes to wear. Now we have them. • When we borrow money in emergencies, we have no fear as we are able to settle them with our daily earnings		• Now I am married and have a child. The cost of living is extremely high • If I am unable to go for business, I do not have an income for that day.

3.3 Street food businesses

The baseline survey conducted with 100 street food vendors observed that 70% of the vendors were in the business for more than 5 years while another 15% conducted their business operations during a period ranging from 3-5 years. These vendors had been introduced to the business through their close associates such as family members, relatives, friends etc. A majority of the vendors were engaged in economic activities of similar nature (petty-trade) prior to their graduation to street food business.

Food types: The baseline survey also observed the diversity of the food varieties prepared and sold by the street food vendors. This diversity of food was further reflected in the sample of twenty-five vendors selected for the present study, where not only the food varieties but also the combinations of food variety prepared/sold by them were taken into consideration. The complexity observed in the combinations of food variety has thus prevented the possibility of classifying vendors in terms of food types prepared and sold by them. The types of food produced by the vendors and their respective numbers appear in the following table while the size of their business enterprises in terms of daily food production is presented in Table 2.

TABLE 2: TYPES OF FOOD PRODUCED BY TWENTY-FIVE STREET FOOD VENDORS

	Food type	No. Street food vendors
1.0	Breakfast	01
2.0	Breakfast & tea	01
3.0	Breakfast, Wade & Short-eats	01
4.0	Breakfast, Wade, Short-eats & tea	01
5.0	Lunch	04
6.0	Lunch, Wade, Short-eats & tea	01

7.0	Short-eats & tea	01
8.0	Snacks	02
9.0	Kadala (gram)	03
10.0	Wade & Kadala	01
11.0	Wade	01
12.0	Wade, Short-eats & Tea	01
13.0	Rotti, Wade and Kadala	01
14.0	Tea	03
15.0	Dinner	02
16.0	Kolakenda (herbal porridge)	01

Place of food preparation: 36% of the street food vendors prepared food at home and carried them to their respective market places while 16% prepared food on the street. The latter group primarily consisted of vendors who sold tea or Kadala. Another 12% of the vendors prepared food both at home and on the street. For example, the Wade vendors prepared the Wade mixture at home while frying was done on the street. A majority of the vendors who prepared food on the streets were exclusively dependent on kerosene and used either kerosene wick-type stoves or cookers. Lack of appropriate alternative energy sources and devices and the convenience of using kerosene cookers on the streets were the reasons for vendors to depend on kerosene. Meanwhile, the vendors who prepared food at home and on the streets used more than a single source of energy such as firewood and kerosene. For example, firewood was used at home while kerosene was used to prepare food on the street. However, there were instances of using kerosene both at home and on the street.

In addition to the above mentioned groups of vendors, there were vendors who bought part of the food they sold from a wholesale food outlet and prepared the balance part of the food they sold either at home or on the street. For example, there were vendors who bought string hoppers, rotties, rolls, buns etc. from a food outlet and prepared curries to mix with and/or tea to drink either at home or on the street. When food was bought from a food outlet and re-sold, the vendors kept for themselves a profit margin of 50 cents to Rs.1/- from each item they sold. The vendors who fell into this group were 36% of the sample. The expenditure incurred by this category of vendors on energy may have a variance with the expenditure incurred by the vendors who prepared all their food items either at home or on the street.

Time spent on business: The time spent by the vendors to prepare, transport and sell the food they produced was notable. It was estimated that the time spent by 72% of the vendors on their business operations ranged between 10-15 hours while another 12% spent more than 15 hours for this purpose. 12% spent 5-10 hours and another 4% less than 5 hours. On average, vendors operate 25 days a month. The real time spent by the vendors on business related activities if calculated in terms of person hours spent by the family members particularly during food preparation could rise up to very high levels. It was reported that 40% of the vendors were supported by two other family members in the preparation of food while another 28% were assisted by three or more persons. The time spent on street food businesses by the vendors and their family members points to three major issues which require further investigation. They are;

- Do the vendors receive adequate *returns to their own labour inputs* and of their family members?

- What is the *opportunity costs* to the vendor and his family members?
- Can the *efficiency of the street food businesses* be increased to minimize the labour inputs?

Mode of operation: 80% of the vendors had a fixed place to sell their food. Such vendors either used carts, vans, huts etc. to sell their food or moved around with their food baskets looking for their clients. The vendors who used carts and operated in the nights used petro-max lamps for lighting during food preparation and selling. However, 20% of the vendors did not have access to such a permanent/fixed place but operated as mobile vendors moving from one place to the other.

Business locations: The Manning market, a wholesale market for vegetables, fruits etc. located in the centre of the Colombo city was the business location for 32% of the vendors. 20% of the vendors had their business points in the Colombo Fort area where several government and private sector establishments including the Colombo harbour are located. The Galle Face ground, situated by the sea and a venue used by many city dwellers for recreation purposes and entertainment was the market place for 16% of the vendors. Another 16% of the vendors operated in an around Pettah where the central public bus transport stations are located. The percentage of vendors operated outside the main city area was 16.

Clients and demand for food: The clients of the street food vendors represented a broad cross section of the urban population. They included city dwellers who came for recreation and entertainment to the Gall Face ground in the evenings, students from outstations who visited the Galle Face ground, businessmen operating in the Manning market, labourers, commuters to Colombo, employees in the government and private sector establishments etc. The food prepared by the vendors was hardly left unsold and the quantities of food to be produced per day were known to the vendors through years of experience. However, the demand for food decreases during festival times such as Sinhalese New Year, Vesak, and Christmas etc. and on public holidays when several service establishments are kept closed. Similarly, the demand for food on Mondays and Fridays decreases as those coming from outstations to work in Colombo bring along with them their lunch prepared at home on Mondays and leave for home early afternoon on Fridays. The vendors were aware of such fluctuations in the demand for food and thus their daily supplies were maintained accordingly. As a strategy to attract and retain the clients, prices of the food items sold by the vendors were kept lower than the prices of the same food sold in the restaurants. They also mentioned that they try their best to maintain the quality of the food they sell so that they could retain their clientele.

3.4 Energy usage in street food

Energy use patterns - Firewood, kerosene and LP gas were the three major sources of energy used by the vendors for purposes of cooking, heating and lighting during selling. The majority (44%) of the vendors used a single source of energy, which was kerosene. Another 20% used kerosene in combination with firewood. Kerosene and gas were jointly used by 8% of the vendors while kerosene, gas and firewood were used together by 4%. ***This shows that kerosene was either the main or the supplementary source of energy for 76% of the vendors.*** Firewood was exclusively used by 12% of the vendors while firewood with LP gas was used by 4%. The number of vendors who used only LP gas was 8%.

Table 3 appearing below presents the energy use patterns of the twenty-five street food vendors in terms of the types of energy and devices used and the purposes for which they were used.

TABLE 3: ENERGY USE PATTERNS OF THE STREET FOOD VENDORS

Vendor No.	Type of street food sold	Type of energy used	Type of devices used	Purpose of energy usage
Vendor No.1	Breakfast	Gas and Electricity	Gas cooker with two burners, Grinder and Refrigerator	Cooking and preserving/cooling the curry mixtures prepared on the previous day
Vendor No.2	Breakfast & tea	Kerosene	2 Kerosene stoves (1 at helper's house and 1 on the street)	Cooking & warming
Vendor No.3	Breakfast, Wade & Short-eats	Kerosene & Gas	Gas Cooker & Kerosene stove	Cooking
Vendor No.4	Breakfast, Wade, Short-eats & Tea	Kerosene	2 Kerosene stoves (one at home and one on the street)	Cooking & warming
Vendor No.5	Lunch	Gas & Firewood	Gas cooker & 3 firewood hearth	Cooking
Vendor No.6	Lunch	Firewood and Kerosene	1 Firewood hearth & 1 energy efficiency clay hearth	Cooking and kerosene lighting
Vendor No.7	Lunch	Firewood & Kerosene	2 hearth made out of iron pieces	Cooking & kerosene for lighting the hearth
Vendor No.8	Lunch	Firewood & Kerosene	3 Firewood hearth & 2 energy efficiency clay hearth	Cooking & kerosene for lighting the hearth
Vendor No.9	Lunch, Wade, Short-eats & Tea	Kerosene	3 Kerosene stoves (2 at home and 1 on the street)	Cooking & warming
Vendor No.10	Short-eats & Tea	Kerosene	Kerosene stove	Warming
Vendor No.11	Snacks (casava chips and veralu pickle)	Gas	Gas cooker	Cooking
Vendor No.12	Snacks (casava chips, murukku, gram, jak seeds	Firewood and Kerosene	Firewood hearth and Petro-max lamp	Cooking & kerosene for lighting the petro-max lamp during selling and for lighting the hearth
Vendor No.13	Gram (kadala varieties)	Kerosene	Kerosene stove and Petro-max lamp	Cooking & lighting the petro-max lamp during selling

Table :3 (Contd)

Vendor No.	Type of street food sold	Type of energy used	Type of devices used	Purpose of energy usage
Vendor No.14	Gram (kadala)	Kerosene	Kerosene stove	Cooking
Vendor No15	Gram (kadala)	Firewood & Kerosene	Firewood hearth & Kerosene stove	Cooking & Kerosene stove for frying chilies
Vendor No.16	Gram (kadala) and Wade	Kerosene	Kerosene stove	Cooking
Vendor No.17	Wade	Kerosene	Kerosene stove	Cooking
Vendor No.18	Wade, Short-eats & Tea	Kerosene, Gas & Electricity	Kerosene cooker, Gas cooker & Refrigerators	Cooking, warming & cooling/ preserving wade mixture prepared on the previous night
Vendor No.19	Wade, Gram (kadala) & Rotties	Kerosene	4 Kerosene stoves	Cooking
Vendor No.20	Tea	Kerosene	Kerosene stove	Boiling & warming
Vendor No.21	Tea	Kerosene	2 Kerosene stoves	Boiling & warming
Vendor No.22	Tea	Firewood	Hearth made out of iron pieces	Boiling & warming
Vendor No.23	Dinner	Kerosene, Gas, Firewood, Electricity	Kerosene stove, 2 Gas cookers, Firewood hearth, Grinder, Electric coconut scraper, Refrigerator	Cooking, warming, cooling, coconut scraping
Vendor No.24	Dinner	Firewood	Firewood hearth	Cooking
Vendor No.25	Kolakenda (herbal porridge)	Firewood	Firewood hearth	Cooking

The reasons/justifications attributed by the vendors for using the different types of energy, which they had been using, were elicited from the vendors themselves and their perceptions were as follows;

TABLE 4: FACTORS INFLUENCING STREET FOOD VENDORS TO USE THE CURRENT SOURCES OF ENERGY

Kerosene	Firewood	Gas
• Easy to carry the kerosene stoves. • Kerosene stoves retain heat • We ourselves can attend to the repairs of the stoves. • Kerosene stove is energy efficient. • We can buy kerosene from the village boutique. • Kerosene is easily available and can find it within a short time. • Gas is sold only in particular places and not available everywhere and difficult to find. • The one time payment that we have to pay for gas is too high for us. • We can get kerosene on credit from the village boutique. • Time waste is high when cooking with firewood. • We cannot carry a gas cylinder to our market places. • Initial investment for gas is quite high. • Firewood cannot be used in congested and open places. • We have no place to leave the gas cooker in the nights, as there is no security. • Unlike gas, we can open the tank and see for ourselves the remaining quantities of kerosene inside the stove and buy the necessary quantities before it runs out completely. • Unlike gas, we need only a small amount of money at a time to buy kerosene. • We can buy kerosene on credit. This is not possible with gas. • Cost of kerosene stoves are comparatively low. • Carrying/transporting kerosene is easy. • Using gas is dangerous as rats can cause damage to gas tubes.	• Convenient to find. • Food prepared with firewood has a special aroma and taste. • Gas is expensive. • We can collect firewood, coconut shells and leaves in the neighbourhood. • Neighbours give us coconut shells and leaves free of charge. • Villagers sell firewood at comparatively low prices. • Can find firewood at no cost. • When kerosene stoves break, it is difficult to repair them. • Kerosene is relatively expensive. • Our present economic situation does not allow us to use either kerosene or gas. • We can reduce the cost of production if we use firewood.	• Cleanliness of the food can be maintained. • It is smoke free. • We do not have to spend much time to wash cooking utensils as there is hardly any soot. • We do not want much soap to clean soot. • Time spent for cooking is relatively short. • Heat generated by kerosene stoves is relatively low. • We can maintain the quality of the food we produce. • Cooking is less time consuming and efficient.

The constraints and difficulties perceived/experienced by the vendors in using the current sources of energy, which they had been using, were as follows;

TABLE 5: PERCEIVED CONSTRAINTS FOR USING CURRENT ENERGY SOURCES

Kerosene	Firewood	Gas
• Difficult to meet the frequently escalating prices of kerosene. • Current price of kerosene is too high. • The sound emerging from the kerosene stove (shhh..) is irritating and disturbs conversation with clients. • Energy efficiency is sometimes low. • The burner has to be replaced every 6 months at a cost of Rs.700/-. • The wicks have to be replaced almost every month. • There is a bad smell that comes out when kerosene is burnt. • Kerosene stoves have to be repaired frequently and on such occasions, vendors loose business.	• Smoke fills inside the house when cooking. • Heat affects the body. • A lot of smoke and soot. • A lot of time is taken for cleaning soot sticking to the cooking utensils (1- 1½ hours). • The people supplying firewood are not regular. • Cannot light the hearth on rainy days as it is placed outside the house. • Difficult to use firewood on rainy days when it gets wet. • Houses get dirty due to smoke and we may have to spend Rs.10-15, 000 to colour wash the houses (rented) on the day we have to hand over the houses to the owner.	• Increase of gas prices within a short period. • Gas runs out in the mornings unexpectedly and we cannot cook food on that day. • Burners are too small to place large utensils used for cooking. • High cost of gas. • An empty gas cylinder is expensive. • A gas cooker is expensive. • There are sudden gas shortages.

Energy expenditure **–** Table 6 below presents the monthly average energy consumption patterns and expenditure of the street food vendors derived from the calculations made with the vendors in respect of their daily consumption patterns and expenditure. The energy consumption and expenditure per month is calculated on the assumption that a vendor on average operates his/her business for 25 days a month.

TABLE 6: ENERGY CONSUMPTION PATTERNS AND EXPENDITURE

Vendor No.	Type of street food sold	Type of energy used	Monthly Energy Consumption			Monthly expenditure on energy (Rs.)			Total Exp-enditure
			Kerosene	Firewood	Gas	Kerosene	Firewood	Gas	
Vendor No.1	Breakfast	Gas and Electricity			1 cylinder			531.00 (	**531.00**
Vendor No.2	Breakfast & tea	Kerosene	38 litres			760.00			**760.00**
Vendor No.3	Breakfast, Wade & Short-eats	Kerosene & Gas	12 litres		1 cylinder	120.00		540.00	**660.00**
Vendor No.4	Breakfast, Wade, Short-eats & Tea	Kerosene	53 litres			1060.00			**1060.00**
Vendor No.5	Lunch	Gas & Firewood		3 cwt	1.5 cylinder		390.00	660.00	**1050.00**
Vendor No.6	Lunch	Firewood & Kerosene	6 litres	8 cwt		120.00	800.00		**920.00**
Vendor No.7	Lunch	Firewood & Kerosene	30 litres	35 cwt		600.00	3500.00		**4100.00**
Vendor No.8	Lunch	Firewood & Kerosene	6 litres	25 cwt		120.00	3250.00		**3370.00**
Vendor No.9	Lunch, Wade, Short-eats & Tea	Kerosene	300 litres			4300.00			**4300.00**
Vendor No.10	Short-eats & Tea	Kerosene	100 litres			1200.00			**1200.00**
Vendor No.11	Snacks (casava chips and veralu pickle)	Gas			12 cylinders			6600.00	**6600.00**
Vendor No.12	Snacks (casava chips, murukku, gram, jak seeds	Firewood and Kerosene	25 litres	6 cwt		500.00	360.00		**860.00**
Vendor No.13	Gram (kadala varieties)	Kerosene	62 litres			1240.00			**1240.00**
Vendor No.14	Gram (kadala)	Kerosene	150 litres			3000.00			**3000.00**

Table 6: (Contd..)

Vendor No.	Type of street food sold	Type of energy used	Monthly Energy Consumption			Monthly expenditure on energy (Rs.)			Total
			Kerosene	Firewood	Gas	Kerosene	Firewood	Gas	
Vendor No15	Gram (kadala)	Firewood & Kerosene	12 litres	8-9 bundles		240.00	450.00		**690.00**
Vendor No.16	Gram (kadala) and Wade	Kerosene	87 litres			1740.00			**1740.00**
Vendor No.17	Wade	Kerosene	62 litres			1240.00			**1240.00**
Vendor No.18	Wade, Short-eats & Tea	Kerosene, Gas & Electricity	50 litres		1.5 cylinders	1000.00		765.00	**1765.00**
Vendor **No**.19	Wade, Gram (kadala) & Rotties	Kerosene	110 litres			2200.00			**2200.00**
Vendor **No**.20	Tea	Kerosene	82 litres			1640.00			**1640.00**
Vendor **No**.21	Tea	Kerosene	75 litres			1500.00			**1500.00**
Vendor No.22	Tea	Firewood		-					**-**
Vendor No.**23**	Dinner	Kerosene, Gas, Firewood, Electricity	25 litres		8 cylinders	500.00		4120.00	**4620.00**
Vendor No.24	Dinner	Firewood		6 cwt			840.00		**840.00**
Vendor No.25	Kolakenda (herbal porridge)	Firewood							**-**

As shown in the Table above, the total monthly expenditure on energy was in the range of Rs.1000-2000 for 36% of the vendors while 28% of the vendors spent less than Rs.1000/- a month. 8% of the vendors did not spend a single cent on energy, as they were able to find firewood free of charge in their localities. This shows that for a majority of the vendors that the total expenditure on energy was less than Rs.2000/- a month. It was the balance 22% whose energy expenditure exceeded Rs.2000 and reached to Rs.5000/- and above.

In addition to the daily operational costs on energy, vendors particularly those who were using kerosene and gas had to make an initial investment in buying kerosene cookers/stoves and gas cookers as well as to spend for their maintenance. The initial investment made by the vendors in cookers/stoves ranged between Rs350/- and Rs.2000/- depending on the type and quality of the devices they purchased. For example, the price of a wick-type stove was less than Rs.500/- while the price of a two-burner cooker was rather expensive and ranged between Rs.1000/- and Rs.2000/-. The vendors further had to incur cost of maintenance of kerosene cookers/stoves such as replacing wicks almost every month and other repairs required from time to time such as repairs to kerosene leakage. Meanwhile, vendors who had been using LP gas spent approximately Rs.7500/- to purchase both the cooker and the cylinder.

3.5 Income-expenditure and profits of the street food businesses

The type of food produced by the twenty-five street food vendors, their scales of operation and their daily expenditure on the business, their daily incomes and profits were found.

The daily profits generated by a majority (48%) of the vendors were less than Rs.500/- per day. The percentage of vendors who were able to generate a daily profit between Rs.500-1000 was 36%. The profits accrued by 12% of the vendors were in the range of Rs.1000-1500 while the balance 4% had a profit between Rs.1500-2000. In the context of vendors having relatively large families and several dependents to support with, the net profits generated by a majority of the vendors could be considered as hardly sufficient to meet the consumption needs of their family members, particularly at a time of increasing cost of living in the country as a whole.

The following Table shows the estimated total expenditures and incomes of the vendors and the proportion of energy expenditure from the total expenditure and incomes. The monthly expenditure and income is estimated on the assumption that a vendor on average operates for 25 days a month.

TABLE 9: STREET FOOD RELATED EXPENDITURES AND INCOMES OF THE VENDORS AND THE PROPORTION OF ENERGY EXPENDITURE

Street Food Vendor	Total Monthly Expenditure (Rs)	Total Monthly Income (Rs)	Monthly Expenditure on Energy (Rs)	Total Energy Expenditure as a % of Total Expenses	Total Energy Expenditure as a % of Total Incomes
Vendor No.1	22500	30000	531	2.36	1.77
Vendor No.2	14000	24250	760	5.42	3.13
Vendor No.3	16875	24250	660	3.91	2.72
Vendor No.4	14375	26250	1060	7.31	4.03
Vendor No.5	21000	35000	1050	5.0	3.0
Vendor No.6	59000	75000	920	1.55	1.22
Vendor No.7	81250	112500	4100	5.04	3.64
Vendor No.8	78750	100000	3370	4.27	3.37
Vendor No.9	50750	74875	4300	8.47	5.74
Vendor No.10	22250	26250	1200	5.39	4.57
Vendor No.11	63250	95000	6600	**10.4**	6.94
Vendor No.12	22200	25000	860	3.87	3.44
Vendor No.13	44375	62500	1240	2.79	1.98
Vendor No.14	24250	41250	3000	**12.37**	7.27
Vendor No.15	14375	25000	690	4.8	2.76
Vendor No.16	23750	41250	1740	7.32	4.21
Vendor No.17	16000	21250	1240	7.75	5.83
Vendor No.18	28250	45500	1765	6.24	3.87
Vendor No.19	30750	57500	2200	7.15	3.82
Vendor No.20	8125	13,625	1640	**20.18**	12.03
Vendor No.21	14125	23125	1500	**10.61**	6.48
Vendor No.22	12000	33750	-	-	-
Vendor No.23	97500	140000	4620	4.73	3.3
Vendor No.24	28125	35000	840	2.98	2.4
Vendor No.25	5000	11250	-	-	-

The table above further affirms the information already presented in Table 6 where it was shown that the expenditure incurred by a majority of the vendors on energy is negligible and is only an insignificant proportion of the overall expenditure incurred on the respective business enterprises. Energy consumption patterns also vary with the type and quantities of food prepared and sold by the vendors. It was only four vendors (16%) who had exceeded their energy expenditure over 10% with one vendor reaching 20% of the total expenditure. As such, many vendors interviewed did not observe expenditure on energy or the need for its conservation as a priority of their business enterprises. However, they were of the opinion that they would be able to benefit from a low-cost energy efficient stove/cooker, which absorbs less fuel, and preserve the heat particularly at a time when kerosene and LP gas prices are escalating and firewood is increasingly becoming a scarce commodity.

4.0 OBSERVATIONS AND RECOMMENDATIONS

The present study observes a greater potential for intervention in improving the energy usage by the street food vendors and the efficiency of their devices primarily because of the following three reasons. They are as follows;

- A majority of the vendors are dependent on kerosene, which is subject to fluctuation along with the change in global market prices. However, street food vendors still perceive kerosene use as relatively cheap and convenient to them. Thus, improving the efficiency of the kerosene cookers/stoves used by them and optimizing the fuel usage could bring desirable effects/benefits on the vendors. Such interventions would enable them to minimize any adverse effects on their business enterprises resulting from increasing fuel prices.

- The proportion of fuel cost incurred by a majority (84%) of the vendors was less than 10% of the overall monthly business expenditure. Though this expenditure was perceived by the vendors as insignificant at present, any reduction in the cost of energy will have a direct bearing on the profit margins of the vendors and improve their returns to labour. It was noted that the daily profits of a majority (48%) of the vendors were less than Rs.500/-.

- 40% of the street food vendors lived in slums where their dwellings were small and congested. Many vendors complained their inability to use firewood hearths inside their houses due to smoke and soot that such hearths generated. The vendors who placed their hearths outside their houses could not use them on rainy days and were unable to conduct their businesses. They are unable to purchase LP gas cookers because of the high investment capital required. Thus, interventions to introduce appropriate devices and improve the efficiency of energy usage will not only improve the home environment and the health conditions of its inmates but will also ensure the continuity of their enterprises even during rainy days.

As mentioned above, almost 76% of the street food vendors were dependent on kerosene as a source of energy for preparing their food. There were several reasons for their over dependence. The mobile tea vendors in particular found that it was convenient for them to carry kerosene stoves in the market place. Similarly, the initial investment for kerosene cookers/stoves was relatively low while kerosene was readily available for them in the nearby boutiques. Another advantage of kerosene was that unlike LP gas, vendors did not have to purchase it in bulk and make a one-time payment (refer Table 4). However, vendors experienced difficulties with their stoves such as leakage of kerosene which required frequent maintenance and repairs to their stoves (refer Table 5). An observation of the vendors was that the cost of maintenance and repairs increases when stoves are used for more than two years. Despite these difficulties, vendors expressed their preference to work with kerosene cookers/stoves over gas cookers and firewood, as they did not have alternative devices/energy, which could replace kerosene cookers, and sustain the relative advantages that it currently brought to the vendors. Any interventions to improve the efficiency of the existing kerosene cookers/stoves or to introduce alternative devices/energy to vendors require further experimentation of technical nature. However, from a sociological point of

view, this study points to some of the important criteria that need to be taken into consideration when such interventions are designed and planned. They are;

- ***The initial investment of a device should be relatively low and affordable to the vendors.*** As this study has already pointed out, profits generated by a majority of the vendors from their business enterprises remain relatively low (48% less than Rs.500/- and 36% between Rs.500/- to Rs.1000/- per day) and are hardly sufficient to meet the consumption needs of their dependent family members. Thus, vendors are unable to make relatively large investments, as their savings too remain small.

- ***The convenience of the vendor particularly those who are mobile should also be taken into account.*** In congested market places, vendors are unable to carry heavy and large devices. They also cannot use relatively expensive devices, as they do not have secure places to keep their stoves in the night. They cannot carry them home as they lived far away from their market places and used public transport to travel. This study observed that many mobile vendors have left their stoves in the night in boutiques belonging to their friends, as they did not have alternative places for its safe keeping.

- ***The operation and maintenance costs of the device need to be relatively low***. As already pointed out, vendors working with kerosene stoves do not have to buy kerosene in bulk and can buy it only when their cookers/stoves run out of kerosene. They can see for themselves the remaining quantities in the tank (unlike gas) and easily buy it from the nearby boutiques. Further, small repairs could be attended to by the vendors themselves without incurring heavy expenses (refer Table 4).

As pointed out in the earlier baseline survey conducted with 100 street food vendors, there is no complete enumeration of street food vendors operating in Sri Lanka. The baseline survey and the present study conducted with twenty-five street food vendors generated only a few insights to understand the relationship between energy and street food. The studies highlighted the diversity and the complexity associated with the street food business in respect of energy usage. They further pointed to the perceptions of the vendors on the use of a particular source of energy, the difficulties and constraints experienced by them, the costs involved in energy use etc. However, one has to be cautious in generalizing the findings and insights generated in the present studies to the larger population of street food vendors as the present coverage of the street food vendors is hardly adequate to make such a justification. Therefore, a larger study/survey covering a substantial number of vendors is recommended not only to assess the applicability of the insights gained from the present studies but also with a view to identifying the macro-level implications of energy use patterns of the street food vendors and the technological and other interventions required.

……

2.4 International Workshop report (October 28/29th 2001, Bangladesh)

Summary of Proceedings of International Workshop on
ENERGY ISSUES IN STREET FOOD SECTOR

Venue : Thengamara Mohila Sabuj Sangha(TMSS)
(A women-oriented Development Organization)
Gokul, Bogra, Bangladesh, October 28-29, 2001

Prepared by:
Naved Ahmed Chowdhury, Manager, Energy and Street Food Project,
ITDG-Bangladesh

Background

The international workshop on ENERGY ISSUES IN THE STREET FOOD SECTOR was held on October 28-29, 2001 at the auditorium of Thengamara Mohila Sabuj Sangha (TMSS), a women-oriented development organization in the northern town of Bogra. The purpose of the workshop was to share and disseminate comprehensive reports of in-depth participatory survey conducted with street food vendors both in Bangladesh and Sri Lanka with a view to identifying the possible strategic intervention guidelines for piloting the second phase of the project. In the first phase, a baseline socio-econmic survey of the street food vendors was carried out in order to explore their fuel use pattern. The study covered 114 street food vendors both in Dhaka city and peri-urban areas of Bogra. The base line survey was followed by an in-depth study to determine the impact of fuel use on environment and profit margin and health of the street food vendors. The in-depth study covered 54 vendors who were selected from the 114 people covered earlier in the base line survey conducted in Dhaka and Bogra. The second phase will concentrate on training and providing cook stoves to the beneficiaries

Objectives

The objective of the workshop was to discuss and share views on the energy efficiency in the street food sector and to raise the livelihoods of the poor people engaged in the food
sector which is generally overlooked by the government and other development intervention agencies. The workshop also aimed to share and disseminate the findings of in-depth surveys separately conducted in Bangladesh and Sri Lanka on the present fuel use pattern and devices. The surveys also laid importance on socio-economic aspects of the lives and livelihoods of the people engaged in the street food sector.

Organizer

ITDG-Bangladesh in collaboration with TMSS organized the workshop. Mr. Naved Ahemd Chowdhury, Energy and Street Food Project Manager, ITDG-Bangladesh

presented the country paper on the in-depth study findings while Mr. Susil Liyanarachchi Project Manager, ITDG-Sri Lanka presented the country paper on behalf of his country. Leonard Tedd, International Project Manager, Energy and Street Food, ITDG-UK also attended the workshop.

Dr. A M Hasan Rashid Khan, Project Director of Institute Of Fuel Research and Development (IFRD) of Bangladesh Council For Scientific and Industrial Research (BCSIR), a governmental research organization promoting low cost energy-saving devices and systems, also attended the workshop as special guest.

BCSIR and TMSS were partners in the Street Food and Energy Project. Individuals involved in street food vending, development workers from Government and NGO sectors attended the workshop.

Inauguration

Energy and Street Food Project Manager Naved Ahmed Chowdhury welcomed the participants and delivered a brief outline of the purposes and objectives of the workshop. Prof. Hosne Ara Begum of TMSS chaired the inaugural session while Dr. Hasan Rashid Khan of IFRD, BCSIR delivered the speech of special guest. Ms. Veena Khaleque, Country Director of ITDG- Bangladesh delivered the vote of thanks.

Speaking as the Special Guest, Project Director, Institute of Fuel Research and Development, BCSIR, Dr A. M. Hasan Rashid Khan said that a woman usually suffers the effect of smoking 20 cigarettes if she cooks in a traditional cook stove for one hour. Justifying the need for improved cook stove, Dr Khan said, "The traditional cook stove can only use 5 to 15 per cent of the fuel and the rest is wasted." He said an average-size family burns around two tons of fuel wood every year but the introduction of improved cook stove would reduce the fuel requirement by around 50 per cent.

ITDG-Bangladesh Country Director Veena Khaleque said that expensive technologies are hardly cost effective and sustainable. "That is why, we will have to go for appropriate technologies which are environment-friendly, suitable for users and build on local knowledge and resources.

Veena Khaleque said the problem of fuel use is now a global problem and the future of human being largely depends on the effective and safe use of fuel.

Manager of the Energy and Street Food Project of ITDG-Bangladesh Naved Ahmed Chowdhury said the use of energy has links with poverty and the poor are compelled to bear the brunt of using less effective fuels exposing them into health hazard, pollution and extra expenditure. He also underscored the need for institutional support to enable the street food vendors to use fuel more efficiently for raising their profit margin, reducing health hazard and to check environmental pollution.

Executive Director of TMSS Prof. Hosne Ara Begum in her address of the chair appreciated ITDG-Bangladesh's role in the field of development providing appropriate technology support to elevate the skills of unskilled people and to create awareness and ability of people in using the huge un-utilized resources in Bangladesh.

She also emphasized the need for adopting technology as an indispensable part of development with wisdom, clear vision and strategy, supervision and a regular follow up for a sustainable achievement through institutional structure.

Leonard Tedd of ITDG-UK and Susil Liyanarchchi from ITDG-Sri Lanka also spoke at the inaugural session. Over 60 participants including researchers, development practitioners, street food vendors, academicians participated in the event and formulated an action plan to address the problems of street food vendors with a total and integrated approach so that they can improve their livelihoods.

The Working Sessions

There were two sessions on the first day of the two-day workshop. The inaugural session gave an overview of the program reflecting the policy issues which are relevant to the Energy and Street Food sector as well as the future plans for intervention in the sector which has so far been addressed neither by the government nor the NGOs. In the second session, Naved Ahmed Chowdhury presented the Bangladesh Country Paper on the In-depth Study Findings while Mr Susil Liyanarachchi presented the Country Report on the Study conducted in Sri Lanka. Presentation of both the papers was followed by open discussions, which highlighted the issues, concerns, and problems faced by the street food vendors. The discussants draw comparision between the Bangladesh and Sri Lankan perspectives of Energy and street Food issues and suggested some initiatives with a view to improve the livelihoods of the poor people involved in street food vending. In the evening, TMSS Deputy Director for Planning and Management Mr. Khorshed Alam presented an overview of TMSS activities, its accomplishments and specialization.

Institutional Support

In spite of the sector's importance, howsoever informal it be, in the economy in respect to providing cheap food to millions of working people as well as creating countless employment opportunities both at individual and family level, there has been no specific effort from any quarters to look into the interest of this sector. No regulatory rules have been framed for the sector so as to ensure the health & hygienic and environmental aspects.

Concluding Remarks

The urban-based vendors, particularly in Dhaka city, faced constant threat and extortion from law-enforcing agencies and local mustans/muggers, as they have to operate their business under no institutional legal coverage.

Use of fuel by the vendors is conditioned by local availability. Whereas in Dhaka, vendors use kerosene and wood for cooking purpose, the vendors in Bogra's peri-urban areas use twigs and kerosene. Bogra vendors prefer twigs as these are available locally at a cheaper rate. The stove that they use in both Dhaka and Bogra are mostly the earthen and tin stoves. Their average daily expenditure on fuel is below Tk.50/-. Most of the vendors reported to have faced little or no problem in using fuel.
This cooking system has been found to be popular with the rural households for its efficient use of the energy. Such improved stove can be provided to the street food

vendors through collaboration with BCSIR, which also provides necessary training to the customers of their products.

In conclusion, it can be said that while this baseline survey on energy use by the street food vendors have revealed interesting information about their socio-economic condition, their business operation and use of fuel therein, there is a scope for further broad-based studies in this very important sector of the economy. The pattern of fuel use by the vendors and other related issues deserve to be further investigated, in view of its implication into the environmental aspect of the country. It is time for the concerned government agencies to take up appropriate regulatory measures so that the street foods taken by millions of people are safe and healthy for them, environmental degradation being caused by unscientific and indiscriminate use of energy sources by the vendors are minimized.

Discussion and comments

The participants critically analyzed the paper making points on various issues such as livelihoods, poverty alleviation, energy use, health hazard, legal problems of the vendors, deforestation, climate change and other issues and concerns relating to Energy and Street Food sector.

Referring to the fact that in many countries street food sector is considered as a formal sector, the participant also stressed the need for a proper legal support for the people in street food business so that they are legally recognized and can run their business without harassment and oppression. Another discussant said that the street food vendors should be supported to form their association so that they can bargain with the government and other functionaries in order to safeguard their interest as a whole and can influence policy formulation. Discussants also cited examples of several countries like India, Malysia, Thailand etc where street food sector has tremendously developed and suggested to share experiences from those countries to apply those in our perspectives. The entire discussion was dominated by the energy needs of the street food vendors as well as the needs to increase their efficiency in energy use in order to reduce their expenditure for fuel, rasining their profit margin, containing air pollution and above all, to improve the standard of living of the people in street food business.

After a long group discussion and brain storming session, participated & represented by Leonard Tedd- Energy Unit-ITDG UK, Susil Liyanarachchi- Project Director – ITDG- Sri-Lanka, Naved Ahmed Chowdhury- Project Manager- ITDG-Bangladesh and the local partner NGO Thengamara Mohila Sabuj Sangha(TMSS) and other concerned people, it was unanimously agreed that an integrated piloting intervention with **fuel efficient devices** will be introduced both in Sri Lanka and Bangladesh under the following criteria:

a) An Improved Cook Stove developed
b) The stove, which will be developed, will ensure efficient energy use
c) It will encourage huge supply of briquette as an alternative fuel source thus reducing pressure on our forest resources
d) The current project will continue till December 2002 instead of August 2002

As part of the piloting intervention, **at least two training courses** will be launched to build up the skill of the street food vendors so that they can construct the improved cook stove and acquire technical know-how to operate, maintain and manage the energy efficient system in a better way.

It was also proposed by the project director-Sri Lanka that people in Sri Lanka will have to be organized to build up awareness about the benefit of the utilization of the improved cook stove. Moreover, food vendors will have to be organized, through consultation, discussion and motivation following a participatory method. Their opinions, problems and priorities should be taken into consideration.

Street Food Vendor preparing Jalappy. Dhaka, Bangladesh.
The stove is a pump-kerosene type.

2.5 Laboratory efficiency testing in Sri Lanka

RMA study, Sri Lanka.

Acknowledgement
This study was conducted as a follow up of the recent survey and study conducted by ITDG South Asia on "Energy For Street Food". This study was sponsored by ITDG.

H.A Vimal Nadeera
Project Engineer
June, 2002

1 INTRODUCTION

This is based on the findings of the 2nd part of the Street Food & Energy Project. Research carried out on the every devices used in street food vending and the efficiencies of these devices showed that there is a scope for improving the efficiency of conventional stoves used in food preparation. This consultancy is to design improved stoves and testing the efficiencies of improved versions before pilot testing with the street food vendors.

Several stoves are used by the vendors of street food for on street and off street preparation and warming up of food. One of the expected out puts of the project is to design a more efficient down draft single mouth stove and up draft double mouth stove.

1.1 Disadvantages of Traditional Stoves

The traditional stoves generally used all over the country cause unnecessary loss of heat due to the following reasons.

1. The stoves are too deep, depth ranging from 30 to 60 cms. Because of the large distance between the pot and fuel bed, heat transfer to the cooking pot is considerably reduced, resulting in low efficiency.

2. Because of the large size of the fuel gas exists between the cooking pot and the stove, much of the flue gases get out of the stove without coming in contact with the cooking pot thus lowering the convective heat transfer.

3. As air cannot reach the bottom of the stove, a considerable amount of fuel remains un-burnt and accumulates at the bottom as charcoal.

Thus main disadvantages of the traditional stove are,

- Consumes too much fuel wood and thus efficiency of the stove is low, 5-14%.
- Smoke emission causes health hazard to the users: eye irritation, respiratory diseases, headache etc.
- Release of particulars and polycyclic organic matter (POM) cause thick layers of soot in the kitchen walls and its surroundings.

- Sometimes causes fire hazard.

1.2 What are improved stoves?

The improved stoves are those which save more fuel and comfort in cooking than those of traditional one. Since the early seventies, scientists and technologists all over the world, reacting to the alarming crisis of traditional fuels, The improvement was made by proper dimensioning of combustion chamber to provide maximum heat transfer to the utensils. The number of improved stoves have been developed to suit the requirements in respect of biomass fuel types, shape of cooking pots and cooking habits.

Advantages of improved stoves are,

- Saves 30 - 35% traditional fuels.
- Reduces CO_2 emission in the atmospheres & thereby reduce the green house effects.
- Maintains the proper nutritive values of the cooked food.
- Helps conserve the forest resources of the country.
- Saves cooking time.
- Comfort in cooking
- keeps the kitchen environment pollution free and thereby check the health hazard of the users.
- Less fire hazard
- Reduces blackening of utensils
- Construction material are indigenous and easily available.

2 DESIGN AND CONSTRUCTION OF IMPROVED STOVES

2.1 Down draft Single Mouth Wood Stove

This consists of three main parts:

1. Fire chamber
2. Pot hole
3. Chimney as shown in fig. No.1

a) Fire chamber

The fire chamber is made of clay. At the bottom of the chamber, there is a grate. The grate is made by placing metal strips. The distance between the grate and the top of the fire chamber is 12.5 cm. The chamber is connected with a pot hole through a 7.6 cm diameter cylindrical hole below the grate.

b) Pot hole

The pot hole is placed between the fire chamber and the chimney and its has a mouth of 24 cms diameter. Its bottom is made slanting downwards from the centre towards both sides along the direction of the flow of the combination gases. This pot hole is connected with the chimney through a 7.6 cm diameter hole.

c) Chimney

The chimney (180 cm high & 9 cm diameter) is placed on a flat platform at a distance of 10 cm from the pot for creating necessary draft. This chimney leads the flue gases out of the stove.

2.1 Up draft Double mouth Wood Stove

This consists of following parts:

1. Two pot holes
2. Grate
3. Feed hole/ash outlet
4. Chimney
5. Air intake

Two dice of equal size are placed one after another in such away that there is a little space (10cm) between them. A rectangular mud platform (120cm x 40cm x 20cm) is made by putting mud around the dice. After a while, both the dice are removed by twisting from the mud platform. It is then allowed to dry for 1-2 days, then hedge is made at 15cm below from the top to hold the grate. Later on feed hole, one ash outlet, one exit for flue gases and a chimney holder are made according to dimensions of the stove, as shown in fig. No.2. The second mouth is partially filled up with mud, thus a slanting is made from the grate to the second flue gas exit. A chimney having appropriate dimensions made of M.S sheet, mud is places on the chimney holder. The chimney creates the necessary draft and carries the flue gases out of the kitchen. The top surface of two mouth must be smooth so that on placing the utensils no smoke or fire can escape through the space between the utensil and the mouth. Then the stove is suitable for burning.

Table 1- Materials required for making improved stove

S.No	Items	Quantity
1.	Clay(Fine potters clay is most appropriate)	9 Pans
2.	Sand (fine)	9 Pans
3.	Ash	3 Pans
4.	Cow dung (fresh)	1.5 Pans
5.	A chimney (180 cms long & 9 cms dia.)	1
6.	Broken earthen ware, for making shelf for supporting the grate	3-4 pieces

2.3 How to use the Stove

- Cooking in the first mouth is done by direct burning of fuel on the grate and in the second mouth by the hot flue gases coming out from the first mouth.
- Fuel is added according to need.
- During cooking two pots are simultaneously placed on the two mouths of the stove. When the cooking item in the first mouth starts boiling it is then interchanged with cooking item of the second mouth.
- An up draft of air is crated trough the chimney which leads the smoke out of the kitchen.
- When the cooking items reached the boiling stage feeding of fuel in the stove should be reduced in such away that, the boiling is just maintained.

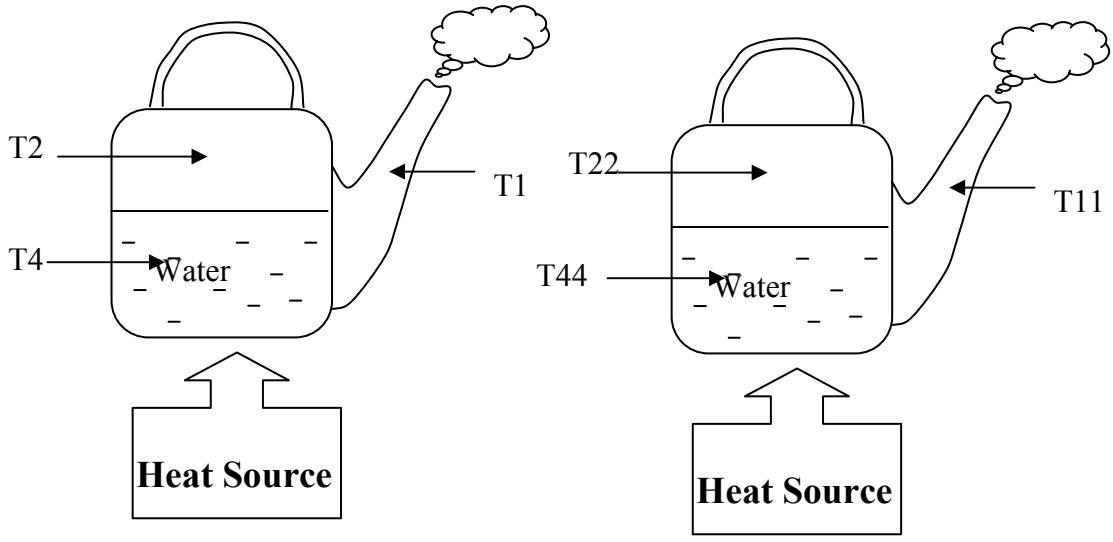
"Excessive burning of fuel will never hasten cooking time rather it decorates the cooking quality of the food."

3 STUDY METHODOLOGY

3.1 Standard Water Boiling Test

A standard two vessels (Aluminium Kettles) were used to boil one kg of water, with each vessels for double mouth up draft stove. And one of the above vessel was used to boil one kg of water for each type of stove. Water at ambient temperature was heated to the boiling point, and was held under the boiling condition for five minutes. The total fuel consumption and total duration was measured for each type of stove. The test was repeated three times for the each type of stoves.

Fig.No 3



All relevant data, such as the evolution of temperatures (T1,T2,T11,T22) at different points on the vessels, as well as in the water(T4, T44) were recorded. The water was allowed to remain boiling for five minutes after reaching the boiling temperature, and the mass of water evaporated was then recorded. Finally, the volume or the mass of fuel consumed during the test was estimated.

3.2 Tests on Stoves

The test was repeated three times on each stove. All the data logged were interpreted in the graphical form for better visualisation. The evolution of the mean temperature on kettles and water with respect to time, cumulative energy absorbed by the kettles and water, cumulative energy absorbed, and the cumulative Efficiency (Efficiency based on cumulative energy) were also calculated and plotted. The following equation was used to calculate the overall efficiency for each stove. All detail test results are given in the following sections.

$$\text{Overall Efficiency} = \frac{\text{Heat absorbed by water} + \text{Heat absorbed by evaporated Vapor} + \text{Heat absorbed by Kettle}}{\text{Amount of Heat supplied by fuel}}$$

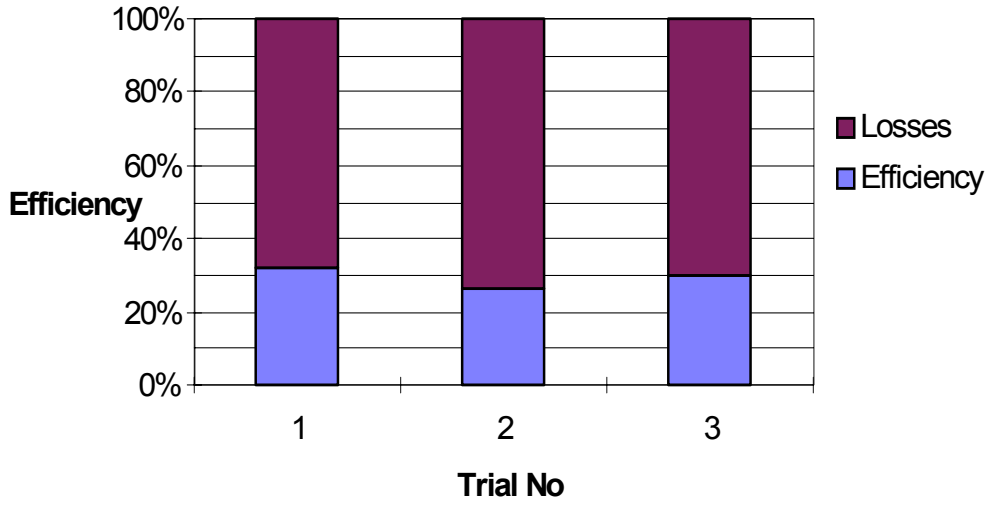
Assumption: It was assumed that the water evaporation rate after boiling point is constant.(Because the surface area of the water is constant) and that there was no evaporation prior to boiling.

3 STUDY RESULTS

3.1 Up draft Double mouth Stove

Figure 4 shows the results of the Up draft Double mouth Stove. The three trial recorded overall efficiencies of 32%, 26%, 30%.

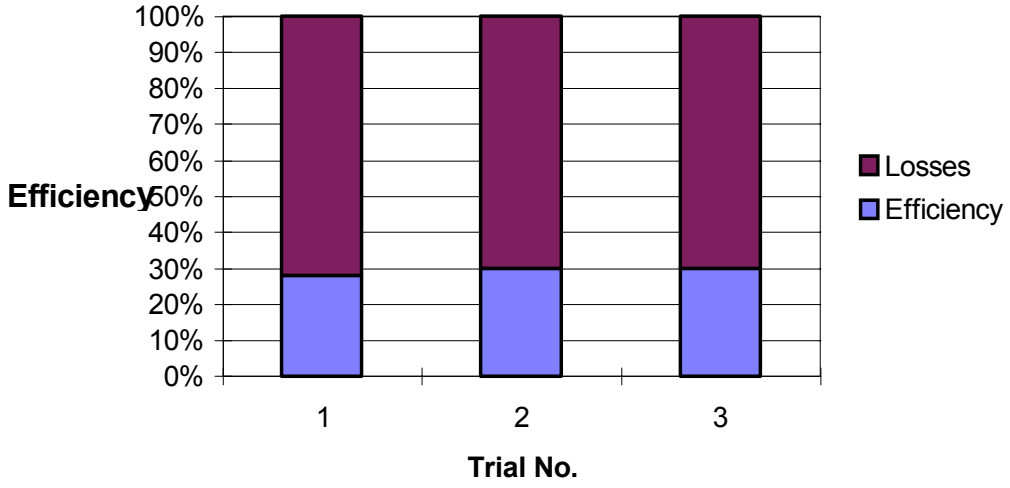
Figure 4-Overall Efficiency of the Up Draft double Mouth Wood Stove



3.2 Paddy Husk Stove

As shown in figure 5, tests on the Paddy Husk Stove gave efficiency of 28%, 30%, 30%

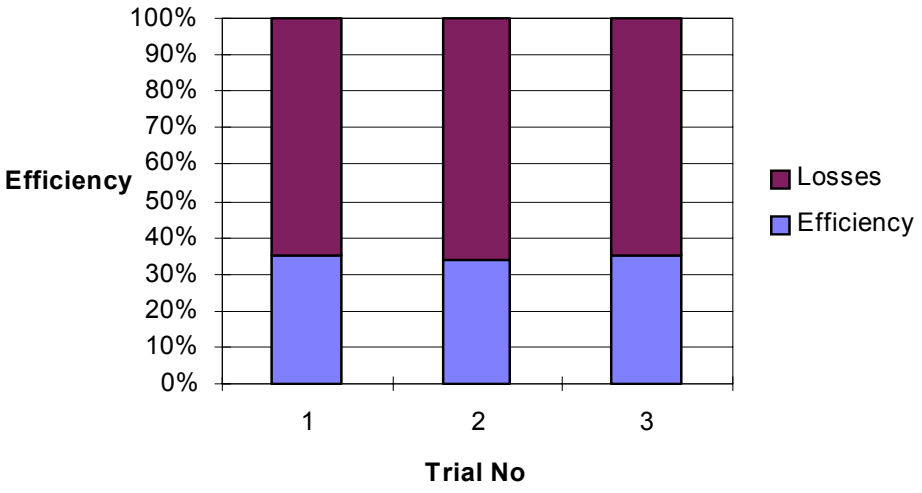
Figure 5-Overall Efficiency of the Paddy Husk Stove



3.3 NERD Stove

Figure 6 shows the results of the three trials on NERD Wood Stove. The three trial recorded overall efficiencies of 35%, 34%, 35%.

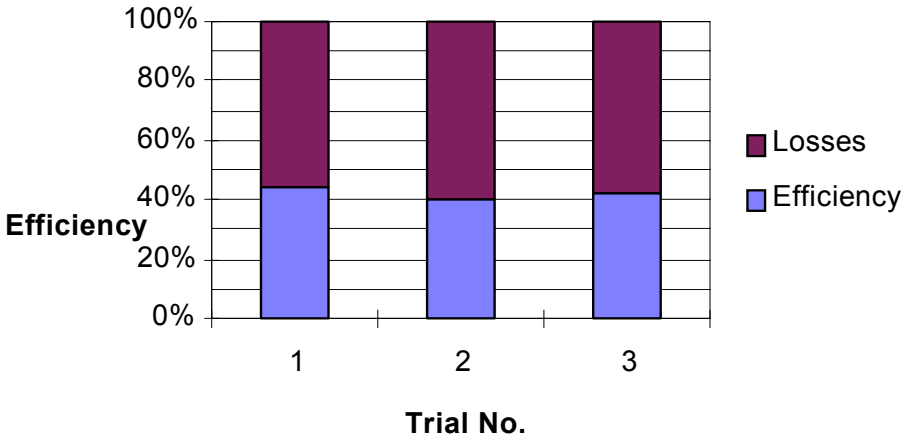
Figure 6-Overall Efficiency of the NERD Wood Stove



3.4 Kerosene Stove with Chimney

As shown in figure 7, tests on the Kerosene Wick type Stove with chimney gave efficiency of 44%, 40%, 42%.

Figure 7-Overall Efficiency of the Kerosene Stove with chiminy



4 SUMMARY OF RESULTS AND CONCLUSIONS

Table 2 gives a summary of test results.

Table 2- Summary of Test Results

No	Stoves	Range of Efficiency Reached during Trials	Highest Efficiency (%)
1	Up draft Double Mouth Stove	26% to 32%	32
2	Down draft Single Mouth Stove	NF	NF
3	Paddy Husk Stove	28% to 30%	30
4	NERD Stove	34% to 35%	35
5	Kerosene Stove with Chiminy	40% to 44%	44

NF - Not Funtioning

Using the test results, the fuel cost of supply a unit of useful thermal energy to the kettle was calculated for each stove. The fuel cost and heat content data are also shown in the Table 3.

Table - 3

Type of Stove	Fuel	Kcal/kg	*Rs/kg of Fuel	Rs/1000 Kcal of	Stove Efficiency	Cost of 1000 Kcal effective

				Fuel Input		(Rs)
Updraft Double Mouth Stove	Fire Wood	4,067	3.00	0.738	32	2.3
NERD Stove	Fire Wood				35	2.1
Paddy Husk Stove	Paddy Husk	4,000	0.50	0.125	30	0.42

4.1 Conclusions

The results of the efficiency measurements, compared with the traditional stoves are very high. If the paddy husk are available, the usage of paddy husk stove is very economical. In this study, good combustion is characterized by low CO concentration, no smoke formation, low concentration of organic compounds in the flue gases and high temperature near the fuel bed. From the health hazard point of view, CO is considered to be the most important factor in the cooking stove. During the simmering period smoke formation was considerably less, but it was never smoke free.

2.6 Results of Pilot Testing of improved stoves with Street Food Vendors, Sri Lanka

Conducted by ITDG South Asia, Colombo, Sri Lanka

Project Team
Susil Liyanarachchi – Team Leader, ITDG South Asia
Chamindra Weerackody – Consultant Sociologist
Wimal Nadeera – Consultant Engineer
Midantha Immaduwage – Field Coordinator
Hemantha Chitrasena – Field Coordinator

Contributing Organizations
Resource Management Associates (Pvt.) Ltd.
Energy Conservation Fund
NERD Centre
Colombo Municipality Council

In 2002, a pilot project was launched by the ITDG to introduce energy efficient stoves to the street food vendors and assess their technical, economic and social feasibility. For this purpose, three types of stoves were identified. They were the a) double mouth stove adapted from a Bangladesh model, b) paddy-husk stove, a model developed by the Energy Conservation Fund and c) NERD stove. Both stoves a) and b) were fabricated by a local manufacturer under the supervision of an Engineer while the NERD stove was purchased from the NERD Centre. A description of the three types of stoves and their technical designs appears in **Annex 2**.

Selection of vendors to participate in the pilot project

The stoves selected for experimentation were distributed among 11 street food vendors identified on the basis of the following criteria. They were;

- Willingness of the vendor to participate in the pilot project
- Both male and female vendors
- Vendors preparing different food types
- Ability of the vendor to find raw material such as fire wood, paddy husk etc.

Mobile vendors were excluded from the pilot project as none of the stoves suited their requirements. A description of the vendors who participated in the pilot project is presented in the following table.

Vendor No.	Male/ Female	Type of food prepared	Type of stoves currently used	Energy efficient stove introduced

1	Female	String hoppers, hoppers, *Pittu*, short-eats	Conventional firewood hearth with three sides covered and constructed with clay	NERD Stove
2	Male	String hoppers	Wick-type kerosene stove	NERD Stove
3	Male	*Wade*	Kerosene pressure cooker	NERD Stove
4	Male	*Kolakenda,* hoppers, *Seeni sambol*, tea	Wick-type kerosene stove	Paddy-Husk Stove
5	Male	Rice and curries	Three conventional firewood hearths constructed with metal stones	2 Double Mouth Stoves (large and small)
6	Male	Gram, green gram and *wade*	Conventional firewood hearth with three sides covered and constructed with clay	Double Mouth Stove
7	Male	Gram, green gram and *cow pea*	Conventional firewood hearth & wick-type kerosene stove	Double Mouth Stove
8	Male	Rolls, *Seeni sambol* and dhal curry	L.P. gas cooker	Double Mouth Stove
9	Female	Rice and curries	Conventional firewood hearth constructed with three metal stones and conventional firewood hearth with three sides covered and constructed with clay	Double Mouth Stove
10	Female	*Kolakenda*	Conventional firewood hearth constructed with three metal stones	Double Mouth Stove
11	Male	*Kolakenda*	Conventional firewood hearth constructed with three metal stones	Double Mouth Stove

Monitoring the use of energy efficient stoves - Methodology

The monitoring of the use of energy efficient stoves by the street food vendors was conducted at three different levels. They are as follows;

Stage 1: Collection and documentation of basic information on the current energy use patterns and situation of the vendors. This information was collected through personal interviews conducted with the vendors at the time of delivering the energy efficient stove.

Stage 2: Documentation of experiences and perceptions of the vendors on the use of energy efficient stoves. This exercise was conducted through personal interviews conducted with vendors two weeks after they started using energy efficient stoves.

Stage 3: Recording of the use of energy efficient stoves by the vendors on a daily basis. This was done through a self-administered format introduced to the vendors. A weighing scale was provided to the vendors to measure the daily quantities of firewood and paddy husk used by them.

A researcher who worked under the guidance of a social scientist was assigned the task of identifying the appropriate vendors to participate in the pilot project and carrying out the monitoring process described above. Not all vendors selected could participate in the project at the same time and continue for the same length of time. Some vendors selected did not continue in the project and abandoned the use of stoves after some time. As such, new vendors had to be selected to replace vendors who failed to continue. Therefore, periods of participation in the project differed among the vendors. Also, there were periods when vendors could not use their stoves continuously due to social and environmental factors.

Monitoring results – Use of stoves

The table below presents the periods of monitoring the use of energy efficient stoves by the vendors and their current status. Accordingly, the NERD stoves have been completely abandoned by their users. The key reasons are a) lack of electricity facilities, b) difficulty/lack of interest to chop firewood into small chips and c) insufficient heat generated by the stove for cooking large quantities of food. Meanwhile, paddy-husk stove too has been abandoned by its user as, a) he could not find dry paddy husk, b) it generated a lot of smoke and c) heat generated was not adequate for boiling water.

Of the 7 double-mouth stoves, four vendors have successfully used them as they a) generated and retained adequate heat b) consumed less firewood and c) generated less smoke and soot. Two vendors have abandoned the use of double mouth stoves as the heat generated by the stoves was not sufficient for cooking the large quantities of food they prepared. It was subsequently found that the type of stoves given to the vendors was not large enough to hold the large vessels used by vendors to cook their food. As such the heat generated from relatively small stoves was not sufficient for cooking large quantities of food. One other vendor could not use the stove as she was under pressure from her landlord not to use the stove.

Vendor No.	Period of monitoring	Current status	Reasons given for continuity/abandoning
1	12.7.02 – 4.9.02	NERD stove - never used the stove	• Lack of space inside the house/kitchen (about 15 people are living inside the small house)

			• Lack of an electric plug point inside the kitchen • Lack of interest to chop firewood into small pieces and lack of time for chopping
2	22.10.02 - 29.10.02	NERD stove - used only once and abandoned	• Difficulty to chop firewood into small chips as it is time consuming • Difficulty to insert firewood chips once in every two hours • Difficulty to open the lid from time to time while using • Difficulty to re-charge the Dc battery (stove was given to him on his request and the promise that he would use a battery as he did not have electricity in the house)
3	22.8.02 – 4.9.02	NERD stove - used only once and abandoned	• Generated a lot of smoke • Soot generated was comparatively high • Heat generated was not sufficient for cooking • Took a long time for heating oil • Cannot carry the stove to the pavement for frying *wade* as there is no electricity • Cannot afford to use a DC battery • Lack of motivation to experiment
4	12.7.02 – 16.8.02	Paddy-husk stove – used only twice and abandoned	• Heat generated was not adequate for boiling water • Generated a lot of smoke • Difficult to place the stove inside the temporary hut due to heavy smoke • Inability to find dry paddy husk • Lack of space to de-hydrate paddy husk • Soot generated was comparatively high
5	16.7.02 – 20.10.02	Double mouth stove (small and large) – continue to use	• Small stove is not adequate to place large vessels • Less smoke and soot • Firewood required is comparatively less and three times lower than the firewood required for a conventional fire wood hearth • Generates adequate heat
6	16.7.02 – 29.8.02	Double mouth stove – used only once and abandoned	• Heat generated was not sufficient to cook large quantities of food • Was discouraged to continue as the stove could not generate required heat • Lack of covered space to keep the stove
7	16.7.02 – 24.8.02	Double mouth stove – used only twice and abandoned	• Heat generated was not sufficient to boil large quantities of gram • Lack of covered space to keep the stove (his house was dismantled by the Urban Development Authority as it was an illegal structure)
8	16.7.02 – 20.10.02	Double mouth stove – continued to use until 30.9.02	• Could reduce gas quantities used by 2/3 • After 30.9.02, he used LP gas cooker as he could not find firewood due to heavy rains
9	16.7.02 –	Double mouth	• Generates sufficient heat

	20.10.02	stove – continue to use	• Firewood required is comparatively less and can save about 10 kg per day • Less smoke and soot
10	24.10.02 – 29.10.02	Double mouth stove – never used	• The landlord of her house was jealous of her using the stove and did not allow her to use the stove
11	24.10.02 – 1.11.02	Double mouth stove – continue to use	• Firewood required is comparatively less and three times lower than the firewood required by the conventional stove

Use of Double Mouth Stoves

The use of double mouth stoves by the four successful street food vendors was as follows.

Vendor No.	Average quantity of firewood used per day	Average time used	Type of food prepared in a day	Average quantity of food prepared
5 (DMS – small)	3 Kg	2 hours	Rice, fish, meat and a vegetable curry	Rice – 2 kg Fish – 1 ½ kg Meat – 1 kg Vegetable curry – 4 kg
5 (DMS – large)	8 kg	2 hours	Rice, fish and meat	Rice – 14 Kg Fish – 2 kg Meat – 2 Kg
8	4 kg	4 hours	Dhal curry, *seeni sambol*, potato curry and egg curry	Dhal curry – 1kg *Seeni sambol* - 3 kg Potato curry – 1 kg Egg curry – 10 eggs
9	3 kg	4 hours	Rice, fish, and 3 vegetable curries	Rice – 5 kg Fish – 2 kg Vegetable curries – 3 kg each
11	1 kg	2 hours	Rice, dry fish, meat, vegetable curry	Rice – 750 grams Dry fish – 200 grams Meat – 250 grams Vegetable curry – 500 grams

It may be still premature to forecast the efficiency of the new energy stoves introduced in terms of its inputs and outputs. However, we would be able to reiterate the comparative advantages of the double mouth stoves as perceived by their users, namely a) they consume less firewood, b) they generate less soot and c) they generate less smoke.

Lessons learned

Despite the fact that energy related costs borne by street food vendors remain comparatively low, interventions to improve the efficiency of their fuel usage and reduce their vulnerability to market fluctuations would obviously bring a positive impact on the street food vendors and their enterprises. However, it is important that following aspects are also seriously considered in designing and planning energy related interventions in the street food sector. They are;

- Affordability of the vendor to make the initial investment in the energy efficient stoves
- Convenience of the vendor to use the stoves
- Affordability of the vendor to operate and maintain the stoves

The pilot project conducted with street food vendors observed a number of factors that need to be taken into account in designing and introducing energy efficient stoves. Among them are a) the social environment in which the vendor lives and operates, b) availability of raw materials to use the stoves (e.g. firewood, paddy husk, electricity), c) type and quantity of food they prepare and sell and d) the size of vessels they use for preparing food. Apart from these factors, it is also important that vendors change their attitudes and behaviors and shift from their conventional modes of operation.
The strengths and weaknesses associated with different types of energy efficient stoves should be further analyzed and appropriate measures should be taken to further strengthen their strengths and minimize the weaknesses. It is recommended that these stoves are also introduced to the community at large so that they could bring about significant environmental impacts particularly in a situation where fuel wood is still the main source of energy for a majority of the population. Energy efficient stoves that would consume less firewood will contribute to the conservation of the country's forest cover as well as to reduce health hazards caused through excessive kitchen smoke.

Figure 7 shows a street food vendor who piloted the stove in Sri Lanka. The double mouth stove on the right, and the improved larger stove is on the left. The mode of production for this vendor was preparation of lunch packets at his home, and transport to the busy Manning Market in Colombo. This vendor used biomass fuel exclusively.

Figure.7 Street food vendor with improved biomass stoves

2.7 Impact Assessment of Use of Improved Stoves in Bangladesh

Prepared by: Satya Ranjan Saha, Manager, Mostafa Haider Chowdhury, Coordinator

Chapter 1: Introduction

Following the baseline survey, another follow-up study was carried out among a selected 54 street food vendors to have an in-depth analysis of the situation. Additionally, some of the government and non-government organizations related with energy use were investigated in order to ascertain their possible involvement in providing any support to the street food vendors. This second phase study was followed with an international workshop in October 2001 with participants from Bangladesh, UK and Sri Lanka. The workshop identified the possible strategic intervention guidelines for piloting the second phase of the project.

1.2 Piloting of the Energy and Street Food Project:

Following the recommendation of the workshop, ITDG-B organized five training courses in 5 districts in the northern region of the country, namely Bogra, Joipurhat, Rangpur, Gaibandha and Kishorgonj. Under the five training courses, a total of 112 energy users 27 male and 85 female – were imparted training. These energy users were mostly the NGO group members. The training covered the following aspects of energy

a) Awareness raising regarding the inefficient use and wastage of fuel by traditional 'chula'
b) Construction process of 4 types improved stoves
c) Repair and trouble-shooting in respect to use of improved stoves.

A portion of trainees took part in trial cook in their long used traditional chula

A group of trainee participants are doing the art of making Improved Stove at TMSS, Jaipurhat

Janab Mahbuba Hasnat, Sadar Upazilla Nirbahi Officer, Kishoregonj is handing over the Improved Stove construction equipments among the trainee participants

The training was aimed at building up a work force for future construction of improved stoves in the participants' respective localities. As such, the trainee-participants were also provided with necessary equipments such as two dice, one each of scale, knife and scissor for facilitating construction activities, and two nets (chakni), one chimney and one cap for use while cooking. Except in Kishoregonj district, the training sessions were organized during the months of December 2001 – February 2002. For Kishoregonj, the training was organized only recently, in the month of September 2002.

Additionally, a few of the concern NGOs were also provided equipment support for demonstrating the construction and use of improved stoves in the districts of Madaripur, Bogra, Joipurhat, Rangpur and Gaibandha. These equipment supports were aimed at demonstrating the improved methods of fuel use among the food processors.

1.3 Rationale of the Study:

This study was undertaken one year after the training and equipment supports were extended to the trainee-participants in four districts under this pilot phase, except in the district of Kishoregonj. In the follow-up, it was found that the trainees have been using the improved stoves both at family level as well as for commercial purpose. They have also been engaged in popularizing the use of improved stoves in their neighborhood, and some of them have even helped others in making of the stoves. One-year time may not be enough to measure the full impact of use of improved stoves, even then it is expected that there would be some effect level changes. As such, it was thought worthwhile to have an assessment study on the extent of use of improved stoves as well as its economic, hygienic and environmental implications.

1.4 Specific Objectives of the Study

The specific objectives of the study have been:

a) To assess whether use of improved stoves has increased or not.
b) To measure the extent of fuel savings both in terms of volume and cost.
c) To measure the extent of time saved through use of improved stoves.
d) To elicit the users' perception on health and hygienic effect of improved stoves.
e) To elicit the users' perception on environmental impact of use of improved stoves.
f) To elicit customers' perception on health, quality of food items as well as environment by use of improved stoves.

1.4 Study Methodology:

The main study instrument was administering of a structured set of questionnaire to the 100 respondents. Out of the total respondents, 50 were from amongst the trainees who were selected from a total of 100 trained persons from the four study districts, namely Bogra, Joipurhat, Gaibandha and Rangpur. These 50 trainee-respondents were selected through application of random sampling. Another 30 respondents were from the NGO-motivated and supported community and group members. As for the remaining 20 non-trainee respondents, they were selected from the neighborhood purposively, on being identified by their trainee-motivators and the NGO staff. Recall

method was used for comparing the effect and impact level changes between the two periods of the traditional and improved stove use.

Chapter 2: Findings of the Study

The findings of the study have been presented in this chapter following the sequence of investigation as reflected in the questionnaire. In other words, the findings on the socio-economic features of the respondents are presented first, followed by the information on processing of food items, technological issues, impact of use of improved stoves on economic, health and environment factors.

2.1 Socio- economic features:

The socio-economic characteristics of the respondents were investigated and the findings are tabulated in the table below:

Table-1: Socio-Economic Characteristics of the Respondents.

Variables	N=100	%
A. Sex distribution		
Female	95	95%
Male	5	5%
Total	100	100%
B. Marital status		
Married	97	97%
Widow	1	1%
Divorced	-	-
Deserted	1	1%
Unmarried	1	1%
C. Age distribution		
00-30	53	53%
31-40	34	34%
41+	13	13%
D. Profession		
Housewife	61	61%
Food processors	27	27%
Service holders	10	10%
Social worker	2	2%
E. Family members #		
2-3	20	20%
4-5	48	48%
6-7	17	17%
8+	15	15%
F. Education status		
Illiterate	00	0.0%

Primary	28	28%
Secondary	25	25%
Higher secondary	3	3%
Graduation +	7	7%
Can sign only	37	37%

As the table depicts, a vast majority (95%) of the user respondents are female with only 5% male. Again, a still higher proportion (97%) of these respondents is married. As for age of the respondents, the majority (53%) is under 30 years of age or below, followed by another 34 percent whose age ranges between 31 and 40 years.

The distribution of the respondents' profession show that about more than half of them (61%) are simply housewives. Only 27 percent are actually food processors. There are ten (10) service holders and two social workers.

Almost a half of the respondents (48%) have their family members, whose number ranges between 4 and 5, followed by another 20 percent who has had 2-3 members in their families. Almost an equal proportion (17%) of the respondents has family members between 6 and 7. However, 15 percent of the respondents has family members equal to or above eight.

As for the respondents' educational status, none of them were found to be illiterate, although 37 percent indicated that they could sign only. Another 28 percent has education up to primary level, followed by another 25 percent who has education up to secondary level. The number of graduates and above is 7, followed by another three respondents who have education up to higher secondary level.

Marketing Process-

Table-3: Distribution of the Improved Stove users by the marketing process

Marketing Process	N=100	%
Made & sold by self	25	25%
Made by self & supplied to others	23	23%
Made by self & sold by family members	6	6%
For Self Consumption	73	73%

N.B. Multiple answers allowed

2.3 Technology Related Issues:

The issues related to use pattern of the improved stoves were also looked into. The findings are described below:

Types of IS used-

Table-6: Distribution of the users by types of IS used

Types	N=100	%
One mouth	48	48%
Two mouths with chimney	33	33%
Both of the above	5	5%
Commercial stoves	14	14%

As the above table depicts, almost a half of the respondents (48%) are using the IS with only one mouth, followed by another 33 percent who use two-mouth IS used for cooking food items both for family use and commercial purposes. Only 5 percent users use both of the above types. Another 14 respondents were found to be using commercial stoves. It appears that 11 of the users have installed commercial stoves in their houses, which are used for cooking food items both for family use and commercial purpose.

Types of fuel used-

As for the types of fuel used, the users said that they use twigs as their fuel (50%), followed by cow dung ball (48%) and leaves (29%). Heather and briquette are also used but at a much lesser proportion, 7% and 5% respectively. The use pattern of fuel is indicative of a typical rural scenario at family level. (Table-6)

Table-7: Distribution of the Improved Stove users by types of fuel use

Types of fuel	N=100	%
Twigs	50	50%
Heather	7	7%
Briquette	5	5%
Cow dung ball	48	48%
Leaves	29	29%

N.B. Multiple answers allowed

Topics learnt in the training-

As indicated earlier, 50 out of the 100 respondents were exposed to training organized by ITDG on various aspects of IS use and maintenance. These trained users in their turn also motivated and trained others. As such, the respondents were asked to indicate the topics and issues that they learnt from the training. The findings are tabulated below.

Table-8: Distribution of the ITDG trained respondents by the topics they learnt

Topics	N=50	%
Importance of IS	31	62%
Construction of IS	50	100%
Trouble shooting	50	100%
Disadvantages of Traditional Stoves	42	84%
Awareness raising	35	70%

N.B. Multiple answers allowed

As table shows, majority of the respondents could recollect the topics that were discussed in the training sessions and these are construction of IS (100%), Trouble shooting (100%), disadvantages of traditional stoves (84%), awareness raising (70%) and importance of IS (62%).

Sources of IS procurement-

Regarding the sources of IS procurement, 36 respondents claimed that they themselves made the ISs, with the technological knowledge that they acquired from the ITDG training. These 36 respondents are from the 50 ITDG trained respondents. The remaining 14 trained respondents are the users of commercial stoves, which they could not construct by themselves owing to the complicated technological process involved in construction of such stoves. These users were supplied stoves by ITDG in collaboration with NGO. Out of the remaining 50 respondents, 30 users were the community and group members who were supplied stoves by the NGOs with equipment support from ITDG. Another 20 respondents were the motivated users whose stoves were constructed by the ITDG trainees and sold to them. All these information are tabulated below.

Table-9: Distribution of the respondents by sources of IS procurement

Sources	N=100	%
Made by ITDG-trainees for self use	36	36%
Supplied by ITDG in collaboration with NGOs	14	14%
Supplied by NGOs, but with equipment support from ITDG	30	30%
Made by ITDG-trainees and supplied on payment basis	20	20%

Perception of use of IS-

The respondents' perception on popularizing and spreading the use of improved stoves was solicited. All the respondents except two wanted that IS use should be popularized and extended. (Table-10)

Table-10: Distribution of the respondents by their perception on extended use of IS.

Opinion	N=100	%
Yes	98	98%
No	2	2%

Transfer of IS making technology-

It was expected from the trainees, equipped with technical knowledge of making the stoves, would train others in their neighborhood in the art of making stoves. However, as depicted in the table below, half of the trainees did not transfer the knowledge. Only 17 claimed to have trained 1-2 persons each, while 3 said that they trained 3-4 persons. Similarly, another 3 claimed to have trained 5-6 persons each. One trainee imparted training to 7 persons himself and another to 27 persons by himself.

Table-11: Distribution of the ITDG trainees by the number of persons they taught the art of making IS

Number of Persons taught	N=50	%
0	25	50%
1-2	17	34%
3-4	3	6%
5-6	3	6%
7-8	1	2%
9-above	1	2%

Motivation for IS use-

As for motivating others in use of IS, 61 out of the 100 respondents claimed that they motivated others in using improved stoves. Thirty three (33) out of these 61 claimed to have motivated 1-4 persons each, followed by 18 percent (5-8 persons), 11 percent (9-12 persons) and 16 percent (13 & above). The information are tabulated below.

Table-12: Distribution of respondents (those saying 'Yes') by the number of persons they motivated to use IS

Number of persons motivated	N=61	%
1-4	33	54%
5-8	11	18%
9-12	7	11%
13-above	10	16%

It may be mentioned here that a total of 586 persons were motivated by the trainees following their exposure to ITDG organized training. It was also found that out of these motivated people, 194 are using improved stoves in the study areas.

Table-13 : Distribution of trainee respondents by the number of IS constructed for others (respondents 50)

No. of IS constructed	Frequency	%
1-10	27	54%
11-20	9	18%
21-30	-	
31-40	4	8%
41- above	10	20%

As for construction of improved stove for others by the trainee technicians 50 out of 100 respondents claimed that they constructed IS for others. 27 out of these 50 claimed to have constructed 1-10 (54%) IS each, followed by 18%(11-20), 0% (21- 30), 8% (31-40) and 20% (41-above). The information are depicted in the above table.

Table-14 : Distribution of trainee respondents by opinion of charges for IS construction for others (respondents 50)

Amount charged	Frequency	%
100-200	-	-
201-300	29	58%
301-400	11	22%
401-above	10	20%

The 50 trainee respondents were asked to mention about the charges that they are claiming for the construction of improved stove for others, in reply 29 respondents mentioned that charging TK.201-300 each, followed by 22% (301-400) , and 20% (401- above). The information are shown in the above table.

Obstacles to IS use-

The respondents were also asked to mention about any perceived obstacles or barriers to expanded use of IS. Lack of capital has been mentioned by the majority of respondents (59%) as one of the obstacles, followed by lack of necessary materials such as mud, etc(48%) and ignorance of the people (27%). Rain and floods have also been mentioned as an obstacle by 18 percent. Five (5) percent said that the ISs are costly. However, 27 percent found no obstacles in popularizing the use of IS.

Table-15: Distribution of respondents by their perception on the obstacles to expansion of IS use

Obstacles	N=100	%
Ignorance	27	27%
Lack of capital	59	59%
Monsoon (rain & flood)	18	18%
Not fully motivated	3	3%
Does not like	1	1%
Lack of mud	48	48%
Costly	5	5%
No Obstacle	27	27%

N.B. Multiple answers allowed

Impact of IS use-

In order to ascertain any effect or impact level changes in respect to fuel use and other related issues, the users of IS were asked to record their perception. Recall method was adopted to record the perceived changes.

Fuel use-

The respondents were asked to make an estimate of the quantity and value of the main fuel that they used to buy before while using the traditional stoves as well as now while using the improved stoves for cooking same quantity of foodstuffs. The number of users mainly using twigs was 50, briquette 5 and cow dung ball 45. The estimates of fuel use by them are tabulated below.

Table-16: Quantity and value of selected types of fuel used before and now.

Types of Fuel	Before			Now		
	Quantity (mds)	Rate (Tk)	Value (Tk)	Quantity (mds)	Rate (Tk)	Value (Tk)
Twigs	586.0	60.00	35,160.00	302	60.00	18,120.00
Briquette	30.5	95.00	2,897.50	15	95.00	1,425.00
Cow dung balls	233.0	50.00	11,650.00	126	50.00	6,300.00

As can be seen from the above table, the amount of twigs used earlier for the traditional stoves was 586.0 maunds, which came down to 302 maunds for the improved stoves. Correspondingly, the cost of twigs incurred also decreased by more than a half (51.53%). Similar is the case with the other two sources of fuel mostly used by the respondents. Both the volume and cost of briquette and cow dung balls were decreased by a half when they are using improved stoves, compared to those for the traditional stoves.

Table-17 : Distribution of respondents by their perception on their economic impact on their business (respondents 27 involved in food business)

Perception	Frequency	%
Increase in savings	27	100%
Enhancement in cash purchase	27	100%
Capacity to increase in stock	26	97%
Improvement in life style	26	97%
Reduction of medical cost	14	53%

The respondent's perception about the use of improved stove on economic condition were also elicited in the above table. All the respondents mention that the IS use has a positive economic impact on their business, it has started to enable them to face any awkward situation in respect of economic condition of their business in future.

Time use-

All the 100 users were of the opinion that less time is required for cooking while using an improved stove compared to what was required with the traditional stove. As for the extent of less time use, 61 respondents claimed that they have 30-40 percent less time requirement with the IS, followed by 23 respondents (41+ %).

Table-18: Distribution of respondents by their estimate of less time required

Estimated less time	Frequency	%

requirement by %		
0-10	-	-
11-20	1	1%
21-30	15	15%
31-40	61	61%
41-above	23	23%

Changes in profit margin-

All the 14 users of commercial stoves were asked to provide an estimate of any changes in the profit margin, since their use of improved stoves in place of the traditional ones. All of them were of the opinion that use of improved stoves has had a positive impact on their profit margin, by way of less fuel requirements. As the following table shows, 10 out of the 14 users said that their profit margin increased by 31 percent or above, while the increase in profit margin for the remaining 4 users ranges between 16 to 30 percent. The findings are provided in table below.

Table-19: Distribution of respondents by their perception on increase in profit rate from business

Increase in Profit Margin (%)	Frequency (N=14)	%
0-15	-	-
16-30	4	28.6%
31-above	10	71.0%

Impact of IS use on health issues-

The users of IS were also asked to provide their perception of IS use on their health. They were asked to mention about the advantages and disadvantages of traditional stove use vis-à-vis those of the improved stoves that they are currently using. The findings are presented in the Tables- 17, 18, 19 and 20 below.

Table-20: Distribution of respondents by their perception on relative disadvantage of traditional stove

Opinion	N=100	%
Eye burning	100	100%
Breathing problem	98	98%
Heat problem	100	100%
Headache	39	39%

Table-21: Distribution of respondents by their perception on relative advantage of traditional stove

Opinion	N=100	%
Large twigs could be used	6	6%

Table-22: Distribution of respondents by their perception on relative advantage of improved stove

Opinion	N=100	%
No eye burning	98	98%
No breathing problem	99	99%
No heat or flaming	100	100%
No headache	76	76%

Table-23: Distribution of respondents by their perception on relative disadvantage of improved stove

Opinion	N=100	%
Takes time to startup	27	27%

As depicted in the tables above, almost all the respondents mentioned about a number of disadvantages in using the traditional stoves. In this connection, they spoke of eye burning, heat problems, breathing problems and headache that they used to suffer while using the traditional stoves. Conversely, all the respondents talked about a number of health related advantages of using the improved stoves. They claimed to have faced none of the four problems mentioned earlier.

As for the advantage of traditional stoves, only six (6) respondents said that they could use large twigs conveniently in the traditional stove which is not possible in case of IS. At the same, some 27 respondents mentioned that using of IS is time consuming, in the sense that it takes more start-up time.

Perception on popularizing IS use-

In the end, the respondents' suggestions were sought as to what they thought would be required to popularize wider use of IS in the country. As depicted in the table below, an overwhelming majority (92%) suggested to increase awareness of the people about the adverse effect of traditional stoves and the positive effect of IS use. More than two-third of the respondents called for more publicity and training. Similar proportion of respondents called for extension of credit facilities. They also called for making equipments easily available and at a low cost to the people. About one-third of the respondents (36%) suggested support from the NGO community in respect to motivation and procurement of supplies related to making of IS.

Table-28: Distribution of respondents by their suggestions on how to popularize IS throughout the country

Suggestions	N=100	%
To raise awareness	92	92%
More Training	73	73%
More Publicity	68	68%
Extend capital support	69	69%

Availability of equipment	89	89%
Equipment at a minimum cost	66	66%
Support through NGOs	36	36%

3.2 Recommendations

As can be expected from introduction of any improved system over the traditional one, the users of the improved stoves have been benefiting from its use in a number of ways. Benefits accrued to them in terms of their spending on fuels as less fuel is required. They also benefited in respect to time required to cook. However, their benefit in respect to protection from the health hazards was immense. Unlike the time when they were using the traditional stoves, they are facing no health problems such as eye burning, breathing problem or headache. As less fuel is required under the IS system, there are also social benefits such as less deforestation and consequent positive impact on environment. In view of the above, the importance of extensive and wider use of IS can be hardly overemphasized.

In the context of the present ITDG project, the following recommendations are made:

1. In view of the actual benefits that accrued to the users, there is a need to continue the project activities for an extended period beyond the pilot phase.
2. Training and skill development activities are required to be strengthened in collaboration with the partner NGOs.
3. Arrangement should be made with partner NGOs for appropriate follow-up of the training and skill development activities so as to ensure that the trainees act as the catalytic agents for popularizing IS use in their respective communities as well as for providing technical support in construction of IS.
4. The partner NGOs are to be supported so as to enable them to produce the required IS equipments locally and to supply these to the motivated potential users.
5. In view of the potential contribution of IS both at family level and social level, the NGOs could be assisted to initiate the project activities as one of their regular programs. For this, manpower support may be needed.
6. Credit support may be extended to enable people to procure the IS. Alternatively, a subsidized system of sales may be introduced under the overall management of the partner NGOs.
7. It is also recommended that procurement and use of IS by group members may be linked with other NGO programs (e.g. credit program)

2.8 National End of Project Workshop, Bangladesh

Energy Issues in Street Foods Sector

Venue: Thengamara Mohila Sabuj Sangha (TMSS)
Gokul, Bogra, Bangladesh

November 20 - 21, 2002

A national workshop on Energy Issue in Street Food Sector was held on November 20-21, 2002 at Thengamara Mohila Sabuj Sangha (TMSS) in Bogra. The purposes of the workshop was to share and to disseminate the findings arisen out of modified device intervention and it's impact on profit margin, sound health and pollution free environment as well as other socioeconomic issues in peri-urban locations in northern Bangladesh with a view to identify the future guidelines and recommendation for a complete project for promoting sustainable energy saving options for street food vendors. The impact assessment on improved stove survey covered 100 respondents conducted in four northern district Bogra, Jaipurhat, Rangpur and Gaibandha. TMSS and BCSIR was the collaborating & technical support partner respectively for the implementation of Energy and Street Food pilot Project.

ITDG-Bangladesh in collaboration with TMSS organized the workshop. Mr. Satya Ranjan Saha, Energy and Street Foods Project Manager outlined the reason & the purposes of the project in brief while Mr. Leonard Tedd, International Project Manager for Energy and Street Food; ITDG-UK made the comments on the findings.

DAY ONE: 20 November 2002

Organizer
ITDG-Bangladesh in collaboration with Thengamara Mohila Sabuj Sangha (TMSS) organized the workshop. Mr. Satya Ranjan Saha Energy and Street Foods Project Manager of ITDG-Bangladesh welcome to participants for attending the workshop

and requested Ms. Veena Khaleque, Country Director ITDG-B to take sit as the Chief Guest while Dr. Lulu Bilkis Banu Senior Scientific Officer IFRD of BCSIR took the chair as the Special Guest. The workshop was presided over by Mr. Ashraful Islam, Director (Operations) of TMSS while it was facilitated by project manager Satya Ranjan Saha and he elicit the purposes of the workshop as well as the summery of the study findings. He also mentioned that this research project is also implemented in Sri-Lanka too.

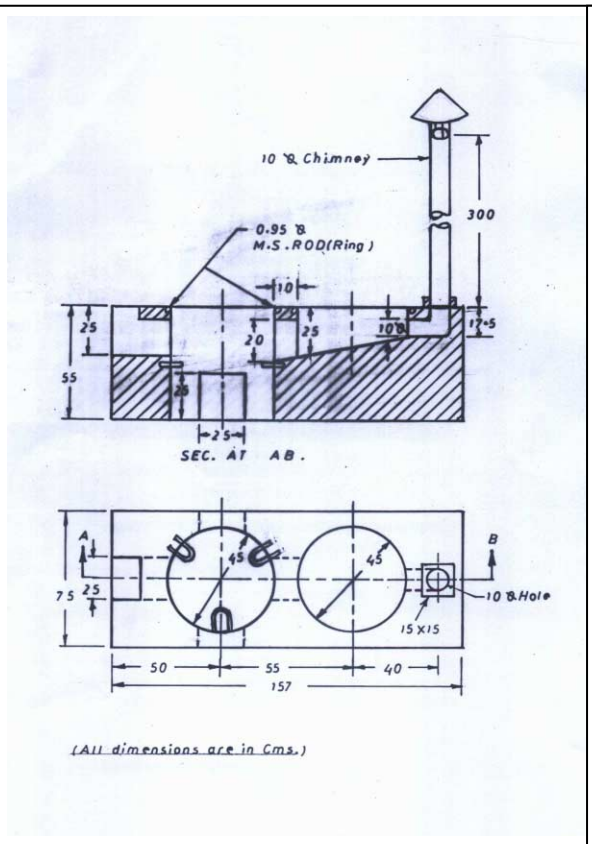
Chairperson, Mr. Ashraful Islam in his speech welcome everybody and convey gratitude specially to ITDG-B for it's continued support in implementing the pilot phase of the improved stove project. He also mentioned for extended cooperation from ITDG-Bangladesh in future with the hope and inspiration of the great success of the workshop.

Dr. Lulu Bilkis Banu an expert on energy issues-speaking as Special Guest claimed that IFRD-BCSIR has been working on fuel conservation devices since 1978 by changing the parameter of the traditional chula into improved stove providing more than 20 model depending on local fuel availability & family requirement. IFRD has built up a work force of 6000 people providing 60 training courses on improved stove, so that they can spread up the initiative through out the country. It has also organized seminar/workshop to disseminate the Appropriate Technology of
fuel efficient device. She mentioned that BCSIR has implemented only 3 Lac IS through out the country where as the requirement is 2 crores.
She emphasized the need for participatory method for implementation of the IS program. She reminded that how many IS has been constructed / implemented is not the factor to be considered rather it should be considered how many are in use or sustainable at the moment? She claims adaptation of Improved Stove in academic courses although IFRD has introduced improved stove in the syllabus of Home-economics College.
Another honorable speaker Sarder Mahtabuddin, Asstt. Director (Agri.) of TMSS
stressed the necessity of IS instead of traditional Chula with reference to the experience that one of TMSS beneficiary involved in food processing business is enjoying a good profit margin by using the improved stove and taking benefit of the following:

1) Enjoying more profit by saving about 50% of the fuel
2) Her stall is free from smoke and carbon
3) More customers are attracting by the inside environment.
4) Selling more food items than before.
5) Her food items are free from smoke smell.
6) Mokul's profit has enhanced at least for Tk. 3000/annum.

While she was asked to make comment on the use of her IS- she said that now I am living in a very good condition than ever before: economically in an upgraded position, good physical and environmental condition.
From this example, Mr.Sarder claims that if we really want poverty to be reduced then ITDG and it's donor agency should consider the importance and role of IS as fuel efficient device to be used by the street foods vendors with the follow up facilities for the project.

While she was asked to make comment on the use of her IS- she said that now I am living in a much better condition than before.
From this example, Mr.Sarder claims that if we really want poverty to be reduced then ITDG and it's donor agency should consider the importance and role of IS as fuel efficient device to be used by the street foods vendors with the follow up facilities for the project.



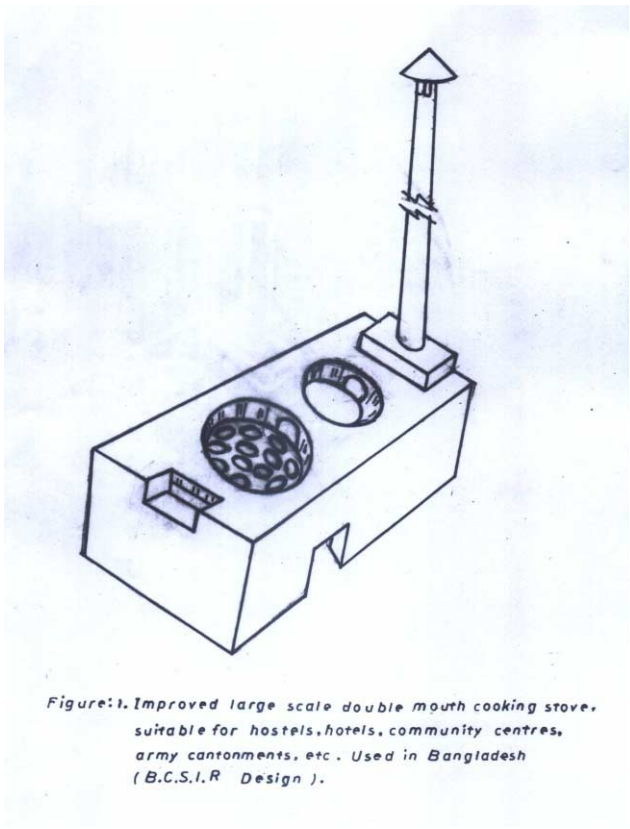


Figure: 1. Improved large scale double mouth cooking stove, suitable for hostels, hotels, community centres, army cantonments, etc. Used in Bangladesh (B.C.S.I.R Design).

Mr. Leonard Tedd of ITDG-UK mentioned that ITDG has a working experience in the sector since 1973 mostly worked in Nepal, Sri-Lanka and Kenya. In Bangladesh, findings from 2.5 years project are very positive with commercial and physical benefit, which could play a considerable role for the proposed next phase of the project for uptake. After reconciliation with the findings from Sri-Lanka, it could be positive for further work in this area.

Speaking as the Chief Guest ITDG-Bangladesh Country Director Ms Veena Khaleque welcomed all and thanked TMSS and BCSIR for their valuable contribution and active participation. She said, "we have a lot to share from this workshop about technology of food processing and others to reduce poverty. Today discussion is on different issues on food processing sector as well as fuel sector which already create as thrusting sectors in Bangladesh." She also added that all development stakeholders should work together for the betterment and development of these sectors. We have opportunity to effective use of our natural resources to over come the existing problems of these sectors. Project may be ended but the partners should expand activities. ITDG always believes in transfer and promotion of people's friendly technologies to continue its activities. The findings of the workshops on Energy and Street Food Sector in Bangladesh and Sri-Lanka will help us for the future intervention of the project.
Finally Veena Khaleque thanked every body for lively participation in the workshop as well as continued support from BCSIR, TMSS and Leonard Tedd. She thanked KAR DFID and ITDG UK offices for supporting this project.

At the end of the inaugural session, all the participants introduce themselves and then Chairperson of the workshop Mr. Ashraful Islam thanked everybody for active participation and to make the workshop a success and declared the closing of the first session.
It was a break for refreshment with watching a visual movie on improved cook stove making; it's use and impact on user's everyday life.

Presentation of paper on impact study on IS

In this session, Mr. Satya Ranjan Saha, ESF Project manager presented the major findings from the impact assessment on the project.

Open discussion:
Mr. Satya Ranjan Saha urged to the participants to take part in open discussion. The Special Guest Dr. Lulu Bilkis Banu said to achieve the target, it is to be started on participatory method just by changing the parameter of the existing stove not by replacing running one. Because the traditional Chula has some social and prestigious values.

The Executive Director of VIEW Kurigram, Mr Enamul Haque said that since the required equipments are not locally available, they are using alternatives to chukney, which has a system loss or looses efficiency by approx 5%. Some suggested that it would be useful and effective by modifying the traditional chula into an improved one since there is emotional and social issues concerning the maker of a chula in a family.

Mr. Khorshed Alam of TMSS said that more than 200 people are using the Improved Cook Stove who are directly / indirectly supported by ITDG-Bangladesh. Mr. Khorshed requested to concerned donors & ITDG authority to continue the project for its sustainability and further replication in the future.

DAY TWO: 21 November 2002

One of the participants named Farida Begum who has her skill and constructed a huge number of Improved Stove around for the use of her neighbors She claimed that improve stove is more useful because it saves approx. 60-65% fuel and contributes a pollution free environment as well as nation saves a huge amount of fuel and money - in financial term it is more than two thousand five hundred crore which covers about 25% of the annual budget of the country. She added that while she started IS construction, it was not popular at that time like it is today. She said that portable one-mouth IS is convenient to use in rainy season or at the time of disaster but two mouth is more demanding now a days. To make the project a success, selection of the trainees should be of active habit and of contributing attitude of mid-age unemployed section of the society and it will bring a good result for the sustainability of the project. She also said that such a selection criterion will bring a two-way benefit providing employment for the trainee as well as spreading of the project also made a comment.

Among the participants, one Saiful Islam Titumir of Mautree Jumbo Society from Rangpur who was trained by ITDG said that he has motivated social /institutional leaders like- teachers, elected Union Council members, unemployed youths and social workers and made a remarkable performance by promoting over 200 improved stoves in his working area in exchange of wages. He experienced challenges like- necessary appropriate clay, monsoon season as a barrier & necessary money ,etc. He added that arrangement for post- training follow up is necessary to replicate the experience.

Another ITDG-B trainee named Mahmudul Hasan of TMSS-Jaipurhat stated that awareness about the detrimental issues of traditional stove and goodness of improved stove to be made clear of among the mass people. He also raised the question of necessary fund for construction of improved stoves among the food processors and suggested that providing micro-credit support among the food processors by the partner NGOs.Mr. Hasan mentioned that now some of his beneficiaries are cooking approx. five times greater quantity of food staff using same amount of fuel using less time consumption than before.

Subsequently, a brain storming session was organized by dividing the participants into two groups to find out the opinion and guidelines for the extension & implementation of the Improved Stove project in future.

.

Group 1: Discussion and presentation

Marketing:

a) Arrangement for sufficient advertisement and follow-up
b) Arrangement for group discussion on the health related issues and benefit out of improved stove use.

c) To make the people understand that the improved stove is beneficial for the health.
d) Could be targeted a specific area for implementation of IS.
e) Motivation and then fixing up
f) To give the message that IS is a less fuel consumption device, it is a pleasing to cook in and it is not detrimental for health.
g) A comparative analysis of the advantages of Improved Stove & disadvantages of traditional cook stove to be placed in presence of the people.

A. Awareness Related Issues

a) Awareness among the beneficiaries could spread the extension of the IS
b) Mass awareness is necessary for the extension of the IS
c) Users of the stove are to be aware about the benefit of the improved stove.

B. Training Facilities.

a) To keep demonstration and technical advice on with follow-up arrangement.
b) Trainee should construct one Improved Stove that would encourage the neighbors.
c) To arrange Improved Stove exhibition involving more women participation.
d) To provide more technical training in the deemed necessary.
e) To organize mobile training for the interested people.
f) To arrange basic IS construction training for the NGO group members.
g) GO/NGO involvement in providing training for the women.
h) More people to be trained on IS construction under this program.
i) Every suburb /village to be covered to provide with training.

D Credit facilities.

a) As the households are the dominating fuel consumers, credit facilities should be extended for them.
b) Subsidies in respect of equipment support and advertisements are strongly. recommended
d) Providing credit support through the involvement of NGOs.

E. Suggestions in respect of input

a) To ensure the availability of IS construction and use equipment.
b) To arrange IS equipment easily available.
c) Arrangement of carrying facility for necessary mud from place to place.

Group -2: Discussion and presentation

A Awareness Related Issues:

a) To raise awareness about the benefits of Improved Stove among the people.
b) To raise awareness about the utility of the one mouth improved stove.

c) To arrange exchange visit between the user of improved stove and non-user of improved stove that the non-users would be encouraged to use IS.
d) To organize workshop in collaboration with and participation by the roadside foods vendors.

B. **Training related issuess**

a) To arrange training in participation with mobile food vendors.
b) To arrange more training
c) To arrange construction of one mouth improved stove for the roadside small food vendors providing credit if required.
d) To arrange training on improved stove.
e) To arrange training on improved stove for the users of the IS.
f) To organize training for all the food processors of a certain area.

C. **Credit related issues:**

a) Local NGOs can provide loan and expertise services for construction of IS for the mobile food vendors.
b) Arrangements could be made to provide with necessary loan support to the roadside food vendors for acquiring an improved stove.
c) Credit support to be extended to promote the activities provided with training.
d) To provide credit.
e) To provide credit to the roadside food vendors.
f) To provide credit support to the roadside food processors and vendors.

D **Institutional organizational support**

a) To specify a certain area of operation with a view to organize the food processors
under a savings oriented society from which their improved stove procurement cost will be met.
b) To initiate a socio networking organization which will incorporate the non NGO - members for uptake of improved stoves all over the country based on findings from this project.

E **Follow up Issues**

a) A regular post -support follows up arrangement to be ensured.
b) Roadside mobile food vendors are to be supported with commercial stove including fund (micro-credit) support.
c) To construct IS and to supply the same to the roadside food vendors free of cost.

F **Marketing Issues**

a) Arrangement for demonstration of IS among the mobile food vendors in collaboration with the local NGOs.
b) One mouth portable improve stove is very much useful for the roadside food vendors.
c) Mobile improved stove could be promoted to street food vendors.

Recommendations

As can be expected from introduction of any improved system over the traditional one, the users of the improved stoves have been benefiting from its use in a number of ways. Benefits accrued to them in terms of their spending on fuels, as less fuel is required. They also benefited in respect to time required to cook. However, their benefit in respect to protection from the health hazards was immense. Unlike the time when they were using the traditional stoves, they are facing no health problems such as eye burning, breathing problem or headache. As less fuel is required under the IS system, there are also social benefits such as less deforestation and consequent positive impact on environment. In view of the above, the importance of extensive and wider use of IS can be hardly overemphasized.

In the context of the present ITDG project, the following recommendations are made:

1. In view of the actual benefits that accrued by the users, there is a need to continue and expand the project activities for an extended period beyond the pilot phase.
2. Training and skill development activities are required to be strengthened in collaboration with the partners.
3. Arrangement should be made with government and partner NGOs for appropriate follow-up of the training and skill development activities so as to ensure that the trainees act as the catalytic agents for popularising IS use in their respective communities as well as for providing technical support in construction of IS.
4. The partner NGOs are to be supported to enable them to produce the required IS equipment's locally and to supply these to the motivated potential users.
5. In view of the potential contribution of IS both at family level and social level, the NGOs could be assisted to initiate the project activities as one of their regular programs. For this, manpower support may be needed.
6. Credit support may be extended to enable people to procure the IS. Alternatively, a subsidized system of sales may be introduced under the overall management of the interested partner NGOs.
7. It is also recommended that procurement and use of IS by group members may be linked with other NGO programs (say, micro-credit) so as to ensure IS use as a mandatory requirement for them.

2.9 Final Workshops in Sri Lanka

The project concluded with the following sessions:

- International Workshop on Energy Aspects of Street Food Enterprises
- November 25th 2002
- Field visits for delegates 26th November 2002
- Exhibition and seminar in Galle 27th November 2002
- Meeting with IDEA (local ARECOP partner), Kandy 28th November 2002
- Internal Workshop on planning for future work, Colombo 28th November 2002.

The itinerary for the Workshop on the 25th:

INTERNATIONAL WORKSHOP ON ENERGY ASPECTS OF STREET FOOD ENTERPRISES
25TH NOVEMBER 2002.
SRI LANKA FOUNDATION INSTITUTE AUDITORIUM, Colombo, Sri Lanka

9.00 am	Registration
9.20 am	Lighting of the Oil Lamp
9.30 am	Welcome Address – Vishaka Hidellage-Country Director, ITDG South Asia
9.40 am	Street Foods – an overview Susil Liyanarachchi - Projects Director, ITDG – South Asia
10.10 am	Tea
10.30 am	Sri Lanka Country presentation Ranga Pallawala – Project Manager, Research and Policy .
11.00 am	Bangladesh Country Presentation Sathya Ranjan Saha
11.30 am	Views from Street Food Vendors
12.30 pm	Discussion on Presentations
1.00 pm	Discussion on potential Follow up activities
1.30 pm	Summing up of Workshop outcomes
1.45 pm	Vote of Thanks

The participants of this workshop are listed in Appendix 5.

Seminar and Exhibition
Galle, 27th November 2002

An Exhibition and Seminar on Energy Aspects of Street Food enterprises was organized in Galle. The event was to make members of the public aware of the use and importance of energy efficient stoves. The morning session was for senior school children, teachers and students of technical collages. The afternoon session was attended by NGOs, government agencies and the general public. In the seminar there were two presentations, one on street food sector and the health implications of improved stoves. The indoor air pollution study done by ITDG Kenya was presented. The second presentation on the importance of energy efficiency aspects of improved stoves was conducted by Dr.Tilak Siyambalapitiya , a renowned expert on energy issues.

In the exhibition we demonstrated some different types of improved stoves designed by various organizations. There were street food vendors preparing food using these stoves. Fig.6 shows the mayor of Galle in discussion with a street food vendor using an improved biomass stove.

Fig.6 Exhibition of improved biomass stoves for street vendors, Galle, Sri Lanka

Several chimney stoves were shown. Also the other stoves (gassifier stove, and improved paddy husk stove) which were laboratory tested and piloted with street vendors were included in the exhibition. These are shown in the following images:

Fig.7 Improved paddy-husk burner.

Fig.8 Biomass gassifier stove

3. Dissemination Channels

Dissemination activities under this project included:

- Five training sessions in Bangladesh
- National and International Project End Workshops

There were several written outputs to the project:

- WREC paper, presentation at the World Renewable Energy Congress in Cologne July 2002 (Appendix 2)
- An article in Boiling Point 47 (Appendix 3)
- DFID newsletter articles
- ITDG project briefing, October 2001 (Appendix 4)
- Internal project evaluation documents
- Funder Summary Report
- Final Technical Report (this document)

4. Future work

- Energy and Street Food Vendors proposal accepted to HEDON[2] shortlist. To be taken forward by C V Krishna, of the Centre For Renewable Energy and Appropriate Technologies in Orissa, India. Summary is appendix 1, Please see HEDON website for up-to-date details.

- Further training on community based training on improved biomass stoves in Bangladesh, proposal prepared.

- Livelihoods project in Sri Lanka. Project Document entitled "Enhancing the Profitability of Street Food Enterprises in Sri Lanka" prepared.

5. Appendices

Appendix 1 Literature Review References
Appendix 2 Paper published, and presented, at the World Renewable Energy Congress VII Cologne July 2002.
Appendix 3 Article Written for Boiling Point 47
Appendix 4 ITDG project information hand-out October 2001
Appendix 5 Stakeholders of the project

[2] HEDON, the Household Energy and Development Organisations Network, http://ecoharmony.com/hedon/

Annex 1. References for Literature Review

Ayoub, J., *Performance of Large Portable Metal Woodstoves for Community Kitchens*, Renewable Energy, Vol 7, No 1, pp 71 - 80

Baldwin, S.F., *Biomass Stoves: Engineering Design, Development, and Dissemination*, Volunteers in Technical Assistance (VITA), USA

Barnes, D., *et al.,* 1998, *The Urban Energy Transition: Energy, Poverty, and the Environment in the Developing Word*, World Bank Draft report, unpublished.

Befidi-Mengue, C., *et al, Practices and Knowledge of Street food vendors as regards Transmission of Diseases,* University of Yaounde, Cameroon, Health Social Science Abstracts

Bennett, M., Newborough, M., 1999, *Auditing Energy use in Cities*, Energy policy 29, pp125 - 134

BRET, 1985, Botswana Renewable Energy Technology Project, *Draft Report of Energy Use and Attitude Survey*, Ministry of Mineral Resources and Water Affairs, Gaborone.

CAC, 1996, *Guidelines for the Design of Control Measures for Street-Vended Foods in Africa',* CX/AFRICA 96/8, Parts I and II, (FAO/WHO)

Canet, C.,1996, *Street Food in Africa*, Food, nutrition and Agriculture 17/18, (FAO)

Chakravarty, DR., I., 1995, 'Safety of Street Food in Calcutta', Intermediate Technology Food Chain, No 14.

Chakravarty, I., Canet, C., 1996, *Street Foods in Calcutta*, (FAO)

Dajani, R., 2000, *Micro and Small Enterprise Development within the context of the Food Supply and Distribution Systems to the City of Amman*, Unpublished

Das, T., 1995, *Energy technology Choice in Rural India*, Energy, Vol 20, No 7, pp 683-685

Dawson, R., 1996, *Bangkok's Street food Project*, (FAO)

El Faki Ali, G., 1992, *Household energy in Sudan*, KENGO Regional Wood Energy Programme for Africa.

Energy and environmental analysis group, 1996, Los Alamos National Laboratory Internet Report.

ESD, 1999, *Commercial Production of Energy Efficient Biomass Stoves for the Commercial and Institutional Sector*, DFID Project 6848, Unpublished

European Commission, 1986, *Energy in the Cities of the Third World*, (European Commission).

FAO, 1989, *Report of an Expert Consultation on Street Foods, Yogyakarta, Indonesia*, (FAO/Rome)

FAO, 1997, *Report of an FAO Technical Meeting on Street Foods, Calcutta, India*, (FAO/Rome)

FAO, 1999, *Regional Seminar on Street Food Development,* (FAO/Rome)

FAO, 2000, *Report of Workshop on Micro and Small Enterprise Development in the Food Supply and Distribution*, FAO project TCP/JOR/8923

Gupta, S., Ravindranath, N., 1997, *Financial Analysis of Cooking Energy Options for India,* Energy Conversion Management Vol 38, No 18, pp1869-1876

Umoh, V. J., Odoba, M. B., 1999, *Safety and Quality Evaluation of Street foods Sold in Zaria, NigeriaI, Food Control 10, pp 9 - 14*

ITDG, 1999, *Energy Provision for the Urban Poor*, (ITDG – unpublished)

Jaber, J., Probert, S., 2001, *Energy Demand, Poverty and the Urban Environment in Jordan*, Applied Energy 68, pp 119-134

Levin C., *et al*, 1999, *Working Women in an urban Setting: Traders, Vendors and Food security in Accra*, World Development, Vol 27, No 11, pp. 1977-1991

Misra, M., *Domestic Fuel energy Consumption in an Indian Urban Ecosystem*, Biomass and Bioenergy, Vol 9. No 6. pp 473-486

Mossel, D., *et al*, 1999, *Microbiological Safety Assurance applied to Smaller Catering Operations Worldwide. From Angst Through Ardour to Assistance and Achievement – The Facts*, Food Control 10, pp 195-211

Nahar, N., 2000, *Design, Development and Testing of a Double Reflector Hot Box Solar Cooker with a Transparent Insulation Material*, Renewable Energy, Vol 23, pp 167-179

Quadir, A., *et al*, 1995, *Barriers to the Dissemination of Renewable Energy Technologies for Cooking*, Energy Conversion and Management, Vol 36, No 12, pp 1129-1132.

Rana, S., 1997, *Economic Performance Of Energy Efficient Devices For Cooking And Lighting In Rural Areas Of Madhya Pradesh*, Energy Conversion Management, Vol 38, No 8, pp 735-750

Sadownik, B., Jaccard, M., 1999, *Sustainable Energy and Urban Form in China: the Relevance of Community Energy Management,* Energy policy 29, pp 55-65

Sathaye, J., and Meyers, S., 1990, *Urban Energy Use in Developing* Countries, in Desai, A. V., *Patterns of Energy Use in Developing Countries*, International Development Research Centre and United Nations University, Wiley Eastern Limited

Sharma, S., 1999, *Design, Development and Performance Evaluation of a Latent Heat Storage Unit for Evening Cooking in a Solar Cooker*, Energy Conversion and Management, Vol 41, pp 1497-1508

Siwatibau, S., 1987, *Urban Energy in Fiji*, International Development Research Centre, Ottawa, Canada.

Sobel, C., *et al.,*199? *A Simple System reduces Fecal Contamination of Street-Vended Beverages in Guatemala*, Centers for Disease Control and Prevention, Atlanta, USA, Public Health Abstracts

Stewart, B., 1987, *Improved Wood, Waste and Charcoal burning Stoves: A Practitioners' Manual*, IT Pubs, London.

Tinker, I, 1993, 'The Street Food Project: Using research for Planning',

Tinker, I., 1997, *Street foods: Urban Food and Employment in Developing Countries*, (Oxford University Press)

Tripathi, A., *et al*, *Biomass Gasifier Based Institutional Cooking in India: a Preliminary Financial Evaluation*, Biomass and Bioenergy, Vol 17, pp 165-173

Tyler, S., 1990, 'Household Energy in Thai Cities: The Influences of Value of Women's Time and Commercial Activity', Report for IENHE/World Bank, in Tinker, 1997.

Appendix 2
A paper presented at the World Renewable Energy Congress, Cologne 2001.

Energy and Street Food

L. G. Tedd[1], N. A. Chowdhury[2], and S. Liyanarachchi[3]

[1]Intermediate Technology Development Group, Schumacher Centre for Technology and Development, Bourton Hall, Bourton-on-Dunsmore, Warwickshire, CV23 9QZ, UK
[2] ITDG Bangladesh, House 32, Road 13A, Dhanmondi, Dhaka 1209, Bangladesh
[3] ITDG Sri Lanka, 5 Lionel Edirisinghe Mawatha, Kirulapone, Colombo 5, Sri Lanka

ABSTRACT

This project is researching energy based intervention strategies with street food vendors in urban areas of Sri Lanka and Bangladesh. The project has completed a broad social survey of this sector of the urban informal economy and an in-depth investigation with a selected number of street vendors.

There were various significant findings from the research phase including the contrast between the urban and peri-urban situation. The research identified that the complexity of the issues surrounding street food vending necessitates a cross-sectoral approach to addressing their need. Their activity is entrepreneurial and involves preparing a product for sale, there is a big spectrum of types from very poor tea-sellers to those with motorised means of transport, and there are gender and cultural issues that need to be considered. This research project into energy and street food will lead into a more comprehensive programme for working with this marginalised sector, which will include business development services and advocacy for institutional change.

INTRODUCTION

The preparation and sale of street food provides employment and income to millions of people around the world, as well as affordable nutrition for low-income people. It is an activity which represents a significant portion of the informal urban economy in cities worldwide [1]. It is undertaken by entrepreneurial women and men, and more often supported by the assistance of their families than by paid labour. Their businesses are typically irregular, unstable and marginal. Incomes for street vending vary from tea sellers who (in Bangladesh) might expect a daily income of only 200

Taka (€3.93[3]) to those vendors offering a variety of foods, for example a vendor in Sri Lanka selling lunch packets, fried rice, meat and vegetable curries with a daily profit of 4500 Sri Lanka Rupees (€20.57).

Street food vending is not an easy task. In Sri Lanka, 38% of those surveyed spent more than 15 hours on the street selling food every day. This does not include time spent in transport, in preparation at home, or in procuring ingredients and fuel. Also significant is that a typical street food vendor has been involved in this type of work for several years, in Sri Lanka 70% had been in the business for more than five years. This relatively long period of time suggests a proven capacity to sustain themselves in this informal trade.

This paper draws from the research findings of the first phase of an ongoing project by ITDG country offices in Bangladesh and Sri Lanka into the energy needs of street food vendors. The aim of this project is to improve the livelihood of street food vendors and their dependents by identifying and improving access to energy efficient technologies and fuel. Previous studies of street food vendors have typically focused on the health factors of the product, and urban energy studies have either been concerned with non-commercial household activities or planning issues at a macro level. Although the deficit of baseline data has necessitated enumerative surveying, the data collected will give an insight into this sector which will lead to the identification of possible interventions with an aim to improve livelihoods.

RESEARCH

Survey Methodology

The research took place in Colombo in Sri Lanka and in two locations in Bangladesh, Dhaka and Bogra; this gave a contrast between the issues of an urban area and a peri-urban population. The research element has formed the core of the work completed to date. The basic format was an enumerative study with one hundred vendors followed by an in-depth survey with open-ended questions asked of fewer vendors. The energy use patterns were found, identifying the technologies used and sources of fuel. The legal and institutional frameworks in which the enterprises operate were also evaluated.

In October 2001, an international workshop was held to analyse the findings from the first phase and to work from these findings to design the strategy for interventions for the second phase. The second phase of the project will pilot improved stoves for street food vending, in Bangladesh at a household level and in Sri Lanka at the point of sale. The workshop was also an opportunity to involve other NGOs and government organisations to bring the issues of this sector onto their agenda.

Bangladesh, Key Research Findings

The baseline and in-depth survey findings are synthesised in the country report [2]. Selected results are given:

- In urban Dhaka 52% of street vendors are female, in Bogra only 4% are women.

[3] €1.00 = US$0.86 (Jan 2002)

- The illiteracy rate of all respondents is 48%.
- In Dhaka 97% live in informal settlements and 70% have five or more dependents.
- Difficulties identified by street food vendors in Bangladesh are listed in Table 1.

TABLE 1
PROBLEMS FACED BY STREET VENDORS IN BANGLADESH

Type of Problem	Frequency[1]
Capital shortage	36%
Natural Calamities[2]	35%
Oppression by Police	32%
Bribe / Subscription	30%
Local 'Mustan'	11%

[1]More than one problem could be identified by each vendor.
[2]Natural calamities include epidemics for which street food vendors receive much harassment from local authorities.

- The use of kerosene and *kori* (twigs) as a fuel source is extensive in Bogra and Dhaka. Other fuels are *guri* (logs), *ghutta* (dried dung) and briquettes (usually made from compacted sawdust or rice husk).
- 18% in Dhaka and 13% in Bogra mentioned smoke and eye burning.

Sri Lanka, Key Research Findings

As in Bangladesh the types of fuel used in Sri Lanka are mainly kerosene and fuelwood but in Colombo there is also a significant number of vendors who rely on bottled gas (LPG) for preparation of street food. Participatory research, predominantly by means of semi-structured interviews, with street vendors has identified different factors associated with the different fuels. Some of these are in the following table:

TABLE 2
PERCEIVED CONSTRAINTS FOR USING CURRENT ENERGY SOURCES

Kerosene	Firewood	Gas
• Difficult to meet the frequently escalating prices of kerosene. • Current price of kerosene is too high. • Energy efficiency is sometimes low. • The burner has to be replaced every 6 months at a cost of Rs.700/-. • The wicks have to be replaced almost every month. • There is a bad smell that comes out when kerosene is burnt. • Kerosene stoves have to be repaired frequently and on such occasions, vendors loose business.	• Smoke fills inside the house when cooking. • A lot of smoke and soot. • A lot of time is taken for cleaning soot sticking to the cooking utensils (1- 1½ hours). • The people supplying firewood are not regular. • Cannot light the hearth on rainy days as it is placed outside the house. • Difficult to use firewood on rainy days when it gets wet. • Houses get dirty due to smoke and we may have to spend Rs.10-15, 000 to colour wash the houses.	• Increase of gas prices within a short period. • Gas runs out in the mornings unexpectedly and we cannot cook food on that day. • Burners are too small to place large utensils used for cooking. • High cost of gas. • An empty gas cylinder is expensive. • A gas cooker is expensive. • There are sudden gas shortages.

The full results are presented in two reports [3,4]. This type of information is what is used in identifying what are the energy constraints on street vendors and what factors need consideration in the design of interventions to assist this group. Based on the research gathered in Colombo efficient kerosene stoves will be piloted with a selection of street vendors.

ISSUES

Household energy

Twenty million households in Bangladesh use traditional *Chula* cook-stoves for which wood, twigs, agricultural residues, or *Gutta* dried animal dung are usually used

as fuel. The efficiencies of these stoves is between 5% and 15% with the rest of the energy wasted. For families which prepare food for sale using traditional stoves an improvement in efficiency will have various positive impacts. In an urban area even biomass fuel must be bought and so inefficient stoves have a direct bearing on street vendor income. Inefficient stoves are also more time consuming, and therefore a greater labour burden.

Production of food for sale is a family based activity and much of the preparation is done in the household environment, for example in Bangladesh 62% of people surveyed reported that food was wholly or partly prepared at home. Also as production is typically small-scale all the issues of household energy are pertinent to street food vendors. Any improvement at a household level in the production of food for sale would be to the benefit of the livelihoods of street vendors. So one element of working with street food vendors is concerned with similar issues to the body of knowledge developed concerning household energy.

Institutional context

Street food vendors are also disadvantaged because there is usually no support from formal institutions to improve their businesses or protect them from external influences. The usual response being that they sell unhygienic low-quality food, dump garbage, engage in criminal activities and are a nuisance to maintaining law and order [5]. They are often illegal in that their status is not recognised, resulting in victimisation by the police, public health institutions and local government authorities.

From the findings in Sri Lanka there are two distinct factors which need to be addressed when considering institutions and street vendors. Firstly there is a lack of institutional capacity, in that street vendors are a group of scattered individuals unable to negotiate with formal institutions from a position of strength. This would be addressed by forming an association of street vendors and build their capacity for empowerment. Secondly there is a lack of institutional support for street vendors. Improved support could take the form of increased access to credit or improved security and would be brought about by a change in formal institutions of the valid contribution of street food vending to the urban economy.

Street Food and Health

There is a common perception that street foods represent a health risk. This is most often present in food which is prepared at home and warmed at the point of sale. A more reliable energy source would be better at destroying bacteriological pathogens, through proper cooking or re-heating. Therefore an improvement in the energy aspect of street food vending coupled with education in the hygiene aspect of adequate heating-through will result in reduced incidence of (occasionally fatal) food poisoning. Also the contribution to total nutritional intake of poor urban populations of street foods is large. One reason for this is because there are economies of scale that can make street food more competitive for individuals than preparing food at home.

Gender and Street Food

The income generating activity of street food vending has a potential to empower women, for example they can control the production process, and keep the profits generated. This could lead to women's labour input being better recognised. Consequently there is a strong gender focus to this project. For example, one element of energy and street food is that energy is used for food preparation at a household level. Here the energy user is likely to be female and an intervention at household level, which would reduce the fuel and time needed, could result in a more equitable division of labour.

In Bogra, Bangladesh this project is working with Thengamara Mohila Sabuj Sangha (Thengamara Women's Cooperative or TMSS). TMSS is large, employing 1800 people directly and around 4000 volunteering; the numbers of direct beneficiaries is greater than 250,000. Although they run a huge variety of projects, all have a common gender approach where the beneficiary is always female. For example if a credit, training, or support need is identified at a family level, it is the woman who is the point of contact with the NGO and it is she that receives the training or credit.

The issue of mobility is inextricably linked to the social and economic empowerment of women. In the rural areas of Bangladesh where the source of fuel is getting scarcer, women have to travel a long distance to gather branches, twigs to be used as fuel. This results in restrictions to physical movements of women that define their entitlements to income and employment opportunities and to other services like education and health. Because women spend a long time in gathering fuel, they are deprived of income and this perpetuates their poverty further.

Financial Return on Labour

A thorough analysis of daily income and expenditure was undertaken with the research group in Colombo. The striking result from this is the daily profit divided by the number of hours spent on the activity of street vending, results in a very low financial return on labour. A majority 53% spent between 10 and 15 hours a day preparing and selling food, and a further 38% spent more than 15 hours a day. The distribution of daily profit was 48% at less than 500 Rupees (€6.04) and 36% between 500 and 1000 Rupees (€6.04 to €12.08), and 16% higher than this. These profits are divided by a typically large number of dependents. Work in Sri Lanka will continue to investigate the opportunities to increase the profit margin so that returns to family labour could be increased.

ITDG

LT/Bangladesh/01/01

Fig 1. Street food vending, often a family-based activity

CONCLUSIONS

Research and field experience in the sector of street food vendors is valuable because it is a large significant area supporting the livelihoods of millions of the urban poor and it is a section of society which overlaps many different disciplines within the sphere of development. This is household energy used in small enterprise where gender issues are of prime importance in the division of roles, work and income, and where the entrepreneurial activity itself is in the field of food processing. This project has furthered the knowledge of this sector in three cities in the Asian sub-continent. The results of the investigations will be used as a baseline for interventions researching the efficacy of fuel switching and more efficient combustion to improve the situation of street food vendors. The dissemination phase of this project will take place in many fora: further workshops will be held with street vendors, there will be meetings at municipal government level, an international workshop in Sri Lanka, and publications in the ITDG journals *Boiling Point* and *Food Chain* and a stand alone publication. Informing policy makers and municipal authorities is seen as especially important. This sector is important because it is a significant portion of the urban

informal economy, an economy which is growing rapidly with burgeoning urban populations worldwide.

Acknowledgements

This project is funded by the UK Department for International Development under their Knowledge and Research programme.

References

1. Tinker, I. (1997) *Street Foods: Urban Food and Employment in Developing Countries*, Oxford University Press, New York.
2. Chowdhury, N. A., Chowdhury M. H. (2001) *Energy Issues in the Street Food Sector, findings from the Base Line Survey and In Depth Study*, ITDG internal document, available on request.
3. Liyanarachchi, S., Weerackody, C., Siyambalapitiya, T. (2001) *Energy and Street Food in Sri Lanka - Results of a Baseline Survey of 100 Street food Vendors*, ITDG internal document, available on request.
4. Liyanarachchi, S., Weerackody, C., Siyambalapitiya, T. (2001) *Energy and Street Food in Sri Lanka – Results of 25 case studies*, ITDG internal document, available on request.
5. Cohen, M. (1986) *Women and the Urban Street Food Trade: Some Implications for Policy*, University College London, London.

Appendix 3 Article Written for Boiling Point 47

Energy and street food vendors

by Leonard Tedd [1], Naved Ahmed Chowdhury[2], Susil Liyanarachchi[3]
[1] Intermediate Technology Development Group, The Schumacher Centre for Technology & Development, Bourton-on-Dunsmore, RUGBY, CV23 9QZ, UK. Email: leonardt@itdg.org.uk Tel: +44 (0)1926664448
[2] ITDG Bangladesh, GPO Box 3881, Dhaka 1000, Bangladesh. Email: itdg@bdmail.net Tel: 00 880 2 811 1934
[3] ITDG South Asia, 5 Lionel Edirisinghe Mawatha Kirulapone, Colombo 5, Sri Lanka. Email: itsrilan@sri.lanka.net Tel: 94 1 852149 / 829412–5

Energie et vendeur d'aliments préparés dans les rues
La vente d'aliments préparés dans les rues est le principal gagne pain pour des millions de personnes vivant en milieu urbain. Ce projet d'ITDG a révélé que ce métier exige de longues heures de travail, est souvent une affaire familiale et n'est pas, en général, formellement reconnu. La contribution à la restauration des plats écoulés par les vendeurs de rue est significative et demande une quantité d'énergie importante qui pourrait être diminuée avec le recours à des équipements plus performants. Les principaux résultats de ce projet seront diffusés, entre autres, aux décideurs politiques.

Theme

Introduction

The activity of selling food on the streets forms a large part of the informal sector in urban areas worldwide. It is undertaken by entrepreneurial women and men, and more often run with the assistance of their families than paid labour. Their businesses are typically irregular, unstable and marginal. The concept of a street food vendor covers a broad range of activities. In Bangladesh, those who earn least are tea sellers, whose income is very low, but who require a daily working capital of less than 200 Bangladesh Taka (£2.50) to set up each morning (Figure 1). The most extensive operations comprise vendors offering a variety of foods; for example a vendor in Sri Lanka selling lunch packets, fried rice, meat and vegetable curries requires 4500 Sri Lanka Rupees (£35) to start his day's work (Figure 2).

There is currently a project being run by the ITDG country offices in Bangladesh and Sri Lanka and UK into the energy needs of street food vendors, and funded by the UK government Department for International Development (DFID). This is an integrated project, bridging the areas of household energy and small enterprise. Previous studies of street food vendors have typically focused on the health factors of their products, and urban energy studies have either been concerned with non-commercial household activities or planning issues at a macro level. Street food vendors use energy for cooking, lighting and transport. This project has focussed on the energy aspect of cooking.

As there was a deficit of baseline data, the first phase of the project has involved collecting information which will give an insight into this sector and lead to identification of possible interventions to improve livelihoods.

Street food vending is not an easy task. In Sri Lanka, 38% of those surveyed spent more than 15 hours on the street selling food every day. This does not include time spent in transport, in preparation at home, or in procuring ingredients and fuel (Figure 3). Also significant is that a typical street food vendor has been involved in this type of work for several years; in Sri Lanka 70% had been in the business for more than five years. This rela-


ITDG/BIO

Figure 1: Tea seller, Bangladesh


ITDG

Figure 2: Vendor selling a variety of foods, Sri Lanka

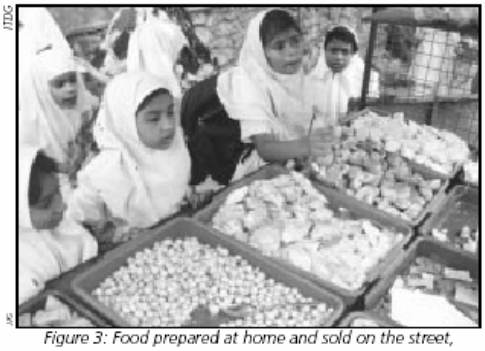


Figure 3: Food prepared at home and sold on the street, Sri Lanka

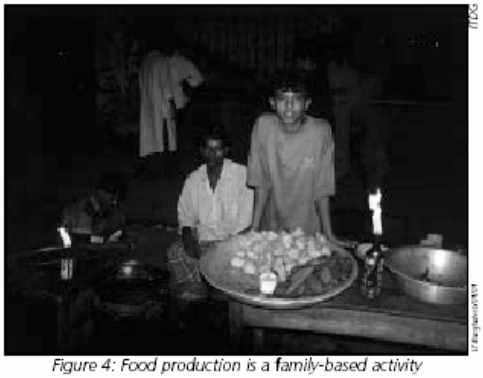


Figure 4: Food production is a family-based activity

tively long period of time suggests a proven capacity to sustain themselves in this informal trade.

Household energy and street food vendors

Production of food for sale is a family-based activity, and much of the preparation is done in the household environment; in Bangladesh 62% of people surveyed reported that food was wholly or partly prepared at home. Also as production is typically small-scale, all the issues of household energy are pertinent to street food vendors. Any improvement at a household level in the production of food for sale would be to the benefit of the livelihoods of street food vendors. So one element of working with street food vendors involves very similar issues to household energy.

Institutional context

Street food vendors are disadvantaged because there is usually no support from formal institutions to improve their businesses or protect them from external influences. The usual response at policy level is that they sell unhygienic low-quality food, dump garbage, engage in criminal activities and are a nuisance to maintaining law and order. They often have no legal status, resulting in victimisation by the police, public health institutions and local government authorities. This project hopes to address this problem in the urban areas under focus by communicating the results to the local authorities; for example, the deputy commissioner of Bogra is the chief guest of the forthcoming workshop.

Street food and health

There is a specific connection between energy and health aspects of street foods as a poor, intermittent energy source will fail to destroy bacteriological pathogens. This is especially the case for food which is prepared at home and warmed at the point of sale. Therefore, an improvement in the energy aspect of street food vending, coupled with knowledge dissemination on the need for adequate hygiene will result in reduced incidence of (occasionally fatal) food poisoning.

Another factor is that the contribution of street foods to total nutritional intake of poor urban populations is large. This is because it may be cheaper to buy street food than for individuals to prepare food at home, as street food vendors can buy raw materials and make food in bulk.

Results of baseline study

The baseline study has been completed and many demographic statistics have been found. However, even more interesting are the findings of participatory research with selected vendors. Difficulties identified by street food vendors in Bangladesh are tabulated below:

Type of Problem	*Frequency**
Capital shortage	36%
Natural calamities	35%
Oppression by police	32%
Bribe / Subscription	30%
Local *Mustan* (local racketeers)	11%

* more than one problem could be identified by each vendor

Natural calamities include epidemics, for which street food vendors receive much harassment from local authorities.

Gender and street food

The income generating activity of street food vending has a potential to empower women. Women can control the production processes, and keep the profits generated which would mean that the women labour is more recognised. In any situation where food preparation takes place a the home, the energy user is likely to be female (Figure 5). Throughout the project, it is therefore their knowledge which must be incorporated into the design of pilot interventions. As the street seller is often male (Figure 6), steps must be taken to go beyond identifying the need for interventions at the point of sale, and involve women in the decision-making process.

Energy aspects

The primary focus of the project was to explore the energy use patterns of street food vendors. There have been several interesting results. In Bangladesh, survey work was completed in the

Figure 5: The cook is usually female

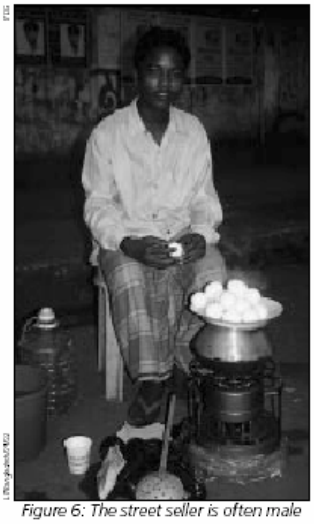


Figure 6: The street seller is often male

capital, Dhaka and in peri-urban areas around Bogra. The main fuel sources in both areas were twigs and kerosene, though some users in the capital used gas and 20% of those in Bogra used *Ghuta* (fuel 'cakes' made from dried cowdung). All the vendors in Dhaka and most in Bogra procured their fuel from the local market. Reported problems in using fuel included smoke hazard, eye burning, and the heat. Respondents were asked about their opinions on efficient fuel, and there was a clear-cut difference in perception of fuel efficiency. More than half the Dhaka respondents thought gas was the most efficient, whereas street food vendors in the peri-urban district of Bogra thought that twigs were the most efficient fuel. This would suggest that an intervention based on improved wood-stove technology would be suitable for piloting in Bogra (the Bangladesh Council for Scientific and Industrial Research, have developed an improved cook stove) and, with proper analysis of the affordability of LPG technology, gas stoves could be piloted in Dhaka.

A similar in-depth investigation of energy issues was completed in Colombo by the ITDG – Sri Lanka regional office. Here firewood, kerosene and LPG were the three major sources of energy for cooking, heating and lighting during selling. Of these, kerosene predominated with 76% of vendors using this either as the only, main or supplementary source of energy. Participatory research identified the factors that influenced the choice of fuel and the perceived constraints of the different fuels. The overall perception was that kerosene is relatively cheap and convenient. In particular tea vendors found it was convenient to carry kerosene stoves in the market place. However some stoves were the wick-based stoves which are less efficient than pressurised kerosene stoves.

Conclusions

Research and field experience in the sector of street food vendors is valuable because it is a large significant area supporting the livelihoods of millions of the urban poor. It is a section of society that requires research input from many different disciplines within the sphere of development. It encompasses household energy used in small enterprise where gender issues are of prime importance in the division of roles, work and income, and where the entrepreneurial activity itself is in the field of food processing. This project has furthered the knowledge of this sector in three cities in the Asian sub-continent. The results of the investigations will be used as a baseline for interventions researching the efficacy of fuel switching and more efficient combustion to improve the situation of street food vendors. The dissemination phase of this project will take place in many fora: further workshops will be held with street food vendors, there will be meetings at municipal government level, an international workshop in Sri Lanka, and publications in this journal, in Food Chain and a stand alone publication. Informing policy makers and municipal authorities is seen as especially important as lack of recognition of street food vending as a viable occupation is a barrier to an improved situation for street food vendors.

Leonard Tedd, has recently joined the International Programmes Unit of ITDG. He studied engineering at Durham University and previously worked for ABB's Department of Energy and Global Change in Switzerland. He has experience of field research with appropriate technologies in Mozambique and Zimbabwe, working for PumpAid.

Appendix 4: ITDG Project Hand-out

PRACTICAL ANSWERS TO POVERTY

Progress Statement
Energy and Street Foods Project

Energy Programme, International Programmes Unit

October 2001

Outline Description

Rapid urbanisation has led to a proliferation of very small food outlets. The preparation and sale of street food provides employment and income to millions of people around the world, as well as affordable food to low-income people. As there are economies of scale involved the energy used by street food vendors replaces fuel consumption at the household level. The aim of this DFID-funded project is to improve the livelihood of street food vendors and their dependents by identifying and improving access to energy efficient technologies and fuel. This project is a new piece of work as previous work in this area has concentrated largely on health aspects of preparation, nutritional, and legal issues.

The activity of selling food on the streets forms a large part of the informal sector in urban areas worldwide. It is undertaken by entrepreneurial women and men, and more often run with the assistance of their families than paid labour. Their businesses are typically irregular, unstable and marginal. The concept of a street food vendor covers a broad range of activities. Some are operate a very modest scale either as an extension of household food preparation activities or those engaged in selling a single product, such as a tea seller with a very low turnover. More extensive activities include the sale of 'lunch packets' consisting of rice and curry, or stalls with a variety of produce, such as the one shown.

Street food vendor, Colombo, Sri Lanka

Research

During the first phase of this project, surveys of energy use and flows in the street food sector have been undertaken in Colombo (Sri Lanka) and Dhaka and Bogra (Bangladesh). In each country a hundred street food enterprises have been involved, through participatory research into their situation and needs. Structured questionnaires were also used to gather baseline data of the social, economic, and demographic features and information about the business operation and fuel use of the street food vendors.

Results

The results of the first phase show that energy issues for street food vendors is a complex issue with energy being used for numerous purposes including: cooking, lighting (during cooking and selling), heating, and grinding. There is a spectrum of fuel in use including wood, charcoal, kerosene, bottled gas, and (in Bangladesh) 'ghuta' which are dung cakes used as fuel when dried. Many other factors were also investigated, interesting results include how vendors procure fuel and which technologies are perceived to be more effective for cooking.

Pilot Interventions

In the second year of the project, appropriate technologies will be specified and piloted with 25 vendors in each country. Strategies for improving the vendors access to energy and energy-efficient technologies will be developed with local NGOs and municipal institutions. The pilot strategy will address the role of appropriate technology in improving the livelihoods of street food vendors including the non-technical issues of barriers to access of improved stoves or fuel and financial mechanisms for the widespread uptake of improved technology. This project will conclude in September 2002 with a dissemination workshop with the target audience, policy makers, local NGOs and the participating street food vendors. The results will be published on the Internet and in Boiling Point and Food Chain journals.

Energy Programme
Intermediate Technology Development Group
Bourton-on-Dunsmore, Rugby,
Warwks CV23 8QZ, UK
Contact: leonardt@itdg.org.uk
http://www.itdg.org
Tel: +44 (0) 1926 634 400

Appendix 5, Project Stakeholders

Bangladesh:

Participants and Nominated Organizations

Sl. No.	Name of Participant	Designation	Organization
01	Satya Ranjan Saha	Manager-Agro- Processing	ITDG-B
02	Susil Lianarachchi	Project Director	ITDG-SL
03	Md. Shams Uddin	Forestry Expert	TMSS
04	Leonard Tedd	Energy Unit	ITDG-UK
05	Jahanara Begum	Coordinator-FP	ITDG-B
06	Md. Ziaur Rahman	Executive Director	SAPNO(Dream)
07	MA Qudds Sarker	Executive Director	Samaj Kallyan Sanghstha
08	Ahmedul Ghani	Free Lance Consultant	PromPT
09	Prof. Wazed Ali	Executive Director	Khodeja Foundation
10	Mostafa Haider Chow.	Project Coordinator-ESFP	ITDG-B
11	Gobinda Bar	Program Officer	ITDG-B
12	Uttam Kumer Saha	Prog. Officer- Clean Tech	ITDG-B
13	Sarder Mahtab Uddin	Asstt. Director Agriculture	TMSS
14	Foy zoon Nahar	Asstt. Director-Training	TMSS
15	M. Ataur Rahman	Deputy Director –IA	TMSS
16	M. Ashraful Islam	Director - IA	TMSS
17	M.Momtaj Hossain	Consultant	TMSS
18	Md. Aminul Islam	Deputy Dirctor-IGA	TMSS
19	M. Mokhlesur Rahman	Executive Director	MBSKS
20	Dr. AM Hasan R. Khan	Project Director	IFRD-BCSIR
21	M Rejaun nabi Raja	District Supervisor	BCSIR –Bogra
22	Habibur Rahman	Project Officer-Agro- PP	ITDG-B
23	Tanjima Akkter	Sub divisional Women A.O	Govt. PRB
24	M.A Wadud	Coordinator	USS
25	Samchi Ara Happy	Trainer	GUK
26	M A Latif	Chairman	AMUS
27	Moniruzzaman	Consultant	ITDG-B
28	Ms Shahjadi Begum	DD-(HRDD)	TMSS
29	Md Moshiur Rahman	AD(IA)	TMSS
30	Hosne Ara	Executive Director	TMSS
31	Trishna Rani	Group member	TMSS
32	Mokbul Hossain	Cow MAA	Vatenary department
33	Khorshed Alam	Deputy Director	TMSS
34	M A Salam	Deputy Director`	AC
35	Mir Rustam Hossain	District Super	IFRD/BCSIR
36	M Mahbubar Rahman	Chairman	SS
37	M AKader	DD(PP)	TMSS
38	MA nwar	Group member	TMSS
39	Forman Ali	Group member	TMSS
40	Ms.Mukul	Group member	TMSS
41	Sabina yasmin	Director	Dhrubo Society

42	Matiun Nahar	Group Member	TMSS
43	Farida Begum	Thana Superviser	IFRD/BCSIR
44	Md. Raju	Group member	TMSS
45	Fazlu	Group member	TMSS
46	Manwarul Azad	Executive Director	Shova
47	Shamsun Nahar	Consultant	ITDG-B
48	Taslima Khnom	Consultant	ITDG-B
49	Hasna Banu	Dist. Social Service Officer	Govt. PRB
50	Nibaron	Group member	TMSS
51	Veena Khaleque	Country Director	ITDG-B
52	Naved Ahmed Chowd.`	Project Manager- ESF	ITDG-B
53	Mrs Rostom Ali	Thana Technician	BCSIR
54	Farda Akter	Do	Do

The following attended the end of project workshop in Sri Lanka:

STREET FOOD WORKSHOP – NOVEMBER 25TH, 2002

PARTICIPANTS LIST

1. A G T Sugathapala - University of Maratuwa
2. A Maduraveeran - Silumina
3. Anusha Malani Gunatilleke
4. Assath Sally - Deputy Colombo Mayor
5. Bandula Chandrasekera - Energy Forum
6. Beni Yatawara - British High Commission – DFID
7. C V Krishna - India
8. Chamindra Weerakody - ITDG - Consultant
9. Chandrani Dhaluwatta - Vendor of Ragama
10. Dasun U Edirisinghe - Vidusara
11. Dhanushi Sennanayake - ITDG-South Asia
12. Dr Dula de Silva - Health Ministry
13. Dr. Pradeepa Kassyawana - CMC
14. Dushanthily Sithamparam - ITDG-South Asia
15. Feixac Samathi - Sunday Times
16. H M Somaratne - FORUT
17. H M U Chularatne - SEVANATHA
18. Hemantha Chularatne - ITDG – Consultant
19. L G Lamasena - IDEA
20. Leonard Tedd - ITDG – UK
21. M S Asis - LFO
22. Mahendra - Lakhand
23. Mahinda Imaduwage -
24. Mahindha Jayasekera - SPDA – Galle
25. Nalin Munasinghe - ITDG-South Asia
26. Neshad Mandakody - DEIHERM
27. Nilanthi Gunawardene - ITDG-South Asia
28. Padma Weragosa Arachchi - Dinamina
29. Parithri Peiris - SEEDS (Gte) Ltd
30. R M Amarasekera - IDEA
31. R Thiyagarajha - Vendor of Wellampitiya
32. Ranga Pallawala - ITDG-South Asia
33. Ranjith - Vendor of Dhelgoda

34.	Rasika Suraweera Arachchi	-	Sunday Lakbima
35.	S M Kathriarachchi	-	CMC
36.	Satya Ranjan Saha	-	ITDG – Bangladesh
37.	Susil Liyanarachchi	-	ITDG-South Asia
38.	T Siyambalapitiya	-	RMA
39.	Upali Pannilage	-	ITDG-South Asia
40.	Vanee Surendranathan	-	Basic Needs
41.	Vimukthi Fernando	-	Sunday Observer
42.	Vishaka Hidellege	-	ITDG-South Asia
43.	W Priyankara	-	Vendor of Kaduwella
44.	W U S Waidyaratne	-	People's Bank
45.	Wasantha Samaraweera	-	MOWA