

BUILDING A BETTER STOVE

the Sri Lanka Experience

Emma Crewe, Shyam Sundar and Peter Young



Practical Action

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Acronyms

AGA	Assistant Government Agent
ARECOP	Asia Regional Cookstove Programme
CBO	Community Based Organisation
CEB	Ceylon Electricity Board
CISIR	Ceylon Institute for Scientific and Industrial Research
DCO	District Coordinating Officer
FWD	Foundation for Woodstove Dissemination
GS	Grama Sevaka
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (German Technical Cooperation)
ITDG	Intermediate Technology Development Group (Now Practical Action)
IDEA	Integrated Development Association
IDB	Industrial Development Board
IRDP	Integrated Rural Development Programme
MPE	Ministry of Power and Energy
NGO	Non-Governmental Organisations
NERD	National Engineering Research and Development Centre
NFCP	National Fuelwood Conservation Programme
NORAD	Norwegian Agency for Development Cooperation (NORAD)
PHSWT	Plantation Housing and Social Welfare Trust
R&D	Research and Development
TO	Training Officer

Foreword

Every year, 1.8 million people in the world die of illness related to smoke from cooking fires. Most of these are children. Up to 3 million people in the world depend on biomass to meet their household energy needs. Further, those who depend on firewood for their energy for cooking, spend a third of their income on it. Fuel efficient stoves can reduce the smoke emissions and the use of fuel wood, while also reducing the time spent by women at the stove and collecting firewood.

This publication by Practical Action (formerly the Intermediate Technology Development Group or ITDG) highlights the technology development of the fuel efficient stoves in Sri Lanka.

Practical Action together with Sarvodaya, the Alternative Energy unit of the of the Ceylon Electricity Board (CEB), Integrated Development Association (IDEA), set up in early 90's to promote stoves amongst poorest, has carried out fuel efficient stoves programmes since the eighties.

Practical Action is a development organisation, interested in identifying and offering appropriate technology options to combat situations of poverty and marginalisation. The fuel efficient stove was one such technology option that was found to be successful in its adoption in Sri Lanka, and the

improved stove was taken up for manufacture by potters all over the island and it is now a common sight in most rural households.

It is hoped that this volume will encourage further development of the stoves in Sri Lanka.

Vishaka Hidellege

Regional Director

Practical Action

Acknowledgements

This book sketches twenty years of work on improving stoves in Sri Lanka. The cooks and potters worked most intensively, supported by the initiatives of four key organisations Sarvodaya, the Alternative Energy Unit of the Ceylon Electricity Board (CEB), Integrated Development Association (IDEA), and Intermediate Technology Development Group (ITDG - now Practical Action) in Sri Lanka and the United Kingdom. Four key characters dedicated themselves to stoves development for over fifteen years each - Lamasena, Bandara, Amarasekera and Young. The success of Sri Lankan stove projects is largely due to their extraordinary commitment, determination and energy.

Some of the information for this book was gathered by Emma Crewe during her Ph.D. research, carried out from Edinburgh University and ITDG, and funded by the Economic and Social Research Council of the United Kingdom. All of it came from those working with or for stoves development.

The authors would like to express their appreciation to Caroline Ashley and the staff of IDEA for their comments on earlier drafts, and to the organisation for financing this publication.

Introduction

Aims of the Book

Stories of failure plague technology development, and stove projects are no exception. The documents describing more positive examples of project work tend to be dismissed as propaganda for a particular approach or organisation. Yet, there are successful stories to be told and to get good value from those initiatives it is important to work out why they worked, so that others can learn from them.

One such positive story, the development of stoves in Sri Lanka, is well worth telling. The projects did not go exactly according to plan. Rather the work done on stoves in Sri Lanka reveals that adaptability is more important than sticking to misplaced objectives. Despite persistent political instability, and the difficulties in introducing a new product to both the users and producers, stove programmes in Sri Lanka have managed to reach over 25% of the total number of households.¹ A new self-sustaining stove industry has been established within twenty years, benefiting around 250 producers and 800,000 cooks and their households. While not much more than a million pounds has been spent on stoves by development agencies and households since 1977, the financial benefits are valued at over £25 million. That does not take account of the unquantifiable but impressive quality of life, health and environmental benefits.

¹ The figures are based on the 2001 census figure on total number of households in Sri Lanka (4.68 million) and the rough production/sales figures provided by the producers.

This book describes the historical background to this stoves development work and to Sri Lanka; the detailed progress of the stove programmes during the last decade; the impact on the environment, the national economy, potter producers and cooks; and a description of the lessons to be learned from the successes and setbacks.

While most of the book will be more interesting to those concerned with household energy, there are many practical lessons that concern development workers in any field. This case study describes why and how we need to transform our approach to the practice of planned development. The importance of local control, taking marketing seriously, monitoring progress, co-operation between agencies and consulting beneficiaries at all stages, are all essential criterion for success. Having the right and fashionable attitude is not enough. We offer advice about the next, more challenging, phase: how to put good theory into better practice.

Finally, we hope that this success story may rejuvenate interest in stove and household energy projects within both international and national aid agencies. We offer evidence that expanding stove technology choice could potentially offer significant benefits to over a half a billion women (predominantly the cooks) and their children.

Stoves Technology Development

Development workers turned their attention to improving stoves in Gandhian organizations within India in the late 1940s. They tried to reduce the level of smoke emissions from biomass-fuelled fires through the introduction of mud and clay stoves with chimneys, such as the Magan Chula.



Magan Chula
(T. Kallupatti
model. India)

It was not until the following decade that such improved stoves were first widely publicised by Raju (1953). His article reminded people that they were ‘working for the emancipation of women’ by improving hygiene in their kitchens. During the 1960s stove designs multiplied in India, while research and development (R&D) was also initiated elsewhere producing, as examples, the Ghanaian oven and several new models in Indonesia (Foley and Moss 1983:104-5). These early stoves were not disseminated in large numbers but laid the technical foundations for future designs with chimneys, such as the Lorena stove, the Thai moulded stove and the Nepali Insert stove.

The concern to reduce smoke in kitchens was overtaken by the wood fuel crisis. Over-use of finite resources, such as trees, and the rise in oil prices in the 1970s, combined to elevate wood fuel conservation to the status of a high priority in energy planning. It was argued by energy planners that improved stoves could reduce fuel consumption through more efficient combustion and heat retention. They assume that householders cut trees for fuelwood, so decreasing the amount of fuel used in stoves should reduce the rate of deforestation.

Since fuel-efficiency became the prime objective, the technical performance of stoves became critical. Karekezi, of the Foundation for Woodstove Dissemination (FWD) in Nairobi, surmises that:

‘The socio-economic aspects of stove development and dissemination took a back seat. In the 1970s, technical and scientific parameters were perceived to be as important as (and probably more important than) the needs and aspirations of the stove user’ (1989:23)

Unfortunately, the emphasis on fuel-efficiency at the cost of users’ priorities often resulted in low acceptance amongst households during these early stages.



Deforestation

In the 1980s Foley and Moss concluded that energy experts had been mistaken in their assumptions about wood energy. They had assumed that trees felling could be reduced by giving rural households more fuel-efficient stoves. It should follow that if rural cooks use less wood, fuel wood gatherers would refrain from cutting down the forest. However, wood fuel consumers are the victims but not the cause of deforestation. Clearing land for agriculture, creates by far the greatest pressure on wood resources; and timber logging, charcoal-making, and industrial fuel-use all account for substantially more depletion of the forests than domestic consumption (Foley and Moss 1983:19-21). Rather than tackling the cause of deforestation, stoves were promoted as a means of alleviating the shortages caused by diminishing forests. The swing away from the aim of saving trees has been so zealous that charcoal making and rural 'headloading' (cutting trees and carrying wood for sale to urban areas) have been forgotten as causes of deforestation entirely by some donor agencies. Few realise that charcoal burning stoves, and wood burning stoves sold to urban dwellers, can reduce tree felling.

These subtleties were ignored within many aid agencies, overwhelmed, as they tend to be, by the pressure to produce simple, standardised blueprints. By the late 1980's stove programmes had been abandoned by the United Nations (except for the Food and Agricultural Programme), the World Bank, and bilateral donors (except for the Dutch government and GTZ). Many international Non-governmental Organisations (NGOs) followed suit, with notable exceptions such as ITDG, GATE and Association Boie de Feu.

Meanwhile, environmental and medical research, such as that by Dr. K.R.Smith and Dr. M.R. Pandey, began

to highlight the enormous potential benefit of stoves in reducing the health risks of indoor air pollution. A woman cooking with wood or dung in an unventilated room is exposed to the equivalent of more than a hundred cigarettes a day. It became well established that it contributes to acute respiratory infections, the biggest killer of children in the South (World Bank 1993). The World Development Report 1992 identified the reduction of indoor air pollution from cooking fires as one of the four priority areas for protecting the environment (World Bank 1992: 2). However, this recommendation does not appear to have been put into practice as yet.

Despite this decline in funding, stove producers and project staff in Africa and Asia were beginning to make improved stoves accessible to large numbers of households. As projects moved into household development, and away from fuel conservation, they took greater account of the needs and demands of stove users and producers. In addition to realising the multiple economic, social and health benefits offered by improved stoves, project staff also switched their attention from the technology to the process. It had already been realised that effective dissemination strategies were as much of a key to high rates of adoption as popular stoves. Many stove projects focused on using existing commercial networks for selling stoves. Sri Lankan stove specialists were foremost amongst them.

At present, it is estimated that there are over 100-stove programmes and over 165,000,000 improved stoves installed in Africa, Asia and South/Central America. Following the enormous success of stove projects in the last decade, they are growing in popularity amongst household energy experts, governments and NGOs in those regions. The history of stoves in Sri Lanka offers

convincing evidence of success - and valuable lessons for development workers in other countries in any technology field.

Box 1 : Potential benefits of improved stove technology

Economic

- Provide employment opportunities for stove producers and builders
- Generate income for stove producers, builders, distributors and sellers
- Enhance the technology development capacity of local artisans/research organisations/agencies
- Reduce household fuel expenditure

Quality of Life

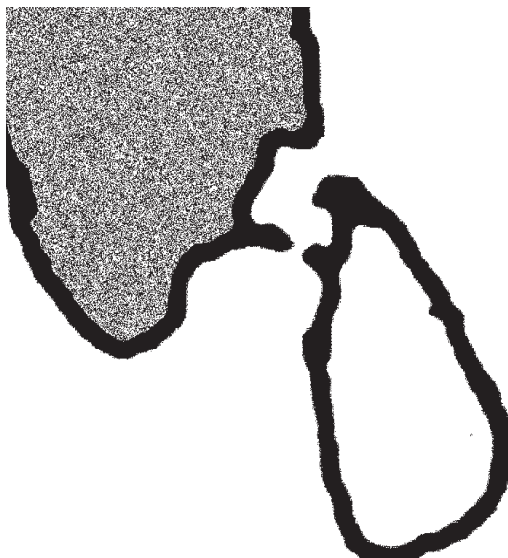
- Reduce women's heavy workload
- Cut time spent cooking, cleaning and collecting fuel
- Reduce the incidence of lung diseases, and eye and acute respiratory infections through lower smoke emissions
- Improve safety by reducing burns and fires
- Increase convenience while cooking

Environmental

- Alleviate the effects of fuel wood shortages
- Relieve the pressure on biomass resources
- Raise awareness about environmental, ecological, energy, and health concerns
- Reduce rate of tree felling for use in charcoal and urban-based wood burning stoves
- Educate at national and household levels about health, safety and hygiene
- Act as a spring board to other community and gender development initiatives

A Sri Lankan Background

Sri Lanka is a teardrop shaped island sitting in the Indian Ocean almost 77 km from the southern tip of India. It has a land area of about 66,000 square km and stretches 350 km from north to south



and 220 km across. The topography of the country is characterised by a mountainous region in the South Central region, surrounded by a coastal plain, which narrows in the West and South, and expands to a vast tract in the North and East.

The population is estimated to be 19 million, of whom approximately 72% are Sinhalese, 20% are Tamils, 7% are Muslims and the remaining 1% comprise Malays, Burghers and a very few of Sri Lanka's earliest inhabitants - Veddhas. It has one of the highest literacy rates in Asia at 86.5% (among those aged 10 years and over). The total number of housing units according to the 2001 census stands at around 4.7 million and accounting for nearly 5 million households.

Although only 29% of the land is cultivated in Sri Lanka, 80% of the population lives in rural areas

deriving most of their income from agriculture. The most important industries are based on the manufacturing and /or processing of agricultural products, especially tea, rubber and coconuts, imported oil and chemicals, and textiles and garments. The export of tea, clothing, petroleum products, rubber and fresh fruit, and to a lesser extent, tourism, generate much of the foreign exchange. In 2001 the per capita Gross National Product (GNP) was US\$ 820, the rate of inflation was 14.2% and 7.6% of the population was unemployed. (Source: Central Bank of Sri Lanka, March 2002)

The country has been going through a phase of conflict for about two decades. This includes the long standing conflict in the North and East of the country with its spill over effects on the rest of the country, and also the Southern insurgency which lasted a couple of years. All this has necessarily meant that for a long period of time, there has been little or no development efforts in the North and East of the country, while development efforts saw some trying conditions in the rest of the country as well.

Introducing Stove Users and Producers

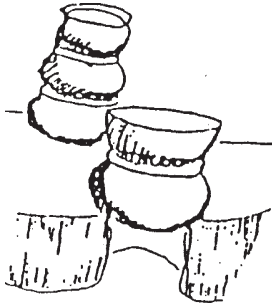
Sri Lankans use stoves mainly for cooking, space heating, lighting, drying crops and getting rid of insects. Although the biomass fuelled fire often has these, and many other functions, the principal one is cooking and so for convenience, stove users will be referred to as cooks. In the vast majority of Sri Lanka's households, cooks are female. An exception can be found in estates in Nuwara Eliya, where a few Tamil men cook during the day while their female relatives pluck tea.

Box 2 : Constraints facing Sri Lankan women

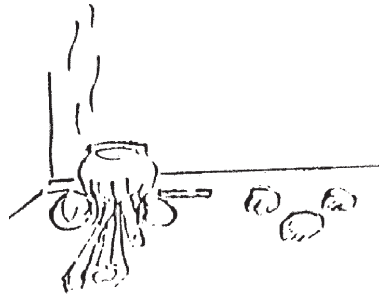
Women in Sri Lanka are severely overworked. They undertake some income-earning activities and marketing, and much of the agricultural and horticultural labour. They are entirely responsible for childcare, cleaning, food processing and preparation, cooking, and collecting fuel and water. They spend many hours administering community services, such as tending the sick, exchanging goods, attending rituals, and gathering information. A Sri Lankan woman's working day often amounts to over 15 hours. In women headed households, the work burden is intensified. For the bulk of this work, women are not paid. Not only do they have relatively less access to income, capital and credit than men, but they also depend upon men for acquiring social status.

One of the most time-consuming areas of women's work is that associated with cooking food. Gathering wood and using it to cook are particularly onerous where women face fuel shortages. Spending longer on fuel collection often leads women to invest less time in food preparation, cooking, attending to health, and earning income. The consequences are detrimental to their own health, status and well-being, but also to all the members of their households, especially their children, and infants.

Until recently, all aspects of cooking technology were almost entirely handled by women. Their equipment consisted of a fire, over which the pot sits supported by three or more stones, bricks, mounds of mud, or lumps of other fireproof material. This arrangement is



An open hearth



A three stone fire

widespread throughout rural Africa, Asia, and Central/South America, and is referred to as a 'three stone fire'. In Sri Lanka it is also common to find cooks filling two of the gaps between the supports with mud, to prevent the heat from escaping while leaving one space for feeding the fire with fuel. This is often referred to as an 'open hearth'. The complex skills necessary for using this technology can be observed in the way fuel is conserved, heat is controlled, and different functions that are performed by varying the relationship between the fuel, the pot, and the stones.

Stove programmes in Sri Lanka have also attempted to generate income for potters, whose industry seemed to be gradually dying. In 1981 there were roughly 5,500 professional potters, of whom 3,000 were men and 2,500 were women, living in rural areas.² They tend to reside in Potter caste villages or communities within a larger multi-caste village. Sinhalese Potters often refer to themselves as belonging to 'one big family' stretching across the Sinhalese dominated areas of Sri Lanka.

² 1981 National Census. This is probably not very accurate because five districts were excluded and the population may have altered significantly since then.

Box 3 : A Potted History of Potters

The pottery industry has been in state of constant flux throughout Sri Lankan history. During the time of the Kandyan Kingdom pots were mostly made for landlords in payment for using their land. Today, pots are market commodities, not service or informal exchange goods based on caste membership as they were in the past, and potters rarely cultivate land. Although pottery making no longer entails caste services (except occasionally when pots are made for the temple, former patrons and ritual occasions) the occupation is still considered polluting. It is this, together with the position of working for others and receiving cash payment for services, which perpetuates the lower caste status of potters. Young potters appear to be searching for alternative employment in order to escape the caste identification but the quest is not easy. They are still discriminated against in schools, and few can acquire the necessary qualifications for desired white-collar jobs.

Potters, young and old, have managed to substantially improve their relative social position by earning large amounts of money through stove manufacture. Others have moved into other clay based occupations such as brick making units and tile factories. Brick making units are scattered across the country whereas tile factories tend to be found in a few clusters. The stove programme worked in partnership with seven tile factories in the 1980's; they embarked on stove production and provided employment for a number of potters.

The History of Sri Lankan Stoves Programmes

Early Improved Stoves

Improvements to the three stone fire have probably been in use in Sri Lanka for up to 1000 years. Artifacts unearthed during excavation work in Polonnaruwa contained broken parts of pottery stoves used in the ninth and tenth centuries (Sepalage and Amarasekera 1987:20). Since Sri Lankan potters are both male and female, these developments may have been innovated by either. It is likely that women have been using the improved version of the three stone fire, where stones are covered with mud to form a semi- circular shape, since the eighteenth century. This U- shaped stove was later also moulded with clay and fired by potters, and is still widely used in Sri Lanka and South India.

At the beginning of the 19th century south Indians, immigrating to work on the plantations in Sri Lanka, brought stove improvement practices with them, such as the use of multi-pot hearths made of mud. Some volunteers, government agencies, and NGOs attempted to popularise the south Indian Hyderabad Engineering Research Laboratory stove in Sri Lanka without much success (ibid:21). It was not until the 1970s that Sarvodaya³ initiated a small, but more concentrated

³ The Sarvodaya movement was founded by Dr. A.T. Ariyaratne in 1958. Sarvodaya volunteers have worked in over 5000 villages, aiming to develop village infrastructure with community participation, conduct development education activities, and engage in welfare programmes. The aim has been to establish a village oriented, non-governmental people's organisation, whose activities are geared to integrate cultural development based on Buddhist values.

stove project. The important events in the Sri Lanka stoves history are as summarised in the chart below.

Important Events in the History of Stove Activities in Sri Lanka

- 1950 Introduction of the Herl Chula
- 1972 Interest shown by government research organisations, namely Industrial Development Board (IDB) and Ceylon Institute for Scientific and Industrial Research (CISIR) in designing stoves.
- 1977 Sarvodaya initiates its stoves work
- 1979 Sarvodaya stove project with technical inputs from ITDG
- 1981 International seminar on stove projects -ITDG/Sarvodaya
- 1983 Formation of the National Fuelwood Conservation Programme (NFCP) under the Ministry of Power and Energy (MPE)
- 1984 Pilot project to identify a suitable stove design funded by the Ministry of Housing and Construction
- 1984 Pilot project to identify a suitable dissemination strategy for large scale dissemination funded by the CEB
- 1985 Commencement of a three year large scale dissemination programme in the Hambantota district under the Integrated Rural Development Programme (IRDP) and funded by NORAD
- 1985 Launching of the national Rural Stoves Project jointly funded by the MPE and the Royal Government of Netherlands
- 1985 Prof. Mohan Munasinghe Award presented to the stove team for implementing the best energy project in 1985

- 1985 High priority accorded to the CEB's stove project activities by H.E. The President
- 1987 Launching of the Urban Stoves Programme by CEB and ITDG jointly funded by MPE and ODA(UK)
- 1989 International seminar on Urban Wood Stove Dissemination funded by ODA(UK) and CEB
- 1989 Pilot project to identify suitable stoves for the plantation sector
- 1990 Extension of the Rural Stoves Programme by CEB
- 1990 Commencement of the Stoves Marketing project - extension of the urban commercial strategy to rural areas, implemented by Integrated Development Association (IDEA) in collaboration with ITDG
- 1992 International seminar on Commercialisation of Woodstoves Dissemination jointly organised by IDEA/ITDG
- 1993 Termination of the CEB stoves project
- 1994 IDEA stove marketing project phase 2
- 1994 Pilot project to commercialise stoves in the plantation sector funded by the Plantation Housing and Social Welfare Trust (PHSWT) implemented by IDEA
- 1994 Introduction of the stoves to the Batticaloa district in the conflict area supported by NORAD implemented by IDEA
- 1994 Asia Regional Cookstove Programme (ARECOP) funded pilot project to set up revolving funds led by IDEA
- 1996 IDEA scales-up projects in the Plantations and Batticaloa/Trimcomalee districts
- 2000 IDEA large-scale ARECOP-funded project in 15 districts to create a network of NGOs working on stove projects

Sarvodaya's Success with Stoves

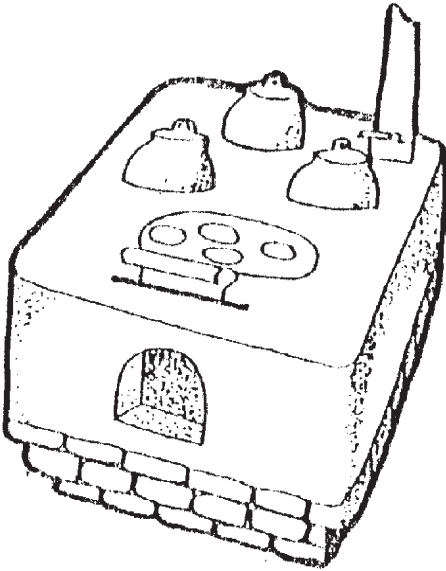
The work on 'fuel-efficient' stoves in Sri Lanka was initiated in earnest by the NGO Sarvodaya Shramadana Sangamaya in 1997. Their customary approach to community development led the stoves project towards a participatory, integrated and needs led style. They were determined to address the needs of the poorer rural people and identified two key problems associated with cooking:

- Deforestation and resulting fuel shortages
- Health hazards associated with smoke pollution

The process of designing both the stove and the dissemination method for it were the result of responding to the opinions of villagers. The cooks reacted to the technical ideas while the artisans voiced refusal or acceptance of the production implications. It was a mixture of these responses that guided the project staff.

Although Indian stoves had been constructed in Sri Lanka since the 1950s, Sarvodaya found that they were not sufficiently durable. An American volunteer (Bill Stewart, who later joined ITDG) began working on stoves by field-testing a copy of the Lorena stove from Guatemala.

Unfortunately, when cooks in the Kandy District were asked to test the stoves they proved unpopular. They reported that the four pot-holes (i.e., openings above the fire with rests for the cooking pots to balance upon) were difficult to use, especially with small pots and kettles. In 1980, Stephen Joseph, of the ITDG Stoves Project,



The Lorena stove is still an artisan's product with wide variation between different makers - good Lorenas last well beyond their payback period.

visited Sarvodaya and recommended that stoves should be re-designed to suit existing stoves, cooking practices, and fuel usage. At this point, Sarvodaya received funds from Helvetas (Swiss), NOVIB (Dutch), and VITA and Appropriate Technology International (both USA).

Following Stewart's 1980 visit to the Gandhiniketan Ashram in South India, he followed their example and began testing stoves based on two different designs:

- Mud stoves with chimney
- Stoves with a pottery liner and no chimney

From this point, the testing of two designs ran parallel. Two problems persisted with the chimney stoves: (1) the firebox of the stoves often crumbled within six months of use; (2) the priorities of the user, i.e. the cook, were being ignored. Stewart relates that 'the men of the household often took the lead position with issues of

new technologies even if they had little to do with the activities in the kitchen' (1983:10). Greater efforts were therefore made to consult the women cooks.

During 1981, Sarvodaya found another source of inspiration, the Dian Desa stove project in Indonesia. Their chimney stove helped to improve cooking speed and efficiency. An evaluation of the Sarvodaya Stoves Project was conducted in rural areas during the same year, which revealed that 60% of the newly designed chimney stoves were being used for all cooking tasks. On the negative side, durability was still not assured, villagers did not seem interested in building their own stoves and the stove builders still needed extra support due to insufficient training. The high cost placed the chimney stoves beyond affordability for most households. Also many found that new stoves cooked too slowly with a chimney, and so they dismantled the chimney pipes. Another smaller survey was carried out in a slum area of Colombo found that these urban-based cooks also rejected the chimneys.

A more successful strategy emerged out of the work carried out on pottery stoves with no chimneys. By 1982 the quality of the chimneyless liners was good enough to start promoting, thanks to the persistence of project staff, advice from users, and further inspiration from designs seen at Dian Desa. Although the stove was made as one piece in 1981, by 1982 the production process was simplified by separating the liner into two pieces. The potters had refused to make the complicated one-piece design, although they agreed to revert back to the one-piece model after six years of stove production experience.

The ceramic pottery liner was insulated by a mixture of clay, sand, ash and cow dung on installation. Like the chimney stoves, it had two pot holes that allowed the cooks to save fuel and time by cooking two dishes at once.

Advantages of the Sarvodaya Chimneyless stove

- The cost was lower
- installation required less precision and, therefore, shorter training which allowed more time for stove promotion
- pottery lined stoves were expected to be stronger and last longer



The Sarvodaya stove

It was estimated that the Sarvodaya stove consumed 20% less fuel, and cooked about 20% faster than the three-stone fire, lasted for between 9 - 18 months, took four hours to install, and cost only SL Rs. 25 or about \$1 (Stewart 1983:21,23) [Note: the exchange rate given is for the early eighties]. They were sold at

virtually full cost to rural dwellers. Health workers and Sarvodaya village level members installed over 5000 of these stoves by 1984. They were receiving 200 new requests for stoves per month. Although the number sold was not enormous, with relatively few resources and staff Sarvodaya staff had laid the foundation for promoting new, popular stoves that greatly pleased the cooks.

The CEB Continues with Conservation

In 1984, Munasinghe, an energy economist seconded from the World Bank, presented his influential report on energy policy to the Government. He argued that fuel conservation and the management of forest stocks could significantly reduce the rate of deforestation. Partly on advice from visiting ITDG staff, he recommended that the government should put resources into large-scale stove programmes. The Ministry of Power and Energy (MPE) asked the Ceylon Electricity Board (CEB) to investigate the possibilities for conserving fuelwood as part of an overall programme to reduce deforestation. In 1984, the President made the subsequent National Fuelwood Conservation Programme (NFCEP) a high priority as a short-term means for slowing the pace of deforestation (Amarasekera 1986:5).

The MPE programme began in response to reports from the Mahaweli Land Development Programme that land clearance for agriculture was causing fuel shortages for settlers. The Alternative Energy Development Unit of the CEB tested the Sarvodaya pottery liner stove with households in the Mahaweli 'H' area (in Anuradhapura District). They decided that its popularity made it a suitable design. A dissemination strategy was developed which made use of existing government networks,

particularly officials such as the District Co-ordinating Officers (DCOs), the Assistant Government Agents (AGAs), and the village level Grama Sevakas (GSs).

The government was pleased to embark on this conservation strategy partly because they did not have to start from scratch and could build on previous successes. By 1984 Sarvodaya had carried out lengthy consultative research and development work and proved the popularity of the new technology (see above). The CEB recognised that Sarvodaya was unlikely to step up distribution sufficiently to make the stove widely available. It was relatively easy for the government to step in with its well-organised national distribution network to implement a project aiming for much wider dissemination of stoves. Thus, in 1984, when the NFCP was launched, the fuel-efficient wood stove dissemination project was designated as its major activity.

The rationale behind their strategy wove together a mixture of environmental and economic concerns. Since Sri Lanka imports all its fossil fuels, and the potential of developing hydro-power was considered limited an increase of pressure on forest and non-forest biomass resources was expected (Sepalage and Amarasekera 1986:5). Even if a shortage of firewood might tempt people to shift to commercial energy to meet their daily household requirements. Also, importing more oil at a high cost would have a detrimental effect on the national balance of payments. So, it was suggested, reducing energy consumption would prevent an increase in imports. One such method of reducing consumption would be fuel-efficient stoves.

Initially, the DCOs were responsible for selecting producers for training in stove manufacture. They obtained a list of suitable trainees from the GSs, and passed this on to the CEB's Training Officer (TO). Potters made the stoves in household based workshops. Very low capital investment is required for pottery making, since they generally construct all their own equipment with relatively cheap materials. Both men and women participate in pottery production with children giving occasional assistance. In the districts of Kandy, Matale, Kurunegala, Kegalle, and Ratnapura, the TO trained about 200 individual potters to make the two-piece Sarvodaya stoves. By 1987 only 73 potters were participating in the rural Stoves Programme. More than half of the trainees abandoned production due to:

- complexity of producing stoves as compared to pots
- delays in payment by the government
- lack of capital or credit for poorer potters to develop facilities sufficiently

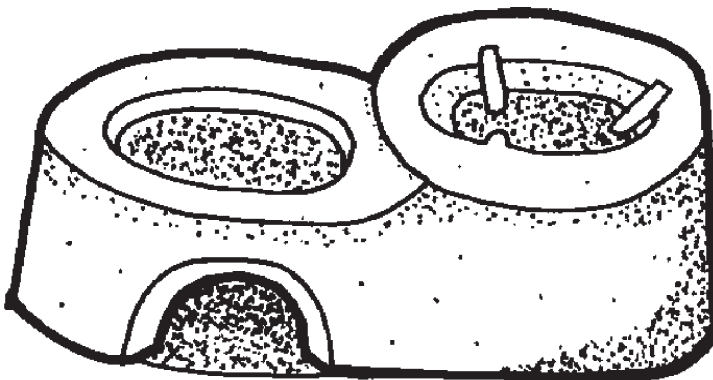
Once the training was complete and the pottery liners were produced to a satisfactory standard, they were purchased by the DCOs and distributed by AGAs (Amarasekera 1987a: 13-15). The local government administration was given Rs.3 for each stove to cover transport costs. In some areas, village organisations, such as the Death Donation Society, distributed the stoves for an equivalent commission.

In addition to generating more income for potters, the Programme created jobs for stove installers/builders. Between 1984-88, the CEB trained over 300 stove builders to install the two-piece stoves. The installer

received Rs. 15 (or Rs.20 by 1990) for each stove directly from the customer, while the 'actual' retail cost of the stove was about Rs. 60-65. The subsidy of Rs. 50 for each stove paid for the potter's labour, transport, the distributors' commission, and administration.

The dissemination strategy was tried out first in Udunuwara Division and 700 stoves were installed within 8 months, which was taken as proof that the scheme could work. Funds were provided for stoves to be disseminated at a subsidised price in Hambantota, Ratnapura, and Kandy by the Norwegian, Dutch and Swedish governments and the MPE. By the end of 1985 the Dutch approved funding for a national programme. However, the subsidised price clashed with the commercial approach of the continuing Sarvodaya project. Since they were charging customers almost the full cost, they could not compete with the low CEB price. By 1985 they agreed to become incorporated into the CEB programme and acted as production trainers and distributors.

The expected benefits over 4 years from the 15,200 stoves installed were stated to be the saving of 9,000 tons of firewood, employment for 185 unemployed



Picture of Sarvodaya insulated mud stove

youths, an impetus to the pottery industry, additional income for 74 potters, and improved health and hygienic standards. The total economic benefit to the country over 4 years was expected to be Rs.48 million (Amarasekera 1986:3). The target was to install 500,000 stoves by the year 1995.

In practice, between 1986 and 1987, 66,400 stoves were produced in the districts of Kandy, Kurunegala and Kegalle alone (Amarasekera 1987b: 12-15; CEB installation records). During 1988 almost 65,900 stoves were installed outside Colombo, but subsequently the rate decreased due to the political unrest. In the middle of 1989, the CEB stopped collecting stoves for several months because it was dangerous to travel in rural areas, particularly in a government vehicle, as the civil unrest in the South of the country was at its peak. Nevertheless, by the end of June 1990 as many as 232,300 stoves had been installed (outside the Colombo District), which is equivalent to about 8.75% of the possible dwellings (Clarke 1991). In 1986, the CEB Project Manager, Amarasekera, won the prestigious Mohan Munasinghe Award in recognition of his contribution to energy conservation.

Factories Produce for City Folk

The CEB did not stop at disseminating the Sarvodaya stove in rural areas. They recognised there was a need for them in urban and peri-urban households where fuelwood shortages were more obvious. A CEB/IT/CISIR project collaboration took root in 1985, when IT energy advisers visited Sri Lanka to appraise the potential of both rural and urban stove programmes. They voiced a concern that the CEB rural programme was not sustainable in the

long-term. They argued that stove installers could never reach enough people, that subsidies would be bound to end once project funding ceased, and that the market place was the only mechanism for widening availability to all income groups (Burne 1985). ITDG suggested that higher dissemination rates should be the priority and that one way to expand the market would be to promote a cheaper stove. A 'one-piece' portable model was needed because it would require no installation and could simplify the marketing process.

The new project marked the return to a market approach to Sri Lankan stove dissemination. Once a market was established, it was argued that this project could become sustainable only if large scale production was established with the support of urban based tile factories (in Colombo, Gampaha, and Kurunegala), for, they would provide higher production levels than could be achieved by village-based potters. In addition, it is also true that the producers trained under the CEB programme were less inclined towards the market based approach, given that they had secure earnings from the CEB programme. A factory-made stove would be of a higher quality and therefore offer greater benefits to users. On the other hand, it was proposed that there was also room for informal sector producers, who could sell for a lower price, making the stove available to the poorer sections of the community (ibid).

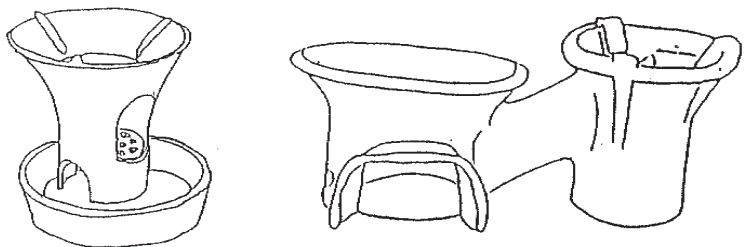
In 1986, the British ODA agreed to fund a new urban-based project through ITDG as part of a bilateral agreement with the Sri Lankan government. The main objective was 'the reduction of the consumption of fuelwood for domestic cooking using an improved design of cooking stove' which, it was hoped, would reduce

fuel bills for the poor and middle class of Colombo by 50% (ITDG 1986:1,4). The CEB began work on a new portable, one- piece version of the Sarvodaya stove. The Ceylon Institute for Scientific and Industrial Research (CISIR) had already tested a wood burning stove with only one pot, and the Industrial Development Board (IDB) had designed a one-pot stove with a small chimney. In addition the National Engineering Research and Development (NERD) centre had also designed a one pot stove.

The CEB and ITDG decided to promote their newly designed two-pot *Anagi* (meaning 'excellent' in Sinhala, the language of the majority) and the one-pot CISIR model through centralised production at the tile factories in Negombo, Gampaha District. Since they had extra space in their kilns while the tiles were being fired, stove production costs were kept reasonably low. The immediate project aim was to develop production facilities for 100,000 wood burning stoves per year for the Colombo area. Thirty tile factories were contacted and seven became involved in production, attaining a production level of 50,000 stoves within two years.

This phase was characterised by a "PUSH" strategy pursued by the project implementers along with the producers. The producers indicated to their clientele (who were largely wholesalers) that for every load of

One pot
CISIR stove
and the Anagi
stove





Factory workers moulding the Anagi stoves

bricks and/or tiles purchased by them they had to also purchase certain number of stoves. In addition a vigorous publicity campaign, using the media, public cooking demonstrations, and advertising was carried out. As a result the demand for these stoves in urban and peri-urban areas multiplied. They were sold through the private sector by wholesalers and retail shops who already had some marketing experience in ceramic goods. The CEB and ITDG continued to give quality control training and advice during the two-year project period. The result was that by June 1990 over 80,000 had been sold through wholesalers and retailers in Colombo District, and some rural potters started producing “look-alike stoves” and selling them in the Gampaha and Colombo Districts.

The urban project was unusually innovative and efficient in its monitoring. ITDG carried out a survey with about 100 users to ascertain their response to the stove. They discovered that the time saved by faster cooking was valued even more than the fuel savings. They also carefully monitored production levels, quality, and sales

so that the project could tailor their advice, and design publicity material, according to what they learned from the information gathered. On a more negative note, they discovered through an omnibus⁴ survey carried out by a market research agency, that it was primarily middle and higher income groups that were buying the stoves. They were not, it became obvious, accessible to poorer households.

Offering Anagi to the Rural Areas

The British government decided that their funds had helped to get the urban stove manufacture started, but that the industry could now stand on its own. CEB and ITDG were concerned that the poorer cooks were not yet benefiting from the Anagi stoves. They decided that leaving stoves in the hands of market forces was not helpful to people on a low-income, and so their collaboration continued.

Although the higher and middle income groups had disproportionately benefited from using Anagi stoves, there was an advantage to this. The Anagi had status. It was associated with a high standard of living, rather than being a charitable product for the poor, and, consequently, was desirable to all. The remaining problem was that it was expensive for those with little cash income, and so it was decided that the price should be brought down. It was hoped that rural potters might be able to produce the stoves more cheaply for a rural market.

⁴ Large scale 'omnibus' surveys are organised by market research companies. They sell question space in questionnaires to various customers. In this instance, CEB/ITDG purchased four questions on a survey of 2000 households randomly chosen from 17 districts of Sri Lanka.

At a time when the funding for the CEB's rural project was being streamlined, ITDG decided to appraise the potential market for Anagi stoves in rural areas. The need to take the Anagi to rural dwellers was perceived as particularly acute since the production and marketing of the two-piece Sarvodaya stove was showing signs of collapsing in some districts once project support had been withdrawn. In Hambantota, when the project pulled out the potters did too. They stopped producing Sarvodaya stoves because they were too time-consuming to market and install without the government's distribution and installation network. Conversely, potters near Colombo were producing copies of Anagis on their own initiative since the urban stove project producers could not always meet the demand. The evidence that rural potters should switch to making the Anagi stove was convincing.

Box 4 : Advantages of the Anagi Stove

Although harder to manufacture, the advantages of the Anagi are that it is portable and can be sold directly to retailers or customers without the need for installation. The Anagi functions as efficiently without a surround, although installation does improve its durability. Since the liner is fixed, this task could be carried out easily by householders. Distribution would not depend on the CEB, but on the potters utilising their existing links for other pottery items with the pottery retailers and wholesalers. Once again the technical improvements were responding to people's needs, rather than designer's whims.

An ITDG social scientist collected information on production and distribution costs, which indicated that several rural potters were already producing liners on a commercial basis at a price of between Rs. 55-65.

Market research consultants were employed to assess potential demand, and a figure of 71,802 potential purchasers was projected for the following year (Banda and Sundar 1990:19). A marketing and distribution strategy was proposed by ITDG, whereby areas with a fuel deficit, high population density, availability of potters, and absence of subsidised stoves would be defined as regions of high potential for stove production sales (Clarke 1991:5).

In 1990, the CEB's NFPC Manager, Amarasekera, established a new NGO and called it Integrated Development Association (IDEA). This new organisation had more independence and fewer bureaucratic constraints than the MPE. While the latter was more concerned with energy issues on macro-level, such as combating deforestation, IDEA developed objectives which related to community and household levels as well. In March 1991, IDEA and ITDG set objectives for a new Anagi programme, as follows:

- To create additional income earning opportunities for potter communities
- To improve household conditions through greater cooking convenience and saving of time spent in the kitchen
- To reduce fuel costs and/or time spent collecting fuelwood

IDEA trained 241 rural potters to make good quality Anagi stoves by 1997. Eighty two of them were women and most were relatively better-off in their community. The male bias arose partly because all four trainers were male, and partly due to women's relative poverty and lack of access to resources such as time, credit and labour. However, the project recruited three of the trainers from the potter community and this helped increase the participation of women potters over a period of time. The difficulties of

establishing a new enterprise are unavoidable for poorer producers, particularly if time and money need to be committed to training, new equipment and marketing. Although the project was trying to reach poorer producers, the fully commercial approach inevitably conflicted with efforts to encourage potters who face serious constraints. So, a Potter Association was set up which tried to assist poorer producers, whether they make stoves or not, by offering low-interest loans.

Potters now report that it is easier to make profit selling Anagi stoves than their previous products. Although they are more costly than the look-alikes, customers prefer their superior quality. Anagis were sold through retailers who would only accept those with a 'seal' and a 'collar', proof that they are up to standard. Although this practice was dropped after a year, by then it had served its useful purpose.

The idea of selling the stoves with a collar came from the potters themselves who wanted a way of proving the quality of their product. This system allowed the customer to check that the stove would perform as well as they expected. Wholesalers and retailers had once been doubtful about securing as much profit from Anagis as they had been getting with look-alikes, but they now refuse to sell the latter.

The project is uncertain as to how many stoves have been sold because potters do not keep a record of production. The current annual sales of Anagi are probably in excess of 60,000 a year, more than the projected sales of 30,000 stoves. The previous rural and urban stove projects substantially raised awareness of improved stoves amongst the population. At the beginning of this

project rural potters could not cater to the demand. Once their production was well-established, the project ran a publicity campaign which appears to have had a major impact. 10,000 posters, 200 points of sale displays (in sheets) and hoardings carried the message about ANAGI and its benefits.

In view of the extremely high literacy rate in Sri Lanka, these visual displays with text appear to have been an excellent choice of strategy for promoting the stoves.



Anagi poster
- Anagi
Fuelwood
Stoves for
Faster, Easier
Cooking!

However, there remains a concern about whether the stove is accessible to people with fewer resources and lower incomes. Although improved woodburning stoves are already a lower cost energy option relative to other renewable energy technologies, both IDEA and ITDG want to reach poorer people. They have linked up with other agencies with this aim in mind. Since April 1992, Sathyodaya, a local NGO involved in community

development work, has been offering loans to village associations in the Kandy District who then have the option of buying Anagi stoves at a reduced price. The associations then sell the stoves to villagers who can pay by installments. Sathyodaya view the stoves as a 'dynamic entry point' for discussion of other household development issues, such as health and nutrition.

Gramiya Nayakayo, another local NGO involved in community development work within the Kandy District, sells the stoves (payable in installments), directly to householders in the district and residing in an area with particular fuel shortages. CARE International has been offering Anagi stoves as an alternative to an honorarium for those attending training courses. While villagers have received them enthusiastically, CARE treats the stoves as a 'springboard' to other programmes such as health care, kitchen improvement and income-generating activities. By 1997 the Stoves Commercialisation project had worked with over 50 NGOs, and all have been linked to producers trained in their respective locality. IDEA has also successfully implemented revolving funds in partnership with over 10 NGOs in different parts of the country to enable poor users to obtain stoves by paying in installments. This initiative was supported by the Asian Regional Cook Stove Programme (ARECOP) initially and later by NORAD.

Between 1994-1998 IDEA implemented a new stoves project in the plantations and Batticaloa District, supported by the Plantation Housing and Social Welfare Trust (PHSWT) and NORAD respectively. In planning these initiatives IDEA drew on the broad based approach of stove projects implemented thus far. The priority was to disseminate stoves that suit the localised needs.

Plantation Project:

This stoves project came about as a result of the fuel wood scarcity faced by the workers in the tea plantations. With the management of the plantation being handed over to private companies, the management of the environment within the plantations became the responsibility of these companies. They were concerned about how much wood energy was available within their plantations.

The Plantation Housing and Social Welfare Trust (PHSWT), a body formed with representation from the government, the companies and the trade unions, had the responsibility of ensuring the welfare of the communities living in the plantation. PHSWT recognised the problems faced by workers in the plantation (who were mainly women) in accessing fuelwood and initiated the stoves programme mainly with the support of the Dutch Government. IDEA was requested to implement this project in collaboration with the various estate managements. Their main initiatives were:

- Demonstrating the efficiency of the stove
- Linking producers to the estate management and introducing a system of payroll deductions to facilitate payments in installments
- Stimulating the retail markets in nearby towns

This project covered almost 50 estates scattered in the Hatton, Nuwara Eliya and Badulla regions. One of the major problems faced by this project was that the market forces did not take off as expected. This was because transporting stoves from the retail outlets in towns to their homes was difficult. However, the efforts taken to provide stoves through the estate management proved to be successful.

Batticaloa/Trincomalee Project:

The Batticaloa/Trincomalee stove project was implemented at the request of NORAD. It came about largely as a result of people finding it difficult to access fuel for cooking. Since the area was within the conflict zone, movement of goods and services had been severely restricted for some time. NORAD had supported development initiatives within the area in collaboration with the Rehabilitation Ministry, and so realised the problems faced by the communities. To address these problems, IDEA trained potters for stoves production, improved their kiln and firing practices, linked with local NGOs and helped them to integrate the stove project with their other development projects. This project required extensive inputs because most of the potters trained had never used the pottery wheel. This required a shift in the approach to training itself.

Latest developments:

An ARECOP-supported revolving fund successfully enabled poorer users to purchase stoves. As a result, IDEA has expanded the stoves initiative. They have been encouraging and equipping local NGOs and CBOs to implement stove projects, giving local NGO staff the skills required to be producer trainers, and training them to be monitors of quality control. The main objectives of the stove work being implemented during 2000-2002 period, and covering 15 districts, is to 'develop, expand and ensure the sustainability of improved cookstove programmes in Sri Lanka through establishing a network of NGOs with the capacity to provide necessary services.' It is hoped that these efforts can be extended so that the last step in this stoves story will be to ensure that everyone can have this new technology if they so wish.

IDEA carried out a review in 2001, and found that nearly 75 percent of the stoves are uninstalled and users claimed that they last for a year at most. This was also reinforced by the market information, which indicated that most of the purchases were replacements. The marketing networks have started operating with diverse pricing. These networks previously operated on the basis of a mixed demand for a variety of clay products, and stoves were a part of the mix of products. Now stoves are perceived as a separate product with more producers taking on the role of wholesalers/distributors and having specific market chains. This new role of the producers has also extended to taking orders from government departments and NGOs to supply stoves on a regular basis. The estimates suggest that nearly 1/4th of the stoves produced are channeled through NGOs and GOs while the remaining 3/4th find their way to the users through the market.

The reviewers also noticed a growing tendency among producers not to use templates and moulds (both assumed to be necessary for attaining high standards). Potters argue that although using templates and moulds ensures quality, it also slows down the production process and reduces their income. They explain that they achieve good quality in any case because they have the 'hand feel' of the technology; for this reason, the quality does not suffer.

The role of NGOs has moved away from dissemination. The latest IDEA initiatives have paved the way for NGOs to form networks at the district level. They share skills and experience and jointly integrate improved cookstove projects into other development programmes, such as organic farming, child/youth development, food

processing, nutrition, savings and credit and micro enterprise . One of the other major achievements has been the inclusion of fuelwood efficient stoves as a part of Energy Resource Conservation and Management in the Social Studies Curriculum for children in Grades 7 - 11, in schools. IDEA has also developed a gender sensitive monitoring and evaluation toolkit for the stoves programme supported by ARECOP as well as a new manual for Anagi production.

Impact of Stoves in Sri Lanka

Our understanding of the impact of stoves is far from complete. Nevertheless, it is clear that improved stoves offer benefits of an environmental, economic, social and health nature. In Sri Lanka they have positively affected the environment, economy, as well as producers and users, as described below.

The use of Sri Lankan stoves is almost exclusively the domain of women, while their development, production and marketing are undertaken by a mixture of men and women. The positive and negative effects of these roles on gender relations and social relations are also discussed in this section.

The Stove-users

What about the benefits from the perspective of cooks and energy providers? The users have been very impressed by the new stoves, even if their reasons differ according to season, socio-economic status, geographical location, and individual preference. Although the Sarvodaya stoves use at least 20% less fuel, this saving has not necessarily been seen as its biggest advantage. A study amongst rural users of the Sarvodaya stove in Hambantota found that the most prized quality was the reduction in time required for cooking. The stoves are about 30% quicker, according to kitchen performance tests. Reduction in fuelwood consumption was ranked as the second preferred quality (Sumanasekera 1986:18). On the other hand, in a study

in Kurunegala and Ratnapura, all the users interviewed stated that the stove was valued for its ability to cook faster and consume less firewood (Amarasekera and Sepalage 1987:58). For the majority of Sarvodaya users, it seems that the most popular attribute of the stove was the fact that it cooks more quickly than a three stone fire (ibid:92). For women who spend up to twelve hours cooking (but not necessarily exclusively) in a fifteen-hour working day, it is not surprising that reducing this workload is highly valued. Cooks have remarked upon the fact that these stoves emit less smoke, leave less soot and tar on pots, and make it easier to warm or boil water because they hold two pots at the same time.

For the Anagi too, fuel concerns alone did not account for its popularity. 86% of 169 Anagi users in Colombo reported that the stove's time-savings were its most important feature. Since urban dwellers tend to purchase rather than collect fuel, the time impact of fuel conservation was likely to be minimal as compared to the money saved. But it was commonly reported by both urban and rural users that the Anagi required less supervision time during cooking, which allowed the cook to attend to other tasks at the same time. It was also estimated that only 5% of stove purchasers lived in low standard housing associated with lower income groups. Purchasers came mainly from middle class households.

According to a 1991 'omnibus' survey of 1,000 rural and 1,000 urban dwellers, over 10% had purchased a stove. Of the purchasers of Anagi stoves, 62% have an income below Rs. 2,500/ a month (which includes 70% of the population) (ITDG 1991:13). At the same time 31% of these households could also afford a gas

or electric stove. Currently Anagi purchasers are only slightly disproportionately urban middle-income people. The lower income households do appear to be purchasing new stoves in larger numbers (though it is difficult to make comparisons because people's wealth is measured in different ways by various researchers). 99% of the sample was still using their stove regularly, 93-97% for cooking and 71-76 % for boiling water. The main motivation of buying the Anagi (for 67%) was to save firewood, thus revealing once again that preferences vary over time and place.

As indicated by the table below, in response to the question, 'what are the advantages of the Anagi?', 66% still stated firewood savings as the main advantage. Roughly three-quarters of fuel needed in urban areas is bought, while the same proportion is gathered in rural areas. The Anagi Stoves saves money mainly for those living in towns and time for the rural dwellers. The second biggest advantage (mentioned by 51%) is that it has two pot-holes, so two items can be cooked simultaneously thereby speeding up cooking time. The third was also that it cooks quickly. 83% reported no disadvantages, and only 5% said it breaks easily while another 5% complained that it could not cook large enough quantities.

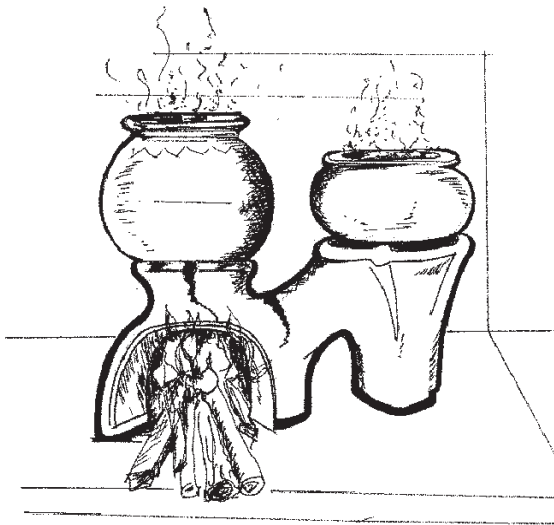
Table 1 : Advantages of the Anagi as perceived by the users.

Advantages	Urban %	Rural %	Total % *
Less fire wood required	74	64	66
2 stoves	57	50	51
Clean	6	4	4
Quick	18	26	25
Easy to use	5	4	4
Heat is conserved	4	2	2
Durable	1	-	0
No advantages	2	3	2
Cannot say	2	4	4
Total**	100	100	100
No. in sample	126	115	241

* Weighted average

** Totals sum to over 100 due to multiple responses

Source: Omnibus Survey 1991 Report, Table 18



A stove cracking under the strain of a heavy cooking pot

A survey of 45 users in Buwalikada, Kandy District, carried out by ITDG in 1993, found that people bought the stove because they were told that it saved fuel. Fuel scarcity had been identified as one the gravest problems by members of the community. Even so, the time saved on cooking was considered its greatest advantage once people had the experience of using it (Dhanapala 1993:2).

Time Spent Cooking (per day) by 45 Cooks in Buwalikada, Sri Lanka	
Hours spent Cooking	% of users
1-2	6.7
3-4	40.0
5-6	44.4
7-8	6.7
12	22.0

(Dhanapala 1993:12)

The amount of time spent cooking in Sri Lanka is incredibly high. Plainly the cooks are also engaged in other activities while they are cooking; even so the stove has to be supervised while it is alight. In contrast, the majority of women spend only 3-6 hours per week collecting fuel. All other findings were also encouraging: 68% of the cooks found the Anagi stove had no disadvantages; 78% plan to buy another one if their current stove breaks. Perhaps most heartening of all, a high value is placed on the kitchen improvements resulting from stove. People have built themselves platforms for the stove, surfaces, and racks for wood storage.

Without being prompted, users observed that the Anagi is beneficial because it reduces soot and smoke, improves light, makes them consider safety and better ventilation, enhances cleanliness, and encourages people to boil more water. It seems that stoves can act as a springboard to reducing indoor air pollution and generally improving people's health and living conditions. And it is not just for the rich. Over a third of the sample users was paying for the stove in installments, which made the new equipment more affordable to relatively poorer households.

In relation to constraints facing most Sri Lankan women, freeing up their time probably has the biggest potential for improving their lives. It is sometimes assumed that the most important rationale for time-saving technology is to allow women more time for earning income. There are three reasons to be doubtful about such a generalisation:

- 1 Activities aside from earning income may be important to women. Sleep, rest, brewing medicine, growing food, visiting the clinic, acquiring education or training, may all take priority. Like any of these, income is only a means to improving living or working conditions rather than an end in itself
- 2 Income-earning channels are not always available for women. If a stove programme aims to free up women's time for income generation, opportunities must be made available
- 3 Women do not necessarily retain control over income, so that not all those engaging in more income earning activities benefit from the fruits of their labour

According to Rowcliffe, stoves play an important part in improving the socio-economic and political position of

women. They are targeted at particularly onerous work, carried out in an area, which is frequently ignored by other projects (1988:26). Time 'saved' by stoves and dissipated or reinvested in other activities can only be meaningfully evaluated by users in context, and not by development planners in the abstract. In fact it can be wise not to draw attention to the time savings within households since greater demands on women's time from relatives or neighbours may result. Even if outsiders are uncertain about how women spend the time, simply having more control over such a valuable resource is a precious end in itself.

The Stove-makers

Another level of benefits was enjoyed by potters even if, once again, the rewards were different from those expected. It was anticipated that stove production would rouse the pottery industry out of its decline. The demand for clay products was falling, it was claimed, with the increased popularity of imported plastic and aluminum cooking equipment for particular functions. Until fairly recently potters hand-crafted:

- clay pots for cooking
- toys and animals
- flower pots & vases
- oil lamps
- milk & curd dishes
- water pots
- traditional ceramic stoves

Nowadays, households using gas or electric cookers tend to use aluminum pots for cooking, which transmit heat more quickly and do not crack.

On the other hand, most households still have wood burning stoves and retain the use of some clay cooking pots. Many Sri Lankans prefer clay pots to the aluminum equivalents because they are cheaper, food tastes better when cooked in clay pots, and clay retains moisture, heat and coolness better than aluminum. Clay curry cooking pots, water pots, water filters, yogurt bowls, and pots for boiling milk or water are still used in the vast majority of rural homes. Even those households who have switched to aluminum rice cooking pots still purchase clay rice pots and washing bowls for Sinhalese New Year in April. Handicraft items, far from losing popularity, are in enormous demand according to potters, especially amongst the urban middle class and hotels (Crewe 1988:26).

Although incomes amongst some potters have skyrocketed, the benefits have not been distributed equitably. The small number of potters trained (between 5-6% of the total potter population), and the tendency towards centralised production, has caused a greater concentration of wealth in the hands of the 'elite' of stove-makers. This 'elite' is made up of many potters who were already financially relatively better off. Project staff continues to find that it is difficult for poorer potters to take on stove manufacture because they have less:

- access to markets, credit and capital
- labour, equipment and facilities
- time to spare for training

They are often unable to take the risk of trying to sell a new product. On the other hand, elderly potters have taken to stove manufacture well because they find the repetitive operations very easy.

Box 5 : Stove-making potters spending their new found wealth

Potter households in Kurunegala tended to spend about 75% of their income on subsistence (Kirk 1984b 120), and the remainder on clothing, medicine, visiting relatives, ritual occasions, and donations to the temple. Until recently, very little has been spent on their houses (which are typically wattle and daub), education of children, or similar large capital outlays. The new wealthier stove producers, on the other hand, claim that the first investment priority is to renovate their house. The majority of the stove producers have accumulated capital or acquired loans to improve their kitchen facilities at the least. Most of the long- standing stove makers have constructed a new house and an outside latrine. Walking into a stove producer's house, you will notice newly acquired wooden furniture, a connection to the electricity supply if available, a cabinet packed with decorative items, a radio cassette player, and perhaps a television. Outside you may see a cart to collect materials for production or to take finished products to market, and bicycles for their own transport. A few families have even bought small lorries and motor- bikes. Consumer goods are not the only valued commodities; some of them have invested in land for housing and agricultural purposes. Many stove makers also claim that investing in their children's future is a high priority.

Some potters have managed to secure enormous amounts of additional income. Since most Sri Lankan potters are relatively poor, the increased income for stove producers has significantly improved their standard of

living. In 1988, the average per capita monthly income of a pot-maker was Rs. 519.00, while a stove maker made a monthly average of Rs. 1,566.00, and those who made pots and stoves earned Rs. 1,776.00 in a month (Crewe 1988:32.3)

The reason that resources were not put into making training available to poorer potters relates to the objectives. The benefits to the stove users, who are numerically roughly 1,000 times larger, were prioritised above the concerns of the potters. In the subsidised programme resources were conserved in the dissemination process by focusing assistance on the relatively better-off potters. Collecting stoves from a very small number of highly productive workshops was logistically easier and cheaper for the project staff. This was especially true during times when travel in rural areas was dangerous for the project staff. In any development programme trade-offs have to be made between the objectives of the programme and the conflicting interests of different stakeholder groups. The decision not to spend substantial resources on reaching poorer producers, but prioritising accessibility for users on a sustainable basis, was based on sound principles.

Another impact of all Sri Lankan stoves programmes has been the introduction of waged labour. As increasing demand for stoves has made production less risky, stove-makers have begun to employ labourers. These labourers were typically relatives, who received training, room and board in return for their labour, or neighbours being paid a daily or piece-rate wage. This waged labour signals a departure from a social organisation which was previously relatively egalitarian in at least some communities (Kirk 1984a 17). The potter communities

became distinctly inequitable with the tension between households becoming so great in one village that one relatively wealthy stove-making family had to move elsewhere.

Waged potters may lose their highly valued position of independence. Potters greatly appreciate freedom from outside interference, and their feeling of being one enormous island-wide family. To illustrate this, they frequently describe independence as the most positive feature of their profession. One potter explains that, “unlike government service, there are no set times to begin and finish work. No one orders you about and you can do your work, eat or rest whenever you feel like it”.



Potter
assembling
a stove

The waged labour in tile factories during the early urban programme was more inequitable still. It has been estimated that if since 60,000 stoves were sold a year during the course of the project, the profit for eight factory owners amounted to Rs. 570,000 and wages for all the potters and assemblers taken together were valued at a total of Rs. 229,500 per annum (Jones 1989:56). This has to be weighed up against the fact that these employees would not necessarily have

had any income if the factory owners had not taken on new staff. Furthermore, the project staff had little room for manoeuvre as far as the level of wages were concerned.

Material gains were not the only benefits for potters. Their position within rural communities was often significantly improved. The extent to which their status was affected varied according to their relationship with other villagers. The higher caste neighbours of stove-makers in a village in Matale perceived the programme as undermining their interests. The stove-making couple in this village belong to the only potter caste household in this village, and they claim that the behaviour of their rich higher caste neighbours has changed dramatically since they started making money through stove manufacture. In the past, they used to pay interest on debts by labouring and showing deference to the higher caste loan givers. Since the potters have become wealthier, paid off their debts and refuse employment, they are treated with considerable, if grudging, respect.

In many villages, members of the same potter caste, who were not on good terms with stove-makers, gave voice to considerable resentment as well. In one village in Kandy a potter gave up making stoves because he suspected that his stoves had cracked due to interference from jealous neighbours. According to his wife, he had made stove happily for four years. Then, during one firing every one of the 100 stoves cracked in the kiln. He tried again and again, but the same problem occurred, so eventually, he consulted an astrologer. He told him that his neighbours had used spells to break the stoves because they were jealous of his relationship with the government.

Other potters on good terms with the stove-makers, viewed the stove programme in a different, rather more ambiguous light. They expressed pleasure at the idea of a 'member of the potter family' doing so well, adding that since they belonged to the same 'family' it benefited them too. At the same time they resented their own lack of opportunities. They missed out on income but also equipment, a stream of important visitors, and a guaranteed market. (It is worth noting that a constant supply of visitors has its disadvantages. One potter infuriated with being interrupted in his work that he took a job at a Sarvodaya workshop to get away from the visitors.)

A review carried out by IDEA during 2001 revealed that of the 250 potters trained (182 men and 68 women), 205 were still involved in stove production. About 60 percent of them were producing an average of 50 stoves per month. The remaining 40 percent were producing around 200 stoves per month on average. The overall estimated annual production of stove is, therefore, around 300,000. The Potters Association set up by IDEA has collapsed, which may be attributable to the increasing competition among potters, but a stove chit has become active in a Kurunegala village, Kumbugetta, with a value of Rs. 40,000.00, which has helped 16 small producers to improve their access to credit.

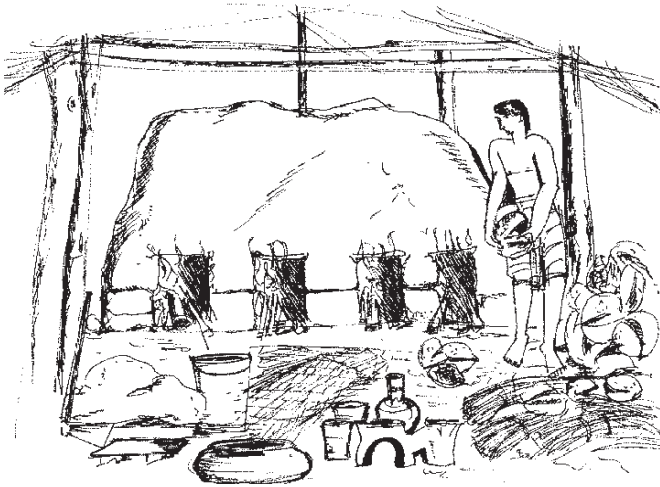
In contrast to the pre-stove project pattern of young potters leaving the occupation, there is an increasing trend for young people from higher castes to join the village stove production units as assemblers on daily piece rate wage. When asked why these youth cannot be trained in clay mixing or throwing on a pottery wheel, potters reacted by saying that it is those skills that allow

them to hold their head high as a professional group. They would never share them, therefore, with people from other communities.

Gender Roles

In Sri Lankan households women have far less access to, and control over, key resources, such as time, income, capital, credit, networks, and technology. Despite this, they also have a severe burden of unremunerated work to carry out in the household, in the fields, and in the labour market. The stoves project has not strategically revolutionised their overall position within the household because the inequity between men and women remains. On the other hand, the workload of stove users predominantly female has been reduced and so they have gained more control over their time.

Almost half Sri Lankan potters are women. In most cases they are married and perceive themselves to be carrying out pottery work for all the members of their household. For women potters, gender roles in pottery manufacture and household work are structurally unaltered. Women potters tend to collect and prepare materials, carry products, turn the wheel, and do the household work. Men throw at the wheel, coil or beat pots, fire the products, and do the marketing. These roles have been replicated in the parallel processes of throwing/coiling stoves, assembling, and selling to the CEB. Men tend to continue throwing the larger pieces, not because women lack the strength to do so, but because women turn their own wheels and have only one hand free for throwing. Men always have help with the wheel and thus can throw with two hands. Firing is still deemed an unacceptable task for women due to the “unbearable heat of the kiln,



A potter
'firing' the
stoves

which even boils the blood of men,” as one potter put it. “Also the kiln attracts demons and women are more susceptible to being “possessed by demons”. “Marketing remains a male role because it is deemed improper for women to travel alone and have dealings with unknown men outside their village.

On the other hand, gender roles in stove development in Sri Lanka may be changing slightly, allowing women less control over some of the production processes. For the last few decades, in all the projects men have created the stove designs, been the majority of stove production trainees, and taken the lead in the marketing process. Women are central actors only at the use stage. Women were consulted as testers during the development of different stove designs, and the innovative work was led by their knowledge about fire and kitchen management. They received no financial reward for their advice. On the production side, in contrast to established modes of pottery training, whereby both women and men learn about pot and handicraft manufacture from their relatives, training in stove-making was targeted mainly

at men because they had more time, mobility and access to markets.

Despite the reverse intentions, the stove training in all projects has discriminated against women. Training involved sending the Training Officer to the workshops, rather than holding courses in towns away from the potter households that would have made attendance for women impossible. So the project did try to reach women. Even so, it was usually male trainees who were given the instructions. This was partly because the trainers have always been men; so direct communication with women was sometimes awkward. During early stages it was assumed that men would transfer the knowledge to their wives or daughters, which they did only partially. Rather, few women learned the whole process of stove-making, and so women focused on throwing the smaller pieces and turning the wheel, while men threw the larger pieces and assembled the stoves into two parts. This does not mean that women's work has been reduced in quantity in stove-making households. In fact, in some cases it appears that women spend a greater proportion of their day making stoves than they used to spend producing pots. In the majority of households they receive no direct financial reward for this additional burden, although in a small minority of cases, women do control the income.

Women receive insufficient reward for their role in the design, production and marketing of stoves. As the stove users, their economic position is unchanged. Their relatively undervalued work, such as cooking and fuel gathering, is not necessarily given greater status or shared more equally with men. On a more positive note, improved stoves have alleviated some of the problems women face in their working lives:

- Cooking (or supervision) time has been shortened
- Discomfort of smoke emissions has been reduced
- The process has become safer, cleaner, and more convenient

Their workload has been reduced by approximately an hour a day, which frees up valuable time in an arduous, work-packed day. The importance of supporting women's efforts to gain more control over resources, such as time, cannot be underestimated. The reduction to the health risks associated with indoor air pollution particularly facing women is also potentially significant.

In summary, while the production and marketing of stoves has benefited rather more men, the use of stoves has improved the quality of living and working conditions for mainly women, as well as both male and female children. Neither time savings nor health improvements will radically improve women's social and economic position within Sri Lankan households and society. But this is true for any technology project. Alongside other initiatives for empowering women, they might transform their lives for the better. Stoves can not only free up time to make space for other activities but can act as a springboard for women gaining confidence, skills and control over resources.

The Environment

The main aim of the early stove programmes - that of combating deforestation by reducing fuelwood consumption - was not as successful as was hoped. It is clear that disseminating fuel-efficient stoves in most parts of Sri Lanka has not saved its forests (see box 6). However, in estates the situation is different.

Due to the scarcity of fuel in the tea plantation areas, the estate workers tend to uproot abandoned tea plants for fuelwood (these plants are usually left behind for a period of time to ensure that soil structure is protected) and this leads to conflict between estate management and the workers.

Deforestation rates were not affected to a significant degree. In the early stages of the national programme, they did not even focus on areas with higher fuelwood deficits. During the mid 1980s the highest numbers of stoves were distributed in Kurunegala, Ratnapura and Hambantota Districts. Of the districts with an overall fuelwood deficit - Colombo, Badulla, Kandy,

Box 6 : Fuelwood use and causes of deforestation in Sri Lanka

The idea that rural people cause or aggravate fuelwood shortages by chopping down trees for fuel proved false. In fact there has hardly been a shortage of fuel in most districts, except in some of the central hilly areas of Sri Lanka. Fuelwood supplies have been plentiful in most areas because trees have been felled to clear land for agriculture, to provide timber for the construction industry, and for replanting in rubber estates, and these activities have provided fuelwood as a by-product. The rural population has some access to plantation residues, namely coconut, rubber, and tea, and other firewood producing resources such as wayside trees, forests, and home gardens. Even when cut wood is not easily available, it is now acknowledged that rural women do not strip forests; they gather dead wood, twigs, some tea clippings, coconut residues and dung, depending upon the area.



A woman gathering dead wood and twigs as fuel wood

Gampaha, and Nuwara Eliya - only the last three had stove programmes. Howes suggests that even fuel prices could have been no more than minimally affected by the NFCP (1995). However, fuel conservation at the household level can have a beneficial environmental impact by relieving the pressure on the biomass resources. The urban stoves project and rural initiatives since 1990 have targeted areas with fuel deficiency and with a high concentration of population.

Sri Lankan stoves do have positive environment impacts:

- they reduce the pressure on biomass resources so that even the fuelwood users do not suffer as much. Women do not have to spend as much time collecting wood or save money by purchasing less fuel;
- stoves have had a positive impact on people's indoor environment, even if the details are not yet known. Stoves reduce smoke emissions, and biomass smoke is known to be a contributory factor in causing acute respiratory diseases, so we can assume that indoor air pollution is being lessened.

In a study carried out in the plantation households (Young et al. 1994) it was found that the carbon monoxide emissions are reduced by 30% when using an Anagi as opposed to traditional mud stoves. It is not known, by how much pollution is being reduced, because the smoke does not contain proportionately equal quantities of each pollutant chemical. Both the type of fuel and combustion process affects the amount of pollution in the smoke. Getting rid of some of it is undoubtedly beneficial to people's health and comfort. In short, although the total environmental benefits of stoves are not quantifiable, we can only be sure that for the cooks and their children, problems caused by both the fuel shortages and smoke pollution are being alleviated.

The Economy

In assessing the costs and benefits of stove programmes to date, there are difficulties in obtaining accurate estimates. The reasons for this are manifold. On the cost side, firstly, it is difficult to find an accurate record of total investment on projects to date. Secondly, it is difficult to obtain accurate production cost figures from different producers. On the benefits side, it is artificial to cost the time saved by stoves, and time used by cooks and fuelwood collectors productively on other tasks, or the value of relieving the pressure on biomass resources or improving health. For a start, the opportunity costs, estimates of forest depletion, and people's state of health vary to an enormous degree in different parts of the country. Also, keeping a multitude of factors (or 'confounding variables') out of the equation is impossible, but would make the calculation convoluted and unreliable if included. For example, less respiratory

problems may be partly the result of a reduction in biomass smoke; it might also be linked to climate, adults smoking cigarettes, a change in ventilation, and so on.

Financial Benefits and Costs of Cook stoves	
Benefit / Cost	1991-96 (450000 stoves sold) SLRs / month
Benefits to Producer	
* Low	11.8
** High	18.5
Benefits to User	
Low	467.5
High	625.0
Total Benefits	
Low	470.3
High	643.5
Total Costs	
Low	8.5
High	10.8
Total C/B Ratio	
Low	18.1
High	23.1
* Low indicates Low Cost (Rs. 19) and Low Price level (Rs.45)	
** High indicates High Cost (Rs.24) and High Price level (Rs.65)	

However, the final evaluation of the Stoves Commercialisation Project offers some useful indications in its cost benefit analysis for 1991-1996.

Looking at the costs and benefits accruing over two decades a series of assumptions can be made. An estimated £ 500,000 has probably been spent in Sri Lanka on stove development and promotion since 1977. This represents about £ 0.25 per stove. The gross expenditure on stoves by households is approximately £900,000. Each fuel-purchasing household gets their money back on the cost of the stove within 2-3 months (at the most) from savings on firewood expenditure. The total amount invested by development agencies and households is £1,400,000 or £0.70 per stove.

Even without artificially guessing at the monetary value of benefits, the financial value of the benefits of Sri Lankan stove programmes are impressive. The measurable benefits amount to roughly £27,300,000. This represents an internal rate of return of 3060% on project funds, only for the monetary benefits, which are easiest to measure and only up to the present. It does not include the value of time saved by faster cooking and less fuel collection, positive health effects, or any future benefits. Since stove production by potters shows every likelihood of sustaining for as long as people use wood fuel, the return on the investment should continue for many years to come. Even if crude cost benefit analyses have grave limitations, it is clear that the value for money spent on stove development in Sri Lanka has been fantastic.

A very simple cost-benefit analysis

Assumptions: It is estimated that an approximate 25 percent of the 4 million households use an improved stove in Sri Lanka (excluding the North & East of the country). This amounts to 1,000,000 user households.

2,000,000 Households purchased an improved stove since 1984.

400,000 (average) fuelwood purchasers regularly using an improved stove since 1987.

Average life of stove - 1 year.

Fuelwood use - 2 Tons / Household / Year.

Fuelwood price - Rs. 2,000.00 per Ton.

Fuelwood savings through using an improved stove - 25 percent.

A potter makes on an average SL Rs. 25.00 profit for an ANAGI stove.

A potter makes SL Rs. 11.00- profit for a Sarvodaya stove.

£ 500,000 has been spent by agencies on stoves since 1977 (includes the dissemination programmes carried out by NGOs / GOs as well)

Based on the above assumptions we could arrive at three distinct benefits, namely:

- Direct fuelwood saving benefits accruing to those households purchasing fuelwood
- Indirect fuelwood saving benefits accruing to these households not purchasing fuelwood.
- Money earned by potters involved in stoves production.

However, for the purposes of this calculation, it is assumed that households purchasing fuelwood, and not purchasing fuelwood have the same value for fuelwood used. The premise here is that households not purchasing fuelwood spend time collecting fuelwood. Hence, in the absence of any accurate “Value (Opportunity cost) for time spent”, it is assumed that at least the basic fuel value should be considered for arriving at benefits.

Direct/Indirect fuelwood saving benefits accruing to household’s purchasing/not purchasing fuelwood.

Using the simple formula:

$$X_1 = n \times y \times w \times s \times r$$

Where:

X₁ - value of fuel saved by households to date

n¹ - no. of stoves sold (n + n_s – see below)

y - Average life of stove^a

w - Average consumption of fuelwood/household/year

s - Savings factor through use of ANAGI

r - Price per tonne of fuelwood

We get,

$$X_1 = 2,000,000 \times 1 \text{ Yr} \times 2 \text{ Tonnes} \times 0.25 \times$$

$$\text{Rs. } 2,000.00$$

$$= \text{SL Rs. } 4,000,000,000.00$$

$$= \text{£ } 27,000,000 \text{ (@ £ } 1 = \text{Rs. } 150.00)$$

Money earned by potters involved in Stove production.

Here the production figures for ANAGI & SARVODAYA have been based on available data including tile factory productions. The profit margins are based on estimates arrived at during 2001 review.

Using the simple formula:

$$X_2 = (p_1 \times n_a) + (p_2 \times n_s)$$

Where

X_2 - Money earned by potters by way profits.

p_1 - Profit per ANAGI stove

n_1 - No. of ANAGI stoves produced to date

p_2 - Profit per SARVODAYA stove

n_2 - No. of SARVODAYA stoves produced to date.

$$\begin{aligned} X_2 &= (\text{Rs } 25.00 \times 1,600,000) + (\text{Rs. } 11.00 \times 400,000) \\ &= \text{Rs. } 40,000,000.00 + \text{Rs } 4,400,000.00 \end{aligned}$$

$$\begin{aligned} X_2 &= \text{SL Rs. } 4,440,000.00 \\ &= \text{£ } 296,000 \text{ (@ £ } 1 = \text{Rs. } 150.00) \end{aligned}$$

$$\begin{aligned} \text{Hence, Total Benefits} &= X_1 + X_2 \\ &= \text{£ } 27,000,000 + \text{£ } 296,000 \\ &= \text{£ } 27,296,000 \end{aligned}$$

Approximately upto 2002

Benefits = £ 27.3 million

Cost = £ 0.5 Million

The spin-off effects which have not been estimated in this sketchy guesstimate, but will also potentially have a beneficial impact on the national economy, include the following:

- greater productivity by at least 300,000 women due to freeing up time and better health (especially through less incidents of respiratory diseases)
- money saved on health care due to lower rate of respiratory diseases, fewer eye infections, and less water-borne diseases (due to boiling more water), with a potential impact on 1.8 million people
- less foreign exchange spent on importing fuel once shortages become more acute
- less pressure on biomass resources preventing fewer agricultural residues being used as fuel (instead of fertilizer), and possibly trees being felled for fuel in the future when shortages become more acute
- income earned by wholesalers, retailers, and installers

Learning from Sri Lanka

Planning

The decision to develop stoves was based on the assumption that a new cheap piece of cooking equipment was the best way of achieving two beneficial functions for the rural poor: smoke removal and fuel conservation. It soon became obvious that smoke removal was too costly an aim. Fuel conservation then became the priority. With hindsight it is easy to see that the attempts to conserve fuel would have benefited from a more thorough needs assessment at the start (see box 7).

Such information would have enabled staff to decide whether stoves were the most appropriate response, as opposed to, for example, publicising women's fuel conservation techniques. For example, it was found in Gambia that the cheap and more efficient way to

Box 7 : Essential Information Before the Project Begins

- fuel availability in chosen districts
- fuel consumption supply and shortages
- fuel conservation techniques
- cooking practices
- advantages and disadvantages of different stoves available
- women's workload
- income and expenditure within households
- potential benefits and capacity of producers and distributors

save fuel, is to promote the conservation knowledge of cooks (Bennett 1990:20). In Sri Lanka new stoves were undoubtedly the best option, but basing this choice on information rather than surmise would have been less risky. It would also have provided baseline information for monitoring and evaluation purposes.

Though the achievements of the Sri Lankan projects are impressive, they did not meet the objectives as set out at the start. Objectives or targets laid down in the project proposals bore little relation to what subsequently happened, partly because not enough information was available at the time of planning. For example, the rural programme disseminating the Sarvodaya stove failed to achieve its aim of stemming the rate of deforestation. At the time it was not known that deforestation, was not caused by domestic fuel consumption. The result has been that the National Fuelwood Conservation Programme has come in for some criticism.

But it should be recognised, that although deforestation was not achieved, the projects performed well, because other important, unanticipated benefits made the stoves extremely popular. Most significantly women's workload was reduced. Sadly, submitted as a women's project at that time, the programme would have been much less likely to receive the same degree of support. So, ideally the project would have been based on more reliable evidence; however, the lesson for donors might be that they should be able to adapt to new objectives when new evidence comes to light.

Subsequently the project was pushed onto a commercial basis with specific targets per year, mainly thanks to middle income customers. This phase of the programme

also attracted some mild criticism. Once again, these inaccurate targets were not necessarily detrimental. They galvanised the project staff into working with extraordinary energy in an effort to meet their own expectations despite difficult circumstances prevailing in the country due to conflict. It is possible that lower targets would have been matched with lower actual sales.

The important lessons to learn from the experience of objective setting in Sri Lankan stove programmes are twofold:

- ensure that assumptions are well-researched, backed up with empirical evidence, and documented. Planning should be led by the local implementing agencies, in close consultation with intended beneficiaries, rather than expatriates offering technical assistance;
- if objectives and targets become out-of-date (as they do in most projects), then agreement should be sought from relevant stakeholders to change them. New targets should be documented; this will ensure that the project will not be criticised for failing to reach objectives.

Strategy is a critical part of planning. One of the most impressive aspects of the Sri Lankan programmes is that each project, or phase of project, is built on the successes of previous or parallel initiatives. In addition, each phase entailed different partnerships with diverse role bearing producers and users who continue to be part of the entire process. Sarvodaya excelled at the research and development process, basing new designs on the preferences of users, rather than on the laboratory

Clay stoves
available
at the local
market



assessments of technical specialists, at a time when such an approach was highly innovative. The CEB made use of the design work achieved by Sarvodaya and worked out a way to scale-up dissemination by relying on their widespread and efficient distribution network. Their planning was a mixture of extracting the best features from the existing programme and designing improvements on the basis of their own particular strength and opportunities. Similarly, when the CEB/ITDG embarked on the urban stoves project, they took advantage of the substantial awareness already raised about new stoves throughout Sri Lanka, and the new-found stove production expertise of potters, and put resources into working on a more sustainable dissemination strategy. The IDEA/ITDG programme has made use of the commercial approach tried and tested by their predecessors, and taken it to the rural areas, the plantation sector and new districts. Once the production and marketing capacity was in place, IDEA has focused on creating a network of NGOs to ensure sustainability and make the stove more accessible to lower income households.

Research and Development

Developing stove technology has consisted of a long and varied partnership between technicians and cooks. While the Sarvodaya model was an appropriate design as an introduction to new fuel-efficient stoves, once production and demand had been established the technicians embarked on further research and development (R&D). The present popular and fast selling Anagi model did not emerge until about seven years after the beginning of intensive promotion of improved stoves. Technicians have reacted to changing demand and avoided imposing unpopular designs.

The Sarvodaya project initiated a sensible R&D strategy right from the start by consulting users extensively. They had excellent contacts at the 'grassroots' level through their village societies. Those discussing the new technology with users had plenty of experience of working within villages, spoke the language, knew the culture and treated the villagers with respect. Aside from occasional advice from ITDG and DGIS (Dutch government) consultants, the project staff were Sri Lankan. This was critical to the success of the early phases of the project.

The partnership with users during the R&D work on the Anagi was somewhat more formal. The National Housing Authority carried out the most intensive consultation with cooks after they distributed various designs in Colombo households. The cooks decided that the Anagi was the best stove. Cooks did tests to determine levels of fuel savings and durability. Although unusual in stove programmes, this should not be surprising. It is easy to forget that cooks have technical know-how from

years of rich practical experience in fuel, and kitchen management. Their skills in conserving fuel, controlling heat, and ventilating the kitchen can provide the basis from which improved adaptations can be made. Although it takes more time working directly with cooks, it is more efficient than ignoring their technical expertise and then having to investigate why they have rejected inappropriate designs.

This partnership between technicians and cooks in one country should not preclude the additional advantages of exchanging ideas with people from other places. Sri Lankan stoves development benefited from the technical expertise of India, Indonesia, Thailand, and the UK. Through receiving foreign visitors, and visiting other Asian institutions, exchanges of ideas have often acted as a catalyst. Sri Lanka fruitfully borrowed from the pottery liners in South India, the Dian Desa stove in Indonesia, and the marketing ideas from the UK. In return, many foreign visitors have undoubtedly learned plenty from their contact with the Sri Lankan experiences of developing and marketing stoves.

During the latter part of the programme, the Regional Wood Energy Development Programme (RWEDP) under FAO has been one of the institutions that has offered training support to IDEA and also provided space for IDEA to share the experiences widely.

Production Training

In the rural Sri Lankan projects, project staff selected trainees. The creation of an elite of mostly male stove-makers was the inevitable consequence of this process in the early phase. The staff chose those who exhibited:

- sufficient capacity (i.e., several workers and adequate facilities and equipment)
- effective production and techniques to ensure high quality
- a steady income and access to credit to overcome the financial difficulties caused by the training period and possible delays in selling

By making these criteria conditional to selection for training, the project automatically favored the more successful potters in the first instance. This probably made good sense. Now that the risks of stove production have been lessened by more secure demand, increasingly concerted efforts are being made to attract poorer potters into stove making. No women trainers worked on stove production during the early projects and this worked to the disadvantage of women trainees, who cannot easily communicate with non-relative men. But the project increased women's participation over the years by recruiting trainers from the pottery community.

As a general rule, the Sri Lankan experience tells us that as far as possible producers should select themselves for training. It should be up to them to decide if they have the capacity, and are prepared to take the necessary risks, to embark on a new enterprise. At the beginning of a project, it should be accepted that it is less likely to be the resource poor people who try out a new product first. Even so, judging from the Sri Lankan experience, it is well worth offering opportunities widely as the project progresses.

Production trainers have been extraordinarily committed in Sri Lanka. Not only did they insist on the highest quality products, but they also worked excessively long

hours to ensure that the stoves were perfect. Continuous support was given to producers. Regular visits were made to all producers to give technical advice on clay preparation, moulding, assembling, and firing. Producers were not taught in groups; they were individually taught to undertake exactly the same process so that each could go at their own

Box 8 : Equal Opportunities for Producers

The following steps can be taken before and during self-selection to work towards equal opportunities:

- Recognise producers as one of the groups of beneficiaries and set aside adequate resources for supporting their work
- The benefits to producers may be secondary, but the means to the primary goals for users should be as equitable as possible. For example, recruit woman trainers if necessary in the particular place to help ensure that women are given as near equal access to benefits as possible
- Tailor training courses to the needs of the particular groups (e.g. fitting in with their time schedule, choice of location, and pace)
- Tell potential beneficiaries about training offered, the risks of the new product, and what is involved, well in advance so that they can weigh up the pros and cons, decide whether to get involved, and prepare their involvement
- Offer training to as many artisans within each community as possible so that no one is excluded. If resources are very limited offer training within communities with fewer artisans

pace. They were given templates and moulds to make production easier and ensure that the dimensions are standardised.

Since 1993, those producing stoves of a sufficient standard have been issued with a collar denoting good quality. For a time retailers would only accept those stoves bearing a collar of quality. Nowadays they can judge the quality of stoves without the collar, so it served its purpose even though it is no longer used. It is plainly not only important for the producer to maintain good quality, so that marketing is easier, but it is also in the interests of the user. A stove with incorrect dimensions may not retain heat as effectively, and may cause less efficient combustion.

Marketing

The success of Sri Lankan programmes in popularising and selling stoves is stunning. Over the years the project staff have accumulated considerable wisdom about the advantages and disadvantages of subsidised versus commercial dissemination strategies. All stove development programmes are subsidised to some degree. For example, producers never have to pay for training and promotional costs are usually donated by projects. At the same time, all programmes are commercial in some sense. For instance, potters always exchange their labour for money, and users often part with some cash for their new stove. So choosing between commercial and subsidised approaches does not involve a simple 'yes'/'no' decision. Sri Lanka has experience of both, that is, projects that are mainly subsidised and mainly commercialised. They found useful results at different stages:

Three Stove Dissemination Stages:

1. Small-scale commercial

When Sarvodaya began designing and selling stoves, they realised that the truest test of popularity was to see if people would pay the full price. When they did, they knew they had a worthwhile stove. A small-scale commercial approach makes good strategic sense at the beginning of stoves work.

2. Large-scale subsidised

The government came to the conclusion that a small-scale project would reach only a small number of cooks. To make this new product better known, accessible and affordable to rural people, subsidies were used to cut the price by two-thirds. The impact of subsidising stoves was useful in at least three ways:

- a huge number of cheap stoves were sold
- the benefits of improved stove were brought to the attention of the majority of the population
- while installing stoves the extension workers seized the opportunity to discuss other household development and health issues

Since the Sri Lankan government, and foreign donors, were not able to fund the subsidies indefinitely, this was but an effective short-term, solution.

3. Large-scale commercial

Building on Sarvodaya's successful design work, and the CEB's extraordinary achievements in raising awareness, the next step was to return to commercialised distribution but on a large scale.

Selling at the full price required a reduction in the cost of the stove, which was achieved by cutting out the installation process. The new portable stove, the Anagi, was designed specifically for a commercial market. It was easy to transport and looked attractive. The advantages of commercialising the stove industry once again were three-fold:

- it became self-sufficient and independent of development funding
- control of the project shifted from government hands to the producers, retailers and users
- it was free from organisational bureaucracy

Other valuable lessons emerged out of the more detailed marketing strategies that project staff cultivated. When working directly through the market place, great attention was paid to balancing supply and demand. Patience was needed at the beginning to allow the producers to develop their manufacturing capacity - including skills, equipment and confidence. Confidence was only assured after projections of economic feasibility looked promising.

Once they were ready to meet demand, the project embarked on a dynamic campaign of promotion. The timing was carefully considered. Project staff consulted wholesalers and retailers, learnt from them about their profits and losses to ensure that they could make money from selling stoves. Since stoves were still initially a high-risk new product, the project offered incentives for them to stock them. This entailed advertising in the shape of enormous billboard, leaflets and posters. They printed the names of stockists on this material and mentioned them in advertisements on the radio and television.

Monitoring and Evaluation

Development project staff can be reluctant to do monitoring, partly because they assume that such activities only pay off in the very long-term or that they will be useful to others – writing reports for donors, for example – rather than themselves. In practice, many of the advantages of regular monitoring are immediate and critical to success. The Sri Lanka experiences have proved that regular monitoring and evaluation can be useful both during and after projects.

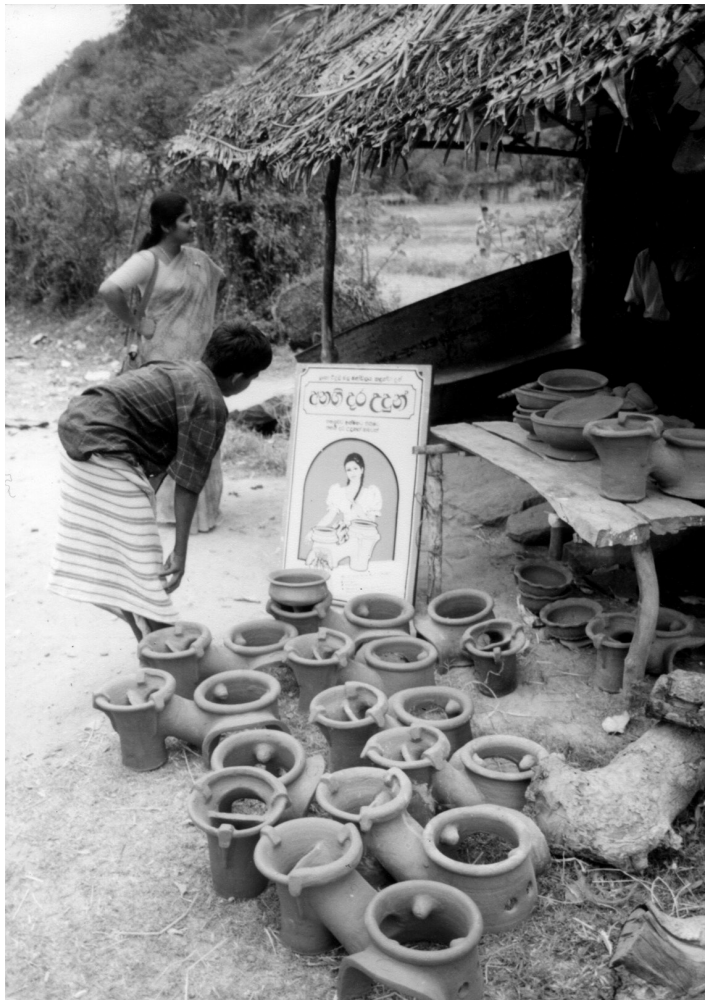
Monitoring during projects

The staff continually reviewed progress from the viewpoint of intended beneficiaries. This kind of monitoring gave a stronger voice to the intended beneficiaries of the project - the producers and users - by allowing them to express their views and responding to their demands. Not only did this enhance the effectiveness of this project, but provided information that helped staff account for their successes and setbacks. To give concrete examples of how the projects relied on monitoring during implementation:

1. During the **rural** programme the manager received verbal reports from the officers responsible for liaising with potters. He was then able to judge when a potter needed technical assistance or was suffering as a result of the delayed payment
2. In the **urban** project, a survey carried out with users showed that it was the time-saving benefits of the Anagi stove, which were most highly valued. This advantage was immediately the focus of publicity material, such as advertisements, to attract attention of potential customers

3. In the stoves **commercialisation** programme staff monitored demand for stoves through the retailers. In the early stages they rightly calculated that it was already outstripping production capacity and so postponed the promotional campaign until capacity was expanded

In the early part of the project informal monitoring was effective given the small scale of the operation. During the CEB's rural and urban programme monitoring was



A government officer visiting a potter's shop

given rather more resources and systematic planning. However, the monitoring suffered considerably when the project coverage widened both in terms of number of producers trained and the geographic spread during the commercialisation phase. This was largely due to the project team not adhering to the monitoring plan and the project not allocating sufficient resources for monitoring (as was highlighted in the 1993 progress review and the final evaluation in 1996).

Monitoring after projects

Not only staff, but outsiders as well, have benefited from the information collected during the monitoring and evaluation. It is being used by agencies interested in developing stoves in other countries. Sri Lankan project staff have disseminated information to those interested in the potential impact, the stoves can have, such as specialists in energy, women's work, health, environment and small enterprise development. Sri Lankan stove projects have featured in numerous articles, (especially in the stoves journal-Boiling Point), television and radio programmes and conference presentations. It was also one of the main projects studied in a World Bank global evaluation of stove programmes (ESMAP 1992). Fundraising is impossible without information gleaned from project work, and reporting to donors is normally an important part of a project-funding contract.

The methods of information gathering developed in Sri Lanka were innovative and varied. As examples, the following techniques were used at different times:

Unlike most development projects, the Sri Lankan stove projects acted on the information gathered and stored it in a way that kept it accessible. Concise reports were

written by the Training Officer to the Project Manager, by the Project Manager to the donors, by the Technical Advisers to other stove projects and so on. Office wall-charts were used, depicting levels of production and number of sales.

There were several, mostly very positive evaluations carried out by outsiders after the projects. But even though monitoring showed an unusually, possibly uniquely, high market penetration of Anagi stoves (28% of the Colombo households had bought one by 1990), an evaluation of the urban project carried out in 1989 was not entirely favorable (Aitken et al. 1989). The reasons for this were not due to failure measured by a cost-benefit analysis, since the project achieved an estimated internal rate of return of at least 135%, which was more than the 128% predicted by ODA at the appraisal stage. The criticism centered on the inadequacy of the proposal (written by ITDG staff from the UK in 1987).

Though the objectives set during planning were challenged during monitoring in all the Sri Lankan projects, this was put to good effect. The project staff remained flexible enough to adapt objectives according to the demands of producers and users. Where the interests of different beneficiaries were in conflict, resolution has been possible through negotiation or giving preferential treatment to targeted groups, such as women, resource poor groups, marginalised communities and so on. The lesson to learn about changing objectives, as we suggest above, is to get agreement and document them as the project progresses.

Monitoring technique	Examples of what it is used for
Fuel consumption tests	To see which stoves are more fuel-efficient
Unstructured interviews	To find out why a stove is popular or about production, profits, sales from the potters
Formal structured surveys	To assess the merits of different stove designs
Observation	To check the quality of stoves
Large-scale omnibus surveys by a market research company as part of a wider survey of consumer goods	To discover level of awareness about stoves
record keeping	to monitor production and sales to see if supply and demand are matched
Consulting secondary sources (e.g, research reports, newspapers, other project reports).	To keep a check on fuel prices, government policy, environmental conditions, women's social position etc
in-depth field studies	to explore the socio-economic impact of a project on men and women from the view-point of users or producers.

Institutional Partnerships

The total number of organisations involved in stoves work in Sri Lanka is surprisingly large. Key agencies alone include:

- Sarvodaya
- Ceylon Electricity Board
- Ceylon Institute for Scientific and Industrial Research
- Industrial Development Board
- National Engineering, Research and Development Centre
- Integrated Development Association
- Intermediate Technology Sri Lanka
- Tile Factories

The relationships between these agencies has been characterised by unusual co-operativeness. The competition and lack of communication more typical of development initiatives is almost absent from the Sri Lankan story. Different organisations worked together well, but specialised in their most professional area, rather than all dabbling insubstantially in many directions.

Box 9 : Sri Lankan organizations each adding value

- *Sarvodaya* made the best use possible of its village contacts and expertise in extension work
- *CEB* brought credibility, status, an enormous distribution network and substantial resources

- *IDEA* offered a new, flexible vehicle for commercialising the programme and working towards social objectives
- *CISIR* provided an independent, disinterested testing service
- *ITDG* (Sri Lanka and UK) has acted as a catalyst, throwing up new ideas, communicating successes, giving technical support and encouragement

The result has been that stove designs and dissemination strategies have been promoted when they suited the producers and users, and not because organisations pushed their own inventions. Representatives from these agencies met frequently to make sure their efforts supported, rather than undermined, each other. Each project or phase built on the last one, so that mistakes were not repeated and successes were reconfirmed. A wide range of expertise was brought to bear on the complex challenge of establishing a new industry: technical (in many forms), social, micro-economic, marketing and communication. The most important element for successful collaboration between organisations is individuals. The key actors in the story of stove projects have been dazzlingly energetic, committed, imaginative and conscientious. Three individuals, Lamasena, Bandara, and Amarasekera, have each given over fifteen years of their working lives to developing the Sri Lanka stoves. They have shifted organisations where necessary to ensure their central involvement. Young visited Sri Lanka for twelve years to offer technical advice. Such staff continuity, almost exceptional in development projects, has been critical to the success of stove programmes. Their combined unceasing determination to make stoves a success has fuelled the work and inspired all those involved.

Sustainability

One of the major impacts of the stove programme has been the establishment of institutional sustainability. Although ITDG has played an important role in enabling the stoves programme from one phase to another, the phasing out of ITDG from the stoves work in 1996 did not deter the progress beyond. ITDG by strengthening IDEA did ensure that the organisation became the lead agency for stoves work in Sri Lanka. This is evident from the fact that IDEA has not only established a strong network comprising of more than 50 NGO's and GO's to reach the unreached stove producers and users. The success and the resultant confidence have also meant that IDEA has started looking at the wider context of energy, especially on the biomass front. They are not only looking at new user segments and their needs but also other biomass resources such as paddy/rice husk, agro waste etc within these new user segments.

Equity

Can the improvement of stoves contribute towards equity between people? The short answer is that it can between some groups and not between others. Sri Lankan people's economic and social position is differentiated most significantly by class, gender, age, caste, and ethnic identity. If implemented in an effective way, stove programmes can have an immediate beneficial impact on women, and a long-term good effect on those in a relatively disadvantaged economic class.

Class

Class membership is partly indicated by income level. Amongst the various groups who benefit from stove membership, the majority of users in Sri Lanka are middle and lower income while the producers began as low income but became substantially richer. The users are relatively poor compared to users of other energy technologies such as gas, electricity, kerosene, biogas, or solar, but are not from the poorest households. The initial outlay necessary for technology produced commercially renders any new equipment beyond the reach of the poorest. On the other hand, unless the national government of a country is prepared to subsidise stove dissemination, there is no alternative to a commercial approach.

If a subsidised programme is possible, it is better to subsidise the dissemination rather than the production. Giving the subsidy to the customer rather than the producer allows the project to target subsidies at the disadvantaged groups, for example, those with lower income in areas of fuel shortages. It also ensures that the producers can develop commercial networks so that the programme will be sustainable if subsidies are withdrawn.

If a commercial approach has been chosen, the programme must recognise a conflict of interests between producer and user. While the stove-makers wants to push the price as high as possible to secure a favourable profit, the users plainly want to purchase the stove cheaply. The project staff can only regulate the price if the producers are working commercially, so alternatives have to be found for making stoves

more accessible to poorer users. For example, NGOs can help to set up lending organisations controlled at the community level so that loans can be acquired for buying stoves.

The artisans who gain from making stoves often begin from a position of relative poverty in relation to other groups, but gained relative affluence as compared to other artisans. The greater wealth accrued as a result of stove production is fine when seen in relation to owners of larger enterprises, but causes tensions amongst other artisans. There are three lessons emerging from the Sri Lankan experience with potters:

1. do not force poorer artisans to take the risk of starting up an untested new venture, but leave potters to select themselves for training
2. keep other artisans, who are not making stoves, informed about project activities so that they can continue appraising whether to get involved
3. suggest that artisans may like to form collective organisations to facilitate joint marketing and provide loans for those making stoves or other products

Gender

Since the way work is organised is critically affected by whether the people involved are male or female, projects should consider the gender of intended beneficiaries and others affected by the project. While it is easy to make this general suggestion, it is harder to know precisely what to consider. The experience from Sri Lanka provides plenty of lessons about how to work with both women and men effectively.

Planning

The Sri Lankan project staff were obviously knowledgeable about the position of men and women in households. For example, they knew that women's mobility was restricted. As project staff in all the projects wanted to ensure that both women and men were offered production training, they planned to hold courses close to people's homes. On the other hand, their planning has not been informed by a consideration of the particular detailed needs, interests and roles of stove producing and using women. As a consequence, women have not benefited from stove production to the same extent as men, and the longer-term impact of Anagi use amongst cooks is still not known.

Training

To ensure that women get a share of all levels of benefits, it is not enough to provide decentralized training because they tend to face a multitude of resource constraints (such as lack of time, money, and information). Much effort has to be put into finding out about and supporting their strategies for overcoming difficulties. Dialogue, and certainly training, has only been successful when carried out at locations and times, which are convenient to women. Since this has been known for decades, and such intentions are usually written into plans, it is prioritising such an approach during implementation that is required in the future.

Reducing Women's Workload

It is well known that most women in rural areas have an arduous workload of agricultural labour, household work, and community management and often paid employment. Sri Lankan women are no exception, especially those in relatively poorer households. Stoves can free up time, most significantly by reducing the amount of time spent cooking, and reduce health risks associated with indoor air pollution. These impacts have huge potential and could, alongside other initiatives to improve women's opportunities for employment education and training, significantly improve the relative position of women. The more transforming potential of stoves in the future might be to open up dialogue within households about how to share unpaid household work more equitably among its members.

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