



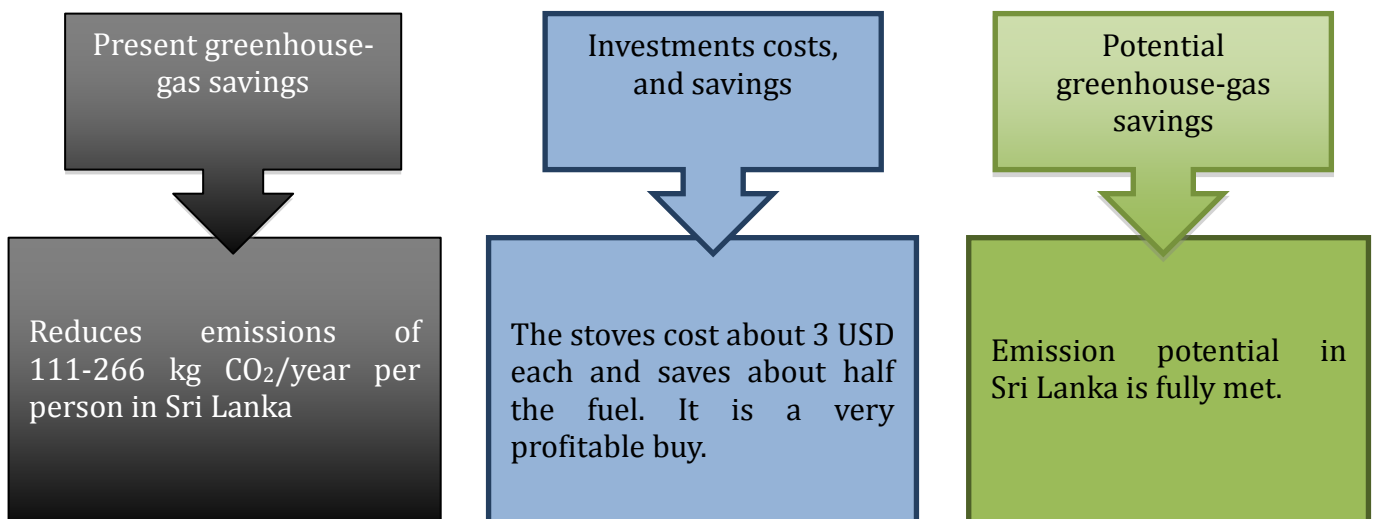
CASE STUDY - Sri Lanka

"Anagi" Improved Cookstoves Commercialisation

By R. M. Amerasekera, IDEA

Summary

Sri Lanka's stove programme can be identified as one of the few large-scale successes in the developing countries' quest for sustainability. The stove dissemination is fully commercialised and several studies have established that its production and social marketing process has reached sustainability in Sri Lanka. At present, over 300,000 stoves are produced annually by 185 rural potter families and marketed by a network of private traders dispersed throughout the country. The stoves are demanded and traded like any other commercial product in the market without any external influence or intervention. However, to reach this level of success, several strategically structured moves with consistent efforts were employed over a period of nearly 30 years by several organisations.



Background of Stove Development Activities

In Sri Lanka, several improved cooking stoves projects have been implemented over the period 1979 to date by a number of organisations. Looking back, the interventions can be broadly divided into three phases of development:

Phase 1: Design Stage	1979 - 1983
Phase 2: Dissemination	1985 - 1990
Phase 3: Commercialisation	1987 - 1996
Phase 4: Diversification and reaching the poor	1996- 2005

These are not planned phases of one project but characteristics of different projects building up from the stage where the previous left off. To make a long story short, this paper will emphasize the activities of the third phase, namely commercialization, which led to the sustainable stage, which is where Sri Lanka is now.

The commercialisation phase consisted of two projects. Urban Stove Programme (USP) in the City of Colombo 1987/1988, Rural Marketing Stoves Programme Phase 1, 1991/1992 and Phase 2, 1995/1996. Phases 1 and 2 covered twelve districts in the country.

The main implementing agency of the dissemination stage was the Ceylon Electricity Board (CEB) under the auspices of the Ministry of Power and Energy, deriving funds from several donor agencies, mainly from the Dutch Government. This project covered 12 districts. The stove selected for dissemination was the two-piece two-pot mud-insulated pottery-liner stove developed by the previous Sarvodaya - ITDG project. During the project period of 1985–1990, nearly 400,000 stoves were disseminated as against a target of 500,000 stoves. Over 200 potters and nearly 2000 stove installers were trained under the project, and officials of the government administrative structure were used in the promotion and extension activities.

Socio-Economic impact:

For the users, it reduces fuel use, improves combustion, reduces smoke in kitchen, and make cooking easier.

For the potters that make the stoves, it increases their income and wealth.

Environment impacts:

It reduces use of wood, which reduces deforestation and therefore reduces CO₂ emissions and gives other benefits. It also reduces local emissions of particles.

The stove, which was purchased at Rs 15 from the trained potters by the project officials, were given free of charge to the user. The user was expected to pay Rs 15 for the installation to the stove installer. The payment and installation were facilitated by the government extension officer. The main objective of this project was to reduce the use of firewood and thereby reduce the rate of deforestation. After the project was terminated, it was expected that the linkage among the user, potter and stove installer developed by the project would continue.

There was a considerable amount of awareness created due to the dissemination programme by the CEB, but it also raised several questions with regard to the future and sustainability of stove promotion and use.

Taking into consideration the large quantity of 400,000 stoves distributed during the dissemination phase covering 12 districts over a period of six years, the project was considered to be a rare achievement and a great success when stove programmes were failing elsewhere in the developing countries. But behind the success there were several questions hidden as to the sustainability of stove use and promotion thereafter. Once the subsidy was removed and involvement of the government officials in promotion activities was withdrawn, the linkages built connecting the producer (potter), stove installer and the user gradually disintegrated.

In the meantime, NGO ITDG (from UK, now called Practical Action), learning from the successful experience gained in commercialization of the “JIKO” stove in Kenya, came out with a proposal for a similar commercial approach for which funding was secured from Ministry of Power and Energy, CEB, and others. The project was implemented by the Ceylon Electricity Board in the Colombo City and the suburbs. The project duration was 18 months starting in June 1987. Thus began the commercialization process of stoves that is the main focus of this article. The total cost of the project was Sterling Pounds 101,404.

Accordingly the USP formulated by ITDG and CEB made provision to improve the previous (Sarvodaya) design (not a complete new design) to be made as a single piece two-pot design, thus making it portable item that could be marketable as an off-the-shelf product and used as it is without the need for installation by a skilled person. This modification facilitated the stoves to be sold commercially like any other pottery item and to adopt marketing strategies making use of existing channels to market similar products. The modified Sarvodaya Stove was named Anagi 2 because it has two pot holes. The programme also included a one-pot (CISIR) grate design in the promotion efforts and it was called the Anagi 1. These stoves were produced by the tile factories making use of trained potters and spare capacity in the tile-firing kilns. Thus, new techniques had to be developed and introduced in making and firing the stoves as compared to the Sarvodaya stove. They were marketed through private-sector dealers. Evaluations show that the urban stove project was more successful than the rural-sector project in terms of sustainability, due mainly to the suitability of the model, large-scale production by tile factories, and independent distribution by private-sector dealers at market prices that did not include a subsidy by the government. As the urban users discovered the benefits of the stove, and as stoves were available in the market, demand for them increased.

This, however, later resulted in the production of low-quality stoves to meet the demand. The urban project was also unable to reach out to the urban poor.

At the end of the USP project in 1989, the infrastructure for producing and marketing 50,000 stoves annually had been established. At the same time, the rural stoves programme too was phasing out and the need for a commercial strategy to replace the dissemination strategy in the rural areas was becoming increasingly evident. The Dutch – Sri Lanka bilateral Energy Programme that provided the major funding for the CEB rural stoves programme was ending. The CEB lost interest in continuing the stove programme, since it is not within the framework of their major business of Electricity Generation and Distribution, so a vacuum was created. Despite the concerns of the evaluators of the USP with regard to the macro objectives of the project vis-a-vis the lack of evidence for reduction of deforestation and reduction of consumption of firewood for domestic cooking at the national level, the establishment of infrastructure for commercial production and marketing of stoves was a success. The need to extend this experience to the rural areas to fill the gap created by phasing out the subsidy programme was recognised by those who were interested in continuing stove developments activities further. However, since CEB was not interested, there was no organization that had the willingness and capability to

continue the momentum created. In the meantime, the Project Manager of the National Stove Programme, with a few other development experts, created a NGO named Integrated Development Organisation (IDEA) to take over the responsibility to continue to extend the programme to the rural areas. The dream became a reality when the ITDG (UK) agreed to continue its support and commitment to IDEA by securing funding and technical assistance for a 4-year programme, which commenced in 1991 and was successfully completed in 1996. During this period, as in the USP, the infrastructure for commercial production and marketing was established to cover 12 districts of the country. This is, briefly, the history and background of the commercialization process in Sri Lanka.

Although, with the commercialization, a large number of stoves were widely available in many areas, it was observed that the commercial channels servicing the demand for stoves were restricted to urban and semi urban areas. Many rural poor do not have access to the distribution channels.

Accordingly, IDEA, with the support of Asia Region Cookstove Programme (ARECOP) and later supported by the UNDP/GEF, initiated a project to address these concerns, commencing in 2000. With this exercise it was able to spread the benefits of commercialization and of scale up the technology further to cover a wider group and area. This phase is identified as the diversification and reaching the poor.

Diversification and Reaching the Poor (1996- 2005)

After the commercialization process, the need for further interventions in the stove development activities was identified for several reasons.

To establish a network to decentralize stove development activities and empower stakeholders to carry out stove dissemination activities on their own, independent from IDEA.

To extend the stove activities to areas not covered by the previous projects and the commercial network.

To diversify stove activities to cover larger cooking needs and rural industries using firewood.

To integrate stoves with other development concerns and with user needs not necessarily confined to energy matters.

The need to decentralize the stove technology expertise and responsibility at district level so that IDEA could focus on other rural energy matters.

The need to diversify stove technology to cover other rural energy needs such as in brick making, bakeries, etc.

The ARECOP network had 15 members representing 15 districts. Although the main objective of these members is not stove dissemination, stoves and kitchen improvement were integrated into their programmes and stoves were an entry point for their work. These network members in turn encouraged other CBOs in their localities to introduce stoves into their activities. Many of these organisations, after the initiation and empowerment provided by IDEA, were able to secure funds from various organisations for stove activities.

It is now observed that stoves have become an important activity in the agenda of many projects seeking funds from donor agencies and many have been successful. The network members were trained by IDEA to prepare project proposals based on the Logical Framework Analysis. Artisans selected by the network members were also given one week

of training in the design and construction of large stoves and kitchen improvement to cater for commercial cooking such as preparing food and sweets for sale, making of pottery, etc.

Stove Production and Marketing Today



Lanka Shakthi Gasifier Stove

Despite the economic growth in the country, it is likely that biomass will remain the major source of energy for cooking.

In addition to the global concerns of climate-change impacts, the need for efficiency improvements in traditional wood use is therefore a necessary national concern to sustain the use of a local renewable resources.

There are several types of stoves used in Sri Lanka today. The thermal efficiencies or social acceptability of most of these stoves are not recorded, as no performance evaluations are known to have been carried out.

The most popular improved stove continues to be the two-pot clay “Anagi Stove” promoted by Ceylon Electricity Board, Practical Action, and Integrated Development Association (IDEA).

In addition, two wood-burning stoves available in the market:

- the “Lakro” single pot metal stoves produced and marketed by the private sector, and
- the Lanka Shakthi Gasifier stove designed by the NERD (National Engineering Research Development Centre), produced and marketed under a franchise arrangement.

However, these stoves are targeted specifically for the urban market and the demand seems not to be very significant.

Unlike these stoves, Anagi stove can use a variety of biomass types and retains many benefits and conveniences of a three-stone fire, which is a specific requirement for rural users. This has contributed towards social acceptance and marketing success.

Since the inception of the Improved Cook Stove Program in Sri Lanka in the 1990s, it is estimated that about 4 million Anagi stoves have been marketed in all parts of the island.

Today, the “Anagi” stove is one of the common items in almost all the sales outlets that sell pottery items and in some village and urban grocery stores. It can be safely estimated that the total number of households in the country is 4 million and, of this, the rural sector may have about 3 million houses. If the Anagi stove is used without insulation the lifetime may be about 1-1½ years, and if insulated, 3 years or more. In several district surveys



Lakro Stove

Anagi Stove



Installed Anagi stove

carried out, it is revealed that about 23% use Anagi stoves, mostly insulated. With the present annual production rate of 300,000, it is unlikely that the penetration could be increased further.

Amidst the ethnic civil disturbances, which disrupted the political and economic development for over three decades, the stove development activities continued uninterrupted beginning in the early 70s to date. Currently, annual production appears to have stabilised at slightly over 300,000 stoves. New strategies and interventions are therefore required if higher levels of penetration of improved stoves are desired.

Anagi stoves are marketed through a commercial network of pottery dealers extending to 16 districts and covering nearly 70% of the country's population. The production, is spread over many parts of the country. Despite the efforts for decentralization of production, nearly 80% production is in 4 villages, namely Ambagaswewa, Nungamuwa, Kumbukgete, Bamunukotuwa and Katupotha, all situated in Kurunegala District. This district traditionally has the highest population of potters mostly living in clusters, producing a variety of pottery items and attracting pottery dealers to the area and giving rise to a strong commercial network. However the majority of the potters in these villages now produce stoves in large numbers. This can be compared to a semi centralized system and the whole village can be considered to be a single production unit, although each producer has a middleman distributor of their choice. This probably is the reason why production is high in these villages. This has further resulted in that more young people are getting motivated in stoves production. However, the overall production is limited to the present level, since the youngsters with average education are not interested in pottery due to the stigma associated with caste in low stove-production areas.

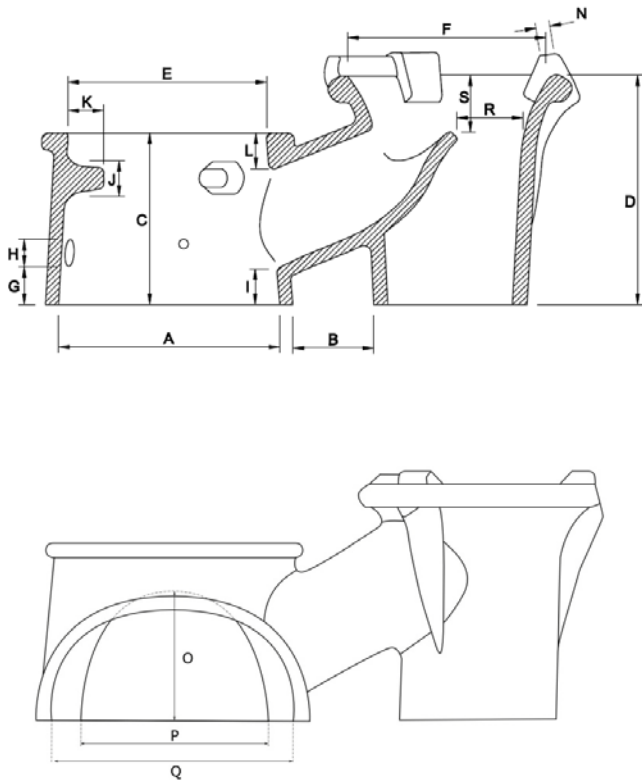
In other production areas, the commercial channels are not well established, which makes the production cost higher than in the Kurunegala district and makes stove production too competitive for small-scale and isolated producers. However, though the production level is not significant, it contributes positively to their subsistence and makes stoves available to isolated consumers. Central Environment Authority has already imposed legislation to limit clay mining in certain parts of the country for environmental reasons. Due to these reasons, it is unlikely that annual production will go beyond 400,000 units. However, since the Kurunegala potters enjoy a high income and social status, they will maintain the present level, which is some consolation for stove activists in Sri Lanka. At present, stove production has helped the informal pottery producers to earn a substantial income, raising their living standards and status in the society due to the economic status gained.

The present decentralized production system is employing a large number of active rural potter producers amounting to about 200 spread throughout the country with individual production levels ranging from 10 to 2,000 stoves a month. This decentralized system has some problems.

The major problem is the difficulty of maintaining a uniform product adhering to designed standards. After some experience in making stoves, the potters are smart enough to make stoves without the templates and moulds with a view to reducing production time, which results in sub-standard stoves. Tools were introduced at the time of training to maintain the dimensions and shape of the designed components, leading to consistency and expected efficiencies. This is unavoidable, as there is anyway a market for sub-standard stoves that look similar to the real "Anagi". The middleman distributors also influence the producer on the shape and size they want, which are way out of the standards specified and, which the producer cannot disregard, fearing loss of market. Many of the second generation of producers are not trained to make stoves but learned from their elders,

which also affects the quality. Fortunately, a random survey carried out shows that the majority of stoves in the market are acceptable quality-wise as shown by tests carried out by IDEA. Presently, wholesale prices of stoves produced by large-scale producers range between Rs 130 – 150, while small producers and selling around Rs 200 to 300 and retail prices are going up to around Rs 250- 450. (1US\$= Rs 130).

Recently, Sri Lanka Standard Institution (SLSI), with the initiative of Practical Action and inputs from IDEA, introduced Sri Lanka Standards for Two pot Clay Cookstoves of two sizes small and medium: SLS 1475/2013 for Two Pot Clay Cook stoves (TPCCS). The standardized dimensions are given below.



Dimension (1)	Type A (2)	Type B (3)
	A	195 – 210
B	73 – 80	58 – 62
C	155 – 165	155 – 165
D	205 – 220	205 – 220
E	175 – 190	145 – 155
F	175 – 190	145 – 155
G	32 – 37	32 – 37
H	22 – 28	22 – 28
I	32 – 35	32 – 35
J	32 – 35	32 – 35
K	32 – 35	32 – 35
L	32 – 35	32 – 35
M	12 – 15	12 – 15
N	12 – 15	12 – 15
O	110 – 120	110 – 120
P	155 – 165	147 – 155
Q	210 – 230	170 – 180
R	≤ 70	≤ 65
S	50 – 60	50 – 60

In addition to the stove dimensions, the thermal shock resistance and load capacities of all 10 components are specified in the standards. Sri Lanka Standard on two-pot clay cookstoves is anticipated to :

- Encourage quality control and adoption of proven methodologies for quality control by manufacturers.
- Promote healthy competition.
- Ensure improved performance and durability of final product.
- Ensure standardized product gets a better market.

However, the interests shown by the producers are lukewarm. Probably, the cost of taking the SLS license is high, which is not affordable to them, and stoves have a market anyway despite the quality.

Anagi Stove's Contribution towards Meeting the Millenium Development Goals

Anagi stove's ability to meet MDGs is proven by research carried out by various institutions nationally and internationally. It reduces energy use, cooking time, greenhouse-gases, and particulate matter. It promotes income generation.

Asian Regional Research Programme - Energy, Environment and Climate - AIT Program 66 report reveals:

Anagi two pot fuelwood stove:

- Rated Power Output 4-5 kWh
- Cost of Energy = 0.64 Rs/MJ
(Three Stone = 1.27 Rs/MJ; Semi-Enclosed = 0.88 Rs/MJ)
- GHG Emissions = 214 g CO₂-e /MJ
(Three Stone = 466 gCO₂-e/MJ; Semi-Enclosed = 292 gCO₂-e /MJ)
- Emission Reduction = 50 kt CO₂-e/y per 100,000 stoves (42%)
- GHG Abatement Cost = -21 US\$/t CO₂-e

The Anagi-2 biomass cooking stove provides energy at a much lower cost than traditional cooking stoves. Replacing 100,000 traditional stoves with these units could reduce GHG emissions by about 50 kt of CO₂ equivalent per year.

It is estimated that considering 4 scenarios, the Anagi Stove has the potential to reduce CO₂ emissions within a range of of 111 kg/ CO₂/capita/year to 266CO₂/capita/year. (Sources: Initial Evaluation of CDM type projects in Developing Countries. Dr K.G.Begg et al. Centre for Environmental Strategy, University of Surrey).

Indoor Air Pollution

Research carried out in 50 households by Research Triangle Institute (RTI-USA) in collaboration with IDEA using the most modern equipment reports particulate matter emission values using traditional and Anagi Stoves with or without chimneys. While "Anagi" stoves reduce PM values moderately, it shows the importance of using a chimney hood irrespective of the stove type.

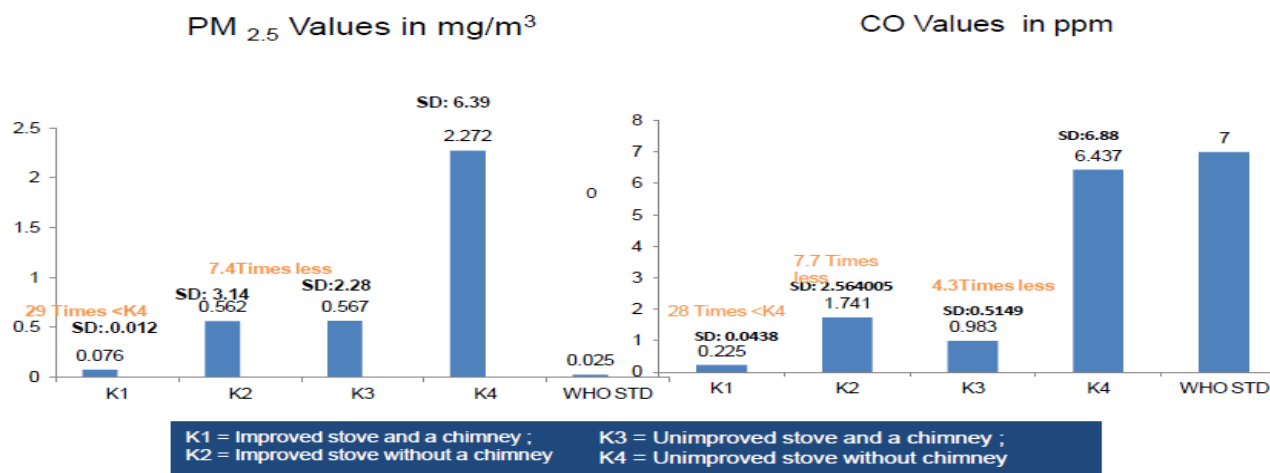


Indoor Air Pollution Monitoring

Graph: IDEA research results in 24 households

	<u>Stove</u>	<u>Chimney</u>	<u>Avg Personal</u> <u>(µg/m³)</u>	<u>Avg Indoor</u> <u>(µg/m³)</u>
1-50 AVG	Traditional	NO	197.4	320.1
1-50 AVG	Traditional	YES	79.6	107.0
1-50 AVG	Anagi	NO	140.8	244.1
1-50AVG	Anagi	YES	84.2	101.7

Graphical Illustration of Geometric Mean of PM_{2.5} and CO values based on kitchen type



Conclusions & Recommendations

The “Anagi” stove production and marketing will continue at the present level, slightly over 300,000, without large increases. Therefore, the stove penetration rate is expected to drop as a percentage of households having such a stove.

In the future, it is unlikely that sufficient clay sources and pottery skills will be available to produce “anagi” stoves to meet the total demand in the country, due to shortages and restrictions enforced on clay mining and a trend of youths rejecting taking up to pottery as a career. This can lead to few large centralized production by few potters.

Although LPG use will increase in urban and suburban areas, firewood will remain the major source of cooking energy in the rural areas, which has to be promoted further to retain the high degree of energy security presently enjoyed by the rural poor. However, it also emphasizes the need for promoting new technologies for efficient use of firewood going beyond the “Anagi”. The urban populace have to be provided with a better-performing biomass stove supported with an uninterrupted supply of biomass in a suitable package.

Since stove production has become a popular income-generating activity at present for older rural potters, promoting centralized production will affect poverty alleviation as an objective of stove production.

Due to cultural reasons, where traditions require cooking using biomass at auspicious times, use of biomass stoves may not get eliminated from the social systems for at least a few decades.