



Results Assessment

Survey on Impacts of the Stove Project in Transmara, Western and Central Cluster of Kenya

Conducted from October 2007 to January 2008

Final report

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i. Abbreviations

BMZ	Bundesministerium für wirtschaftl. Zusammenarbeit und Entwicklung
CDF	Constituency Development Fund Government
DAO	District Agricultural Officer
DFID	UK Department for International Development
DGIS	Directorate General for International Cooperation (Netherlands)
DIE	Deutsches Institut für Entwicklungspolitik
EnDev	Energising Development Programme (German-Dutch)
ESD	Energy Saving Devices
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
HH	Household (s)
ICS	Improved Cooking Stoves
LATIF	Local Authority Trust Fund
MDG	Millennium Development Goals (of the United Nations)
OECD-DAC	Development Assistance Committee of the Organisation for Economic Cooperation and Development
HEO	House Economics Officer
HERA	Household Energy Programme (GTZ)
ICS	Improved Cooking Stove (s)
MDG	Millennium Development Goal
MAPP	Method for Impact Assessment of Programmes and Projects
MOA	Ministry of Agriculture
MOE	Ministry of Energy
NALEP	National Agricultural and Livestock Extension Programme
PM10	Particulate matter less than 10 microns in diameter levels
PRA	Participatory Rural Appraisal
PRSP	Poverty Reduction Strategy Paper
PSDA	Private Sector Development in Agriculture (GTZ /GOK Project)
PU	Productive Use
RBM	Results Based Monitoring
RMS	Rocket Mud Stoves
SI	Social Institution
SME	Small and Medium Enterprises
STD	Sexually Transmitted Diseases

Note: Exchange rate in December 2007: 1 € = 93 Ksh, 100 KSh = 1.10 €

ii. Introduction

With the Millennium Declaration in September 2000, the international community, acting as the United Nations, decided to join forces in their efforts to halve extreme poverty and hunger in the world by 2015. Together with six other goals dealing with education, health, empowerment of women, and the environment, these Millennium Development Goals (MDGs) have provided the primary orientation for governmental and international development action since they were established.

The achievement of the MDGs, and other national development goals, is the focus of those responsible for allocating development funds and justifying their results. Monitoring of national development plans (and development programmes and projects), shifted from a concentration on project activities to monitoring the effects of the respective programmes. These results, occurring directly as an immediate effect of the development intervention, or indirectly as a change influenced to some extent by the direct effects of the intervention, are expected to contribute to achieving the MDGs.

'Managing for Development Results' is now a key principle for the international development community and is enshrined in the 'Paris Declaration on Aid Effectiveness' of March 2005. Partner countries and donors jointly commit themselves to participation in development activities to strengthen both the demand within each country for results-based management, and the capacity to deliver it. Aid management and implementation should focus on the specific results that are required, and use the monitored information to improve decision-making.

The German Federal Ministry for Economic Cooperation and Development (BMZ) changed the requirements from its implementing agencies. The achievement of development policy goals was made a key focus, and the success of projects was measured, not by the services delivered, but by the objectives achieved. In 2004, to fulfil its accountability obligations towards its contracting clients and the public, GTZ introduced a results-based monitoring system for its contracts and co-operation management.

The joint Dutch-German programme 'Energising Development' (EnDev) aims to increase by six million the number of people having access to modern energy by 2015. Both rural electrification and the promotion of improved cooking stoves are considered for project financing. A tight monitoring system has been developed for each project, which concentrates on outputs, the use of outputs, and the outcomes or project goals. Impacts (defined as the indirect results occurring as an effect of the outcome), are more difficult to observe and are thus not part of regular monitoring. However, donors want to know about impacts and about their contribution to the development goals. To provide this information, the GTZ sectoral programme on household energy (HERA), and the Kenyan stove project within the Private Sector Development in Agriculture initiative (PSDA), decided to conduct a joint impact assessment to document experience for other stove projects. The stove projects in Ethiopia and Malawi applied this methodology later for their assessments.

The survey was initiated by a German-Kenyan team of consultants, project staff, national counterparts, and a HERA staff member, from October 2007 until January 2008. Due to some technical problems, data processing and analysis took until June 2008 and the report was written during the following year. Even though the work could not be completed as planned, the following pages present the methodological approach, results of the survey, and some conclusions.

iii. Abstract

The results assessment carried out for the Kenyan stove project examined in detail various direct results and impacts achieved among households, commercial stove users and stove dealers in the three clusters of the project area. For this, 500 households, 22 stove dealers, and 16 restaurant owners were interviewed using standardised questionnaires. Six all-female focus-group discussions were conducted.

In the two years of its existence, the project has achieved some major results:

- Stove adoption rate in households has risen from about 5% to 38%
- Stove production has become an operational business with an average monthly production of 337 jiko kisasa liners per producer
- Average monthly incomes are between 10,000 to 20,000 KSh (about 100€ to 200€).

The former 'Women and Energy Project' provided a favourable starting situation, with the earlier project having a generally good reputation as the project which introduced the first improved stove model. Several former stove producers were ready to get reintegrated quickly into stove production. Lessons learned from the earlier stove project were applied, and a decision made to use a market-oriented stove promotion approach, where the project itself did not engage in marketing (production and selling) of stoves

Households in rural areas in Western Kenya are mainly engaged in agricultural production, which makes them heavily dependent on climatic and economic market conditions, which vary from year to year. Good and regular rainfall, coupled with favourable market prices for products and inputs, will secure livelihoods and help to increase living standards. Such ideal conditions can easily be reversed the following year, and households are thrown back to basic subsistence. Under such fluctuating and unpredictable conditions, improved stoves may appear to play a minor role in the general struggle for survival. During the past years, demographic growth, together with the growth of big agro-industries, has contributed to an increasing scarcity of land and trees for fuel use. Thus, the role of improved cooking stoves to save fuel has become more important, particularly for those households that can no longer satisfy their fuelwood needs from their own farms.

On average, households possess two stoves. Those, owning an improved cookstove (ICS) generally use it for everyday food preparation, and gradually abandon the traditional three-stone-fire. The Jiko Kisasa one-pot stove is predominant among poor households; while better off households have mainly two-pot stoves. Most of the improved stoves were built during or after the project. About 75% of the ICS were in a good or acceptable condition, and 12% of ICS households had replaced their first stove when it had broken.

Private and commercial ICS users overwhelmingly appreciate the stoves for their fuelwood savings (which saves them the cost of fuel), and also for the time saved on cooking. Since cooking is done indoors, they appreciate the reduction in smoke emissions. These benefits occur as soon as an ICS is used. Money saved from buying less fuelwood is used to cover other immediate needs, like foodstuffs, materials for school, medicines, second-hand clothes, soap or other items. Time saved on cooking is used for farming, income-generating activities, housework or, more rarely, for leisure. Free time allows women to participate in civic activities like community meetings. Smoke reduction improves the working conditions for women and girls in the kitchen as it leads to reductions in respiratory diseases, headaches and eye discomfort. With these impacts, the project contributes to the objectives of the Kenyan Energy Act of 2006 concerning the use of renewable energy technologies for biomass and to the goal of achieving a country wide adoption rate of efficient stoves of 30% by 2020.

1. Executive Summary

With the declaration of the Millennium Development Goals (MDGs) in 2000 the international community determined to make a concerted effort to half extreme poverty and hunger in the world by 2015. Other commitments like the Paris Declaration on Aid Effectiveness further strengthened the significance of these development goals. The concept of 'Managing for Development Results' became one of the key principles for their achievement. Implementing agencies, such as GTZ, introduced Results Based Monitoring Systems in order to orient projects towards achieving Development results - in part to fulfil their accountability obligations towards their clients.

The joint Dutch-German programme 'Energising Development' (EnDev) aims to increase, by six million, the number of people having access to modern energy by 2015. One approach is the promotion of modern cooking technologies in more than fifteen stove projects, mainly in Africa. The Kenyan stove project is integrated into the programme for Private Sector Development in Agriculture (PSDA) which is carried out by GTZ on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ). Together with the GTZ sector programme on poverty-oriented basic energy services (HERA), it conducted an impact assessment, which provides data from that experience for other stove projects.

The assessment was prepared, carried out and evaluated by a mixed team of project staff, partnering organisations (such as the Energy Ministry), national and international consultants and a HERA team member, who were all involved to different degrees in the different stages of the assessment. Unforeseen difficulties delayed the process. The survey itself was conducted from October 2007 to January 2008. Data processing took to June 2008 and report writing was completed in May 2009.

The Programme for the PSDA Stove Project (See Chapter 2)

The main objective of the Private Sector Development in Agriculture (PSDA) stove project was to provide 465,400 people or 180,000 households (households) with improved cooking stoves by December 2008. This objective has largely been met. The project area lies within the intervention zone of PSDA, namely Transmara, Western and Central Cluster (see Annexes 1 & 2). The target groups for the project were, on one side, the stove producers, installers, builders, dealers (who buy stoves from producers and sell them at market) and their professional association, and on the other side, the rural and urban households, social institutions and restaurants in the three clusters.

The project followed a commercial approach by empowering groups and individuals to produce and commercialize improved cooking stoves through raising awareness of their benefits among private and public biomass users, and supporting the establishment of a stove dealers' association. Big tea companies were approached to introduce stove promotion into their environmental programmes. HIV/AIDS-affected groups were assisted to start businesses in stove marketing for income generation, and to use improved cooking stoves to reduce indoor air pollution.

Stove types promoted include: portable Jiko Kisasa, inbuilt Jiko Kisasa with one or two potholes, rocket stoves with one or two potholes, institutional rocket stoves, baking ovens and soil sterilizer (for a detailed description see Annex X).

The focal areas of the project comprised districts with high population densities of more than 900 persons per square kilometre (Kisii, Vihiga), those with around 500 to 600 persons per square kilometre (Bungoma, Kisumu) and others which had an average of 300 to 400

persons per square kilometre (Bomet, Muranga, Maragwa). Big agro-industry enterprises (coffee, tea, tobacco and sugar cane) in Central and parts of Western Cluster monopolise huge areas, increasing the scarcity of land for small-scale agriculture. Often, the size of a small farm does not exceed 0.7 hectare, which only allows for subsistence agriculture - mainly maize, beans, vegetables, banana and sweet potatoes. Only a few districts have forests, and in many areas firewood has become scarce.

Methodology and components of the survey (see Chapter 3)

A mixed set of methodological steps and quantitative and qualitative tools were used for the survey, starting with a review of the project's documentation and project literature. On the basis of the project's strategy, results chains were formulated to identify the direct results of the project (use of outputs, outcomes) and the indirect results (impacts). Appropriate tools were selected to measure indicators for potential outcomes and impacts. The detailed structure of the monitoring tools, pre-testing in the field and finalisation of the tools was completed with project staff and cluster managers. The level of success in training enumerators was included as part of the field testing.

Using an approach based on the GTZ Results Model, the project's strategy was defined through results chains, showing the effect of the project's interventions in various fields. The EnDev project goal 'access to modern cooking energy' was set at the 'outcome' level. Various impacts (indirect results) were identified: those that occurred within the house when the occupants started using their ICS; those impacts that resulted from this use, and those outcomes that contributed at a highly aggregated level, along with other interventions and outside factors (e.g. reduction of poverty, health improvements, climate protection etc.).

The main instrument selected for data collection was the standardised questionnaire. It was developed for households with and those without ICS, for stove dealers (producers, installers and marketers¹) and for restaurant and bakery owners. The questionnaires covered information on stoves and their condition, on stove use, on fuelwood, on cooking practices, advantages and disadvantages of ICS, and information channels. The data collection was completed by guided observation of the enumerators on existing types of stoves, their condition and practical use during the interview. Special training was given to enumerators to ensure that they were well qualified to make observations on stove issues.

To complement this approach, Participatory Rural Appraisal (PRA) tools were adapted from the 'Method for Impact Assessment of Programmes and Projects' (MAPP) approach for focal group discussions with women. During the discussions, participants were encouraged to reflect on their household situation and on any changes that had taken place, whether positive or negative. Out of the seven PRA tools provided by MAPP, three were selected and adapted to the stove project context: the trend analysis, the activity list and the influence matrices, allowing participants to discuss the impact of various development activities, in their village, on living conditions and poverty.

A guideline for interviews with village chiefs and elders was developed to introduce the survey teams to the locality and to promote discussion on the local perception of socio-economic categories. The local leaders were asked to define three categories: the 'poor', 'medium poor' and 'better off' households. Households in the locality and participants for the focal group discussions were then selected according to these local criteria.

For the survey area, half the twelve districts in the three clusters of the project's intervention area were selected. The selection criteria for each village were based on the following factors: participation in the baseline survey of 2006; recent stove activities; population density; ratio of urban to rural households; and the poverty ratio.

¹ Promoters and sellers of stoves

The sample size for the household survey was 500 households in total. It comprised:

- A 'general household survey' of 320 households. In this group around 37% had some kind of stove.
- A further survey of 180 different households which *all* had ICS. This group was targeted to find out specifically how households use the ICS.

The distribution of households per cluster reflected the population density and rural-urban-ratio, according to national statistics. Poverty was a criterion for household selection, defined by the locally given categories. The same criteria were applied for the selection of participants for the women's focus group discussions. Altogether, six discussions took place; in each district one group of 'poor' and one of 'better off' women. The 22 stove dealers were selected by interview, based on several factors; gender, years in the stove business, size of business, individual and group production. Finally, sixteen commercial stove users (restaurant and bakery owners) were selected for interviews, including both small and large restaurants.

Field testing of the monitoring instruments and the first round of training of enumerators took place in Kisii in October 2007. Project staff, cluster managers and consultants all participated in this exercise, together with PRA practitioners from the clusters. Following this exercise, the instruments were adapted and finalised. The cluster managers continued to train enumerators in the three clusters, especially on stove issues. The survey itself was carried out by three teams that worked in parallel in the three clusters. Data processing and evaluation took place to June 2008.

Results from the Household survey (See Chapter 4, Section 4.1)

To reflect the local household statistics, two-thirds of the households interviewed were headed by men, and one third by women. From this study, it was found that in most households, the main occupation of the household heads was involved with agriculture. The average household size was slightly above the national figure of five persons per household. Half of all household members were below 15 years of age. In Central Cluster, family sizes were lower (4.5) than in the Western Cluster (6.9).

A large variety of stoves was found in the interviewed households. The traditional three-stone-fire has lost its predominant position. Only in the Western Cluster was it still the single most frequently-used stove with 34% of households using it. In Central and Transmara Clusters, improved stoves (for firewood and charcoal together) were the most frequent stove types. For firewood ICS users, the Jiko Kisasa dominated the Central and Western Cluster, while the Rocket Mud Stove (RMS) was mainly found in Transmara, where it had been introduced recently. In areas where firewood was scarce, a switch to other fuels was observed. In Central and Western Clusters more than 20% of all stoves used kerosene or LPG.

Among ICS users, the firewood Jiko Kisasa was predominant in rural and urban areas. More than half the households living in poverty owned the Jiko Kisasa one-pot stove which is the cheapest available ICS (about 300 KSh). Medium and better-off households had mainly two-pot stoves (about 600 KSh). None of the very low-income households was found with a Rocket Mud Stove with two pots. In the general household sample, poor households possessed only 16% of all improved firewood stoves, despite being about half the population. This implies that purchasing power has an influence on the acquisition of an ICS, and on one-pot or two-pot selection.

Most households had stoves. Households with an ICS tended to have more than two stoves. Across all the interviewed households, 38% had improved firewood stoves, with a wide variation between clusters. The Western Cluster has experienced less project activities than the other areas and it showed the lowest ICS coverage (22%). More promotional activities were carried out in Central Cluster, which demonstrated a 41% ICS coverage. In Transmara

Cluster, where the new rocket mud stove was introduced, there was 50% ICS coverage. It appears that the numbers of activities, and the level of project activities, have an immediate effect on equipping households with ICS.

All the stove types found in the project areas were used, but not all of them were used every day. Those used most frequently were fuelwood stoves, comprising traditional three-stone-fires and improved fuelwood stoves. About 70% of these stoves were used every day for cooking and boiling water. Half the existing LPG stoves were used for daily food preparation, and one third of the kerosene wick stoves and charcoal stoves were in daily use. When people were asked about their use of their three-stone-fire, the answers differed considerably according to whether or not they owned an improved cooking stove. The majority of households without ICS used the three-stone-fire every day (81%), but only 21% of ICS households used the three-stone-fire daily. This indicates that ICS households seem to abandon the traditional fireplace in favour of the improved stove for everyday cooking.

More than half the improved stoves were found to be in good condition. Along with stoves in moderate condition, they made up 75% of all ICS whose performance could be expected to match their potential efficiency. About a quarter of the improved stoves were in bad condition and would not achieve their fuelwood savings potential. These stoves were mainly found in Central Cluster, where the inhabitants have a reputation for not being concerned about the maintenance of their houses and stoves.

The vast majority of ICS were built during the past two years (80%), with most of them produced during the last year. It was reported that 20% of firewood ICS were more than two years old and 12% were more than five years old. This shows the long-term impact of the former 'Women and Energy Project', albeit the household numbers are rather low. At the same time, the figures demonstrated that stove promotion activities provided an immediate boost to stove dissemination.

About 12% of households had replaced their improved stoves with new ICS, mainly because their original stove had broken. Other stoves were replaced by people wishing to have a new and modern stove. Another reason for replacement was when the cook moved to another kitchen and built a new ICS in the new kitchen.

In the overwhelming majority of households (98%), cooking was done within the house or kitchen throughout the year. The majority of households used a separate kitchen, whilst the remainder cooked inside the main house. Households with ICS tended to have a separate kitchen more frequently than non-ICS households.

The use of one stove still prevailed in most households. However, ICS users cooked more often on two fireplaces, which saved them time in preparing ugali and relish, or rice with sauce simultaneously. Stove models with two pot holes facilitate this behaviour. Further investigations are needed to determine how much people appreciate and use two-pot ICS, or how many prepare their meals on an ICS and a traditional stove simultaneously.

Most households lit their stove three times per day, some of them even more often, but a complete meal was not prepared each time. The majority warmed up a meal once per day, and this behaviour was not related to the type of stove being used. Half the households warmed up a previously prepared meal at lunchtime, one third in the morning and the rest in the evening.

Apart from cooking meals, which was the main use, most households boiled water. Space heating was another reason, and more than half the households sometimes needed space heating. Among ICS households, only 40% used the stove for space heating. The ICS is not convenient for space heating. Less than 10% of people interviewed used their stoves for lighting.

Cooking practices are an important factor influencing the performance of improved stoves. During interviews, four of the most important cooking practices were observed. Most women followed the recommendations: used dry fuel; split firewood; and used a pot lid when cooking, irrespective of whether they had an ICS or not. The only reported change among ICS users was that the vast majority used fewer twigs. This is certainly due to the planned technical 'constraints' of ICS with small doors for the firewood, which promote better combustion and more efficient fuel use.

Smoke reduction is an important impact of ICS use. While two-thirds of the general household sample was found with smoke in their kitchens when cooking, this was the case in less than half the ICS household samples.

A variety of fuels were used for cooking, yet biomass (including charcoal) remained the most important source of fuel. Besides fuelwood, agricultural residues were the second most important type of fuel. More than half the households used maize cobs, and one third of them used maize and sorghum stalks. Availability of these fuels is linked to the agricultural season and starts after harvest. In Western Cluster, maize cobs were even sold for fuel consumption. Charcoal was used by about 45% of households, while kerosene and gas were utilised in only 20% of households.

Half the households depended on collecting their firewood, about one third collected and bought wood, while 20% bought all the fuelwood they need for cooking. The number of households buying firewood was found to have increased compared to the baseline survey of 2006, which is a sign of increasing scarcity of wood. The main source of firewood was the household's own farm for almost everybody. Other sources, like open land, waste scrubland and neighbours' farms provided negligible quantities.

Firewood collection was done by women in most instances. Girls may help, but not on a regular basis; boys even less. Men hardly got involved in this task. However, slightly more men in ICS households engaged in firewood collection, which was confirmed by project staff who observed this in the field.

About half the households collected their firewood on a monthly or weekly basis; the other half collected several times a week. This depended on the quantity of wood collected and the source. When going to the field, women usually picked up some branches and twigs for cooking. Accordingly the time spent on collection was rather small; less than two hours per week was recorded for half the women. Additional time was only invested when cutting big branches or a tree, which required several hours, or a whole day.

The cost of firewood was in general between 50 and 1,500 KSh (0.5 and 1.5€) per month, depending on factors such as the availability of firewood, the ratio of bought firewood to collected firewood, family size, availability of cash etc.

Improved cooking stoves are not new in Kenya. The Kenyan Jiko was introduced about 20 years ago and is still present in the market and in many households. About 10% of households interviewed possessed a Kenyan Jiko. Promotion for ICS was re-launched with the present stove project. About 85% of people not possessing any ICS knew about them, particularly the Jiko Kisasa (formerly known as Maendeleo Jiko). Other models, such as the Jiko Kuni Mbili (metal stove) and the recently introduced Rocket Mud Stove are hardly known.

Half the people not owning an ICS said that they either had no money to buy one or had no interest. Few said they were unaware of where to get one or that they were planning to buy one in the future. The lack of a separate kitchen was another reason for not buying an ICS. Only 4% of respondents rejected the stove because they believed it broke easily.

When asked how they learned about improved stoves more than half the respondents mentioned stove dealers. Other frequent responses were the public field days, or information through neighbours, family and friends. NGOs and the public media appear to have had very little effect in promoting stoves. The project only started a media campaign after other information channels had been used. It can be concluded that stove dealers have managed to establish their marketing activities and their business rather well.

Results from the stove dealers survey (See Chapter 4 Section 4.2)

Female stove producers mainly concentrated on the production of liners, while their male colleagues often diversified their stove activity and installed and/or marketed stoves as well. More than half the male and one third of the female producers interviewed had started stove businesses more than two years ago. Some of them had even been initiated by the former 'Women and energy project'. Yet, most of these had abandoned stove businesses in the meantime and were retrained by the present project.

Agriculture was the main source of income for almost half of all stove dealers. However, for one third of them, their stove businesses were their primary source of income. For both groups, the stove dealers considered stove activities as an important contribution to their income, often making up more than half the total household budget.

The amount of time spent on stove activities showed their importance: on average six to seven hours per day were invested during three days (installation), rising to five days (production and marketing) per week. Half the producers spent seven to nine hours daily on stove activities, making it a full time business. Differences among men and women existed, and this data is valid mainly for male producers. Women tended to spend less time on stove activities.

Stove installation cannot be done at home and it requires travelling to other villages. Full time employment was therefore less frequent and could only be achieved in combination with production of liners. Those marketing stoves combined selling stoves with installation and/or marketing in order to get fully employed. Those with agriculture as their primary source of income were employed in stove businesses mainly in the off-season.

Family members helped in more than half the stove businesses. They were mainly involved in the strenuous activities of raw material collection and kneading the clay. They may have helped in marketing stoves by 'finding customers', or helped out when liners were being installed.

Around 86% of stove producers hired a labour force, men and women alike, particularly for laborious activities, like preparation of the mud. Other tasks given to hired labour included moulding the stoves, finishing and drying them. Firing the stoves was seldom the responsibility of hired labour. Stove marketers and installers rarely hired a labour force.

Twenty years ago, women's groups produced stoves, and these groups became popular through this income-generating activity. As stove production became profitable, more men joined these groups or created new groups (42% of groups in this study had been in existence for less than two years). Today some groups have more male than female members. Producer groups had an average size of 16 members, varying from six members to around thirty members per group.

The project promoted stove dealer associations rather than helping individual stove dealers. Installer groups and marketing groups were initiated in the previous two years. Smaller than producer groups, their size ranged from six to ten members.

Members were ambivalent about whether or not group work is useful. On the one hand economic advantages were seen in better organisation of work through division of labour, in pooling resources and increasing the production capacity and outreach. Also, moral support, mutual help and learning from each other, were appreciated by those involved in group work. On the other hand, lazy group members, lack of commitment and delays in decision making may hamper the group's well functioning.

The Jiko Kisasa liner is the easiest model to produce and most of respondents were engaged in its production. Women, in particular, made this model, while the portable stoves, the metal stoves and the Rocket Mud Stove were mainly or exclusively made by men. This had been influenced by the project, which was biased in the selection of trainees towards male metal workers and bricklayers.

Raw materials for stove production comprise clay, sand, ant-hill soil, grass, sawdust, water, firewood, bricks (for Rocket Mud Stove) and banana stems. They can be found in nature, on one's own land or on public land. Yet, in more than half the cases, these materials had to be paid for (except water). In some places, clay, ant-hill soil and firewood were considered to be just sufficiently available or getting scarce. In general, raw materials were available provided the client could pay for them.

Most of the installers purchased liners directly from the producer. Some bought them at a higher price from the person marketing them. Installation of liners into fixed mud stoves was done at the customer's house, which needed some travelling from the installer. This might be the reason why men had a higher average production of 26 stoves per month compared to women, who installed 14 stoves per month. Female installers had a smaller field of operation than men, and only went to neighbouring villages. All the raw material needed for stove installation was provided by the customers.

All respondents had obtained some professional training from the stove project. Besides the technical training provided to all, half of them had received training on entrepreneurship skills and a few on organisational development. Most stove producers had trained others on stove production. On average, ten persons were trained per producer.

During their technical training stove producers were acquainted with different quality criteria for stoves. The majority of them stated that they had respected most of these criteria, particularly the right stove dimensions, the door and the pot rests. Among installers, the most important criterion cited was the right positioning of the stove in the kitchen (placed under the window).

Quality control of stoves and liners was usually done by another group member. Some producers relied on themselves for this task. The rocket mud stoves were only monitored by the project during the first three months of their introduction.

A sort of quality label was used by two-thirds of all producers, men and women alike. Usually, the initials of the producer or of the group were scratched into the surface of the stove. Most installers and marketers stated that they only bought labelled liners.

The vast majority of stove dealers gave a warranty on the liners and stoves they sold. Half of them gave a guarantee of one month, the others between two and three months. Some gave a warranty of up to twelve months. The warranty might cover only transport of the stoves from producer to customer. This practise developed on its own, without the project intervening.

Cracking of liners and stoves was cited as a problem encountered by the majority of marketers. Uneven pot rests were another problem found at times. The stove quality varied

from one producer to another. Marketers returned bad quality liners or reduced what they paid, which sometimes led to quarrels with the producer.

Some stove producers modified the stove design to try to improve the stove and make it more attractive for the client. Adjustments included adding clay to the pot rests or above the door to strengthen it. Sometimes doors were widened to allow more firewood to be inserted, which adversely influenced the performance of the stove. Some fixed mud stoves were made more beautiful by treatment of the final mud coat.

Stove production and sales records revealed that the Jiko Kisasa had the largest number of stoves produced, with an average of 337 pieces manufactured per month per producer. The second highest production figure was the Portable Jiko Kisasa stove, with an average of 82 stoves produced monthly, while a few Rocket Mud Stoves were produced during that time. There was a wide range of monthly production figures for the Jiko Kisasa liners, ranging from 100 to 200 per producer, to up to 400 to 1,000 liners per producer.

Sales figures were lower than production figures, yet showed similar trends for the different stove models. The average number of liners sold per month and per producer was about 260 pieces. The difference might be due to the establishment of stocks, but it could also be attributed to the sensitivity of a question aimed directly at the monthly income.

Prices for liners varied between 100 and 250 KSh (€1 to €1.50) with a trend towards higher prices in Transmara and Western, and lower prices in Central Cluster, where there is greater competition.

Almost all producers gave out a percentage of stoves and liners for free. Two main reasons were given for this: getting rid of cracked liners, which were given to poor people, widows or people with HIV/AIDS, and promotional stoves given for free to neighbours, friends and vulnerable persons. Such promotional stoves were often of poor quality. The number of liners given for free did not exceed five percent of the liners produced.

Most liners and stoves were sold at the production site. Half the producers also sold liners at customers' homes, whilst some sold them at market. Usually the stoves were sold collectively by the production group. By far the most important marketing channel was via the marketers who, on average, purchased about half the total production. The second most important group were the agricultural extension officers, who are still involved in stove dissemination, and who bought, on average, around one quarter of the production. Installers and end-customers accounted for the rest of liner sales.

The monthly income from stove production varied from a few thousand Kenya Shillings to several ten thousands of Kenya Shillings. Although the sensitivity of the questions meant that some of the responses have to be taken with reserve, a general trend could be seen. About half the producers earned between 10,000 KSh and 20,000 KSh (100 to 200€) per month. Men earned slightly more than women. The vast majority of stove producers appeared to make a reasonable profit.

The monthly income for stove installers seemed to be less, with an average of 4,750 KSh per person per month. About half the installers earned up to 5000 KSh, while most of the others earned between 5000 KSh and 10,000 KSh. Only 10% earned more. The stove installers considered their profit as reasonable.

Male marketers sold, on average, 100 liners and/or stoves per month while female marketers only sold 47 per month. Almost all marketers sold their stoves both locally and outside their own location, mainly within their own district. The majority of them earned up to 6000 KSh per month.

Stove dealers used their own promotion activities, and these played a decisive role in attracting new clients. Social gatherings (*barazas*), church meetings and women's group meetings were the most common approaches, followed by referrals from satisfied clients. Producers felt that this latter channel was very important. Project promotion activities like *barazas* and information desks during public events were appreciated by marketers. Advertising through the media was hardly mentioned. Comparatively little importance was given to promotional activities carried out by extension officers. This demonstrates that a key actor in earlier stove projects has now been almost replaced by local entrepreneurs for promotional activities.

Feedback given by clients was mostly positive. Most customers said that they appreciated the good performance of the stoves and their nice design. Improvement of stove quality is acknowledged, but negative feedback is rather rare, and mainly concerns stove breakages and bad quality.

Results from the restaurant survey (See Chapter 4 Section 4.3)

Restaurants were usually open throughout the day for six or seven days per week. They generally served at least three different types of dishes, from breakfast and small food items like Mandazi, Samosas and Omelettes to dishes like ugali and relish, vegetables, soup and meat.

A variety of stoves were found in the restaurants in the survey; among the ICS there were KCJ (most frequent), Jiko Kisasa, household and institutional Rocket Stoves and Bellerive stoves. Only one of the restaurants still had a three-stone-fire. Small restaurants used on average 1.4 stoves while the bigger restaurants worked with an average of four stoves.

The majority of ICS (80%) were found to be in a good condition, with most of the restaurants buying an ICS within the last year. Two of the ICS had been broken and had been replaced by a new ICS.

All the restaurants cooked indoors, while some of the small restaurants also cooked outside. The bakeries usually had their ovens installed outside. Around 60% of the cooks had been informed about good cooking practices, ensuring their stoves were used with optimum efficiency. The most common recommendations for good cooking practices (according to the respondents) were: the use of a lid (or banana leaf) while cooking; the use of dried and split firewood; and cleaning the chimney of the Rocket Stoves at regular intervals. These practices were observed by the enumerators during the interviews. In most of the kitchen visited by the team, there were no visible smoke emissions during cooking.

All restaurant owners said that they had saved firewood, but it was difficult to establish the quantity of saved wood during the interviews. The best figures obtained suggest that small restaurants save an average of 100 KSh per day on fuelwood, while big restaurants save about 600 KSh per day. Accordingly, the pay-off period for a Rocket stove with two pots at a market price of 10,000 KSh is about six to nine weeks. A firewood Jiko Kisasa with a single pot hole (300 KSh) or two pot holes (600 KSh) can be paid off in a couple of days. A small Bellerive stove (50,000 KSh) can be paid off in a year and a big one after three years.

Saving fuelwood, saving money, and cooking more quickly were the most important advantages cited by almost all restaurant owners. For big restaurants, smoke reduction was considered very important. One third of the interviewees mentioned a reduction in respiratory diseases, less burns and accidents, and the improved flavour of the food cooked on an ICS. The vast majority of users did not report any problems with using the stoves (83%); only a few mentioned difficulties they had using wet firewood and maintaining the chimneys.

For this group of productive end-users, the most important source of information on ICS was the stove dealers. Neighbours, family members and friends or projects and NGOs were less frequently mentioned.

Results from the focus group discussions among women (See Chapter 4, Section 4.4)

Group discussions with women on the trends in their living conditions over the past five years showed clearly how their opinions reflected the available natural resources and climate. Agricultural yields, which are the nutritional and financial basis for all families in rural areas, vary from one year to another and depend on both adequate and well distributed rainfall during the season, and on prices and thus affordability of agricultural inputs. Agricultural productivity and the price of products determine family income. Both garden plots, maintained by women, and the income-generating activities in which they are engaged, contribute to the family income.

People's health varies from one year to another, depending on the general quality of life of the families. People felt that their health improved when there was enough food grown, and when income was sufficient to cater for health needs. The groups also recognised the benefits of government action, such as the distribution of mosquito nets and spraying of mosquito breeding grounds. Bad harvests coupled with high prices for commodities were immediately reflected in poor nutrition, which compromised family health.

The groups reported that access to natural resources, like firewood and land for planting trees had shown a distinct downwards trend over the past five years. While in some areas (Kisii Central), women felt there was plenty of firewood in 2003, in other areas (Bomet) women said that they had always found problems accessing enough firewood. With the installation of tea plantations and factories, and the use of marginal (swampy) areas for agriculture and brick making, resources had decreased, while demand had increased at the same time. Conflicts over land and boundaries made it impossible to plant new trees. In areas where firewood had been scarce for a longer time, and women had to buy it from distant places, women had started using Mauritius thorn, or took tea bush prunings illegally to supplement maize cobs to be able to cook.

Access to knowledge is an important dimension of well-being and poverty alleviation. In general, women appreciated the increased importance given to it over the past years. Education of girls was improving with the Free Primary Education Programme introduced in 2004. This programme had been accompanied by campaigns targeted on providing equal rights for girls. Due to Government projects and the work done by NGOs, parental attitudes towards their daughters' education had changed. More equal distribution among family members of housework, like fetching water, collecting firewood, cooking and house cleaning had helped girls to find the necessary time for their education.

However, improving primary education had not necessarily resulted in an improvement in the girls as perceived by the women. They felt that girls, who used to be obedient to their parents, had changed over the past few years, and that they had become rude, they now sneaked away from home to hang around doing nothing useful, and behaving immorally. Pregnancy at an early age, and contraction of STDs had become more frequent. Women remarked that very few girls attended secondary education or went to university.

The groups unanimously agreed that skills-training for women had positively developed over the years. The Government Directive on Gender Equity of 2005 had given a big push to women's groups, expanding their participation in training courses and their attendance at field days. It had contributed to changing the attitudes, of both village chiefs and husbands, to women's participation in community activities and decision-making processes in general.

In all the villages visited during the survey, a lot of development activities were being carried out; government projects and programmes; NGO and Church projects village-led initiatives.

Most of these initiatives related to primary education and school construction, water and health projects, improvements in agricultural production and processing, improvements in infrastructure (roads, irrigation and electrification), access to credit facilities, ICS, and improvements in security through police posts. The groups felt that all these initiatives were either relevant or very relevant for the daily life of the villagers.

In a final step, women discussed the impacts of the various development actions on their livelihoods; examining the four dimensions of poverty as analysed during the trend analysis. Among the activities considered to have a very positive impact on living standards were projects on agricultural training, particularly when they were combined with access to agricultural inputs. Water projects were ranked highly, as they improved living conditions a lot. Saving groups ('Merry go rounds') and table banking were the next most significant improvements. These developments allowed women to gain easy access to small sums of money for satisfying urgent needs and for investing in productive activities.

Improved cooking stoves influenced various dimensions of daily life in a positive way. Time gained due to faster cooking, and money saved through needing less firewood impacted on most of the poverty criteria. The additional time was used for farming, income generating activities, girls' education and women's participation in community life. Money saved could be used for necessities of daily life. Health improvements due to reduced smoke emissions and through a reduction in burns to children were considered as improvements in living conditions.

Main conclusions (See Chapter 5)

Plausible links can be established to highly aggregated impacts such as sector goals and MDGs. There are obvious contributions to improved living conditions for women who are the main beneficiaries of ICS as both stove users, and sometimes as stove producers. Quantitative findings cannot be provided, as improved cookstoves are part of a complex structure of climate-based, ecological, economic and social factors influencing the well-being of the rural population to a greater or lesser extent. Agricultural production, as the main basis for living and livelihoods, is subjected to uncontrollable ups and downs for the people dependent on it. The significance of the stove project's impacts depends also on the coverage rate that can be sustainably achieved.

The project considered the essential lessons learnt from the 'Women and Energy Project'(1983 - 1994) when defining its strategy. Care was taken to initiate a market approach that was as comprehensive as possible. Commercialization of liners and stoves was not supported by the project. Instead of extension officers from the Ministry of Agriculture distributing stoves, they set up marketing groups, trained them, and linked them with producer groups. The project did not exert any price control, allowing stove prices to be dictated by the free market. These factors are likely to have had a positive influence on the self-sustaining dissemination of ICS in rural areas. At the same time, the project had the opportunity to build on the achievements of its predecessor. Former producers were reintegrated easily into the new project, and the good reputation of the widely known Maendeleo stove certainly helped to boost stove sales of new models.

The national policy for the energy sector addresses the issue of improved stoves. It aims to ensure sufficient raw materials to meet demand on a sustainable basis. Promotion of renewable energy technologies for biomass is part of the Energy Act of 2006. The strategy for ICS is to increase the rate of adoption of efficient stoves from 4% in 2000 to 30% by 2020. The stove project is not only fully in line with the energy policy, but also actively contributes to the achievement of this goal.

2. Description of the PSDA Stove Project

2.1 The Programme for Private Sector Development in Agriculture - PSDA

The majority of the rural Kenyan population lives below the poverty line. The major reasons for this are lack of sufficient income and employment opportunities in the rural economy. The agricultural sector is the major pillar of Kenya's national economy. Its potential is not fully realised, mainly due to unfavourable framework conditions for the private sector and an unsatisfactory provision of services. In addition, the sector is exposed to a declining resource base.

Planning and implementation of the programme 'Private Sector Development in Agriculture' (PSDA) is based on the Focal Area Strategy Paper (FASP) of the Kenyan-German Development Cooperation. The programme is planned to cover a period of twelve years, in four three-year phases. The project entered its second phase in January 2008.

The main objective of this programme is to support small and medium-scale enterprises in selected value chains in agriculture to increase their use of the market opportunities. Thus, economically viable, and environmentally-friendly farming methods were promoted by the programme. Furthermore, the programme provided policy advice services to institutions.

The following programme components reflect the programme's multi-sectoral and multilevel approach to farming methods

- Improvement of the policy framework in the agricultural sector
- Improvement of service delivery in the agricultural sector
- Strengthening private sector organizations in the agricultural sector
- Promoting resource-friendly technologies

The programme's target groups are commercially-oriented small and medium-scale farmers in parts of the Rift Valley, Western, Eastern, Nyanza and Central Provinces. Also included are small and medium enterprises operating upstream and downstream segments of the selected value chains, and their professional associations. Target groups of the fourth component are households, and stove dealers and their professional association.

2.2 The Stove Project

The PSDA stove project was initiated under the component 'promotion of resource-friendly technologies' as part of the ongoing German/Dutch collaboration within the Programme 'Energising Development' (EnDev). EnDev aims to enable poor people to access clean energy services such as rural electrification and improved cooking stoves. In November 2005 the stove project was brought on board, while actual implementation started in January 2006. The first phase ran from November 2005 to June 2007, with an extension for the next phase from July 2007 to December 2008.

The main objective of the project was to provide 465,400 people with improved cooking stoves by December 2008. This corresponds to approximately 180,421 households accessing stoves (average family size of five people per households).

The target groups were rural and urban households in Transmara, Western and Central cluster, and stove producers, installers and dealers, social institutions (SI) and productive stove users, such as restaurants. The intervention zone covered twelve of the 72 districts in those three clusters. The five focal areas of the PSDA programme can be seen on the map in Annex I. The distribution of the districts between the clusters is shown in Table 2.1:

Table 2.1: Distribution of the districts among the clusters

Cluster	Districts
Transmara	Kisii, Bomet, Transmara
Western	Vihiga, Bungoma, Siaya, Kakamega
Central / Kisumu	Muranga, Thika, Maragua, Kiambu

Project activities were focused on promoting a commercial approach to stove activities at all levels (production, marketing and installation). The main task of the project was to empower groups and individuals involved in all aspects of stove commercialization. Through working with the local administration and community-based organizations/groups, broad local knowledge, experience and resources were expanded. Meanwhile the new skills remained within the community, bringing the service close to the people.

Stove types promoted include: portable Jiko Kisasa, inbuilt Jiko Kisasa with one or two potholes, rocket stoves with one or two potholes, institutional rocket stoves, baking ovens and soil sterilizer (for a detailed description see Annex X).



Rocket stove with two potholes



Jiko Kisasa with two potholes



Institutional Rocket stove



Baking oven



Soil sterilizer

Major interventions included:

- Capacity building of, and support to, the stove producers, builders, installers and contractors on technical skills, entrepreneurial skills, organisational development, and workshop equipment
- Promotion of stove marketing through recruitment and training of stove marketing groups and providing entrepreneurship skills to all stove dealers.
- Awareness creation to educate the public about improved stoves and hence open up the market for stoves.
- Promotion of income generation through stove production and productive use of cooking devices. This was achieved through the sale and manufacture of improved stoves and

ovens (by stove producers, marketers and installers), and by using improved cooking devices in food businesses.

- Promotion of the adoption of energy-saving devices among social institutions (SI) such as schools, hospitals and colleges. This was achieved through sensitization meetings with the heads of such institutions, linking the institutions with trained stove technicians, and linking the institutions with possible financing institutions. Additionally, cooperation was sought with school feeding programmes to include improved stoves in their work.
- Mainstreaming of HIV/AIDS groups into stove activities for HIV positive people, and those groups who, whilst not being infected by HIV/AIDS, are nevertheless affected, such as relatives of HIV positive people and orphans and widows. This initiative was set up to create useful opportunities for them to save time, money and labour. Such groups were provided with equipment (stoves and/or production materials) and skills training for capacity building.
- An appropriate end-user financing mechanism, the formation of a 'Stove Dealers Association' and a mechanism to ensure the quality control were put in place to promote sustainability of the interventions.

The main achievements can be summarized as follows:

- By December 2007, a total of 418, 415 people had gained access at household level to ICS. This exceeded the planned total of 345,200 people. A total of 20 production groups and 24 individuals were involved in the production of fixed Jiko Kisasa stoves, while a total of 220 technicians had been trained on how to build the rocket stove.
- The project supported the establishment of a 'Stove Dealers Association', to take over stove activities once the project was phased out. Major efforts were directed in skills transfer to the association to realize their position and responsibilities as a national entity. Meanwhile the association was linked to the Kenyan Bureau of Standards to take on board stove standards issues.
- The project introduced stove activities to agro-industries, especially tea factories, to include stove promotion in their environmental initiatives.
- The stove business created employment for women and men in production, marketing and installation and hence increased income.
- Many social institutions adapted improved stoves to reduce firewood consumption, hence saving money when buying firewood.
- The productive use of energy-saving devices was promoted. This has been well-received, mainly by small hotels which feel the direct benefit from the savings, whilst promotion of the firewood baking oven has opened up income generating avenues for schools and women's groups in the rural areas.

A description of the focal areas of the project can be found in Annex II.

3. Methodology

The methodology for assessing results comprised a comprehensive set of activities. It started by reviewing specific reports and literature on household energy (HE), stove activities in Kenya in general, and specific development goals etc. Results chains were used to formulate and define all the hypotheses underlying the project's strategy. Appropriate tools and indicators were selected for the survey based on the types of results expected from the strategy. The different questionnaires and survey tools were developed and pre-tested in the field. At the same time, enumerators and team managers were provided with initial training. Experiences from the pre-test and the training were included in the final survey structure. At the same time, team managers trained enumerators on stove issues in identifying different types of stove, and recording their characteristics.

3.1 Identification of possible impacts – the Results Chains

According to the OECD-DAC glossary for key terms in evaluation and results-based management, impacts are 'positive and negative, primary and secondary long-term effects produced by a development intervention, directly or indirectly, intended or unintended'.

To get an idea of possible impacts of the stove project, the GTZ Results Model was taken as the baseline for creating a detailed outline of the project's results chains. The results chains were described in detail using the actual outputs or services delivered by the project. The project team identified specific users of these services, and the direct results or sub-outcomes as a consequence of this use. The outcome of the project that had been stated (its goal) was integrated into the chain, and compared with the expected sub-outcomes of each chain. The team considered the extent to which all the services (and the results stemming from their use) contributed to the planned project goal; namely 'People are provided with sustainable access to modern cooking energy'. In this way, the underlying project strategy became clearer: 'We are doing this to provoke certain changes in the behaviour of specific groups that end up in 'sustainable access to modern cooking energy'.

Only after this could the impacts or indirect results be determined. Impacts are changes that occur after the goal has been reached, and there is an inherent difficulty in determining exactly how much the project goal (or outcome) has influence on further changes in the medium and long term. Possible impacts identified are classed at three different levels: immediate impacts (occurring when the ICS are used according to recommendations), impacts resulting from this use, and highly aggregated impacts to which the ICS use impacts contribute. Many other factors confound the results at this level that are independent of the project. Highly aggregated changes, like for example 'the reduction of poverty', are a result of so many factors in various fields that no single project could claim this result for its own. However, the plausibility of the project's contribution to these development changes has to be demonstrated.

For the stove project, using the various outputs of the project and its outcome, one can identify the following impacts (for the full results chains see Annex III):

- Reduction of smoke and harmful gases in the kitchen (CO₂, PM, GHG)
- Time / money saved on fuelwood collection and cooking
- Reduction of firewood required for cooking (living or dead)
- Modernisation of kitchen
- More safety in the kitchen
- Job creation in stove businesses

Using the set of assumptions developed, these impacts should contribute to changes higher up the chain as follows:

- Reduction of respiratory and eye diseases (for women and girls)
- Better working condition for women and children
- More education for children (particularly girls)
- Economic independence (from parents / husbands)
- Better housing conditions
- Improved living conditions (for households and stove dealers)
- Reduction of wood cutting
- Climate protection

These more highly aggregated impacts in turn contributed to the development goals; namely those MDGs related to the reduction of poverty and hunger; the improvement of education and health of women and children, the empowerment of women and the protection of the environment.

All the impacts described in the results structure are expected to happen, and are assumed to be positive. They are common to stove projects in general and some of them have already been studied in various countries. Each project should be able to demonstrate that these effects occur as plausible results of its interventions in its project area. Unexpected or even negative impacts sometimes appear, and these should be captured and used to adjust the project strategy, or to provide a more complete understanding of the effects of the project.

Selection of the data to be collected

Creating indicators provides a way to measure the different results. These indicators are helpful in showing how well existing monitoring systems are providing information on the expected results, and in analysing how far the sustainability criteria has been monitored. HERA had already established a list of sustainability criteria, based on the experience gleaned from numerous stove projects. This experience was used to inform detailed project proposals for the EnDev programme. The criteria represent, in a condensed form, lessons learnt from the past about strategic elements that contribute to the sustainability of stove promotion and those elements which do not. The full list can be found in Annex IV.

To define possible impacts, it is not absolutely necessary to compare an expanded results structure with sustainability criteria. However, it helps project staff to identify important aspects that are not covered by the actual project strategy, or which have not been sufficiently considered. In the Kenyan case, it also helped to refine the project strategy in some ways, when 'forgotten' criteria were noted. As a result, the project could see ways to strengthen its support to the newly-created Stove Dealers Association as an important future actor which could gradually take over certain responsibilities and interventions from the project to achieve sustainability.

It was realised that precise information on the direct results was needed before trying to gain an insight into indirect project results (impacts). While some were available through the actual monitoring system, others had to be collected during the survey. The project collected data regularly from the producers' records on the number of stoves produced and sold. The project also tried to keep records of productive and institutional stove users at district level. Although producers' and stove traders may have had reasons for not giving the exact figures of their monthly businesses, data on stoves produced and sold seemed to provide a good overview of the scale of stove dissemination in the project area.

It was difficult to monitor households using ICS on a monthly basis: whether they were using the improved stoves or whether they had continued to use traditional ones; whether they used them on a regular basis; whether they maintained them; and whether they used them correctly or not. These were the direct results of awareness creation activities, and were not part of the project monitoring system. Although it is time-consuming and costly to observe these changes, they need to be known in order to be specific about the project's outcomes

and, indirectly, of plausible impacts. Therefore, the survey had to fulfil the double task of collecting data on direct results as well as indirect results.

An impact study on changes in indoor air pollution² through the use of ICS had already provided indirect results. The reduction in levels of smoke was measured by monitoring levels of particulate matter less than 10 microns in diameter (PM₁₀) during 24 hours in households using improved or traditional stoves in a closed kitchen.

Other impacts leading, for example, to an improvement of living conditions or empowerment of women and children had not been observed systematically, and were the main reason for this study.

3.2 Tools and instruments

Appropriate tools had to be designed to identify the information required on:

- Direct and indirect results
- Quantitative and qualitative changes
- Expected results (as determined by the results chains)
- Unexpected and potentially negative results.

The tools chosen were standardised questionnaires. These were used for interviews with households, stove dealers, productive stove users and institutional stove users³ (see Annex V). Focus discussions with women used a set of PRA tools from the Method for Impact Assessment of Programmes and Projects (MAPP) (see Annex VI). Besides these tools, the surveyors observed cooking practices, whilst the quality of stoves was integrated into the household interview and enumerators were charged with recording observations as part of the questionnaire. A guideline for the interview with village authorities was established. Finally, triangulation with project reports, other documents and resource persons from the project helped to examine survey results.

Standardised questionnaires allow one to collect information on quantitative or qualitative aspects (e.g. personal opinions) in a simple and comparable manner. All interviewees were asked the same questions and their answers were later evaluated quantitatively. The questionnaires for the survey were developed during the preparation phase using results chains and indicators to identify the information needed. The questions were mainly to identify quantifiable results and information that could be easily described by the respondent during an interview. Some sensitive data, such as income, was also integrated into the questionnaire, despite knowing that the results might eventually not be usable. This problem was confirmed during the evaluation of the data, and it helped to modify subsequent questionnaires.

As the Kenyan stove results assessment was meant to be a first test for this type of exercise, the evaluators were very keen to get as much information as possible through the questionnaires. This made them rather long, in spite of several cuts during the detailed preparation and pre-testing. There were different questionnaires for particular topics:

Household questionnaire information on:

- Family size and occupation
- Cooking practices

² 'Evaluation study on the performance of cook stoves to quantify air pollution, health impacts, energy efficiency and sustainability in Kisii' April 2007, GTZ/PSDA Kenya

³ Some schools were interviewed with the help of a questionnaire. However, the difficulties that were found later in data processing the small number of respondents led to the decision to skip this part of the survey.

- Type of kitchen
- Number and type of meals prepared daily
- Use of stoves for other purposes
- Application of efficient cooking methods
- Fuel used, type and quantity
- Provision of fuels
- Responsibility for fuel provision
- Scarcity of different fuels
- Money spent on fuel
- Changes observed using an ICS
- Stoves in the household (all kinds), their condition, their age and their usage
- Specific information on ICS, their condition, their maintenance and replacement, their advantages and disadvantages and the channels of information received on ICS.

Stove dealers' questionnaire information on:

- The household
- Occupations of its members
- The importance of their stove business in terms of time and income
- Type of stove business
- Stoves information (stove production, installation and/or commercialisation),
- Skills and competencies acquired, and through whom
- Organisation of work
- Provision of raw materials
- Hired labour
- Production costs
- Promotion of stoves, including labelling, marketing
- Customer relations

Restaurants questionnaire information on:

- Type and size of restaurant
- Working hours
- Number of employees
- Type of meals served
- Type and frequency of stoves used
- Condition of the ICS, their maintenance and replacement
- Advantages and disadvantages perceived
- Fuel use and money spent on it
- Savings made with ICS in terms of money and time, the
- Cooking practices and awareness of good practice

Observations were systematically recorded during all household interviews on the types of stove in the households, their number and their condition, and on how people applied the recommended cooking practices. The enumerator filled out each questionnaire, collecting information on different stove types, the condition of each stove and the different cooking practices. The enumerator was required to visit each kitchen to complete the questionnaire, whether or not the interview took place inside or outside the house. In the kitchen, the enumerator would make detailed observations whilst talking to the woman about the history of each stove and the detailed information required about it. During training of enumerators, special attention was given to exercises on the different types of stove and cooking methods, so that they could record them without any difficulty.

A guideline for the interview with village chiefs was prepared, to help village team leaders find out from village chiefs about their perspectives of the social situation of their location, and to probe their knowledge of ICS and whether they were widely used locally. The discussion with the village authorities aimed to determine the local perception of socio-economic categories of households: that is - what characterises households that are

considered to be 'poor', to be 'medium poor' and those ones that are considered to be 'better off'. The survey team leaders were asked to give special attention to describing these different categories, and to strive for a commonly agreed characterisation of socio-economic categories by including other village elders in this exercise. The categories were later on used for the selection of households to be interviewed.

PRA tools were used to collect more complex and comprehensive information on stoves and their influence on living conditions (positive or negative). Group discussions enabled participants to reflect on their situation, and to talk about changes that had occurred in their lives. Providing a forum for discussion between the relevant actors allowed them to provide insights into different perceptions and common understandings of the indirect impacts, as viewed by local people. This allowed interactions between different causes and effects to be reported.

The PRA tools used were adopted from the MAPP method developed by Dr. Susanne Neubert at the German Institute for Development Policy (DIE) in Bonn. MAPP provides the tools for collecting information on impacts by using structured discussions. The focus group itself evaluates a theme, and the survey team restricts itself to moderating the discussion. The method comprises seven instruments that are applied in a logical sequence to assess the way things have evolved in an area. In a second step, the results are attributed to different interventions. Changes are described from one year to another, and the underlying causes are identified by the participants. This method is particularly suitable for evaluating qualitative impacts. It reflects the target groups' perceptions of impact, as it uses the principles of PRA on which MAPP has been developed. The survey team and women in the villages had limited time, so only three instruments were selected for the stove project.

The first tool, the **Trend Analysis**, encouraged focus group participants to give a picture on the social development in their village over the past five years. It is based on the four dimensions of poverty as defined by DFID;

- Standards
- Access to resources
- Knowledge
- Rights and power.

It examined these through criteria that might be affected, among other influences, by the use of improved firewood stoves.

The next tool, the **Activity List**, asked participants to name all the actual and past development activities carried out in their community, the organisation conducting it, project, NGO or initiative. The participants were asked to describe whether people valued the activities, how they were relevant to the daily life of the villagers, who were the main beneficiaries (men, women and/or children), and the percentage of the population concerned (estimate).

Finally, the participants were asked to discuss, with the help of the **Influence Matrices**, the impact of the development activities they had identified on poverty, and the magnitude of this influence. It was possible to explore positive and negative effects at the same time as determining the importance of each development activity.

The project team, the cluster managers and the enumerators assisted in pre-testing all tools, questionnaires and PRA tools in different locations in Kisii district. This gave the opportunity for incorporating improvements and providing initial training to enumerators on applying the questionnaires. Further training on stoves was given to them later, in their respective districts. The PRA tools were pre-tested with three PRA experienced extension workers from the Ministry of Agriculture. Two of them conducted the focus group discussions with the women during the survey. For further details on the whole procedure, consult Annex VII.

3.3 Selection of the survey area

The stove project intervened in three out of the five clusters of the PSDA intervention zone namely; Central Cluster, Western Cluster and Transmara Cluster (map of PSDA focal areas see Annexe I). These three clusters are part of four Provinces: Central Province, Rift Valley Province, Nyanza Province and Western Province and comprise 12 Districts in total. The attribution of the Districts to the Provinces and clusters is shown in Table 3.1:

Table 3.1: Distribution of Districts in Provinces and Clusters

Western Province	Kakamega	Western PSDA Cluster
	Bungoma	
	Vihiga	
Nyanza Province	Kisumu	
	Siaya	
Rift Valley Province	Kisii	
	Bomet	
	Transmara	
Central Province	Muranga	Central PSDA Cluster
	Maragua	
	Thika	
	Kiambu	

The twelve Districts in which the PSDA stove project has carried out its activities since the beginning of 2006 were the basis for the selection of the survey area. Half the districts were selected for the survey. The criteria for selection were:

- Participation in the baseline survey of 2006
- Duration of recent stove activities
- Population density
- Relation of urban to rural households
- Percentage of population living below the poverty line

The poverty incidence in the four provinces concerned varies considerably from one province to another and is particularly high in the Western Part of the country. Table 3.2 shows the incidence of poverty in October 2007. The total population is highest in Rift Valley Province (which is also the largest Province in Kenya), and lowest in Central and Western Provinces⁴. Central Province has the highest population density in the country.

Table 3.2: Incidence of poverty in the four project provinces

Province	Poverty Incidence	Number of households
Nyanza Province	65%	2,140
Western Province	61%	1,520
Rift Valley Province	48%	3,370
Central Province	31%	1,490

The proportion of households living in rural areas compared to those living in (semi-) urban areas was also considered. In general, the provinces comprise two-thirds rural to one-third urban households. Specific districts may be characterised as more rural or more urban. Table 3.3 represents the urban / rural division and populations for the four provinces and the six selected districts:

⁴ 'Basic Report. Kenya Integrated Household Budget Survey – 2005 / 2006' August 2007. Kenya National Bureau of Statistics

Table 3.3: Relation of rural and urban households in Provinces and Districts of the survey

Province			District					
Central Province			Muranga		Maragua			
Rural	1,010	(68%)	Rural	130	(76%)	Rural	150	(88%)
Urban	480	(32%)	Urban	40	(24%)	Urban	20	(12%)
Rift Valley			Bomet					
Rural	2,370	(70%)	Rural	110	(64%)			
Urban	1,000	(30%)	Urban	60	(36%)			
Nyanza			Kisii					
Rural	1,440	(67%)	Rural	100	(55%)			
Urban	700	(33%)	Urban	80	(45%)			
Western			Vihiga		Bungoma			
Rural	960	(63%)	Rural	130	(62%)	Rural	130	(52%)
Urban	560	(37%)	Urban	80	(38%)	Urban	120	(48%)

The selection of Divisions and Locations within the Districts was done by the cluster managers of the project. They were requested to follow the same proportion for rural and (semi-) urban locations as given in the table above.

3.4 Selection of survey samples

Different target groups were interviewed using standardised questionnaires. The main group were households, independent of whether or not they used improved stoves. Stoves dealers such as producers, installers and marketers were questioned, as well as restaurant owners and some social institutions (schools).

Selection of households

Households represent the most important stove users. They need stoves to prepare their daily meals and the vast majority of improved cooking stoves are produced for private use. The main part of the survey concentrates on households.

The sample size was 500 households, (baseline survey of February 2006 was 432 households). The sample was divided into two parts:

- 320 households were randomly selected whether they had improved cooking stoves or not. (General household sample). Around 37% of these households had some form of stove.
- 180 different households were targeted out of those who owning improved cooking stove (ICS sample).

The distribution of households per cluster was proportional to the population density, allowing for more households to be interviewed in Central Cluster than in the other two clusters.

Table 3.4: Distribution of household by cluster

Cluster	General household sample		ICS household sample	
	N	%	N	%
Central	120	37.5	80	44.4
Transmara	100	31.3	50	27.8
Western	100	31.3	50	27.8
Total	320	100.0	180	100.0

Table 3.5: Distribution of household by district

Cluster	District	Division	Location	General HH Survey		ICS HH Survey	
				N	%	N	%
Central	Muranga	Kahuro	Mugoiri	60	18.8	40	22.2
	Muragwa	Kigumo	Kigumo	60	18.8	40	22.2
Sub-total				120	37.6	80	44.4
Transmara	Kisii	Keumbu	Ibeno	50	15.6	25	13.9
	Bomet	Bomet Centr.	Sibaiyan	50	15.6	25	13.9
Sub-total				100	31.2	50	27.8
Western	Vihiga	Vihiga	Ce Maragoli	50	15.6	25	13.9
	Bungoma	Kanduyi	Bukembe	50	15.6	25	13.9
Sub-total				100	31.2	50	27.8
TOTAL				320	100	180	100

The rural to urban ratio of households interviewed was 73: 27% for both general and ICS samples, to represent the average rural / urban ratio in the chosen Districts. This ratio varies from 68%: 32% in Kisii to 80%: 20% in Muranga according to the District Development Plan (2002 – 2008 GOK).

Table 3.6: Distribution of household by rural and urban areas

HH Category	General household sample		ICS households sample	
	N	%	N	%
Rural	235	73.4	131	72.8
Urban	85	26.6	49	27.2
Total	320	100.0	180	100.0

Poverty was selected as another important criterion for household selection. There were three socio-economic categories: households which were considered to be 'poor', those that were 'medium poor' and finally those that were 'better off'. Village authorities were asked to define their locally considered criteria for these three categories during initial meetings. Although it would have been preferable to determine these categories through discussion with several village authorities and elders, this was not possible everywhere. Some survey team managers could only talk to the local chief.

The criteria given by village authorities varied from place to place, but did not change considerably. The following criteria were suggested: the kind of house and materials used for it; the land owned by the family and its size; the number and type of livestock (dairy animals); food availability; type of clothing; and the education offered for the children (see Annex IX for list of criteria).

On the basis of these criteria, village chiefs were asked to select households at random, according to the prevalence of poor, medium poor and better off households in their community. If they said, for example, that four out of ten households in their location were poor, then 40% of the households to be chosen had to correspond to the criterion of poor households. The following table gives an idea on the different categories interviewed.

The average ratio for the household socio-economic status (better off: medium poor: poor) was 24: 35: 41 for the general household sample. The ICS households' samples were not composed in the same way. The survey teams had difficulties finding enough households with ICS corresponding to the prevailing ratio of socio-economic categories. In Central and Western Cluster they asked local stove dealers to help them to identify households with ICS.

The ICS sample could not be said to be representative of socio-economic status, and was therefore not used in the socio-economic analysis of the data.

Table 3.7: Distribution of households by socio-economic status

Household Category	General household sample		ICS household sample	
	N	%	N	%
Poor	77	24.1	36	20.0
Medium Poor	113	35.3	91	50.6
Better off	130	40.6	53	29.4
TOTAL	320	100.0	180	100.0

Local perceptions of poverty were similar to national figures on (economic) poverty in some cases, such as Bomet and Bungoma. However, this was not the case in all Districts, as shown in Table 3.8.

Table 3.8: National data by location on rural and hard core poverty distribution per district compared to those perceived by local village chiefs.

Province	District	Rural overall Poverty in%	Rural Hard core poverty in%	Total people living in poverty	Medium poor HHs (%)*	Poor HHs (%)*	Total perceived as poor%*
Central	Muranga	29.4	9.7	39.1	40	43	83
	Maragua	31.2	10.0	41.2	35	40	75
Rift Valley	Bomet	59.0	17.8	76.8	38	44	82
Nyanza	Kisii	51.2	22.8	74.0	50	8	58
Western	Bungoma	50.2	23.2	73.4	30	52	82
	Vihiga	40.1	14.8	54.9	18	56	74

* Perception of local village chiefs

In other cases, such as Muranga, Maragua and Vihiga, the national figure on people living in poverty (overall plus hard core poverty) corresponded to the local perception of poor households, not including the medium poor ones.

Selection of participants for focus group discussions

In each of the three clusters, two focus group discussions were held with female users of firewood stoves (users of ICS and non-users of ICS). Participants were selected on the basis of the criteria established by village chiefs on 'poor' and 'better off' households. They were asked to invite women from these two categories for focal group discussions. Thus, three groups comprising women from 'poor' households and three groups comprising women from 'better off' households were chosen, as shown in Table 3.9.

Table 3.9: Number of participants in focus group discussions

Cluster	District / Division	Number of participants in the 'poor' focus group	Number of participants in 'medium' group
Western	Vihiga / Vihiga		11
	Bungoma / Kanduyi	25	
Central	Maragua / Kigumo		31
	Maragua / Marumi	13	14
Transmara	Kisii / Keumbu		30
	Bomet / Central Bomet	30	

Selection of stove dealers

Stove dealers were selected using the following criteria:

- Type of involvement – producers, stove marketers or stove installers,
- Group or individual dealers
- The size of the business
- The duration of time in the stove business
- Whether they were former stove dealers (Women & Energy Project)
- Production capacity
- Male and female stove dealers

Altogether, twenty-two stove dealers were interviewed, of whom fourteen were women and eight were men. In Central Cluster seven stove dealers were questioned, in Western Cluster five stove dealers, and in Transmara Cluster ten stove dealers.

Table 3.10: Distribution of stove dealers by type of engagement in stove business and by gender

Gender	Producer only	Producer + Installer	Producer + Marketer	Producer + Installer + Marketer	Total
Male	4	1	2	1	8
Female	11	1	2	0	14
Total	15	2	4	1	22

All the stove dealers interviewed were producing stoves. Most of them (mainly women) restricted themselves to stove production (15). Two respondents said they produced and installed stoves, while four produced and marketed ICS. Only one man reported providing all three services together. The majority of stove dealers were in the age bracket 20 years to 49 years. Among the men, there were more younger ones, whereas most of the women were more than 40 years of age. This might be due to the relatively lower independence of younger women, and their difficulty in accessing resources for income generating activities.

Selection of restaurants and bakeries

Interviews were held with sixteen commercial users of improved stoves; twelve of them ran restaurants and four of them managed bakeries. A restaurant was classed as 'small' if it served less than 50 clients per day (7 restaurants); and a restaurant was classed as 'large' if it served more than 50 clients per day (5 restaurants). In Central and Western Cluster, six productive users were interviewed, while in Transmara Cluster four restaurants participated. All restaurants were indoor restaurants, with customers seated inside – albeit that cooking was done inside and outside the restaurant. As the sample size is not large, the results should be taken as indicative.

3.5 Field test and implementation of the survey

Cluster managers selected a team of enumerators who were trained during the preparatory phase in Kisii. This was followed by two days of field test exercises, enabling the enumerators to understand the real situation on the ground, and how to deal with it, and how to adapt the questionnaires. Feedback from the field was discussed in plenary groups for all the sets of questionnaires developed; for households, institutions, stove dealers, local chiefs and questionnaires for productive use of energy-saving devices (ESD). As most of the enumerators were not acquainted with stoves, Cluster managers provided additional training after the field testing, on all types of stoves and their characteristics. This qualified the enumerators to make observations on the stoves they observed while conducting household interviews.

The PRA practitioners from the three Districts ran a session during the field tests. Together with the group, they tested out and adapted the three selected tools for focal group

discussions. By observing the performance of the PRA practitioners during this period, the survey team was able to select two of them to join the teams and help with classifying the socio-economic groups with the village authorities, and conducting focal group discussions.

The three survey teams carried out the work from October 2007 to January 2008, with most activities in November 2007. Together with the Cluster managers and with support from the project team, they worked in parallel in the three Clusters. The data was evaluated from January to June 2008 and written up afterwards. Annex VII presents an exhaustive list of the various steps and procedures applied during the preparation, implementation and evaluation of this survey.

4. Survey results

This chapter presents the main results from the interviews conducted with households, stove dealers and restaurant owners, and from focus group discussions.

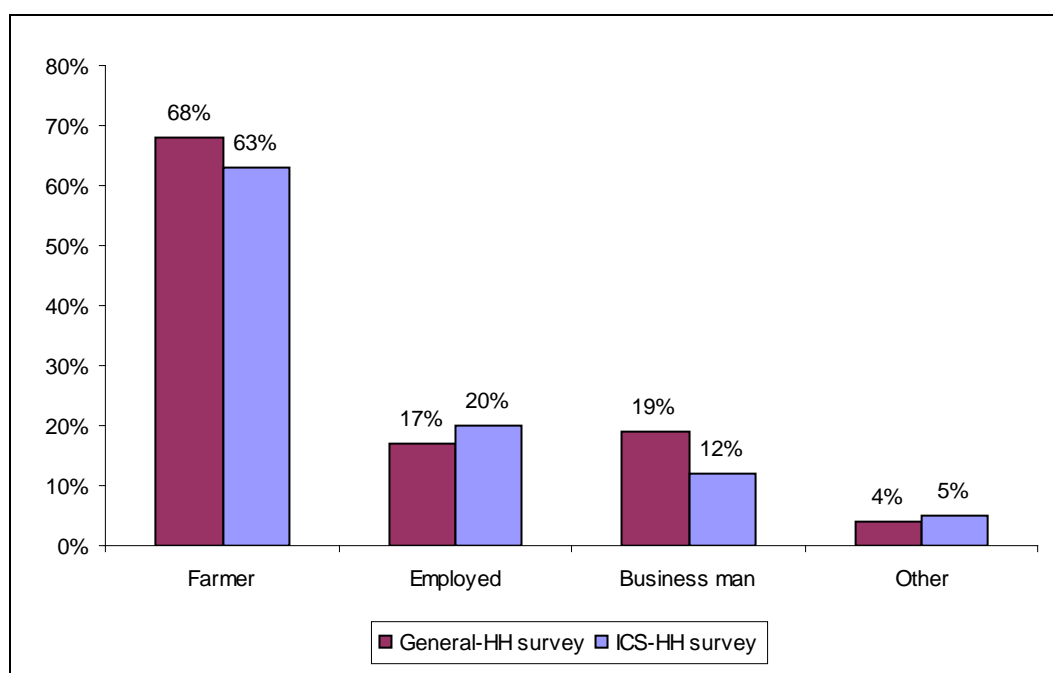
4.1 Results from the household survey

4.1.1 General information on households

Out of the 500 households interviewed, 320 were part of the general household survey and 180 were households all using improved firewood stoves (see Chapter 3). From both surveys, 72% of the households were headed by husbands, while 28% of them were headed by single mothers. This corresponds approximately to the national figures for the region (62% of male headed households and 38% of female headed households).

The main occupation of the household head is farming. This was to be expected as the project area covers mainly agricultural areas of Kenya.

Figure 4.1.1: Distribution of households by occupation of head of household



According to the District Development Plan 2002 – 2008 the agricultural sector contributes to the average household income as follows:

District	% Ag.	District	% Ag.	District	% Ag.
Muranga	70	Maragua	85	Bomet	62
Kisii	44	Bungoma	60	Vihiga	80

The second most important occupation was reported as 'business' or self-employment for the general households survey and as 'employees' for the ICS households survey. The difference between the two survey samples is very small.

The average household size was about 5.4 persons for the general households survey and 5.7 members for the ICS households survey. This corresponds approximately to the national statistic of five members per household. The total number of family members was recorded as 18 for the general household survey and 15 for the ICS households. Half of all household members recorded were below 15 years of age.

Table 4.1.2: Distribution of households by average households size, by Cluster, rural - urban and socio-economic status

Cluster	Average household size			
	Better off	Medium	Poor	Total
Central				
Rural	4.0	4.1	4.6	4.2
Urban	4.6	4.9	4.8	4.8
Total	4.3	4.5	4.7	4.5
Transmara				
Rural	6.5	6.0	4.8	5.8
Urban	5.7	5.5	3.6	5.2
Total	6.1	5.8	4.2	5.5
Western				
Rural	10.6	6.8	6.3	7.4
Urban	6.3	5.9	6.5	6.3
Total	8.5	6.4	6.4	6.9

From Table 4.1.2, the average household size was shown to vary between rural or urban areas, and socio-economic categories, with a minimum average of 4.0 per household and a maximum average of 10.6 members. Central Province has one of the highest population densities in Kenya, combined with shortages of land which influence families to have fewer children. In Western province it is culturally accepted to have two wives and many children, which explains the high percentage of larger family sizes.

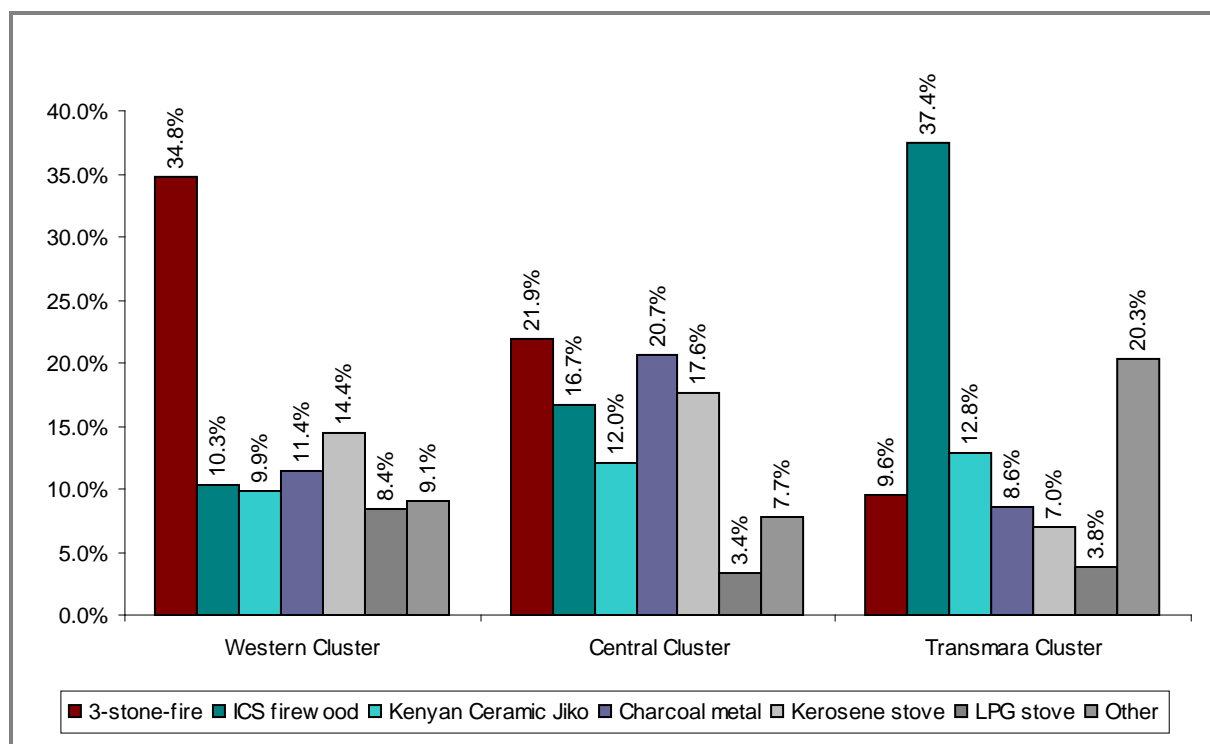
4.1.2 Stove information

A large variety of stoves was found in the households interviewed. Besides the traditional open three-stone-fire, a variety of stoves was reported:

- Three types of improved firewood stoves promoted by the project (Jiko Kisasa one pot and two pots, the Rocket Mud stove one pot and two pots and the portable Kuni Mbili, description see Annex X),
- Unimproved all metal charcoal stoves
- Improved charcoal stove Kenyan Ceramic Jikos (KCJ),
- Chinese kerosene wick stoves,
- LPG stoves
- A few sawdust stoves
- Two electric stoves.

Their distribution in the three clusters is shown in Figure 4.1.3.

Figure 4.1.3: Stoves present in households by cluster

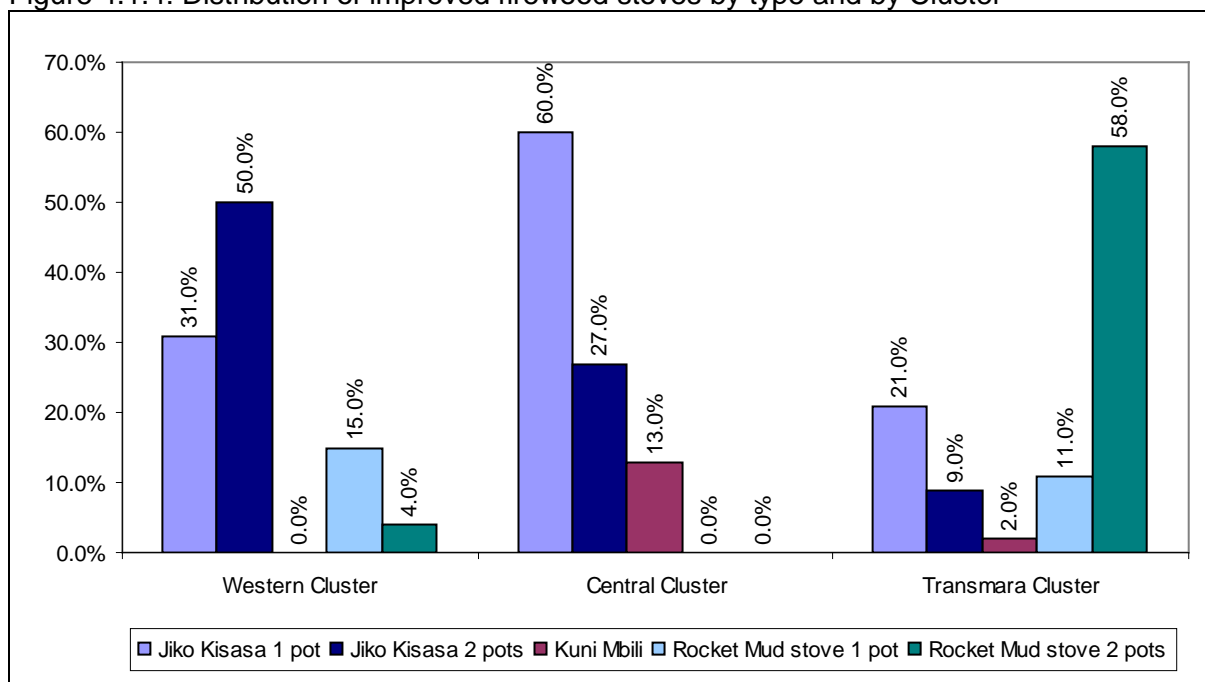


The traditional three-stone-fire appears to have lost its predominant position. Only in Western province was it still the single most important type of stove (34%), while improved stoves (firewood plus charcoal together) were the most important stove types in Central (28.7%) and Transmara Cluster (50.2%). The rather high figure of improved firewood stoves in Transmara (37.4%) is due to the intensive project work in one of the two divisions chosen, where the Rocket Mud stoves were tested and introduced in up to 80% of households.

The charcoal all metal stove was still common in Central Cluster but outweighed by its improved 'rival', the KCJ only in Western Cluster. Western Cluster was the area with the lowest ICS rate. A switch to other fuels was observed in those areas, where fuelwood is scarce, particularly in Central and Western Clusters. Here, more than 20% of all stoves used kerosene or LPG, with the Chinese kerosene wick stove being the most popular. Transmara Cluster was noticeably the area with a sufficiency of fuelwood, and less need to switch fuels.

In terms of fuel savings, the Jiko Kisasa is more dominant in Central and Western Cluster, while the Rocket Mud Stove is more widely seen in Transmara Cluster, where it has been introduced only for one and a half years. The Rocket Mud Stove is more efficient and saves more firewood than the Jiko Kisasa. This might explain its big success in such a short time. Even in neighbouring Western Province, examples of Rocket Mud Stove were found, which might have been built by the trained constructors. The firewood Kuni Mbili stove was found less frequently, perhaps due to its relatively higher price (double the price of the Jiko Kisasa).

Figure 4.1.4: Distribution of improved firewood stoves by type and by Cluster



The vast majority of ICS were found in rural areas (76% of all ICS). There was no distinct difference in the distribution of improved firewood stove models for rural and urban areas (see Annex XI). In both areas, the firewood Jiko Kisasa was predominant (65% of all ICS stoves in rural areas and 50% for urban areas), although the Jiko Kisasa one pot was more frequent in rural areas, while the two pot model was more frequent in urban areas.

Some variation was found among the different socio-economic categories (see Annex XI). More than half of those on the lowest incomes possessed the cheapest available ICS, the Jiko Kisasa one pot (56%). The medium and better off households had mainly two pot stoves (62% and 51% respectively). While one third of them had a Rocket Mud Stove two pot, none of the poor households was found with this more expensive model. Poor households had relatively less ICS than households in the other socio-economic categories. In the general household sample, low-income households only had 16% of all improved firewood stoves, while representing about half the population. This implies that purchasing power has an influence on the acquisition of an ICS, as well as on the choice of the number of pot holes.

Another cooking device promoted by the project was the fireless cooker (description see Annex X). It comprises a basket with insulated walls. This insulation retains the heat within the basket over time; hot food put in a pot into the basket can simmer with its own initial heat. Unfortunately, only 5.6% of the general households interviewed possessed a fireless cooker.

Most households had more than one stove. Only one third of the general household sample possessed just one stove, and this rose to about 20% in the ICS sample. About half the households possessed two or three stoves, and even four stoves were found in several kitchens. On average, households had two stoves. Households with ICS tended to have more than two stoves, probably because the ICS was an additional firewood stove and not seen as a replacement for the traditional one (Table 4.1.5).

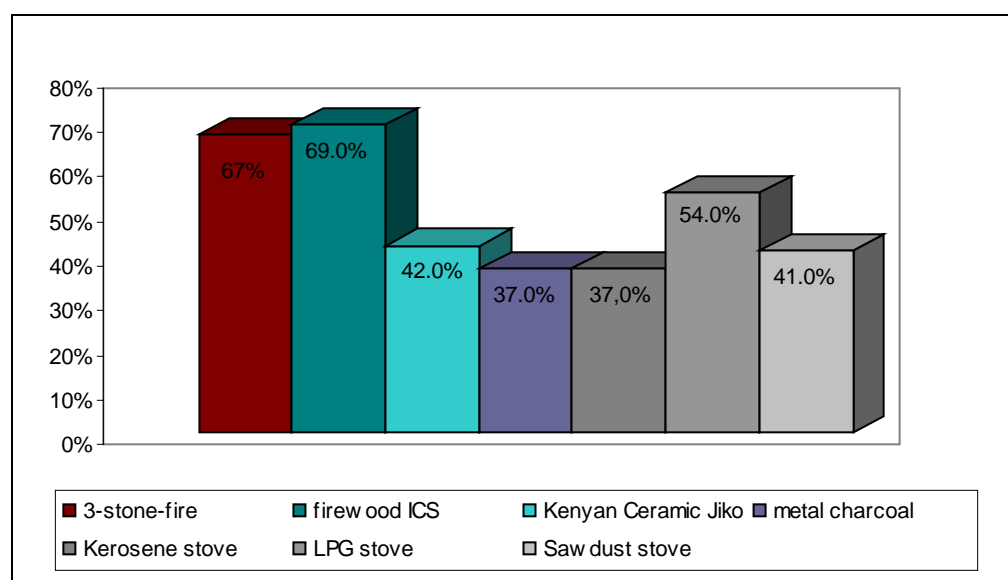
Table 4.1.5: Distribution of households by number of stoves

No. of stoves present	General household sample		ICS households sample	
	No. of households	%	No. of households	%
1	104	33%	35	19%
2	84	25%	46	26%
3	70	22%	31	17%
4	32	10%	37	21%
5	20	6%	21	12%
6 and 7	10	4%	10	5%

Among all the general households interviewed, 38% had improved firewood stove. A big variation was observed among the different Clusters and this showed a similar trend as seen by the stove figures in the general households (see Annex XI, Table XI.5). The cluster with the lowest number of households equipped with ICS was Western Cluster (22% of households) where project activities had also been less intensive than in other areas. Central Cluster (with 40.8% of households possessing an improved firewood stove) and Transmara Cluster, the pilot area for the Rocket Mud Stove in Kisii division, reported the highest number of ICS households (50%). It can be concluded that the number of activities and the intensity with which they are carried out have an immediate effect on equipping households with ICS. The effects in the medium and long term are currently inconclusive.

Most households had one improved firewood stove per household. Very few had two improved firewood stoves and only one case was reported in Transmara where three firewood ICS were noted. In most cases, the firewood ICS would be one of two, three or more stoves present in the household, and thus the usage rate of these stoves has to be questioned when determining whether a household predominantly cooks on an ICS or on other type of stoves. Figure 4.1.6 reflects this diversity.

Figure 4.1.6: Daily use by type of stove

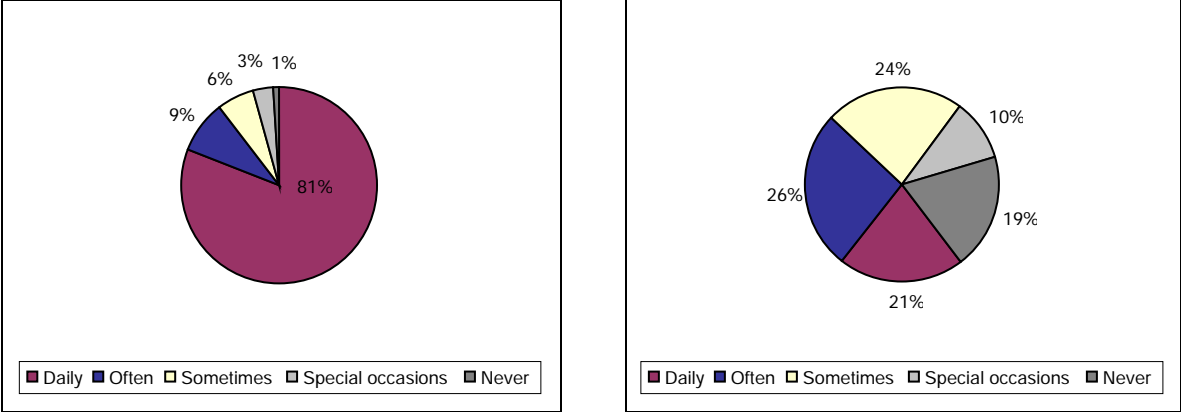


All types of stoves present were used but not all of them were used every day. Those used most frequently were the fuelwood stoves, the traditional three-stone-fires, and the improved fuelwood stoves. About 70% of these stoves were used every day for cooking and boiling water. Although wood seemed to be the most important fuel for cooking (see Section 4.4), other types of fuel played a role in everyday cooking. Half the existing LPG stoves and one third of the kerosene wick stoves were used for daily food preparation. Charcoal stoves were

used similarly, more than one third on a daily basis. The improved charcoal stove (KCJ) seemed to be used more often on a regular basis than the unimproved all metal stove. Apparently, the increased efficiency of improved stoves enabled households to benefit more from the same quantity of fuelwood.

Households with improved stoves used three-stone-fires much less than those without them. The vast majority of the general households without ICS and possessing a traditional three-stone-fire used it every day (81%). Only four percent of them used it only on special occasions or never.

Figures 4.1.7 and 4.1.8: Use of three-stone-fire in general households and in ICS households



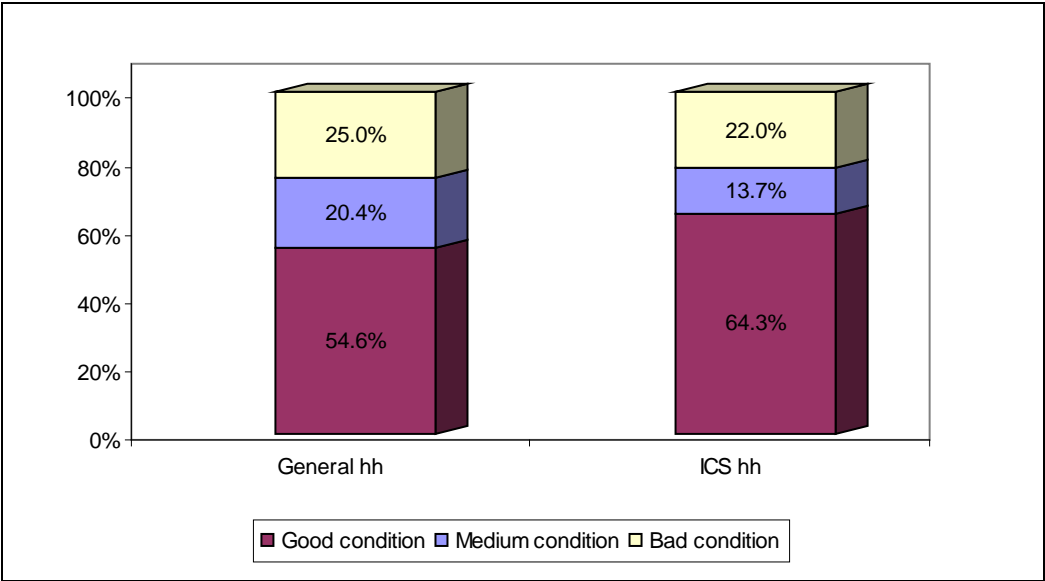
Only 21% of households with improved firewood stoves reported using the three-stone-fire. Another 26% of ICS households reporting using the three-stone-fire rather often, 20% of them never used it. This suggests that ICS households seem to have abandoned the traditional fireplace for the improved stove in everyday cooking.

The condition of a stove plays a decisive role in the achievement of impacts such as firewood saved or smoke reduction. Observations were made during the interview on the condition of the stoves within the household.

Firewood ICS are not permanent as they are made out of mud or burned clay, and mud, bricks or metal to strengthen the body. Their life expectancy depends on people using them carefully, and maintaining the mud components regularly (Figure 4.1.9). The condition of the stoves was classified into three categories:

Condition	Description
Good	Stove has no visible damage and can achieve its potential efficiency;
Medium	Stove has cracks on the body, a broken door or broken pot rests (for the Jiko Kisasa), broken pot rests (for the Kuni Mbili) and is therefore weakened
Poor / Bad	Stove has no firewood shelf, or it has a worn out combustion chamber (for Rocket Mud Stove), cracks on the liner (for Jiko Kisasa), broken liner or worn out metal (for Kuni Mbili), missing pot rests (for Rocket Mud Stove) and experiences loss in its efficiency

Figure 4.1.9: Condition of improved firewood stoves in general household sample and ICS households sample



More than half the stoves observed were in good condition (54% of the general household sample and 64% of the ICS sample). When grouped with stoves in a medium condition, 75% of all stoves could be expected to perform according to their potential efficiency. The relatively good condition of the ICS might be explained by their age; more than half were less than a year old (Figure 4.1.10).

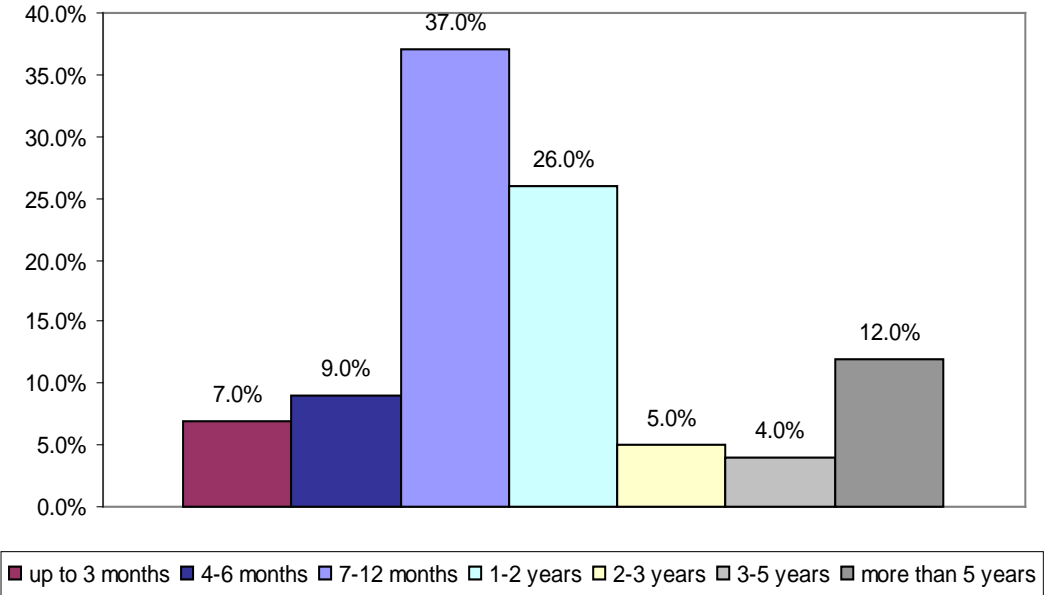
About a quarter of the improved stoves were in bad condition and would not achieve their potential maximum fuelwood savings. These stoves were mainly found in the Central Cluster, where the its inhabitants are known not to care too much about maintenance of their houses (e.g. smearing the walls) – in contrast to the inhabitants in Transmara Cluster who maintain their houses well. According to the project staff, people in Central Cluster prefer solid cement stoves that do not need maintenance. Cultural habits influence whether people will accept the need to maintain their stoves.

The age of a stove influences its condition, as the stove material degrades with time, particularly if there is no maintenance. Figure 4.1.10 shows the distribution of improved firewood stoves by age:

Most of the firewood ICS reviewed in this study were built during the previous two years as part of the project intervention (almost 80%). Most of them were produced during the previous year. Of the 20% built earlier than in the previous two years, one in eight was more than five years, and had been in constant use. This illustrates the impact of the 'Women and Energy Project', even though there are only a few households who still have stoves more than five years old.

The figures show that stove dissemination is given an immediate boost by project activities, such as training of producers, supporting marketing and, as in this case, the introduction of a more efficient stove model (Rocket Mud Stove). The crucial question is the length of time for which support is needed in order to establish widespread use of improved stoves. To date, systematic monitoring of stove dissemination figures has not monitored been put in place beyond the end of a project.

Figure 4.1.10: Distribution of improved firewood stoves by age



Whether or not people replace their improved firewood stoves is an important indicator for stove adoption and sustainability of stove promotion. Only people who are convinced that the ICS is superior will get a new one when it is broken. When households were asked whether they had replaced their ICS, 10% of interviewees from the general household sample and 12% from the ICS sample said they had done so. This group comprised households whose stove was older than two years, and they would replace the stove as a matter of course, independently of the project. It is likely that people would not replace the stove immediately it was slightly damaged, but would wait until it was in poor condition and could no longer be used.

Before the project started in 2006, there was virtually nobody with skills in stove building at community level. The agricultural officers who had learned to install the liner for the Jiko Kisasa during the 'Women and Energy Project' had been transferred to other areas, and local women did not know how to get a new Jiko Kisasa. The project staff noted that some women had improved the stoves themselves with a shield around the fireplace, or had purchased the local all metal stove. Table 4.1.11 shows the responses by women to the question about stove replacement:

Table 4.1.11: Reasons given for replacement of an improved firewood stove

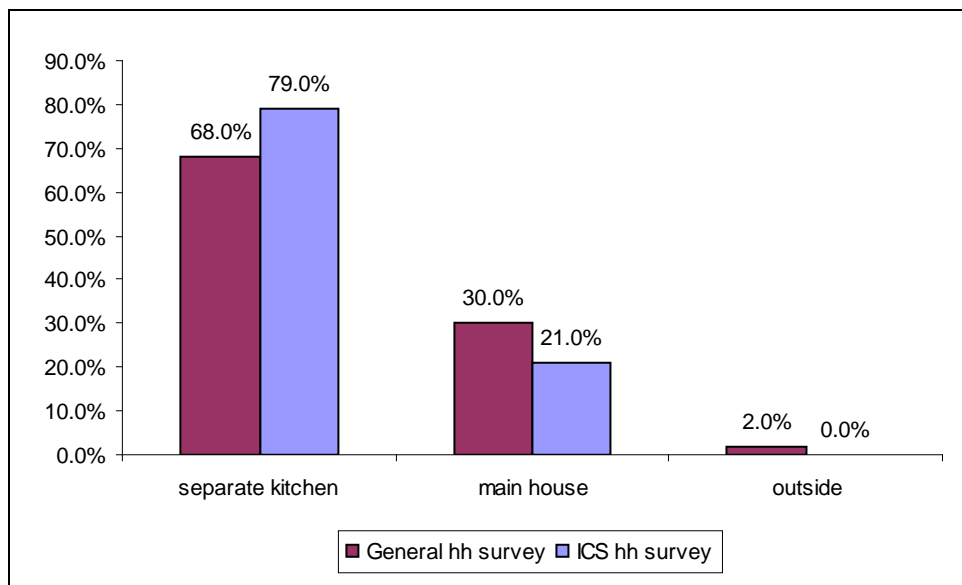
Reason for replacement	General household sample	ICS households sample
Breakage	9	16
Was destroyed through rain or children	1	2
Bad construction (wrong soil)	1	-
Wanted a new, more efficient one	1	6
Moved to a new kitchen	-	4
Total	12	28

The most important reason given for replacing the stove was that the original one had broken. Other reasons were: to own a more efficient stove (such as the Rocket Mud Stove); and moving to a new kitchen.

4.1.3 Cooking practices

People cook inside the main house, in a separate kitchen constructed beside the house, or outside. The ideal case is to have a separate kitchen, where a woman can organise her cooking conveniently. Not all households had the resources to construct a separate small room or building beside their main house, and they had to cook inside the main house. This was harmful for the other household members as the smoke from traditional firewood stoves easily spread through the whole house. Cooking outside reduces the health hazards, but exposes the cook and the stove to wind, rain and heat, and may allow others to see what is being cooked, so reduces privacy. Figure 4.1.12 illustrates the location of the stove for cooking in the households that were interviewed.

Figure 4.1.12: Usual place for cooking

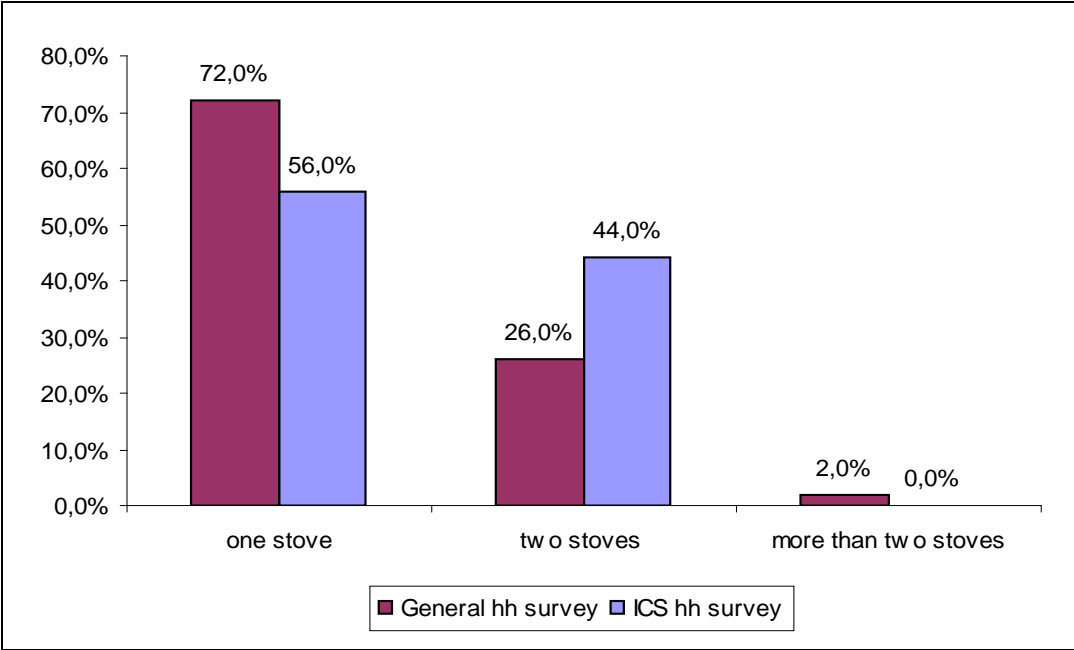


Almost everybody cooked inside (98% of all respondents). This was reported throughout the year irrespective of the season, and is the cultural norm within the region. In most cases, cooking was done in a separate kitchen (68% of general households, 79% of ICS-households). There were 30% of the general household sample who cooked in the main house, and 21% of the ICS sample. This difference may be because people investing in fixed improved firewood stoves tended to build a separate kitchen before or at the same time. So the improved stove could be a gateway to improving the whole cooking and kitchen environment. Some people were known to wait to install an improved fixed stove until they could build a separate kitchen (see Section 4.5 for the reasons given for the non-use of ICS).

Cooking indoors highlights the importance of designing improved firewood stoves to reduce indoor air pollution. Combining buying an improved stove with constructing a separate kitchen reduces the health threats from cooking even more, as the smoke is separated from the family main house, preventing all but the cook from being exposed to it.

It is interesting to know where people regularly use stoves (other than the fireplace), to prepare their meals. There are two possibilities for cooking the main dishes of ugali (a staple food made from maize flour) with a relish, or rice with a sauce; they can be cooked on two fireplaces simultaneously or one after the other on the same stove.

Figure 4.1.13: Number of stoves / fires used for the preparation of the daily meals



The majority of households in the general sample used only one stove for preparing a meal (72%). This reflects traditional cooking on a three-stone-fire, preparing one dish after the other. Around a quarter of the households used two stoves at the same time - one for the sauce and one for the ugali (26%). This number almost doubled when the ICS-stove cooks were questioned. Almost half of those using an improved stove used two stoves (or two fireplaces) for the preparation of meals (44%). This may be because 41% of all improved firewood stoves in the ICS households sampled had two holes, which allows for preparation with two pots simultaneously on the same fire.

The advantage of cooking the two main dishes simultaneously was the time saved in preparing the meal. It might be interesting to explore further how much women appreciate improved fixed stoves with two potholes. These allow women to cook two dishes simultaneously, and research is needed on whether this represents an important or minor improvement in their cooking conditions. The fact that most households possessed more than one cooking stove implies that several stoves were used at the same time. If this is the case, the calculation on savings through firewood consumption for households with ICS would have to be revised, if the ICS is used simultaneously with other, non-energy-saving devices.

Frequency of cooking (Table 4.1.14) is a variable that influences firewood consumption. Eating three warm meals per day is standard for families that can afford it. Scarcity of food or of firewood may influence this number, when the household is poor.

Table 4.1.14: Household distribution by meals cooked daily

Instances of cooking per day	General household sample		ICS households sample	
	No. of households	%	No. of households	%
Twice	18	5.6%	10	5.6%
Three times	238	74.4%	139	77.2%
More than three times	59	18.4%	31	17.2%
Once	5	1.6	-	-
TOTAL	320	100%	180	100%

The majority of households prepared three warm meals per day, irrespective of whether they belonged to those cooking mainly with traditional stoves or those cooking with improved stoves (74% of general households, 77% of ICS-households). Almost one fifth of the households lit their stoves more than three times per day. Very few people said that they only prepared meals twice daily (6%) or once daily (1.6%). This indicates that firewood shortage is not yet so critical that it prevents most the people from having three warm meals per day. Either they provide themselves with sufficient fuelwood or they switch to other fuels. As most of the existing stoves in the interviewed households used fuels other than wood, the diversification of stoves seems to support the second hypothesis.

Eating three warm meals per day does not necessarily mean that three times a day a full meal was prepared. Dishes were prepared in larger quantities and warmed up for another meal. This decreased the amount of fuelwood and time invested in cooking. Respondents were asked to be precise about their cooking habits in this regard (Table 4.1.15).

Table 4.1.15: Distribution of households by those warming up meals

	General household sample		ICS households sample	
	N	%	N	%
Warm up meals	281	87.8%	153	85%
Do not warm up meals	39	12.2%	27	15%
TOTAL	320	100%	180	100%

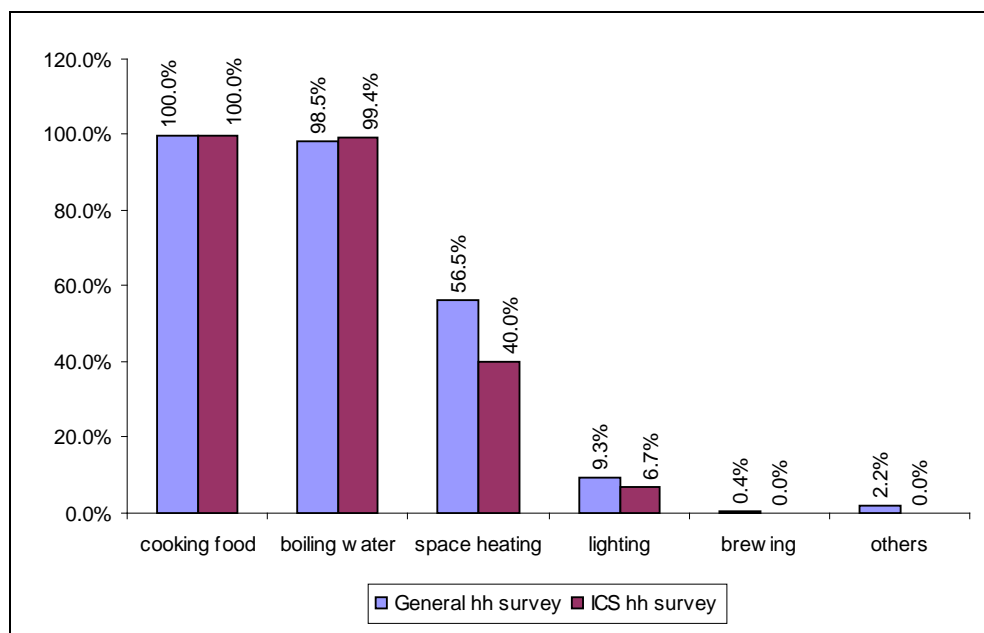
Most households interviewed warmed up meals (88% general household sample, 85% of ICS-households). As there is almost no difference in these groups, it is surmised that warming up one meal per day is a common feature. Mostly, meals were warmed up at lunchtime (58%), or in the morning (30%) and less frequently for the evening meal (24%). Only a few households warmed up meals for special occasions (3%). This implies that even though the majority of households enjoy warm meals three times a day, firewood is mainly required for two meals.

Table 4.1.16: Warming up meals (multiple response)

	General household sample		ICS households sample	
	N	%	N	%
Lunchtime	186	58.1%	87	56.9%
Morning	96	30.0%	41	26.8%
Evening	78	24.4%	19	12.4%
For special occasions	10	3.1%	2	1.3%
TOTAL	320	100%	153	100%

Stoves can be used for purposes other than cooking meals. Replacement of traditional stoves by modern ones may not retain this multi-purpose function, and alternatives would have to be found in such cases. Figure 4.1.17 illustrates the various uses of (traditional) stoves in this region.

Figure 4.1.17: Uses of stoves



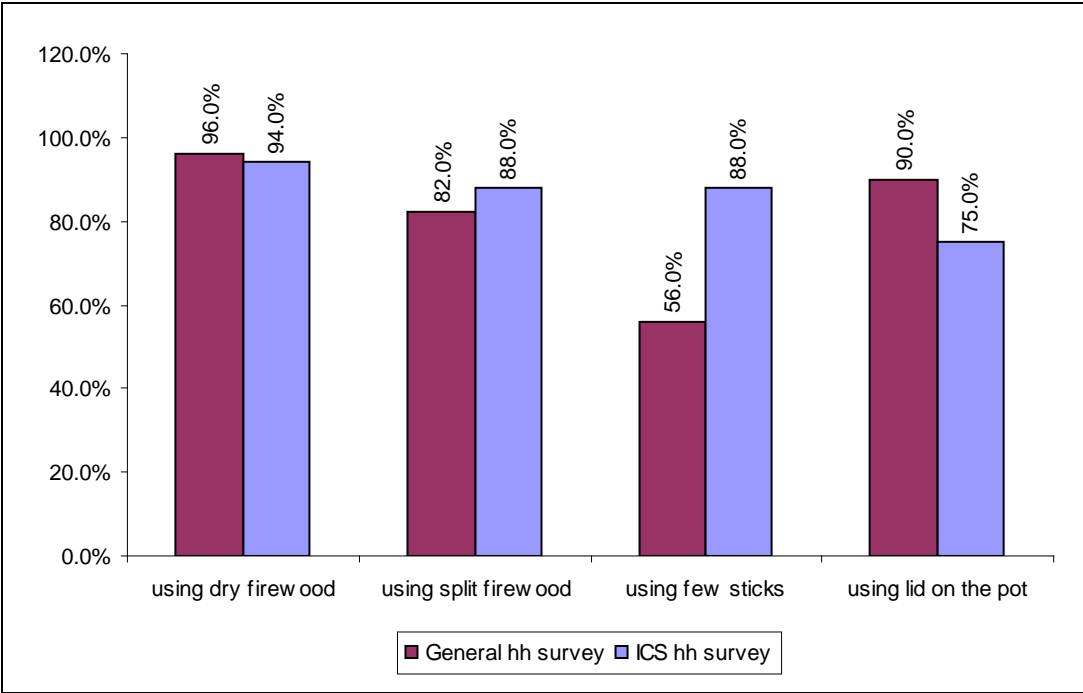
Almost everybody used the cooking stoves for boiling water (99%). Space heating was the second most important 'other' use of stoves, mentioned by 56% of the general household sample, but only by 40% of ICS-households sample. The improved stoves are probably not so effective for space heating, and thus this habit had ceased among the ICS households. It would be useful to know whether people light open fires to meet their demand of warmth during cold periods, or whether other solutions have been found. Less than 10% of households interviewed used their stoves for lighting (9% of general household sample, 7% of ICS-households). This function had apparently been replaced by better means. Very few women used their cooking stove for brewing beer. Usually, big containers with bigger fireplaces were needed for such activities.

The economy and efficiency of stove performance is influenced by the way people cook. Stove producers (and through them stove users) were informed about 'good cooking practices' through project promotion activities at the same time as the stove was disseminated. During the interviews, the enumerators observed cooking habits wherever possible. At the time of the survey interviews with the general household sample, there were 248 respondents cooking. The following four criteria were systematically observed:

- Use of dry firewood; fuel that was used and stocked in or near the kitchen
- Use of a few thin sticks: having two to four thin pieces of stick optimised the efficiency of the stove. A big bunch of sticks overfills the stove mouth.
- Use of a lid: cooks were observed covering the food while cooking, with a lid, plate, another pot etc.
- Use of split wood: people who have access to big pieces of wood have to chop it into small pieces to burn efficiently and to allow it to dry. For those who collect small twigs there is no need for chopping.

Figure 4.1.18 shows the percentage of households observing good cooking practices.

Figure 4.1.18: Observed good cooking practices



The differences were small between the cooking practices of the general household sample and those in the ICS-households sample. The vast majority used dry wood (94% to 96%) and split firewood (82% - 88%). The use of split firewood was widely observed. Either they cut it themselves before cooking or bought it already split. For those who had logs, the advice was given to split it so that it dried faster and was more efficient in use. This advice was given during previous stove projects, and it is probable that people became conscious and changed habits.

The number of sticks being used differed considerably between the general household respondents and the ICS users. Within the general household sample, about half used a few sticks while the other half used larger pieces of wood. This may be because large pieces can be fed into the traditional fireplace, whereas the narrow door of the ICS stove can only accept thin pieces. Most ICS users were correctly using a few sticks (88%) and only a few filled the door of their stove (thus preventing sufficient air from reaching the flames).

Among the general household respondents, most (90%) households used a lid on the pot while cooking, yet only 75% of the ICS samples were found cooking with a lid. It is not very clear how far the use of a lid or substitute (like a banana leave or a plate) has become common practice. It would be interesting to investigate why one quarter of the ICS users did not put any cover on their cooking pots.

In summary, a good proportion of cooks used practices that improve savings of firewood, among both the general sample, and the ICS sample, irrespective of whether they cooked with a traditional or improved firewood stove.

An improved firewood stove, in good condition, and used in the right way, will reduce harmful smoke emissions substantially. The health of women and children can be substantially improved by reducing smoke and thus reducing the harmful pollutants they inhale in the kitchen. This is one of the key purposes for ICS promotion.

The criterion for classifying 'with smoke' and 'without smoke' was for the enumerator to observe visible smoke coming from the stove while the cooking was going on, even a small amount of smoke was considered (Table 4.1.19). It should be noted that not all smoke is visible, so some smoke may be emitted that is not visible to observers.

Table 4.1.19: Observed smoke in the kitchen while cooking

	General household sample		ICS households sample	
	N	%	N	%
With smoke	97	68%	42	46%
Without smoke	46	32%	50	54%
TOTAL	143	100%	92	100%

The interviewers observed smoke in two thirds of the kitchens from the general household sample visited during food preparation. Among the ICS-sample, less than half had visible smoke during cooking. As the observers were reporting even small amounts of visible smoke, this indicates that substantially less smoke was created when cooking with improved stoves. The author has observed that during the cooking process, visible smoke from an ICS usually only appears when lighting the fire or adding more sticks. Table 4.1.20 illustrates the percentage of households where smoke was observed in the kitchen. Poor households had more smoke in the kitchen, whilst those who were moderately poor had the least smoke, for which no clear reason could be ascertained. .

Table 4.1.20: Household economic status and observed kitchen smoke while cooking

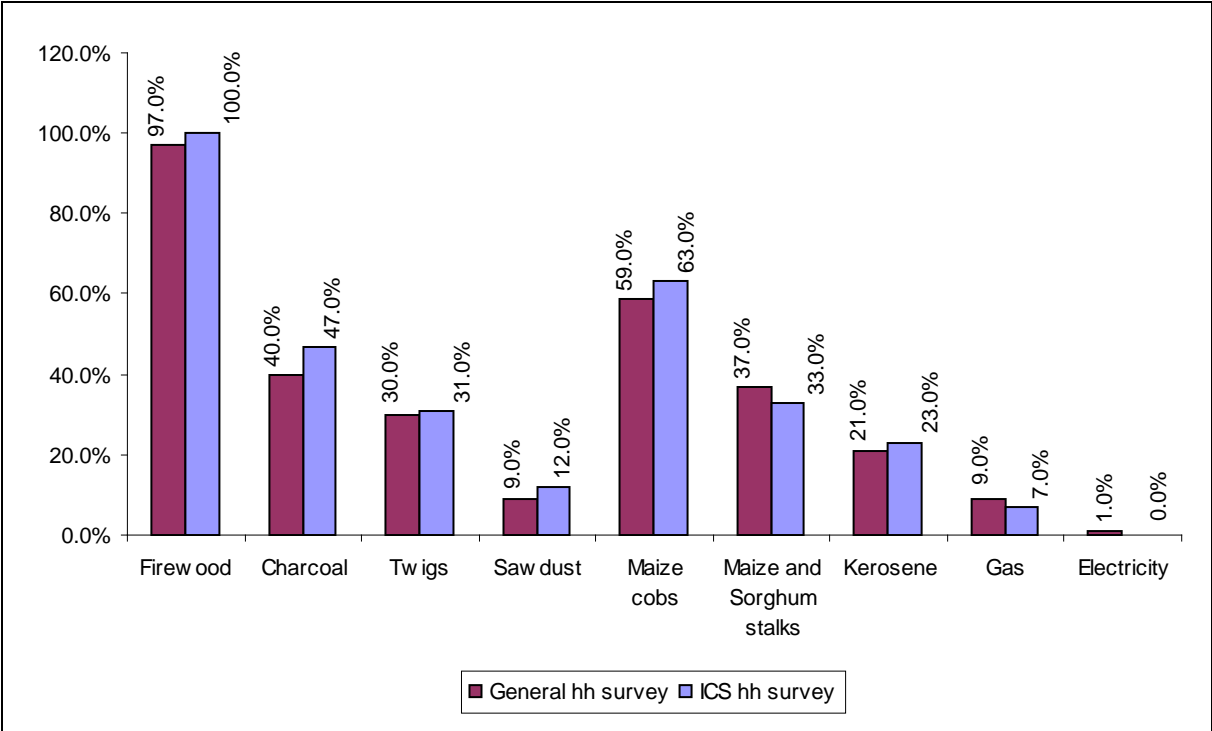
Household socio-economic status	General household sample	
	N	%
Better off	20	64%
Medium poor	23	54%
Poor	53	77%
TOTAL	96	100%

Observations on the reduction of visible smoke through the use of improved firewood stoves suggested that a small majority of the ICS household kitchens were free of visible smoke; these households are clearly in a better situation than the average stove users with only one third reporting no visible smoke. These findings point to potential benefits of ICS on the health of women and children, the main persons affected by kitchen smoke. An in-depth analysis is needed on why so many ICS still emit smoke, particularly if 78% of the improved stoves in the ICS households sample are in good or acceptable conditions (Figure 4.1.9) and the great majority of users follow the recommended practices (Figure 4.1.18).

4.1.4 Fuelwood

A wide variety of fuels is used for cooking. Although all households in the study used firewood, other fuels such as maize cobs and sorghum stalks, charcoal, twigs, sawdust, kerosene and gas were being used by an increasing number of people. Organic matter remained by far the most widely used source of fuel.

Figure 4.1.21: Distribution of households by cooking fuel (multiple response)



The increasing scarcity of fuelwood has led to a diversification of fuels for household use, even among those with improved firewood stoves. Agricultural residues were the second most used type of fuel. More than half the households used maize cobs, and one third used maize and sorghum stalks. The availability of these fuels was restricted to the agricultural seasons and started after harvest. They can be used in Western Cluster from July to September and from December to January. In Central and Transmara Cluster these residues are found between December and February or March. It was reported in Western Cluster that maize cobs were so much in demand as a fuel that they were being sold as a commercial product.

In Malawi, improved stoves were found to be very suitable and efficient for burning agricultural residues (pigeon peas stalks) because all the heat is concentrated below the pot, maximizing the energy of the residues. Also, improved stoves prevented the lightweight particles of the burning agricultural residues entering the pot and making the food dirty.

Charcoal was the third most frequently used fuel with 40% of the general household sample group using it, and 47% of ICS households. Charcoal was the most important fuel for those that could only buy fuel and not collect it themselves. One fifth of the households used kerosene (21%) and less than 20% used gas. Electricity did not play any role as cooking energy in the project areas.

The use of certain fuels is specific to some regions. Thus, the use of maize and sorghum stalks was found to be particularly spread in Transmara Cluster, while charcoal and sawdust were used by more households in Western Cluster. Central Cluster had a higher percentage of households using kerosene (see Annexe XI, Figure X1.8).

Almost all households indicated that firewood was the primary fuel they used - only 2% gave charcoal as their primary fuel.

Table 4.1.22: Distribution of households by primary fuel used

	Firewood	Charcoal	Gas	Kerosene	Maize cobs	Other
General household sample	96.3%	1.9%	0.9%	0.3%	0.3%	0.3%
ICS households sample	99.4%	-	-	0.6%	-	-

This remained unchanged from the baseline survey in 2006, where 97% of interviewed households said they used firewood as their primary fuel. In 2002, the national survey from the Ministry of Energy found that 89% of rural households use firewood as their main fuel source for cooking. Although several areas of the present survey were covered by the expansion programme of the electricity grid (which was mentioned during the PRA discussions), people have not automatically switched to electricity for cooking as it is too expensive.

Table 4.1.23: Distribution of households by second most important fuel used

	Maize cobs	Charcoal	Twigs	Stalks	Kerosene	Sawdust	Other
General household sample	27%	24%	15%	8%	5%	4%	7%
ICS households sample	28%	29%	11%	6%	4%	4%	4%

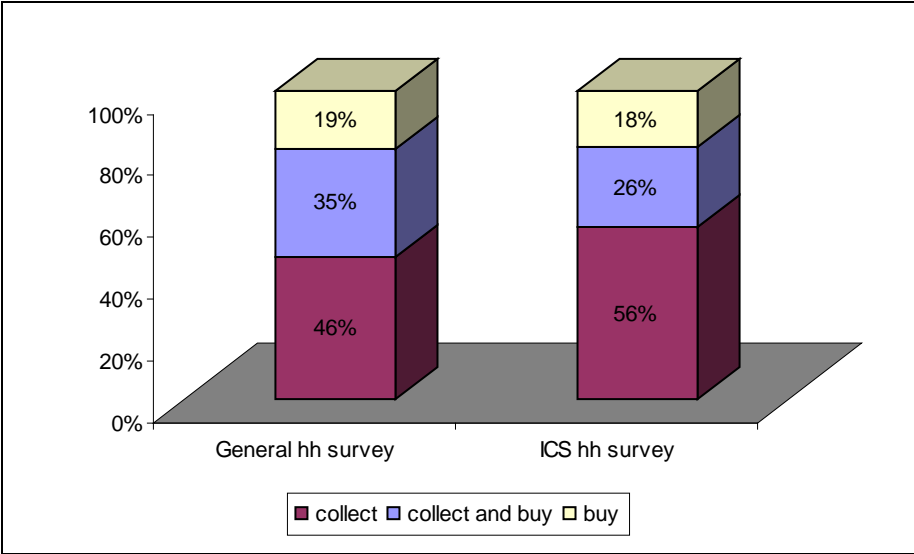
Households mentioned a variety of fuels when asked about their second most important fuel: 27% said they used maize cobs as their second fuel, others said maize and sorghum stalks, indicating that 35% of all households used these residues as their secondary fuel. This underlines the importance of agricultural residues for a major portion of all households, despite these fuels only being available during a limited part of the year. Charcoal played an important role as the second most important fuel, with 24% of general households and 29% of ICS households using it in this way.

Table 4.1.24: Distribution of households by third most important fuel

	Stalks	Maize cobs	Charcoal	Kerosene	Twigs	Gas	Other
General household sample	18%	13%	11%	11%	5%	3%	2%
ICS households sample	12%	11%	13%	12%	8%	2%	6%

Responses about the third most important fuel highlighted once again the importance of agricultural residues. Maize and sorghum stalks and maize cobs were cited by 30% of general households and 23% of ICS households. Charcoal and kerosene were the third option for about 11% of respondents. This indicated that agricultural residues were a major fuel source during the one or two seasons when they are available. It showed the need for affordable alternatives to address increasing firewood shortages. Firewood can be collected by the household, bought, or both collected and bought.

Figure 4.1.25: Supply of fuel wood



The vast majority of households collected firewood for cooking (about 80%), and for about half of them, this was sufficient to cover their needs. Only 46% of the general households were in this position, whereas 56% of the ICS households were self-reliant on firewood. Eventually, fuel savings made by using improved stoves helped them to reduce the quantity of firewood they bought. Only 26% of these households collected and bought firewood. For the respondents from the general household sample, the proportion of those who did both was higher (35%). About one fifth of both samples exclusively bought their fuelwood.

The total percentage of households buying some or all of their firewood was 54% for the general household sample and 44% for the ICS sample. This represented an increase on the baseline survey of 2006, when only 34% of all households interviewed said they bought firewood. This finding can be taken as another indicator of the increasing scarcity of fuelwood. Not only has firewood become more and more scarce, but the sources for its collection were rather limited, as shown in Figure 4.1.26.

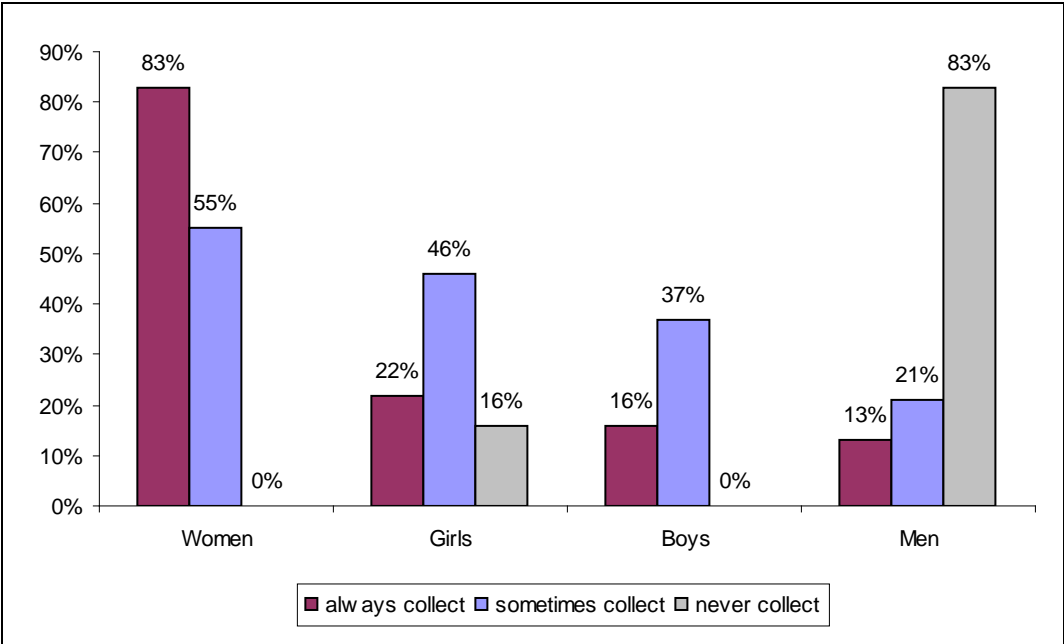
Table 4.1.26: Source of collected firewood (multiple response)

	Own farm	Open land	Public scrubland	Neighbouring farm
General household sample	94.4%	10.1%	1.1%	3.4%
ICS households sample	97.0%	9.0%	0.8%	0%

More than 94% of all households fetched their fuelwood from their own farms (94%); other sources were negligible. Only 10% of respondents had the opportunity to gather fuel from open land, and public forest was shown to be almost non-existent as a source for wood. This showed clearly that firewood is no longer a public good, accessible for anybody, but very much dependant on the ownership of land and on the species grown. It is evident that there is a pressing need for agro-forestry to satisfy energy demand for those unable to buy all their household fuel.

Women usually collect firewood, sometimes helped by their daughters or sons. Little has changed in this traditional division of labour (Figure 4.1.27).

Figure 4.1.27: Persons involved in firewood collection (general household survey - multiple response)

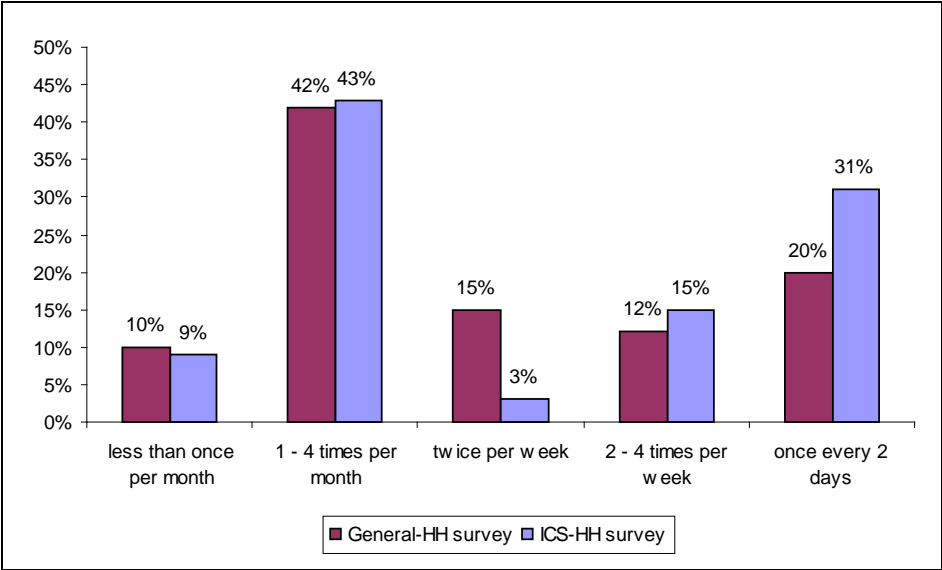


Women were still shown to be the main persons in charge of firewood collection, and 83% of them always fulfilled this task. Girls may help them, but it was a minority of them who collected it on a regular basis (22%). Most girls helped every now and then (46%). Boys also helped, but to a lesser extent. Only 16% fetched firewood regularly, while 37% did it 'sometimes'. From this, it was concluded that children were mainly concerned in assisting their mothers from time to time. Very few men gave a hand. The overwhelming majority of them never assisted in firewood collection (83%). The figures from the baseline survey of 2006 are similar, with 85% of women, 37% of girls, 7% of boys and 7% of men involved in firewood collection.

When comparing these figures with those of the ICS-household sample, a slightly different picture emerges (see figure in Annexe XI) as more men get involved in firewood collection. About 22% of men stated that they collected firewood on a regular basis and 15% assisted from time to time.

This observation by the project staff during field visits could suggest that men are keen to see a change to the ICS. This observation is reinforced by the number of men reported as using the ICS.

Figure 4.1.28: Frequency of firewood collection

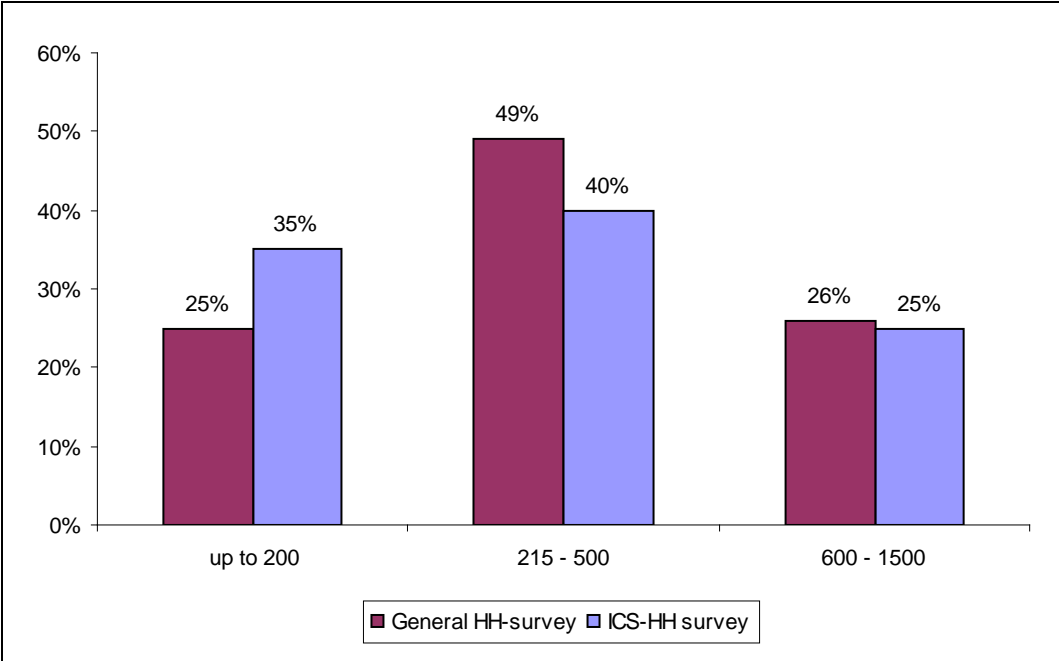


Approximately half the households collected their firewood on a monthly or weekly basis. The other half fetched fuelwood several times per week, from twice per week to once every two days. The smaller the quantity of collected firewood, the more often firewood had to be collected. Usually, when people went to their own fields, they just picked up some branches or twigs and took them home for use. On other occasions, a tree in a field was cut down, providing sufficient fuel for several weeks or even months. Households seemed to practice either the first or the second option exclusively.

The time spent on firewood collection varied between less than two hours and more than 10 hours (see table in Annex XI). Half the respondents in the general household survey spend less than two hours on one collection of fuelwood. This would describe those households (approximately half) that collected their fuelwood several times per week. Those who spent hours or even a whole day on one collection of fuelwood might be involved in cutting down a whole tree, chopping it into pieces and carrying the pieces home. No conclusion could be drawn from information on the time spent on time savings from using ICS.

Another advantage of using an improved stove is to save money on buying firewood because of saving fuel. Households interviewed were asked to estimate the amount of money they spent on buying firewood. Generally people spent between 50 and 1500 Kenyan Shillings on fuelwood per month, depending on the quantities they needed to buy. This in turn depended on the ratio of collected and bought fuelwood, on family size, on the availability of fuelwood and on factors such as the efficiency of their stove. From the analysis of ICS use, it is not possible to determine whether all the savings were exclusively from stove use. A comparison of general households surveyed and ICS-households surveyed shows an interesting pattern of savings from using the ICS stove (Figure 4.1.29).

Figure 4.1.29: Money spent on firewood per month (in KSh)



A larger percentage of households in the ICS-households spend less than to 200 KSh per month than those in the general households. This situation was reversed in the medium category of 215 to 500 KSh per month and there was no real difference between the two groups in the 600 Ksh to 1500 KSh groups. Although this could be interpreted as ICS users spending less on fuel, there are too many confounding variables to use this simple calculation as hard evidence.

4.1.5 Information channels on ICS

Improved cooking stoves are not new in Kenya. The Kenyan Jiko was introduced more than 20 years ago and even though promotion stopped with the phasing out of the 'Women and Energy' project in 1996, the stove continues to be sold in the marketplace and is in widespread use. Between 10% and 13% of the households in this survey owned a Kenyan Ceramic Jiko.

When starting its activities in 2006, the PSDA stove project identified promotional activities to make improved firewood cookers known to a wider public. Field days and other locally organised information events were instigated, leaflets were distributed via stove dealers and, not long ago, a radio campaign and spots on improved stoves were broadcast on TV. Although the survey could not analyse the effects of these promotion activities in depth, the enumerators asked some questions to find out how much was known about ICS.

Among the respondents without improved stoves, almost all knew about them (85%), so ICS were well known in most areas. Within the entire project clusters, the ICS was very well known; more people in Central Cluster (90%) and Western Cluster (88%) knew them than in Transmara Cluster (79%). This might be due to the longer presence in the first two clusters of the earlier project. There was a wide difference in knowledge about the different types of improved firewood stoves.

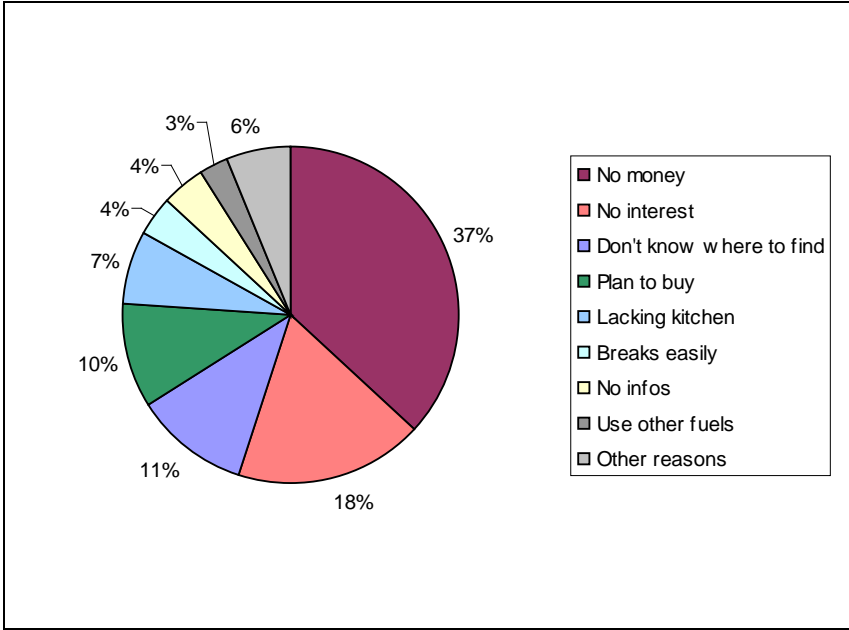
Table 4.1.30: Type of ICS known by non ICS users

	Jiko Kisasa	Jiko Kuni Mbili	Rocket stove	mud	Total
Number	139	29	13		181
Percentage	77%	16%	7%		100%

The most popular ICS was the Jiko Kisasa, known by 85% of the people interviewed. All other stoves were fairly known, with the Jiko Kuni Mbili known by 18% and the Rocket Mud stove by 13% of the interviewees. On-going and previous project activities carried out in Western and Central Clusters had led to widespread use of the Jiko Kisasa, which accounted for its high profile. (Previously, the Jiko Kisasa was known as Maendeleo Jiko.) The Kuni Mbili was not promoted very much, and it was not easy to find one in the markets. These stoves were only produced on demand due to the high cost of metal; stove stocks were not held. Very little was known about the rocket stove as it had only recently been introduced; mainly in Transmara Cluster where the pilot activity had been done.

As so many people knew about improved firewood stoves, the survey investigated why so many people had not bought them. Was it lack of information on where to get one? Or are people not really convinced of the benefits they might gain from it? The answers given by the non-ICS owners to this question are shown in Figure 4.1.31:

Figure 4.1.31: Reasons for not getting an improved firewood stove



The majority of respondents said that they either had no money to purchase an improved firewood stove (37%) or that they were not interested in doing so (18%). Some respondents (11%) did not know where to find an improved stove. While only a few people in Central Cluster gave this response (6%), more people in Transmara Cluster (12%) and in Western Cluster (17%) had no idea where to find an ICS (see the table in Annex XI). Ten per cent of respondents said that they planned to buy an improved stove in the near future. This was particularly true for people from Central Cluster, but less so for those from Western Cluster. Others said that they wanted to wait until they had built their kitchen (7%). They did not see any use in installing an improved stove outside the kitchen. A few people rejected the stove because they felt that it broke easily (4%). A few had no information on improved stoves, and some used other types of stoves and fuels. Other reasons that were given included: 'no time to purchase', 'hard to cook *githeri*' and 'difficult to maintain the stove'.

There was no major variation between the socio-economic categories for the two main reasons 'lack of money' and 'no interest' as shown in Table 4.1.32.

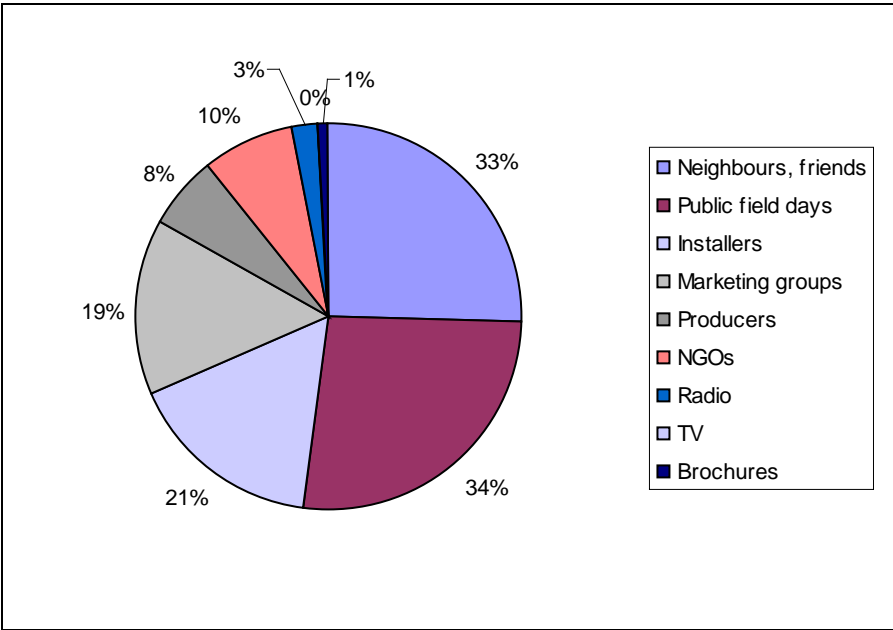
Table 4.1.32: Reason of non-use of ICS by socio-economic category

	Better off	Medium poor	Poor	Average
No money	44%	30%	39%	37%
No interest	19%	15%	19%	18%

Irrespective of their economic group (poor, medium poor, better off), about one fifth (15% to 19%) of those who were asked about not owning a stove said they were not interested. The 'lack of money' argument did not vary much with economic groups either, with 44% of the better off forwarding this argument, 30% of the medium poor and 39% of those on very low incomes saying they did not to have enough money for an improved stove. As it is not plausible that more people from the 'better off' category did not have enough money for a stove, it seems likely that the 'money' argument was just the polite version of saying 'I'm not interested', particularly as the price of an ICS is relatively low.

ICS users were asked how they learned about the new stoves to provide information on the route or channel through which this information reaches potential clients. The result are shown in Figure 4.1.33.

Figure 4.1.33: Information channels on improved stoves (multiple response)



Respondents were asked how they learned about improved firewood stoves for the first time. The most frequently given answers were public field days (34%), and neighbours, family and friends (33%). Stove dealers were another important source of information mentioned by almost half of all ICS owners (48%). Installers were important, as they were in direct contact with clients and potential clients (21%). Marketing groups were mentioned by 19% of respondents, and producers provided information for 8% of ICS users.

Local NGOs circulated information on new stoves, and they were mentioned by 10% of respondents. It may be that their influence is restricted to their members or clients. No real influence could be attributed to radio, TV and print materials (brochures, leaflets, calendars) for disseminating the message on the improved stoves to people for the first time. This

limited effect, as suggested by the responses, might have been because the radio campaign started late on in project activities, making other promotion channels more successful in reaching their target audience first. It could be that the messages were not attracting the attention of those new people who knew nothing about ICS. Further investigation should be carried out on this issue.

It can be concluded that the marketing activities of the stove dealers themselves were apparently well established. Further promotion by the projects themselves (e.g. field days) could be gradually handed over completely to the main actors - the producers, installers and marketers of improved stoves.

4.2 Results from the stove dealers survey

The expression 'stove dealers' is used here to mean those who are dealing with stoves in a broader sense: stove producers, stove installers and stove marketers. Some stove dealers may specialise in one of these activities, but very often, clay stove producers produce, install and/or market them.

Producers usually worked in groups, which generally started as women's' groups. Over time, as stove businesses were found to be profitable, men joined the groups. Often, the groups were composed of members of an extended family.

4.2.1 General information on stove dealers

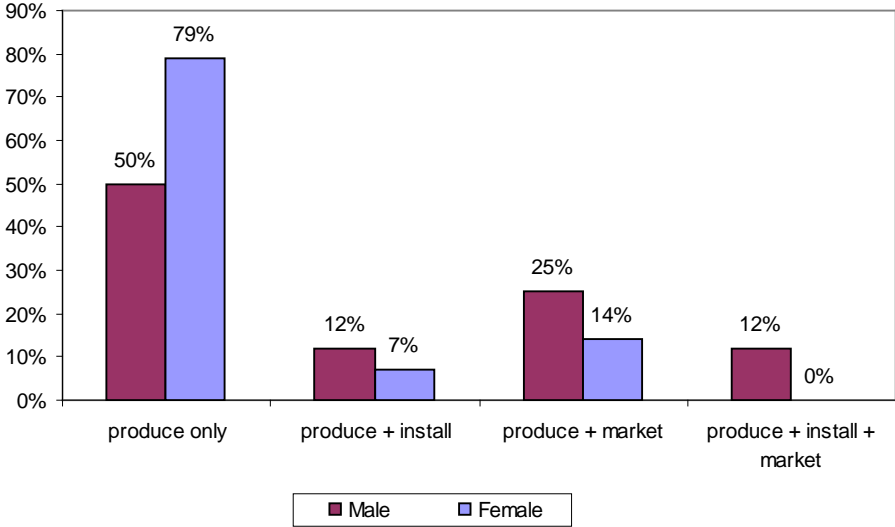
Altogether 55 stove dealers were interviewed; 27 men and 28 women. Table 4.2.1 shows their activities.

Table 4.2.1: Distribution of stove dealers by main stove activity and gender

Main stove activity	Men	Women	Total
Producers	8	14	22
Installers	12	9	21
Marketers	7	5	12
Total	27	28	55

Several stove dealers combined their main activity (shown in Table 4.2.1), such as production, with installation and/or marketing of stoves (Figure 4.2.2). This diversification allowed them to increase their income.

Figure 4.2.2: Distribution of stove producers by their stove activities and gender

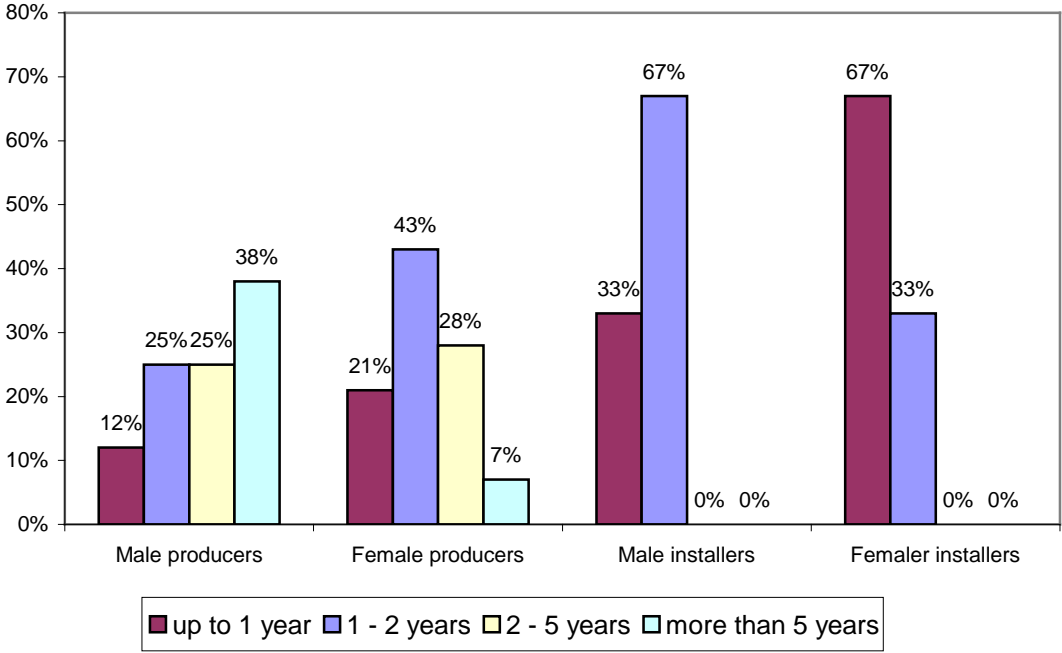


About half the male producers and 80% of the female producers interviewed only produced stoves, while 12% of the men and 7% of the women also installed the stoves they produced. Another 25% of the male and 14% of the female producers also marketed their products. And some men were engaged in all three activities: production, installation and marketing of stoves. In general, more men than women had diversified their stove businesses.

An even greater diversification was found among stove installers, who rarely concentrated on installation alone. Only a third of the male installers and 45% of the female installers restricted themselves to stove installation. Half of those who diversified also marketed stoves, and about 10% produced stoves as well. The percentage distribution in terms of diversification was similar among male and female installers, but again men had a greater scope of diversification than women. This may have been because they had greater mobility than women, who generally had to do the housework and look after the children. During training, the project encouraged future installers to go into marketing as well, to improve their income opportunities.

Some of the stove dealers had been in stove businesses for quite some time. Others started with this project activity. Table 4.2.3 gives an overview on the years of stove activity for stove producers and installers.

Figure 4.2.3: Distribution of stove dealers by years in stove business and by gender



More than half the male stove producers and more than one third of the female producers had been in the stove business for more than two years. Around 28% had been active between two and five years and one fifth had been involved for more than five years - even up to 15 years. These long-term producers were trained during the earlier 'Women and Energy Project' in the early 1990s. The remainder started during the recent stove project, and had been working in this field for up to two years. More women (64%) than men (36%) had become stove producers during the previous two years.

About half the installers had been engaged in the stove business for one year and the other half between one and two years. More women had started installing during the previous year, and more men had been active for more than one year. All installers had been trained during the actual project phase when it had been found necessary to replace agricultural extension officials by private entrepreneurs.

All marketers interviewed had been trained by the project during the previous two years. On average, they had been working as marketers for about one year, reflecting the time the project had been active on the ground. Most of the stove dealers who came into this business during the former 'Women and Energy Project' had abandoned their work once the project was no longer there to support collection of stoves from the production centres and distribution to clients. Without the project, there were dealers who cheated the producers by taking stoves and not paying for them. Finally, the agricultural extension workers and home economics extension workers were the only link left between stove producers and users. The users were trained to install the stoves themselves.

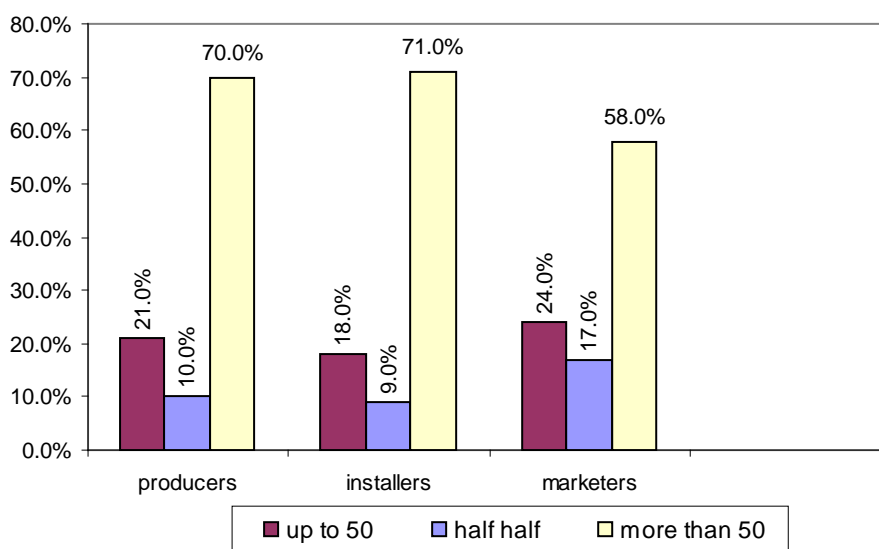
Almost half the stove dealers worked in agriculture as their main source of income. However, one third of all stove dealers said that they made their living from stove businesses as their primary employment. Very few respondents had main occupations other than agriculture. Those that did, were employed in small businesses, masonry, pottery, tailoring, or teaching (Table 4.2.4). These respondents regarded their stove activity as a secondary income-generating activity.

Table 4.2.4: Distribution of stove dealers by main occupation and gender

Main occupation	Producers		Installers		Marketers		Average Total
	Men	Women	Men	Women	Men	Women	
Stove business	37%	50%	42%	11%	29%	20%	32%
Farming	25%	28%	50%	67%	57%	40%	45%
Contractual labour	0	7%	0	11%	0	0	3%
Masonry	12%	0	0	11%	0	0	4%
Pottery	12%	0	0	0	0	0	2%
Nurse	0	7%	0	0	0	0	1%
Tailoring	12%	0	0	0	0	0	2%
Teaching	0	7%	8%	0	0	0	3%
Small business	0	0	0	0	14%	40%	9%

Distribution of stove dealers by gender into producers, installers and marketers showed that women and men perceived stove businesses differently. Half the female producers and 42% of the male installers considered the stove business as their main occupation. For stove producers, this activity was their most important source of income, while for the installers (particularly women) and marketers, agriculture was the main income source and stove business was secondary. The importance of stove business to the household income can be clearly seen in the Figure 4.2.5.

Figure 4.2.5: Distribution of stove dealers by contribution of stove business to household income



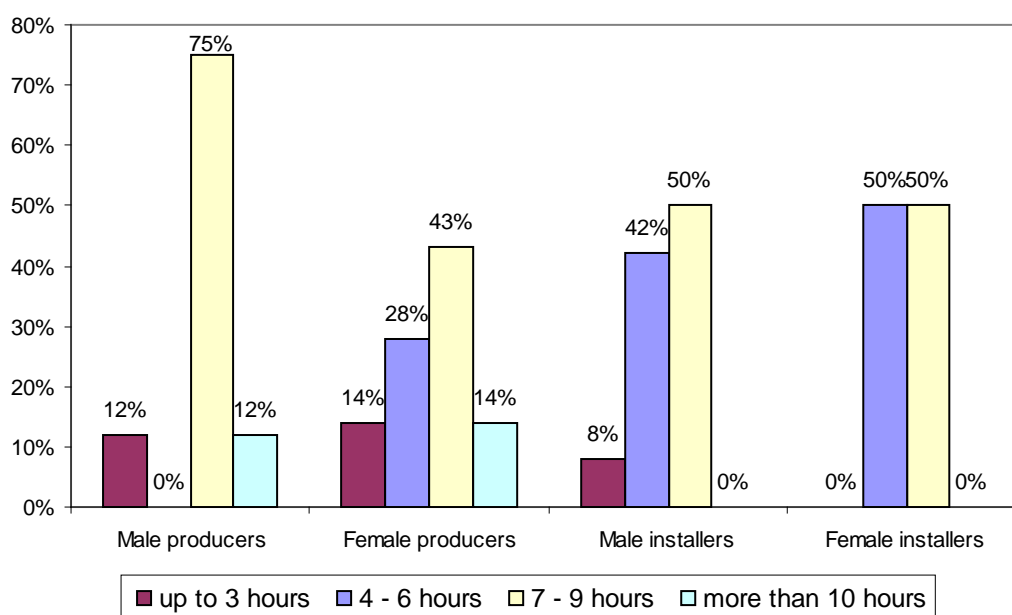
Even though more stove dealers gave farming as their main occupation rather than stove business, in terms of the contribution to the household income, stove business is clearly providing more than 50% for the majority of them. Among producers and installers 70% felt that stove income contributed more than half their household income, while 58% of marketers felt that this was true. It may be that farming provides food primarily, and some income after harvest, whereas stove activities can generate income at all times. Stove activities were seen as an important source of cash, particularly for women and young men who have fewer employment opportunities.

4.2.2 Organisation of work

Respondents were asked about the time spent on stove activities and said they invested an average of six to seven hours daily, for an average of three days per week, for installers, and for five days per week, for producers and marketers.

More than half the stove producers worked between seven and nine hours per day. There was a big gender difference, with 75% of men spending seven to nine hours, and only 43% of women doing so. While the vast majority male producers said they invested more than seven hours a day in the stove business (88%), only 57% of female producers invested that much time. Apparently, women do have quite the same potential (or interest) to make stove production a full time job. Nevertheless, the long time spent by the majority of stove producers implied that stove production had become a real business, and that people were interested in it as much more than a small secondary job to make a bit of extra money. People produced stoves because of the high demand for the product on the market. These findings reinforced the answers given by half the producers that stove production was their main income generating occupation.

Figure 4.2.6: Distribution of stove dealers by amount of time spent daily on stove business, and by gender



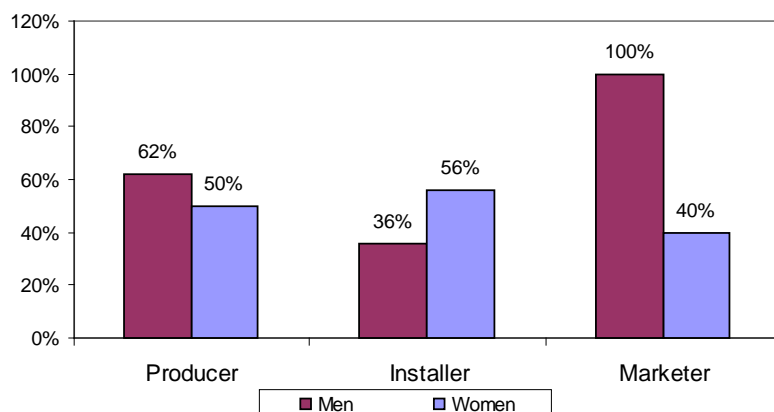
The picture for stove installers was very different. Half of them spent seven to nine hours on stove business, whereas the other half of respondents spent only about three to five hours daily. The difference between men and women was less distinct than among the producers. Stove installation cannot be done at home or nearby in the same way as stove production. The installer has to travel to the village where the client requests the service. The time normally used for the installation of a stove is about three hours when all the material is ready on site. If the installer has to look for stones, water and soil himself, this takes extra time. Sometimes, the installer will repair the mud wall next to the stove first, in order to make a better job for the client. The number of stoves that can be constructed during a working day depends on all these factors.

It is interesting that half the installers said that they worked only up to two days per week (56%). This might have been due to irregular requests from customers for stove installation. On the other hand, one third said they were busy for five or six days per week, which means

their businesses were running well, and as most of the installers indicated, they were also producing stoves. Only by combining installation with stove production could the stove dealer achieve full time employment.

The majority of stove marketers interviewed worked seven or more hours per day (80%), and they did this, on average, five days per week. They combined selling stoves with production and / or installation. Any stove dealers that were not fully engaged in stove activities worked in the stove business mainly to supplement their income from farming (see Table 4.2.6). They may concentrate on their stove businesses during the off-season when there are no farming activities. When they are fully engaged in stoves, they can hire labour to do the farm work and continue with the more profitable stove activities themselves. The author has confirmed that this is the case through observations in the field. It was noted that assistance was sometimes required for stove activities, and this was the first step into running a professional stove business. This assistance came either in form of hired labour or through the help of family members. More than half of all stove dealers received help from family members. This was more often valid men than women.

Figure 4.2.7: Distribution of stove dealers by percent requiring assistance from family members, and by gender



The amount of support given by families varies between the different type of stove activities. Stove installers receive fairly low assistance (46%), whereas most marketers seem to request help from family members (70%). Producers are in the middle with 56% being helped. At the same time, there is less of a difference between male and female producers that use family help.

Family members may help in all the activities around stove production and marketing (Table 4.2.8). They give most assistance to producers by collecting raw materials, kneading the clay, moulding and firing the stoves. All stove dealers need some sort of help with 'Finding customers'. Families help stove installers and stove marketers by marketing the stoves. They help installers in stove installation, and they help marketers to install the liners they are selling.

Table 4.2.8: Type of assistance given by family members to stove dealers

Type of activity	Producers	Installers	Marketers
Collection of raw material	50%	22%	14%
Kneading clay, soil mixing	50%	-	-
Moulding stoves	42%	-	-
Firing stoves	33%	-	-
Supervision of workers	16%	-	-

Installation of liners	-	33%	28%
Transportation of stoves	-	11%	-
Looking for customers	25%	44%	71%
Maintenance of stoves	16%	-	-

A big gender difference was recorded among marketers; all men said they received help, whereas only 40% of the women could rely on help. Apparently, men had easier access to family labour as long as the activities took place within the homestead and its immediate surroundings. This could explain why fewer male installers got assistance when going to work in other villages. Women, on the other hand, might more easily get support away from their home.

Stove producers were most likely to hire a labour force (86%). This was the case for both male as female producers. By contrast, most stove installers did not hire labour (24%) to assist them. In some cases, the client hired an additional person to install the liner. Among the marketers, one third hired labour to produce the stoves, but not to market them (Table 4.2.9).

Table 4.2.9: Type of work given to hired labour by type of stove dealer

Type of activity	Producers	Installers	Marketers
Collection of raw material*	53%	-	33%
Kneading clay, soil mixing	79%	-	33%
Moulding stoves	58%	-	33%
Firing stoves	42%	-	33%
Supervision of workers	-	-	-
Installation of liners	-	24%	-
Transportation of stoves	-	-	-
Looking for customers	-	-	-
Maintenance of stoves	-	-	-
Other*	26%	-	-

* = collection of firewood for cooking, cooking lunch, collection of grass for packing stoves, metal cladding

The most common task given to hired labour was to prepare the raw material (80% of respondents) which is extremely hard work. Hired labour performed other tasks such as moulding stoves, finishing and drying of stoves and getting together raw materials. Hired staff were rarely asked to fire stoves, and the producer himself or his family did all the marketing or selling. In general, male and female hired labour was asked to work on different activities. Men were usually needed to obtain raw material and to mould the stoves, while women were employed to finish dry and occasionally to fire them. Both male and female hired staff prepared raw materials. The author can confirm recording this division of labour.

Among the marketers, it was mainly the men who employed additional labour. They hired a labour force to produce stoves for them to sell. On average, the marketer would pay 50 KSh per portable Jiko Kisasa, and 80 KSh per Jiko Kisasa liner produced. Most female marketers did not hire labour for stove production. The author noted that women tended to do as much work as possible themselves in order to save the money they earned to provide for pressing family needs.

The first GTZ project 'Women and Energy' introduced improved stoves production through women groups. The women worked together, helping each other through each of the processes, and they all made some money once they had sold the stoves. This increased the prestige of the women, and raised the profile of the stoves. Today, there is a more market-focused approach to sustainable stove production and dissemination. As stove businesses became profitable, men increasingly joining the women groups. The project

promoted the foundation of stove dealers' groups, rather than supporting individual stove dealers.

The number of trading years for producer groups was roughly equivalent to the number of years that the interviewed stove producers had been active. During the previous two years, 42% of the groups had been created, with the remaining groups somewhat older. The producer groups had, on average, 16 members. A small number of groups had only four to seven members, and some big groups had more than 20 members. The largest group interviewed had 31 members. The vast majority of producer groups comprised both men and women. Very few groups consisted solely of women, and there were no all-male groups. The male producers who were interviewed came mostly from groups where men were in the majority, while the women interviewed came from mainly-female groups.

Installer groups appear to have formed partnerships during training on stove installation. As installers were only trained during the 20 months prior to the survey, these groups had not existed before this time. Their groups were smaller than the producer groups. Most groups averaged six members for mainly-male groups and ten members for mainly-female groups.

The marketer groups were also established during the previous 18 months, during the actual project phase. The average size of marketing groups was about seven members for the mainly-male groups and fifteen members for the mainly-female groups. Most of the eight groups were mixed, there were two single gender groups for women, and one group where women represented four-fifths of the members. Where several of the members were men, even if they were not in the majority, the group was headed by a man.

Stove dealers were asked how they felt about working in a group. Both advantages and disadvantages were reported. These are issues common to all groups: producers, installers and marketers alike.

Table 4.2.10: Advantages of working in a group by stove dealer

Type of advantage	Producers	Installers	Marketers
Demand can be met more quickly	33%	18%	14%
Larger production figures are achieved	33%	9%	-
Increased capacity to accept orders	13%	18%	-
More customers (from further away)	13%	9%	14%
Division of labour makes work easier	-	9%	29%
Quality control of stoves is facilitated	13%	-	-
Resources can be pooled	13%	18%	14%
Transport costs can be shared	-	9%	-
Allows access to funds, credit, assistance	20%	9%	14%
Savings are possible	6%	-	-
Brings unity among members	13%	-	-
Members can learn from each other	20%	36%	57%
Members encourage and help each other	27%	27%	14%

The respondents identified both economic and social advantages of working in groups. The economic advantages are many: better organisation of work through the division of labour; pooling resources; increasing production capacity and outreach; increasing efficiency; and better access to funds, loans and assistance from Government and NGO projects. The social advantages include; the potential to learn from each other and to share ideas; the encouragement that members can give each other; mutual help; and unity created among

members through their collaborative work. Besides the economic and social benefits seen in stove dealer groups, respondents also experienced disadvantages.

Table 4.2.11: Disadvantages of working in a group by stove dealer

Type of disadvantage	Producers	Installers	Marketers
Lazy members	58%	60%	71%
Lack of commitment	-	10%	28%
Different opinions delaying decisions	8%	20%	-
Mistrust among members	8%	-	-
Misunderstandings, selfishness	8%	20%	-
Use of group money for personal needs	8%	-	-
Less profit, delayed profit	-	10%	28%
No disadvantages reported	8%	-	-

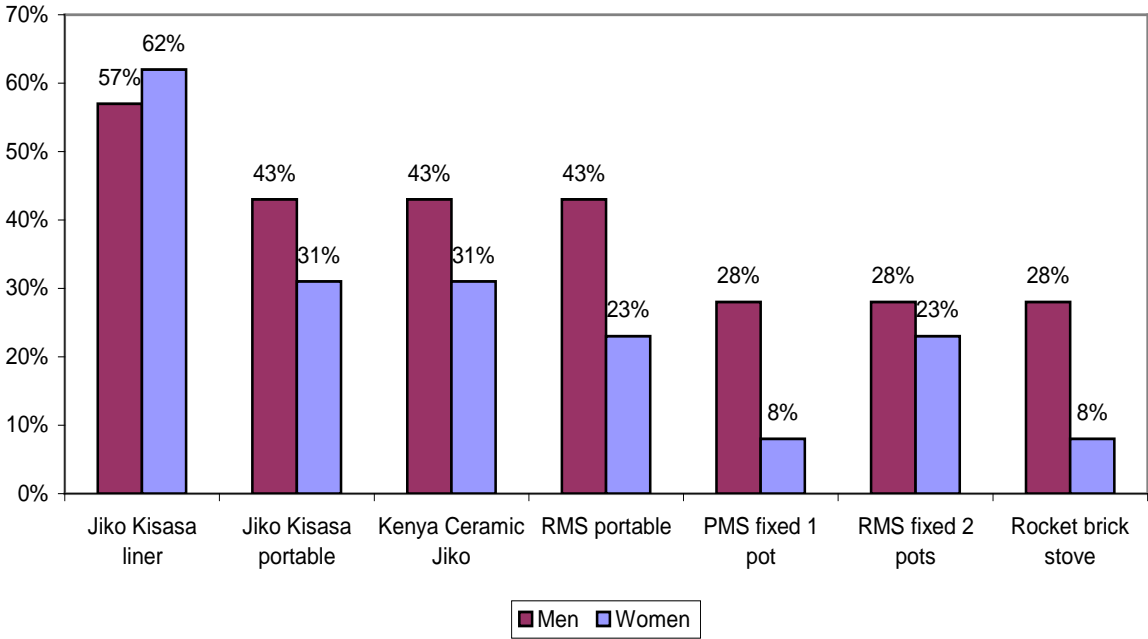
The most serious disadvantages seen in group work included the need to depend on their co-workers, and that some members were lazy. Lack of commitment hindered the group functioning well. Those who wanted to progress fast felt that delay in decision-making caused by different opinions among group members was an issue. Less frequently reported were mistrust among members, misunderstandings, and misuse of group funds. These problems, if persistent, could lead to failure of the group, as had been experienced.

4.2.3 Stove production and installation

Stove production

The people interviewed represented producers of several different types of ICS found in Kenya. Not all types of stoves were produced in the same quantities, and women and men specialised in manufacturing different ranges.

Figure 4.2.12: Distribution of stove models produced, by gender



The Jiko Kisasa liner was produced by most respondents - 60% of all respondents were building it. It was the only model, where women were slightly more involved in its production

than men, as it is the one that requires least physical strength. The three portable stove models, the Portable Jiko Kisasa, the Kenyan Ceramic Jiko and Rocket Mud Stove portable were produced by almost half the men and one third of the women. For the KCJ, the liners had to be integrated into a metal body; this was almost exclusively fabricated by men.

All the Rocket Stove models were constructed only in Transmara Cluster during this period, as it was the pilot area for this new stove model. Here, the men were clearly more involved than the women. Apparently, this has been influenced by the project, which was biased towards male candidates during the selection for producer training. Preference was always given to people with skills in the metal sector for metal-cladded stoves, and in masonry for training on rocket stoves. Both these skills were traditionally employed by men. Besides, men were reported to spend more time in full time employment outside their homes and were thus better equipped to conduct construction of fixed stoves in other villages and homesteads.

Different raw materials were needed for liner and stove production (Figure 4.2.13). Everybody used clay and water - the primary materials for all stoves. Two-thirds of the respondents used sand to mix in with the clay, and one third used grass, sawdust or leaves. Ant-hill soil, firewood and banana stems were used by about one-fifth of the producers. Bricks were needed to construction the Rocket brick stoves. Other materials included cement, ash, metal cladding for the KCJ, and clay, brick or steel shelves for the Rocket Mud Stove.

Table 4.2.13: Distribution of producers by raw material used

	Clay	Ant hill soil	Sand	Fire-wood	Bricks	Banana stems	Water	Gras, sawdust	Others*
<i>Number</i>	22	5	14	5	6	6	22	8	6
<i>%</i>	100%	23%	64%	23%	27%	27%	100%	36%	27%

* *Others = cement, ash, metal cladding, vermiculite, drum, shelf*

Even though most of the materials were natural ones, people were not always able to acquire them at no cost. Some could be collected on one's own land or on public land, open for everybody. But some providers could not get raw materials easily, and had to buy them. In other cases, the client was asked to provide the raw materials when the stove was being constructed in his homestead.

Table 4.2.14: Distribution of products by acquisition of raw material

	Clay	Ant-hill soil	Sand	Fire-wood	Bricks	Banana stems	Water	Gras, saw dust
Purchased	55%	50%	66%	100%	60%	-	31%	45%
Producers' land	5%	-	-	-	20%	12%	12%	9%
Public land	10%	50%	33%	-	-	-	38%	18%
From client	30%	-	-	-	20%	88%	25%	27%

Surprisingly, most raw materials, except for water, had to be purchased. This included firewood, where producers reported buying 100% of their fuel, as well as around half the clay and two-thirds of the sand. Producers collected very few raw materials from their own land or from public land. Customers contributed around one-fifth to one-third of the basic materials used in making fixed stoves. Customers did not provide any materials for the portable stoves.

Overall, there were adequate supplies of raw materials. Clay, ant-hill soil and firewood were 'just adequate', or even 'scarce' according to some respondents. These variations depended on the specific location, but materials were generally available provided the client could pay for them.

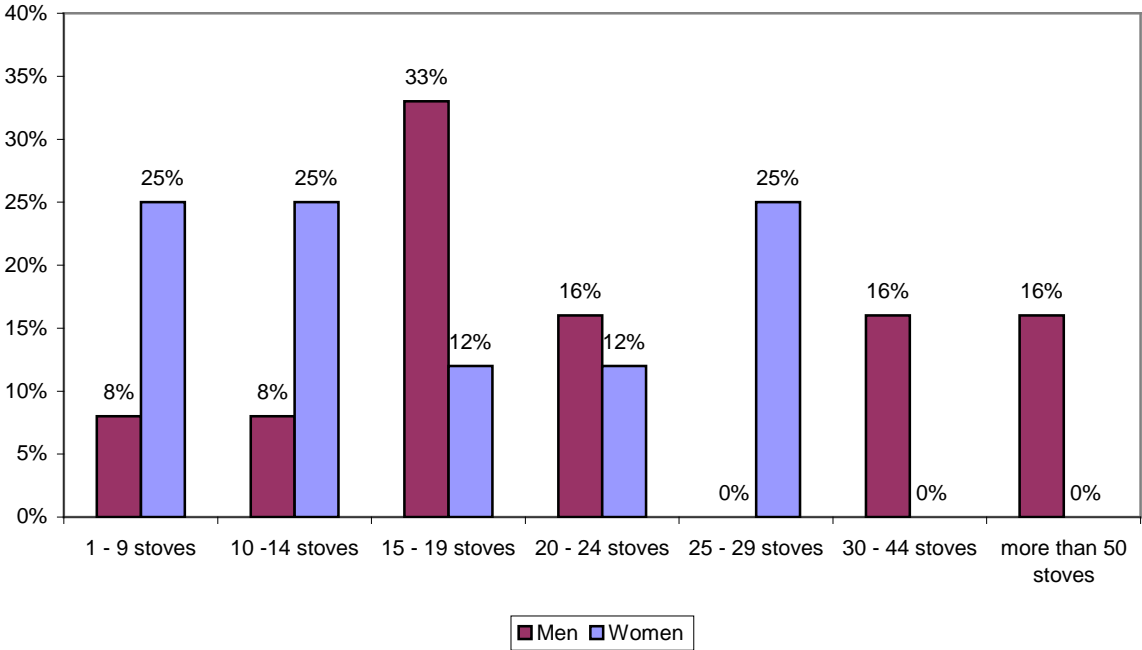
Firewood was needed for firing the liners and portable stoves. More than 60% of the respondents used kilns for firing, while others used open pit firing for their stoves. Rocket stoves did not need any firing.

Installation of liners

The installer usually purchased the liners that he installed at the customers' homes. Most installers bought their liners directly from the producer (66%), while the remaining third bought them from the marketer. The prices paid for the liner varied between 120 KSh and 250 KSh depending on the source of acquisition. The higher prices were paid to marketers who had to pay transport costs and make a profit.

The role of the installer is to install liners into fixed mud stoves. The number they install varies, particularly by gender, averaging 26 stoves for men and 14 stoves for women per month.

Figure 4.2.15: Distribution of liners installed per month, by gender



The average number of stoves constructed ranged from nine to sixty stoves per month for men and from four to twenty-five stoves for women. This is less than the figures given for the number of liners bought per month. Men worked full time as installers more often than women, which explains their higher output. Usually men installed around fifteen to twenty stoves each month, whilst women built between four and fourteen stoves per month. This question proved sensitive, as it reflected income, and the answers, although indicative, might not have been answered completely accurately. The raw materials used for the stove when installing a liner at a customer's house may vary, as shown in Table 4.2.16.

Table 4.2.16: Distribution of raw material used by installers

	Stones	Water	Ant-hill soil	Murrum	Clay	Bricks
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Number	20	19	15	8	2	2
%	95%	91%	71%	38%	10%	10%

The installers mainly used stones, water and ant-hill soil. Some installers needed murrum (a type of clay soil), and a few needed clay for their work. Only Rocket Stove builders needed bricks. All 21 installers said that the customer provided the materials, and specified no other sources for these materials.

By contrast to producers who work at home, installers always work outside their homestead. Their working place is the customer's kitchen, where the stove has to be built. When all interested households in a village have had stoves installed, the installer has to move to other places for work. All male installers interviewed said that they had to go to other locations to find work. Their zone of intervention extended to neighbouring villages and, for one-third of the male installers, to neighbouring districts. Among women, 78% reported leaving their villages and going to neighbouring villages to install liners. None of them went as far as the neighbouring districts. This indicates that female installers have a smaller area in which to find work. Probably this is due to their family obligations, which make it more difficult for them to leave home for more than a day.

4.2.4 Quality of stoves and liners

Special attention was given during the recent project to guaranteeing quality – essential for a market approach to stove dissemination. Past experience showed that stove sales go down when product quality declines. Although it is possible to sell poor quality stoves cheaply during the early stages of a project, in the longer term, customers stop buying improved cooking stoves altogether. The project invested in supporting the technical skills of producers, and motivated producer groups to carry out their own quality control on the stoves they produced.

All respondents obtained some professional training from the stove project. Even those who had started their own stove businesses were offered training by the project once they became known. This does not mean that all stove producers in Kenya have been trained by the project, but because the project had a high profile, and kept a careful watch on stove production activities, virtually all producers and installers in these three clusters were trained.

Anyone identified by the project and who wished to receive technical training on stove production received it. Half of them were also trained in entrepreneurship skills. One third had training on organisational development for production groups (team work, leadership, how to solve problems in working together) and on kiln construction. A few received new knowledge on other topics such as HIV/AIDS information, and on raising goats, provided by other development projects.

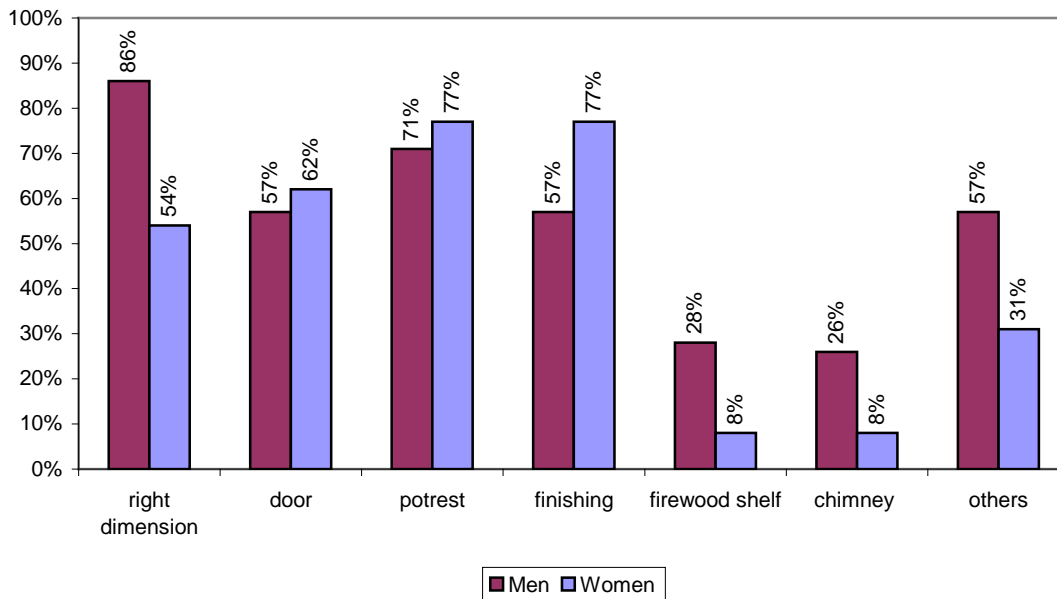
The majority of stove producers reported that they had already trained others in stove production. About 86% of men and 70% of women had done so. On average, about 10 persons had been trained per producer. Some had trained only one or two persons only. Others had trained up to 48 persons, having been in the stove business for many years, sharing skills with a lot of trainees over this time. Usually, the trainees started as simple workers to help out and were gradually initiated in all tasks.

During their technical training, stove producers are provided with a set of quality criteria for stoves. They must ensure that:

- The dimensions for the stove and the stove door are accurate
- The positioning of the pot rests is accurate (a mould has to be used for the pot rests and the correct angle between pot rest and stove body is vital)
- The stove has a high quality finish
- The firewood shelf and chimney for the rocket stoves are correctly installed

- The position of the stove in the kitchen should allow for a good aeration.

Figure 4.2.17: Distribution by gender of producers and the quality criteria they followed in production of stoves



The majority of respondents said that they were careful to achieve the most important criteria for portable stoves and liners: the right dimensions of the stove, of the door and of the pot rests. Most stove producers also took care to achieve a good finish on the stove. Although care was taken by both men and women, women tended to be more concerned about a good finish and men tended to take more care to get the dimensions accurate. Only a few stove producers mentioned the chimney and the firewood shelves as key criteria, perhaps because these criteria only apply to Rocket Stoves. A third of the women and half the men mentioned other quality criteria, such as the ratio of materials they selected, the clay they chose, how they prepared it, and the colour of the finished product after firing. These findings suggest that almost all the producers interviewed followed the quality criteria during their production processes.

A lower percentage of installers mentioned the three most important quality criteria (Annexe XII). The criterion they mentioned most often was the positioning of the stove in the kitchen. The stove should be placed under the window in the kitchen, and the door of the stove should not face the entrance of the kitchen. More than two third of installers worked to these recommendations. Only 40% mentioned the quality of the finish of the installed stove. Those who constructed Rocket Stoves were careful about measurements, the size of the door and the position of the pot rests. Few mentioned the quality of the soil they chose for installation. There was generally a keen awareness on the quality aspects of stove installation.

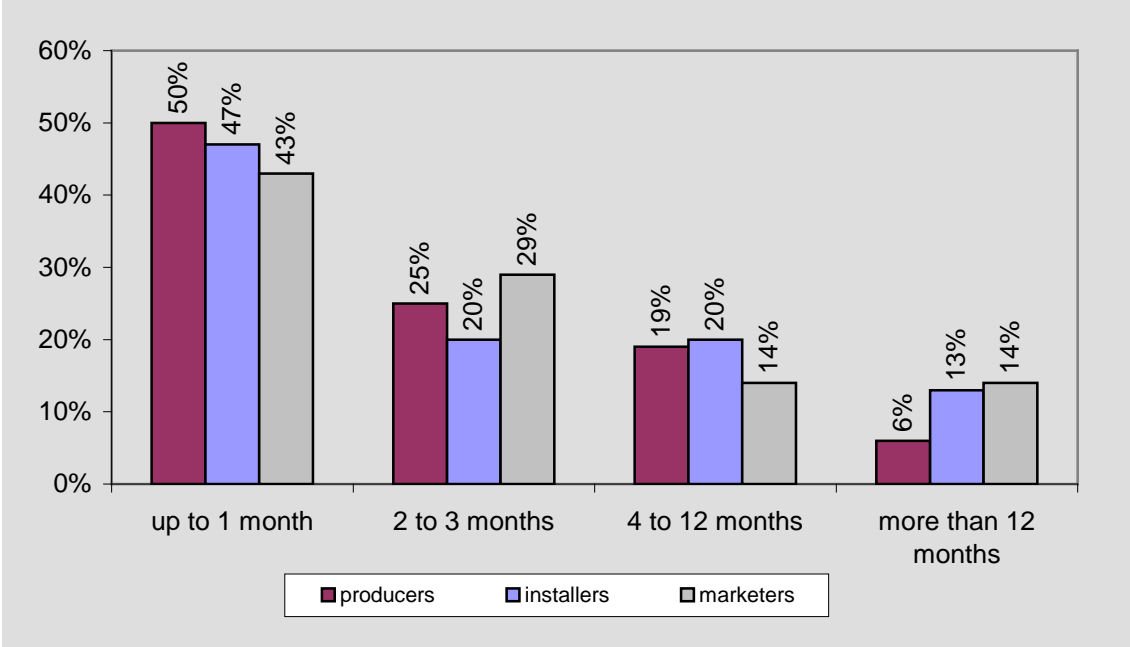
Quality control for stoves and liners is usually done by one of the group members. This task can be assigned to a specific person who is particularly qualified for the job, or the chairperson, or to several group members. In several cases, the producer himself / herself did the quality control for themselves. The marketer or the buyer of the stove may control the quality but this is the exception rather than the rule. It was reported that some manufacturers had asked GTZ staff to review the stove quality during project visits. Quality control seems to have become an integral part of stove production as all stoves were said to be controlled either by the producers themselves or by designated personnel from the production group.

As installers usually work alone in the clients' homesteads, they usually control the quality of their stoves themselves. Very few installers allowed other installers to check their stoves.

Monitors were employed by the recent project to supervise those building Rocket Stoves, as this was a new model for the area. This approach was used for the first three months, to introduce the Rocket Stove into a new area.

Two thirds of the stove producers used a quality label, men and women alike. Usually the producer scratched his or her initial, or that of the group, into the surface of the stove. The project encouraged this approach, so that the source of the stove could be identified, producing a sense of ownership for a good quality stove in the producer. All female installers and most of the male installers indicated that they bought quality labelled liners for installation. The majority of them said that they only bought liners signed by the producer (80%). Only half the installers added their own label to the constructed stove. Those who did so, put their initials and/or the date of the construction on the stove. Other installers decorated the stove with a personal finish to make it unique and recognisable. All the marketers stated that they bought quality labelled portable stoves and liners. Yet, one fifth of them stated that they also included non-labelled products in their goods. About 20% to 30% of their stoves and liners were not labelled.

Figure 4.2.18: Warranty given by stove dealers on their products



The majority of stove dealers (between 70% and 75%) gave a warranty on liners and stoves they sold. About half gave a guarantee of up to one month. Approximately one-third gave a warranty between two and three months. A few dealers guaranteed their goods for 12 months or more. One producer’s warranty only covered transportation of the stove. The project was not involved in the question of warranty, so practices were developed by the stove producers. The project encouraged clients to buy only quality stoves without cracks.

The majority of marketers (more men than women) stated that they had faced problems with the quality of liners and stoves received from producers (63%). The main problem is the liners and stoves cracking. They had to check carefully at the point of purchase that none of the liners was broken. Marketers were also unhappy about uneven pot rests. Marketers observed the quality of liners differed, depending on the producer. The project reacted to these problems by retraining the producers on quality issues. It did some quality checks on the stoves and liners during follow-up visits, and arbitrated in some disputes.

Disputes arose when the marketer returned bad quality liners to the producer, or refused to pay the full price. Some marketers informed or complained to the producer about poor quality goods. Some marketers simply ignored the problem and sold what they have got.

Some producers and installers took the initiative to modify the stove design to improve it and make it more attractive to the client. Men seemed to be more inclined to do this than women, with 62% men making changes compared with 33% of women producers. These adjustments included: adding clay at the junction with the pot rests, or above the door, to strengthen these vulnerable parts of the stove against cracks. Sometimes producers or installers widened the doors to allow more or bigger pieces of firewood to be used. This modification decreases stove efficiency, but makes it easier for the cook. Handles on portable stoves, or chimneys on fixed stoves were modified in some cases. With a chimney stove, the chimney goes out of the kitchen through the thatch, and has to be tall enough to prevent the thatch catching fire. It was observed that low roofs led to lower chimneys. Shelves were sometimes added under the chimney to allow the cook to smoke fish. Producers tended to respond to clients' wishes when adjusting the stove, which led to a higher acceptance of stoves. In some cases it may also have decreased stove efficiency, as in the case with the widened door; such modifications were discouraged by the project. Some of the innovations designed by the producers were encouraged by the project to achieve more consumer-friendly products while respecting stove efficiency.

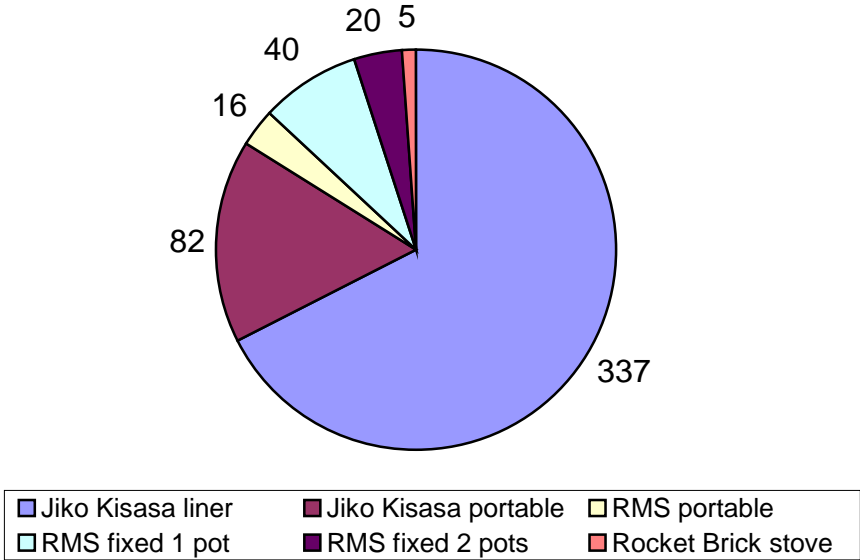
Most of the installers said they had modified the original stove design (71%) – both male (75%) and female (67%) producers. Unlike the producers, their modifications were mainly concerned with making the finished stove more beautiful through a nice design, to attract customers. Some used cement, when requested by the customer. Particularly in Central Cluster, clients wished to have the final finish on the stove done with cement to reduce maintenance work afterwards. Installers had to accede to the wishes of their customers to remain competitive.

4.2.5 Stove sales

4.2.1.1 Producers

All respondents said they kept records on the numbers of liners and stoves produced and sold. The project gave out a form which they filled in on a monthly basis to help them record their production and sales. Figure 4.2.19 illustrates the average number of different stove models produced.

Figure 4.2.19: Average number of stove models produced per producer per month



By far the most important model (in terms of number produced) was the Jiko Kisasa liner, with 337 pieces manufactured on average per month per producer. It was also the easiest model to produce, and was promoted strongly by the project from the beginning. Women could easily make it in or near their homestead whenever they had time. The second highest production figure was for the Portable Jiko Kisasa stove, with an average of 82 stoves produced per producer per month. The different rocket stove models achieved:

- Rocket Brick Stove - five stoves per month
- One-pot Rocket Mud stove - forty stoves per month.

The construction of these models was in its pilot phase in Transmara Cluster, and the figures should be read with caution. A more realistic picture will be available after one or two more years, when demand and production rate for these new stove models will be clearer.

Large variations were observed in individual production figures. Particularly among the Jiko Kisasa liner producers, there were 'small' producers and 'big' producers. Most producers of Jiko Kisasa liners produced around 100 to 200 liners per month. The three big producers produced 400 to 1000 liners per month (Table XII.5 in Annexe XII). This high level of Jiko Kisasa liners provided strong evidence for the stability of this business. The number of Rocket Mud stoves varied between five and twenty stoves per producer per month. The monthly number of portable stoves was between ten and fifty for the portable Jiko Kisasa, and between five and twenty for the portable Rocket Mud Stoves.

The reported average sales figures for stoves or liners sold per month were below the production figures, even though they showed the same trend. The Jiko Kisasa liner was the most popular (260 liners per month per producer), followed by the Portable Jiko Kisasa (60 stoves sold per month); least sold were various Rocket stoves (see Annex XII). The difference observed between production and sales figures might be due to producers stockpiling stoves and liners. Because sales figures provide direct information about producer incomes, these figures are a sensitive issue. It may be that producers provided lower sales figures to avoid consequences such as tax payments or other financial disadvantages. Despite these inconsistencies, the high average production levels for the Jiko Kisasa liner, and the relatively high average sales figures suggest that these are profitable businesses from which entrepreneurs can make a living, confirming the statements from one third of all producers.

Table 4.2.20: Distribution of prices per stove and model

Price In KSh	Jiko Kisasa liner	Portable Jiko Kisasa	RMS portable	RMS fixed 1 pot	RMS fixed 2 pots	Rocket Brick stove
100 – 150	5	-	-	-	-	-
151 – 200	2	-	1	-	-	-
200 – 250	1	-	1	3	1	-
More than 250	3	2	1	-	3	1

Prices for liners varied between 100 KSh and 250 KSh with a tendency towards higher prices in Transmara and Western Clusters, and lower prices in Central Cluster. The author observed that in Muranga District of Central Province, the number of producers was rather high, creating effective competition. In Transmara, there were only a few producers serving the market and they could ask higher prices. In Western District, the number of producers was rather high, but they were facing a big demand, allowing them to demand higher prices. For the Rocket mud stoves, the prices were more homogenous, varying between 200 KSh and 250 KSh for one pot stoves and between 250 KSh and 500 KSh for two pot stoves. The price for the Rocket brick stove can go up to 1,500 KSh.

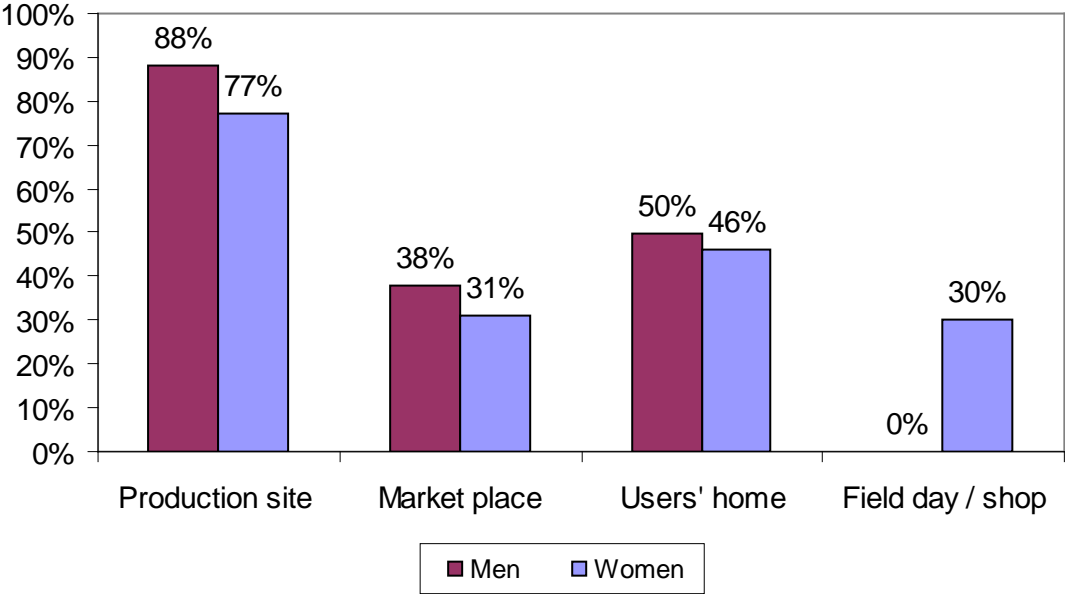
Two-thirds of male and female producers calculated their own labour costs when pricing liners and stoves. The majority of liner producers added up to 50 KSh per liner for their labour costs. One-third of them charged up to 100 KSh for labour costs. Most of Rocket Mud Stove producers added 150 KSh to 300 KSh for their own labour costs.

Almost all producers (91%) gave away a proportion of their stoves or liners for free. There were two main reasons for doing so: One third of respondents said it was to get rid of poor quality stoves or those with cracks – these were usually given to vulnerable groups like widows, those with HIV/AIDS, orphans or those living in extreme poverty (see Annex XII). The other main reason was in promoting stoves. Often these stoves were ones which could not be sold as they had cracks. This kind of promotion proved negative, and was discouraged by the project, although vulnerable groups had received improved stoves. For real stove promotion, stoves given away should always be of high quality.

Half the producers said they had given out up to 10 liners or stoves for free per producer. Some women had distributed between 11 and 30 stoves. Very few producers had distributed more than forty stoves or liners (see Annex XII). Men seemed to have given away fewer stoves than women. Compared with the number of stoves produced, the number of stoves given away for free was quite low.

Producers were asked where their products were sold. Fixed Rocket Mud Stove stoves had to be constructed in the customer's home. This links closely to the question of marketing channels for liners and portable stoves.

Figure 4.2.21: Distribution of selling point location, by gender (multiple answers)



The vast majority (82%) of producers sold their liners and stoves at the production site. This was, of course, the easiest option for them, as either the stove buyer, or more commonly the stove marketer, had to make the journey. Almost half of them sold stoves at the users' home, while installing the stove. About one third also sold their products at market. Other sale points, only mentioned by women producers, were on field days and through big shops. There was no big difference observed between the marketing channels for men and women. This finding may be because all the producers interviewed were working in groups, and most of the groups were mixed. A group will usually market stoves collectively.

Producers were asked about the number of liners and stoves they sold to different buyers. This question was asked to understand the importance of different marketing channels (Table 4.2.22). This table not only shows output per producer, but also the importance of sales to users and to marketers, as only a few producers sell to installers or to agricultural officers directly.

Table 4.2.22: Average number of liners and stoves sold per month to different buyers

	Sold to marketers	Sold to agricultural officers	Sold to installers	Sold to users
Average number	150	87	41	33
Number producers	15	6	10	19

Most producers sold their liners or stoves directly to the user (19 out of 22), followed by sales to marketers (15 out of 22 producers). Installers were an important group of buyers, serviced by almost half the producers. Some of the producers sold their liners to agricultural officers from the Ministry (6 out of 22) to whom liners were sold in large quantities. This reflects former times, when the 'Women and Energy Project' organised stove sales through Government extension services. During the recent study, government extension workers in some cases used their cars to collect liners from the producers and sold them for profit to installers or users in places they had to visit officially. The author's own observation

confirmed this practice, which was a source of complaint from other stove dealers, as it gave an unfair competitive market advantage to those with government vehicles.

The largest average numbers of liners and stoves were sold each month to marketers (150 stoves on average) who apparently ordered and bought large quantities. Behind them were agricultural officers who took rather large quantities in their duty vehicles (87 stoves on average). Stove installers were the third most important group, buying, on average, forty stoves. The producers themselves sold a modest quantity of liners or stoves directly to the users (33 on average).

Producers were asked for their earnings through stove production. This is a sensitive question and answers should not be taken literally. However, the results (Figure 4.2.23) showed a realistic trend, in line with other results on stove production.

Figure 4.2.23: Distribution of producers by monthly income from stove production, by gender



One third of stove producers said they earned up to 10,000 KSh per month with their stoves and liners. About half earned between 10,000 KSh and 20,000 KSh per month, and the remaining 20% earned more than 20,000 KSh per month. There were relatively more women in the lowest income group and more men in the highest income group. Within the social context, these incomes were considered quite good. The lower incomes for women reflected their lower production levels and time investments, due to their multiple other tasks.

Most stove producers, whatever their earning group, felt they made a reasonable profit from stove dealing (91%). All the men were of this opinion and 85% of the female producers. Overall, stove businesses can be considered good businesses. Two respondents, who stated that they did not make a reasonable profit, had continued their stove production in the hopes of better prices, larger sales volumes, and a modest increase in earnings in the future.

4.2.1.2 Installers

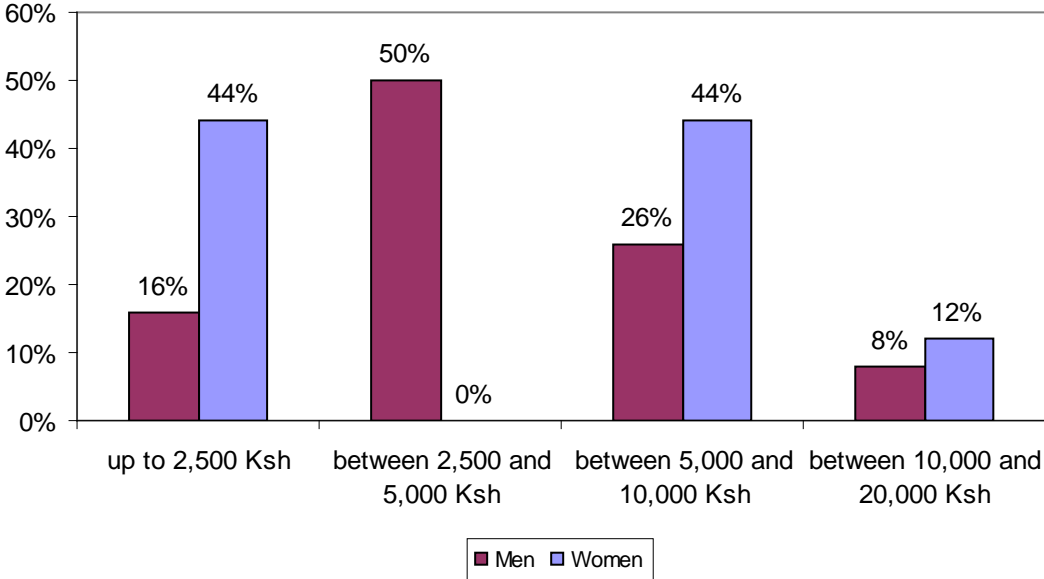
The price for installing a stove varied between 300 KSh and 600 KSh for an installation with the liner provided by the installer, and between 100 KSh and 300 KSh for the construction alone. Prices were not set by the project and had to be negotiated individually between the installer and his or her client. It is believed that increasing competition in this way influenced the price in some locations.

Half the men and almost half the women (44%) said that they sometimes installed stoves for free. They mainly did this for other family members or friends (60%), where the social structure did not allow them to take money for a service. Sometimes installers did it for a very poor or sick person (20%) whom the installer wanted to help. Finally, they may construct stoves for demonstration or marketing purposes, and these stoves were sometimes left for free in the home in which they were installed (20%). The estimated quantity of stoves constructed for free was rather small (below 5% of total production) for most of the respondents. Some installers quoted up to 10% or 15%, perhaps due to the social pressures to which they were exposed.

Stove installers were asked their monthly income through stove construction. In general, it appeared much lower than income earned by stove and liner producers.

The income figures varied from 2000 KSh to 12,000 KSh per individual per month, with an average income of 4750 KSh per month per person. The majority of men earned up to 5000 KSh, while almost half the women earned only up to 2500 KSh. Another group of female installers earned between 5000 KSh and 10,000 KSh and some even up to 20,000 KSh. As the income question is a sensitive one, it was not clear whether the installers really earned so much less than producers, or whether they were reluctant to give more realistic figures. There were reported cases to the project of monthly incomes up to 30,000 KSh.

Figure 4.2.24: Distribution of installers by monthly income from stove construction, by gender



When asked how they felt about their monthly income, almost all respondents said they achieved a reasonable profit from stove installation (95%).

4.2.1.3 Marketers

All marketers were linked directly to producer groups, from which they bought liners and stoves. Theoretically, Government officials (e.g. agricultural extension workers) were no longer necessary as intermediaries between producers and customers. They still represented an important group of buyers for the producers.

Apparently, men marketers purchased nearly three times as many Jiko Kisasa liners as women per month (140: 50 on average) and four times as many Portable Jiko Kisasas (42: 10 on average). They appeared to pay less per piece (140KSh versus 190KSh on average). Marketers were observed, by the author, to buy liners in big quantities from producers and

thus get wholesale prices which varied from 120KSh to 150KSh. They sold the liners to customers at around 200 KSh.

Table 4.2.25: Distribution of marketers by quantity, and prices of liners and stoves bought per month, by gender

	Jiko Kisasa liners per month	Amount paid for Jiko Kisasa liner	Portable Kisasas month	Jiko per	Amount paid for Portable Jiko Kisasa
Male Minimum	30	100	10		120
Maximum	500	170	150		600
Mean	140	140	42		470
Female Minimum	20	150	10		0
Maximum	110	370	10		0
Mean	50	190	10		0
Total Minimum	20	100	10		0
Maximum	500	370	150		600
Mean	102	162	37		387

All marketers kept records on their sales. The average sales figures given during the interviews were below the number of liners and stoves purchased from the producers. This may have been due to the sensitivity of the question, but could also be due to them stockpiling stoves and liners.

The average sales figures were 100 liners and stoves for the male marketers and 41 liners and stoves for the female marketers (Annex XII). There were big quantity of stoves and liners sold varied considerably between different marketers. Two of the five men sold between 100 and 300 stoves per month, while the other three sold only between 15 and 60 stoves per month. Similarly, one woman sold 100 stoves per month, while the other four women sold between 10 and 50 stoves per month.

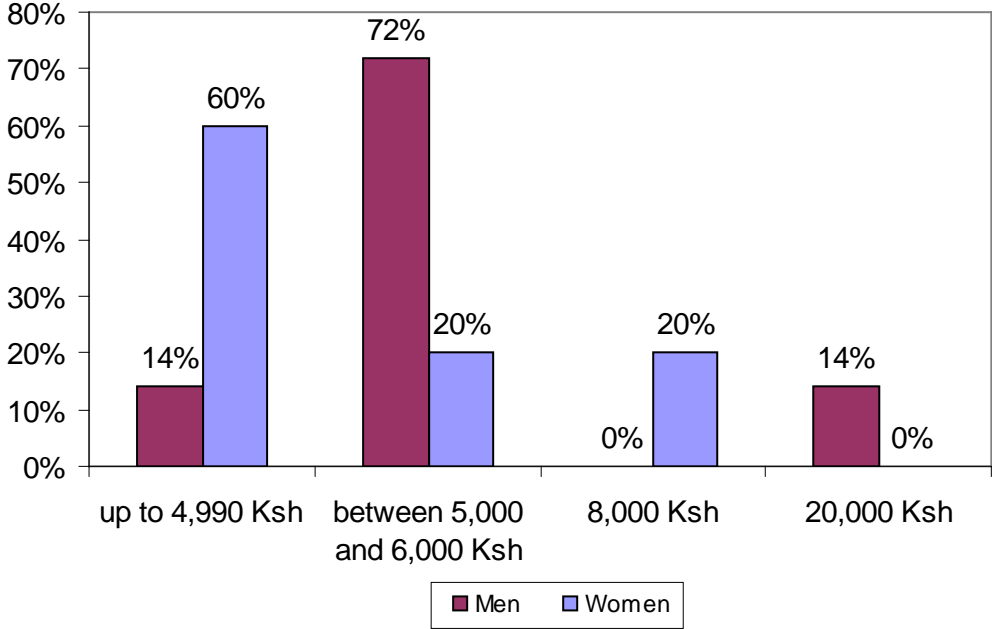
The price of the Jiko Kisasa liners ranged between 200 KSh and 300 KSh per piece, with most liners selling at 250 KSh, followed by 200 KSh. The authors can confirm these prices. The prices for the Portable Jiko Kisasa varied between 450 KSh and 1000 KSh, with an average price of 650 KSh.

One third of stove marketers said they handed out stoves for free. Men were more likely to do this (43%) than women (20%). They mainly gave them for free out of compassion, to those living in poverty, widows or disabled people. One man said he used free samples to promote good quality stoves. The number of stoves or liners given for free was very low. Respondents said that it was not more than 3% of their goods. It is not common for business people like marketers to hand out their products for free.

Almost all marketers said that they sold liners and stoves both inside and outside their own location. Their range of operation, for the majority, was the district in which they lived. One male marketer also visited neighbouring districts to sell his products. The quantity sold outside their own location varied from just a couple of stoves to up to 400 stoves. Male marketers tended to sell more stoves (100 stoves average) than the women (25 stoves average). Women travelled from 15 km to 50 km, and men travelled from 10km to 300 km to market their stoves. The author observed that men can travel more easily to far destinations than women, who have numerous family obligations at home. The transport costs corresponded to the distance and were between 5 KSh to 40 KSh per liner.

The income generated through the sales of liners and stoves varied from 1500 KSh to 20,000 KSh, which corresponded to the very large variations in the number of goods sold.

Figure 4.2.26: Distribution of marketers and monthly income from stove construction

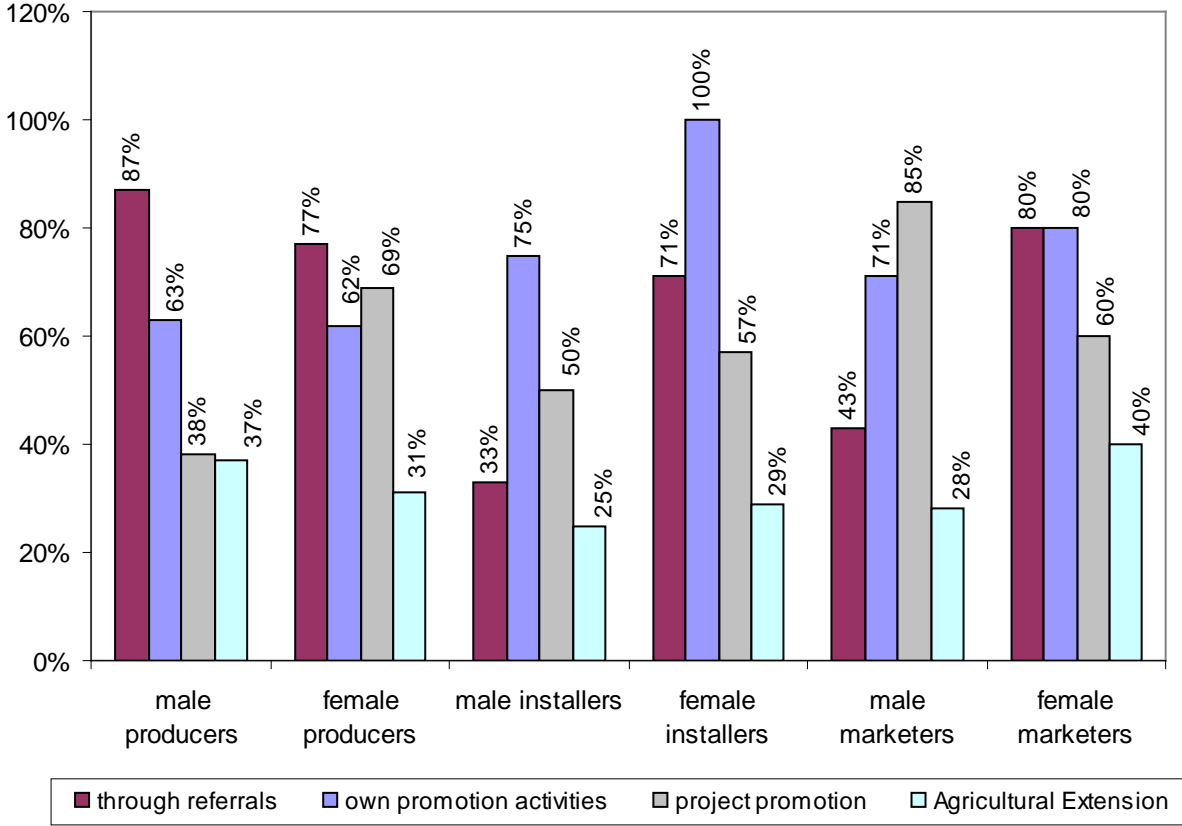


The vast majority of people selling portable stoves and liners earned between 2500 KSh and 6000 KSh per month. Unless the figures given by the respondents were wrong, dealing with stoves in this way was not as profitable as stove production. Among the marketers, there were more women in the lowest income category than men. Unlike the installers and producers, 25% of marketers said that they did not earn reasonable profit from stove dealing.

4.2.6 Promotion of stoves

Clients who buy liners and stoves are vital for all stove dealers to survive in their business. In the early days of the project, stoves were promoted through advertisements on the radio, and during field days at *barazas* (public meetings), hosted by the partner Ministry. Stove dealers have gradually taken over this part of the value chain, thus promoting a sustainable consumer market.

Figure 4.2.27: Distribution of stove dealers by promotion methods and by gender



The promotional work done by the stove dealers themselves played an important role in reaching clients. Female installers and female marketers in particular considered this to be an important source of clients. There were many ways in which they promoted their goods: *barazas*, church meetings and women's group meetings were the most common occasions used by the producers. Field days and house-to-house marketing were less often adopted. The installers felt that house-to-house marketing was an important promotion activity, together with attending church meetings, funerals and *barazas*. Very few mentioned displaying their liners at public markets, or inviting people to come to their home and see the stoves. Marketers used similar approaches: field days and *barazas*, church meetings and other social meetings, house-to-house visits, going to the home of potential clients, and displaying their products in shops and public market places.

The second most important way in which stove dealers found new clients was from referrals from satisfied clients who passed on their views about the stove and where to buy it. Producers, both female and male, reported that recommendations were the most important source for clients. Male installers and male marketers did not consider referrals very important compared to their own promotion activities and project promotion. As they were very new in stove business, they might not have achieved a sufficient number of clients to recommend them. Their female counterparts felt that referrals were very important.

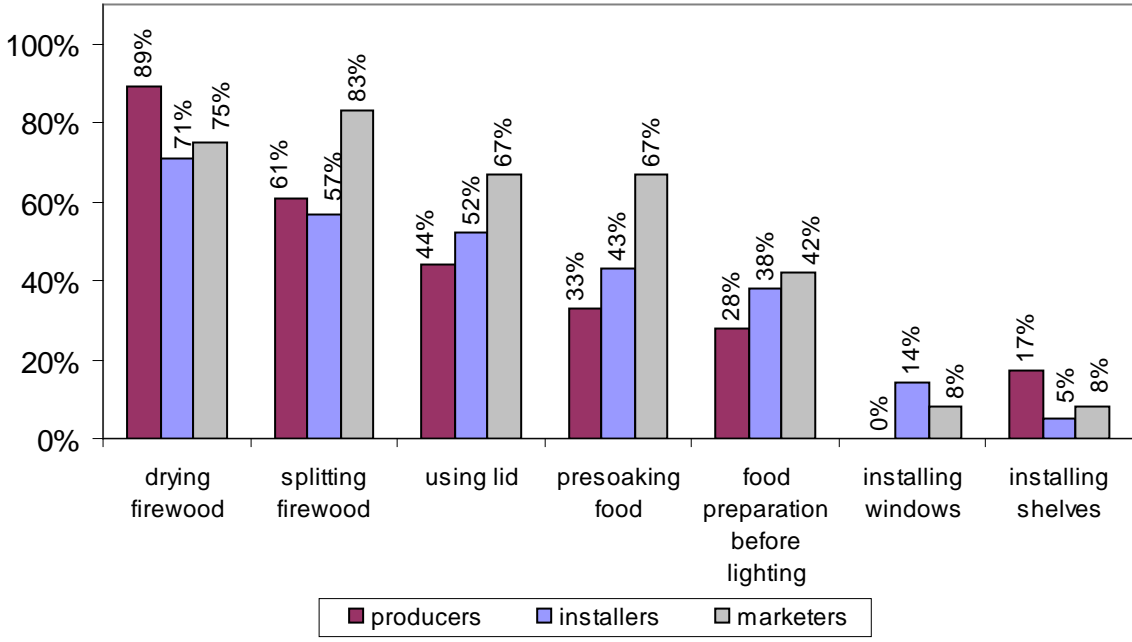
Stove dealers felt that the promotion activities conducted by the project were the third most important way of getting new clients. Marketers particularly considered that project promotion was important for their businesses. Producers stated that *barazas*, field days, or promotions close to their premises showed immediate results. Posters, signposts and radio/TV programmes were rarely mentioned. Marketers suggested that demonstration events and information desks organised by the project, as well as field days, had a positive influence.

Comparatively little importance was given to the activities of the agricultural extension staff, who organised field days every now and then. Some of them had bought liners directly from the producers and sold them for personal profit to villagers in the areas in which they were working. This activity was disapproved of by the project. During the first 'Women and Energy Project', Government services were the main actors in stove dissemination and promotion. The minor importance that extension services have today in the promotion of stoves and liners is a good indicator of their successful replacement by market players themselves.

The project published a leaflet on the ICS with guidelines on how to use the stoves properly. This 'user manual' was distributed to stove dealers to hand out to their customers. Only 20% of producers said that they had distributed this manual to their clients. This was partly explained by the fact that their main clients were not the users of the stoves, but marketers and agricultural extension officers. The project also distributed leaflets to those producers who were marketing the liners directly, and installing them. Installers and marketers were provided with the user manuals from the project for as long as they are available. Among this group, 42% of installers and 50% of marketers distributed the leaflets to their customers.

During their training, stove dealers had been taught to provide information on good cooking practices to the stove users when servicing them. Most of them said they had provided this information to the users.

Figure 4.2.28: Advice given on good cooking practices by stove dealers



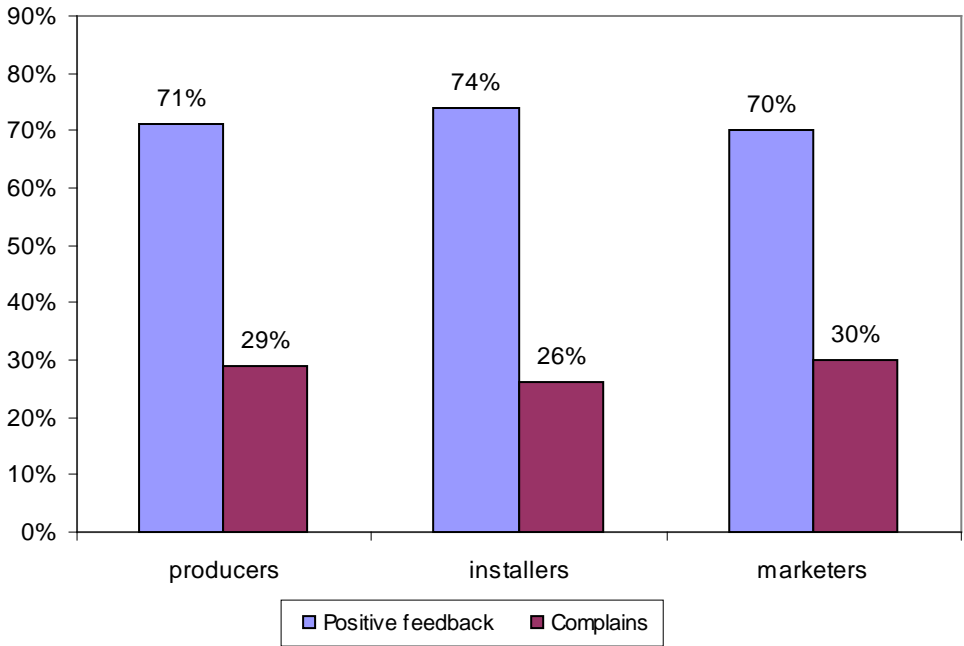
The survey looked at six out of ten of the most important cooking habits promoted by the project (Annexe XIII) along with two further practices; air circulation in the kitchen, and the installation of shelves for feeding in the wood in the Rocket Mud Stove.

The main advice given by stove dealers to stove users was on firewood preparation: the majority of stove dealers recommended drying and splitting of firewood as the most important factor influencing the efficiency of the ICS. Half the dealers recommended using a lid while cooking and pre-soaking the food (beans) before cooking. One third of them mentioned that the fire should only be lit when the food was completely prepared, ready for cooking. Very few bothered to talk to their clients about airflow in the kitchen or about the importance of the firewood shelf on the Rocket Mud Stove. Only one respondent mentioned regular maintenance of the stove to maintain its efficiency.

The answers given by the various different stove dealers showed that producers concentrated their recommendations mainly on cooking practices. Installers, and in particular marketers, gave more recommendations on other aspects as well. This may be because they are in more frequent contact with users.

Through contact with their clients, stove dealers found out what users thought of their stoves. More than 90% of all stove dealers indicated that their clients had given them feedback on the quality of the stoves.

Figure 4.2.29: Feedback given by customers on the quality of stoves



Most of the feedback given by clients was very positive. They talked about the advantages of the ICS compared to the three-stone-fire, the good performance of the stove and its nice design. Often, the positive feedback was coupled with new orders to the producers. The users commented that the stove quality had improved. Previous complaints used to be about breakages of stoves or liners during transport, and about poor quality. Stove dealers can now be contacted more easily so they can deal with complaints. It appears that vast majority of stove customers are satisfied with the stoves and liners they receive.

4.3 Results from the restaurant survey

Sixteen restaurant owners were interviewed to find out their views on the commercial use of improved stoves; seven of them were small indoor restaurants, five were larger restaurants and four were bakeries. Indoor restaurants, in this context, meant that the customers were seated inside, while the cooking was done inside or outside the restaurant.

4.3.1 General information on restaurants

All but one of the restaurants were open throughout the day, which is typical of most restaurants based in commercial districts or market places, serving people who came into town for various reasons. The majority of them were open seven days per week (62%) while the remaining 31% worked six days per week.

The small indoor restaurants and the bakeries employed one to five permanent workers; half of them managed their business with three or less employees. The big restaurants had eleven or twelve employees. Some employed occasional workers in addition to the permanent staff.

Most restaurants served more than three different types of meals. The following dishes were found:

Table 4.3.1: Distribution of meals served in the restaurants

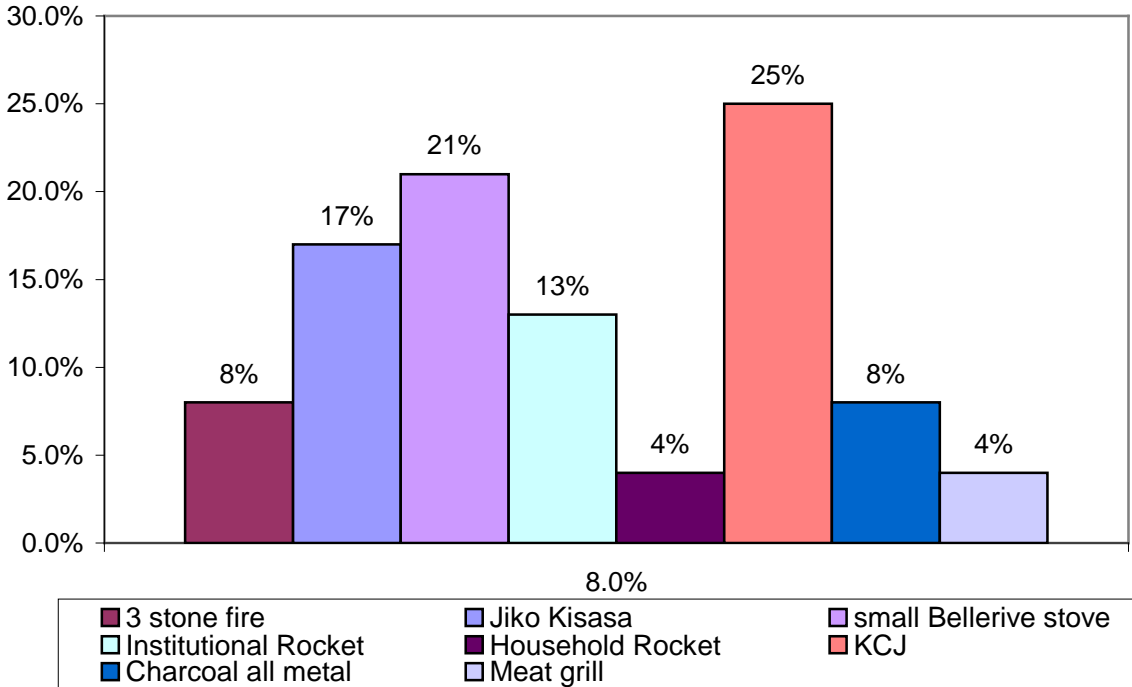
Type of food	Percentage	Type of food	percentage
Meat	75%	Rice	44%
Chapatti	69%	Samosa	38%
Tea and coffee	63%	Omelette	31%
Ugali (maize)	63%	Beans and maize	31%
Breakfast	56%	Mandazi (cake)	25%
Vegetables	56%	Bean stew	19%
Soup	44%	Chips	13%

More than half the restaurants offered meat, chapatti, ugali, vegetables, tea and coffee as well as breakfast. These seemed to be the dishes that were most in demand. Rice and soup were prepared in more than 40% of the restaurants. Between 25% and 38% of the restaurants prepared small food items like mandazi (a doughnut-like pastry), omelettes, samosas, beans and maize. Less than 20% served items such as bean stew or chips. Even the small restaurants responded to the preference of their clients in the variety of dishes they offered. A few restaurants offered very specific dishes such as chips.

4.3.2 Stove information

The restaurants used a variety of stoves. On average, each restaurant used 2.6 stoves, with the bigger restaurants having 3.9 stoves available, and the small ones 1.4 stoves. The bakeries had one or two (improved) ovens, generally Rocket-type ovens. Other types found were the Bellerive oven and the Jua Kali grill.

Figure 4.3.2: Distribution of stoves seen in restaurants



The stove found most frequently in the restaurants was the Kenyan Ceramic Jiko (25%), followed by the small Bellerive stove (21%), the Jiko Kisasa (17%) and the institutional Rocket stove (13%). Only 8% of the stoves were three-stone-fireplaces. This illustrates that restaurants understood the economic benefits of using all types of improved stoves, and soon abandoned the traditional three-stone-fire. The necessity of preparing different type of meals did not appear to represent an obstacle to the adoption of improved woodfuel or charcoal stoves.

The large restaurants mainly used the KCJ (46%) and the Rocket stove (31%), with a small number used of Bellerive stoves (23%). The small restaurants mainly use the Jiko Kisasa (33%) and the charcoal all metal stove (30%). They owned other types of improved stoves in smaller numbers, such as the KCJ, the small Bellerive stove and the Rocket stove.

Most restaurants and bakeries (86%) used all their stoves and ovens every day. This confirmed the fact that existing stoves are suitable for cooking the dishes listed in Table 4.3.1.

Restaurant owners bought improved stoves at the usual market prices. The bigger restaurants used more solid and expensive types of ICS (Rocket stoves). The Rocket stove one pot, built in bricks, is more expensive (15,000 KSh) than rocket mud stove two pots (10,000 KSh).

The age of the stoves varied between two months and three years, with 70% of stoves less than a year old, or less. Half the stoves were between six and twelve months old. Most of the improved cooking stoves were in good condition (80%) which may be because they were all fairly new. The remaining 20% had cracks on the body, or were a bad condition; broken chimneys and worn out shelves. One owner of a poor stove said that the condition of the stove affected its efficiency, whilst another said there was no change. The sample size was too small to draw any conclusions.

Table: Regular maintenance of ICS and improved ovens

Regular maintenance					
Small restaurants		Big restaurants		Bakeries	
Yes	No	Yes	No	Yes	No
50%	50%	100%	-	100%	-

The majority of the restaurant owners (73%) interviewed said that they regularly maintained their stoves. This indicated an interest and concern for the good performance of their ICS. Around 27% of all owners (comprising half the small restaurant owners) said they did not maintain their stoves regularly because their stoves were still new.

Only two restaurants owners had replaced a stove; one because of the worn out metal on his institutional two-pot Rocket stove, and the other had changed his KCJ for a firewood stove because of the increasing price of charcoal. Most of the stoves were less than a year old, and their lifespan is set at between five and seven years. One restaurant stove and none of the bakery ovens had been replaced, so no conclusions could be drawn about the desirability of stoves based on this data.

4.3.3 Cooking practices

All restaurant owners interviewed cooked inside, while one third of the small restaurants also cooked outside. Bakeries worked more often outside than inside.

Table 4.3.4: Where cooking is done

Where cooking takes place					
Small restaurants		Big restaurants		Bakeries	
Inside	Outside	Inside	Outside	Inside	Outside
100%	29%	100%	0%	25%	75%

Table 4.3.4 suggests that 17% of all the restaurants interviewed cooked both inside and outside. The big restaurants cooked exclusively inside the kitchen. This explains why all the bigger restaurant owners stress the important benefit of smoke reduction using the ICS in the kitchen. Three bakeries had their ovens installed outside (with a roof on top) while the fourth bakery was used indoors.

According to restaurants and bakery owners, 60% of the cooks using improved stoves got information on good cooking practices, enabling them to use the stoves with optimal efficiency. This percentage was highest among small restaurants (83%) and lowest among bakeries (25%). About 40% of productive users did not provide their cooks with information. The reasons for this need further investigation.

In most cases (6 out of 7), information on good cooking practices was given to the cooks by the stove producer, installer or sales person. Only in one case did the owner of the restaurant demonstrate proper cooking practices to the cooks. This suggested that most stoves were built with the cook and kitchen staff present, and that they received advice on good cooking practices during installation. There is apparently no special 'training' given to stove users. The project did not undertake any promotion about cooking practices on TV or radio. Stove dealers seemed to be the only ones that disseminating the information they were taught during the training that they had been given during the project.

Table 4.3.5: Good cooking practices mentioned by restaurant owners

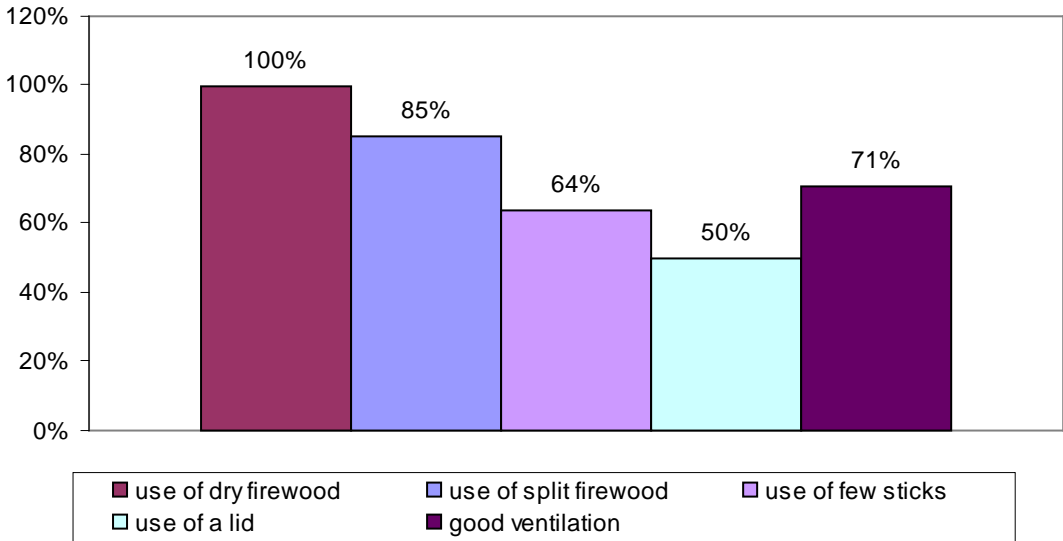
Cooking practice	Percentage	Cooking practice	Percentage
Cover saucepan with lid	44%	Prepare food before lighting fire	11%
Use of dry and split firewood	33%	Lighting only when needed	11%
Use of few sticks when cooking	33%	Closing door of stove	11%
Regular cleaning of chimney	33%	Pre-soaking of beans	11%
Day to day removal of ash	11%		

The commercial respondents stated that the most commonly recommended cooking practices comprised:

- Covering pots with lids (or banana leaves) while cooking
- Using dry and split firewood
- Using only a few sticks
- Cleaning the chimney (for the Bellerive stove)
- Some practices mentioned by one or two respondents included:
- Closing the stove door
- Preparing food before lightning the fire
- Lighting the fire only when needed for cooking
- Pre-soaking beans.

Some of these practices influenced stove performance (e.g. cleaning the chimney), while others saved firewood (e.g. use of dry wood), and cooking time (e.g. pre-soaking beans). These ideas help when using both improved stoves or unimproved stoves.

Figure 4.3.6: Good cooking practices observed during interview



In general, the evaluation group noted that most people adopted good cooking practices. All the restaurants preparing food at the time of the interview were using dry firewood. Even in Central Province, where there was a lot of rain during that period, restaurants had dry firewood. This suggests that the important effect that drying fuel has on fuel consumption had been recognised, and efforts had been made to have dry firewood always to hand. Three quarters of the small restaurants (86%) used split firewood, but only 20% of the bigger restaurants did so. The majority had good ventilation (80% of big and 57% of small

restaurants). About half the pots being used for cooking were covered by a lid, reducing cooking time and firewood consumption.

In line with the observed application of good cooking practices is the observation of smokeless kitchens. Most productive users preparing food during the interview (86%) had no visible smoke in their kitchen. In two restaurants (14%) the interviewers observed smoke. These restaurants belonged to the small indoor group.

4.3.4 Firewood consumption

All restaurant owners confirmed that using an ICS for cooking saved fuelwood. It was difficult to determine the average fuelwood saved in kilograms as the answers given did not seem plausible. The owners assessed the money they saved, as shown in Table 4.3.7.

Table 4.3.7: Average amount of money saved on firewood with ICS

Productive user	Average amount of money saved (KSh)	
	Per day	Per week
Small indoor restaurant	105 KSh	1,143 KSh
Big indoor restaurant	800 KSh	1,667 KSh

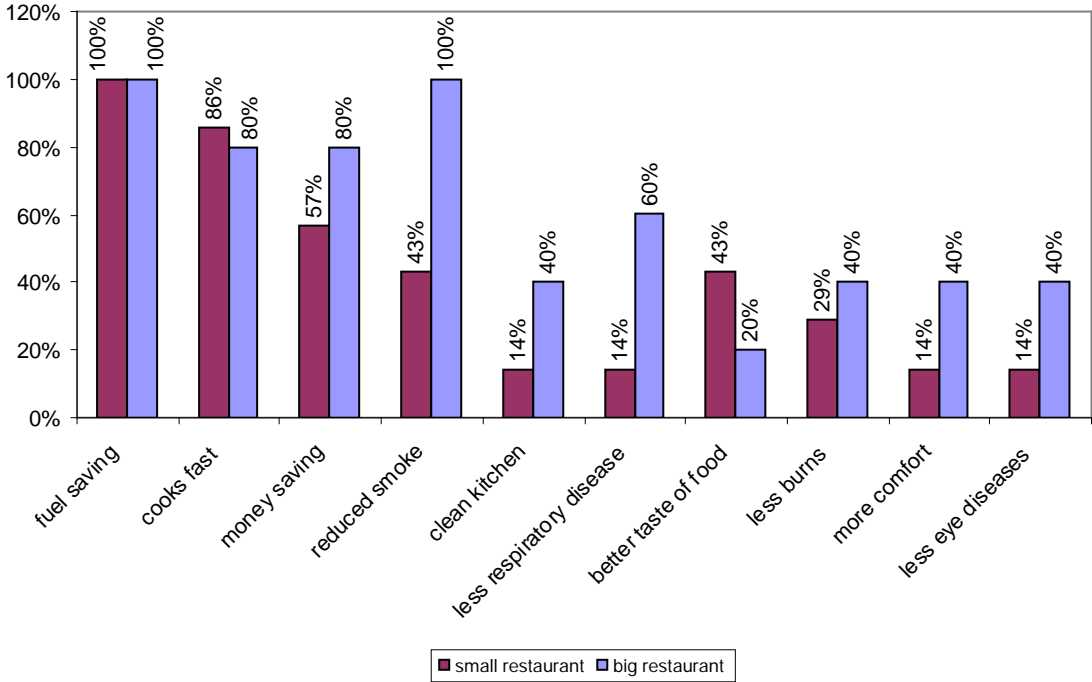
Unfortunately, even these figures are not very consistent as the daily saving rates don't correspond to the weekly amounts. On average, small restaurants saved about 100 KSh per day for firewood – about 1150 KSh per week. Bigger restaurants claimed to have saved on average 800 KSh per day for firewood or 1,600 KSh per week. These differences could, in part, be due to different prices for firewood. Depending on its availability, prices for fuelwood vary from one place to another. Bigger restaurants use more stoves than small restaurants; hence the higher rate of daily savings. Realistic figures, however, in terms of wood saved in quantity and money spent can only be obtained through a kitchen performance test in the restaurants. It seems clear that realistic figures cannot be obtained through questionnaires, but only through measuring the actual fuelwood consumption

Restaurant owners were asked what they did with the money they saved through using an ICS. Most replied that the money saved was reinvested in the business. One person had improved the workers' wages and another had used the money on personal expenses.

4.3.5 Opinions about ICS

All restaurant owners said that saving money was the most important aspect of using the ICS. They could run their businesses for less, if they spent less on fuel.

Figure 4.3.8: Advantages of ICS as seen by productive users



The second most important advantage given by the productive users was that food could be cooked more quickly on the improved stoves (83%). Around 80% of the big restaurants and 57% of small restaurants said that they saved money through needing less fuelwood. The big restaurants (100%) mentioned the major benefits of smoke reduction; less respiratory diseases, less burns and accidents. A third of the interviewees mentioned better tasting food. A fifth of all restaurant owners noted less eye disease, the improved level of cleanness in the kitchen, and more comfort.

The four bakery owners identified fuelwood saving as the most important advantage. Two of them mentioned money saving, and improved levels of cleanness in the bakery. One noted the reduction of smoke and another noted the reduction in respiratory diseases.

While large and small restaurant owners broadly agree about the advantages of an ICS in terms of wood savings and faster cooking, there are differences when it comes to smoke reduction. All the big restaurants noted the change, but only a few small restaurants. It may be because big restaurants often have the kitchen linked to the dining area and, if the entire area is affected, they might lose clients, so it is very important for them to reduce the smoke from the stoves. Bigger restaurants might be interested in fulfilling public health standards by minimising the smoke. Small restaurants cook well away from the dining areas. Because of this separation, they do not need to worry about smoke from the stoves affecting their customers. Other advantages linked to smoke reduction (such as less respiratory diseases), money-saving and improved levels of comfort were more often identified by the big restaurant owners.

Table 4.3.9: Single most important advantage of ICS

Productive user	<i>Fuel saving</i>	Cooks fast	Less smoke	Saves money
Restaurants	50%	25%	8%	17%
Bakeries	67%	0%	0%	33%

More than half the respondents selected 'fuel saving' as the single most important advantage. Together with 'money saving' it represented the most important advantage for all

bakery owners and the majority of restaurant owners. A quarter of restaurant owners selected 'Fast cooking' as a single most important advantage. Smoke reduction played a minor role in selecting the most outstanding advantage of an ICS. This shows clearly, that the economic advantages are predominant for the commercial users.

When asked for any disadvantages, most productive end-users were not aware of any inconvenience with the ICS (83%). Those who complained mentioned the difficulty in using wet firewood with an ICS, the necessity of maintenance, and the chimney clogging.

Source of information on ICS

The restaurant and bakery owners identified stove dealers as the most important source of information on improved stoves.

Table 4.3.10: Initial source of information on ICS

Producers	Installers	Neighbours, friends	NGO /GTZ project	Brochure, leaflets etc.	Public meetings	Other
36%	22%	14%	14%	14%	7%	22%

Neighbours, family members and friends, the GTZ stove project or NGOs, brochures and leaflets on stoves were less-frequently quoted as sources of information. Public meetings and field days played a minor role, as did other sources, such as customers or marketing groups. Nobody mentioned the radio or TV as a source of first information on ICS. This confirmed that by far the most important dissemination route for information on ICS to commercial users (restaurants and bakeries) were the producers and installers. This group had commercial interests in letting potential clients know about the advantages of improved stoves.

4.4 Results from the focus group discussions among women

Women's perceptions on factors influencing their livelihoods were clear and comprehensive. It is difficult to represent in detail the very rich discussions that took place among the women during the focus group meetings. The examples provided highlight aspects which were common to all participants under similar circumstances and give an insight into the complexity of the lives of rural people in Western Kenya.

4.4.1 Trend Analysis

Those who lived in rural areas and eked out a living from agricultural production, depended heavily on natural resources and on the climate. This was clearly seen in the 'Trend Analysis' discussed in this section that covered a period of five years. There are four dimensions of poverty defined by DFID, and comprising:

- living standards
- access to resources (firewood)
- women's and girls knowledge
- and rights and power for women

These have developed in different ways for each dimension and for each socio-economic group (DFID 1995).

Living standards

• Agricultural yield

This is one of the most important criteria influencing living standards. It depends most of all on adequate and well distributed rainfall. Transmara Cluster in Kisii Central experienced good rainfall in 2003, and very good yields were achieved.

Affordable fertilizers and good quality seeds are needed for a successful harvest. In 2006 and 2007, agricultural production decreased because of insufficient access to fertilizers and good quality seeds, even though rainfall was sufficient.

Insects and pests can wreak havoc. The maize streak virus in 2004 reduced the quantity of food harvested, and strong winds may have blown down the maize and led to the maize heads being destroyed. Finally, reduction in field size as a result of sub-division also lowered outputs.

- *Family income*

A good yield for agricultural production needs to be matched by product prices that would give the producer a profit. Although there were very good yields in 2003 in Kisii Central, these were followed by low prices for agricultural products, resulting in very low incomes, as there was a glut in the market. Families were forced to sell much of their produce early in the season to earn sufficient cash. Few had stocks left when prices went up later on. Conversely, in 2004, yields were lower and market prices for agricultural products went up, providing better profits on each product.

When cash income is low and prices for other market commodities rise, it becomes difficult for the families to buy what they need. This aggravates the situation and is effectively the same as a decline in their income level.

Women's' income is seen as a contribution to the family's income, which traditionally has to be provided by the husband. Women improve their income by optimal use of their kitchen gardens through diversification, pooling their resources with other women for income generating activities, and by small business activities.

The health of women and children is primarily influenced by the availability of food. Whenever yields are high enough to provide plenty of food for the family, and surplus can be sold to purchase additional food, the influence on health is very positive. Households with enough money can buy necessary medication; creating another positive effect on health. In 2005, the health situation was improved, despite low crop yields and low incomes, by the Public Health Services supplying mosquito nets for free, and spraying homesteads and mosquito breeding places.

Women are well aware that a balanced diet maintains good health. Whenever diseases appear and no money is available for drugs, the health of the family deteriorates. This situation is often compounded by insufficient food, low income and high prices for commodities. Family health can deteriorate from one year to another; or improve with the economic situation. In 2007, women attributed the observed general improvement in their health to the improved cooking environment created by using ICS. In a similar way they noted that water borne diseases decreased when springs were protected.

Clothing depends on the economic situation of the family and will vary from one year to another according to; how well the crops have grown, the family income, and market prices for commodities. Most women said that they bought second-hand clothes, which can be found all over the region.

When food is in short supply, and when people are on very low incomes, no money is spent on clothes. Women belonging to the 'poor' focus group stressed that they did not even think of buying clothes during the drought period in 2003. The priority was to get food first, with the children preferring to use money for food instead of attending school regularly. Whenever money allowed, the women bought some clothes. For example, in 2005, when primary education became free, women in Kisii saved some money for clothes, despite their low incomes and the relatively high market prices for commodities.

Housing conditions depend on the overall financial situation of the families. Poor families live in grass-thatched dwellings. When the grass is grown a long distance from the dwellings, some houses are left with leaking roofs. Smearing the houses with mud will depend on the availability of mud at a reasonable distance, and at a low price. In difficult years, no money is spent buying mud to make the house more attractive.

When people get more money than is needed for food, health and clothing, they may buy iron sheets to replace thatched roofs. When the market price for iron sheets goes up, the number of families being able to afford this improvement for their houses goes down immediately. Similarly, when trees are scarce, the market price of timber rises. With increasing scarcity leading to higher market prices over the past years, it has become more difficult for families to build decent houses.

- *Access to resources*

During this survey, women discussed two key resources; firewood and land for planting trees. Access to these two resources, which are vital for cooking energy, depended largely on the local situation. But overall availability of firewood resources has gone down everywhere as described in the following examples.

Example 1 – Kisii Central

In 2003, the women in Kisii Central found plenty of firewood, as there was a lot of communal land and firewood could be collected by anybody without restriction. In addition, they obtained firewood from numerous bushes and thickets in the area. The idea of planting trees was not important to them as there was an abundance of existing trees. In 2004, tea factories in the area started to buy firewood for their operations, and the Kenya Power Company bought poles for the electric lines. Firewood was still available, but it was not so abundant as before. This trend increased in the following year, and the swampy areas with some trees and shrubs on which women depended were being closed off to them. Access to land for planting trees went down further as land needed to be subdivided to provide for the increasing population. At this point, the need for planting trees was realised by some women, but conflicts over planting trees on boundaries arose, and this prevented them from planting. This situation continued into 2006. The swampy area was drained for farming, and a brick-making business moved in. Tea was planted on hill-tops replacing the trees that had grown there, and people were restricted from planting eucalyptus along the riverside. Access to firewood continued to deteriorate in 2007 as the industrial demand for fuelwood soared, and land for planting trees diminished.

Example 2 – Bomet Central

The women of Bomet Central considered access to firewood limited from the very beginning. By 2003, women were already buying wood from distant places, and paying with their own money, rather than money that they would expect to get from their husbands. Those who could not afford to buy fuel collected Mauritius thorn, or stole tea bush prunings to supplement the maize cobs they burned. There was very little land they could access to plant trees. In 2004, they were allowed to plant some trees on the family land. Despite this, access to firewood remained difficult; they were prevented by the men from using the wood of the family fields, which they sold to pay school fees for children. In 2005, access to firewood remained a problem for the women. Although the men would ask for cooked food, they did not take any interest on how the women could find the firewood. By 2006, the men started felling the trees to sell without allowing the women to use even the twigs. Women were only allowed to prune fruit trees like avocados. Next, the men began felling the avocado trees to sell to the tea factories. The women could see no future hope in 2007 as lack of money forced the men to sell all the trees to the tea factories. Women provided the labour for planting eucalyptus trees, in return for later being allowed to use the twigs when the trees were felled.

The evaluation found that women in the medium poor groups felt that they had reasonable access to firewood and land for tree planting in 2003, while the women of the poor groups

found resources limited from the beginning. People living in the Central Cluster mentioned that they did not possess any land and lived in rented houses. The subdivision of land had led to such small sizes of family farms that no further division was possible, leaving some children without any land heritage.

Even though economically vulnerable groups had been affected by land scarcity for a longer time, everyone was noting that access to land had decreased over the past years. The women mentioned two main factors repeatedly: the increasing population growth, and the effects of agro-business. In Western Cluster, the big sugarcane plantations required huge land clearing operations which added to the 'natural' pressure on land resources caused by the increasing population. Agro-businesses like the tea factories were major firewood consumers, continuously increasing pressure on the natural resources. Even fruit trees and culturally conserved species of trees, like Mugumo, Ndira muubu and Mukuyu in Central region were cut down. The introduction of power saws speeded up this process. The Government ban on felling trees in 2006 could not reverse the trend.

- *Knowledge*

Access to knowledge has had a major influence on poverty. During the focus group discussions, women were asked about girls' education and skills for women. Most women felt that things were improving overall in both areas, particularly the development of skills among the women themselves.

The education of girls was discussed in two parts: the possibility for girls to get formal education, and the effect of education on girls' behaviour. In 2004, families were encouraged to send girls to school through the Free Primary Education Programme, leading to the same provision for the education of girls as boys. Women from the 'poor' groups mentioned that the restricting factor for girls was the need to pay school fees, especially when living costs rose. The Government's decision to make primary school education free, and to ensure that the local administration complied with this decision, has helped to reduce this obstacle. This change was accompanied by Government, NGOs and CBOs highlighting equal rights for girls, which has contributed to changing the attitudes of parents. The Western Cluster group discussed how they now take girls' education seriously. Reducing many of the chores traditionally done by girls, like fetching water, cooking and house cleaning, and sharing these tasks with other family members, has helped further. Many women argued that the workload for girls is still higher than for boys. Some women noted that it has become more difficult to find home helps and maids since girls started attending school more in recent years.

The groups felt that improved education possibilities for girls had not necessarily resulted in girls being better educated. In Kisii, women pointed out that girls used to be obedient to parents, and that they used not wear the sort of clothes that their parents and the community found distasteful. Gradually, girls had become ruder to their parents, sneaked away from home to enjoy themselves in idleness, and in some cases behaved immorally. Early pregnancies and contraction of STDs had become more frequent, leading to increased drop out rates from school. Some women noted that nowadays girls contracted HIV/AIDS. In most discussions, discontent was expressed concerning the poor results of girls' education due to overcrowded classes and higher dropout rates. Few girls followed secondary education or attended University.

By contrast, the groups felt unanimously that skills-training for women had improved over the years. In 2003, many women did not belong to organised groups, and they considered that their skills at the time were not well-developed. When some women started to attend barazas (public gatherings), field days, seminars and other meetings, they gained knowledge and skills, which they shared with other women. They felt that the Government directive on gender equity in 2005 helped them to participate in forums. Men began to allow them to attend meetings. Projects from the Government, NGOs, religious-based organisations, and

civil society, increasingly addressed women and trained them on topics varying from agriculture and livestock, financial management skills, education, nutrition, to family planning and health care. More skills were acquired through the local language radio station, church gatherings, and visits outside their area. In 2007, some women in Bungoma became trainers, and continue to provide new knowledge to other women.

Groups were created among women to facilitate passing on new skills. In Muranga, welfare groups (*mighiti*) were set up to assist each other during sickness and funerals. Women from 'poor' groups, as in Muranga, repeatedly mentioned that in the past, they had not had time to devote in such meetings and seminars. But with the village chief insisting on their participation and realising the benefit of new skills for their day to day life, they increasingly availed themselves of these opportunities.

- *Rights and power*

Women felt that their access to rights and their decision-making power had increased. Throughout the survey area, discussions in women's groups revealed their increasing participation in community meetings and decision-making, promoted by the same Government Policy on Gender Equity and various projects and initiatives from Government to Civil Society.

Women did not participate very much in village meetings in 2003, where mainly men attended such gatherings. Women from Vihiga, for example, did not feel it was necessary to attend such meetings, as most meetings dealt with conflict resolution between families, and cases of theft. Women from Kisii explained that at that time they were too shy to go to public meetings and that they had no time because of the heavy workloads at home. In Bungoma, women pointed out that culturally they were supposed only to be seen and not heard, so it was considered rude even to sit among men in barazas.

This situation has changed drastically due to awareness campaigns on gender equality from various development actors from the public and NGO sectors, and because of the Government Policy on Gender equity in 2005. Legislation required that one third of village committees' members should be women; in Bungoma, first one woman became a village elder, then in 2006, several women became village elders. Sensitisation as well as special invitations for women from the village chiefs has led to an increased participation of women throughout the survey area. The Kisii women observed that during this process, the importance of women's roles became evident. Men now delegate the responsibility to attend meetings to their wives, for example, for school meetings, but the men still make the decision on whether or not they can attend. The continued migration of men to town in search of jobs has made it necessary for more women to participate in village meetings.

Today, most women consider themselves fully involved in community meetings. They have recognised that they gain knowledge and skills through such meetings, and learn about new development initiatives and projects (which are usually introduced during village meetings). In Kisii, women mentioned that they were able to find time for such meetings because of introduction of improved cooking stoves. However, two women's groups in Maragua explained that during periods of food shortage, those who live in poverty will not find time to go to meetings as they have to search for food first.

Women have started participating, and taking on leadership positions, in village committees in recent years; from not being engaged at all in 2003, they were actively participating in 2007. Women from Vihiga said that through the various skills they learned, they had become more courageous, and were able to hold their ground in discussions with men, when participating in decision making. Women from Maragua confirmed that they are now listened to and respected when they speak out during meetings. In Kisii women said they were first given leadership positions in church. Most of the women's groups found that the

Government's directive on women's representation in village committees enabled them to participate in communal decision making, and to access important functions, such as Assistant Chief, Village Elder, Treasurer or Chairperson. Women from Vihiga felt that everyone in the community was happy that women are now taking these roles, as they actively participate in all development issues. Women from Maragua and Muranga flagged up lack of time as the main constraint to attending village community activities, and to standing in leadership elections.

4.4.2 Local development activities

Group discussions were only held in those villages that had been involved in a number of development actions, which could be government projects (with and without the help of bilateral donors), NGO projects, church projects, and locally-led initiatives; all of which had contributed to a wide range of development activities in various fields. Women listed all the activities taking place in their village, reporting on the groups doing them, their relevance for daily life, whether they concern men, women and/or children, and which sectors of the population had been targeted by the activity. These lists were certainly not exhaustive, but they provided a good idea of what women spontaneously considered to be important for their community. Table 4.4.1 gives an overview of the development actions listed, and the percentage of population benefitting from it.

Every village was shown to be involved with several development projects. The main fields of action comprised: infrastructure (roads, schools, dispensaries, electrification, irrigation), agriculture (training in agriculture, production of various crops and dairy) and financial services (credit schemes, locally initiated saving groups such as 'merry-go-rounds'⁵ and table banking⁶).

⁵ A 'Merry-go-round' is a sort of savings group run by a women's' groups. Every month or week each woman gives a certain amount of money. The whole sum is given to one woman at the end of the month. The next month another woman receives the whole amount and this goes round and round from one woman to another.

⁶ Table banking is similar, but the person who receives the whole sum, has to pay it back

Table 4.4.1 Development actions undertaken in villages and percentage of population benefitting

Development Action	Bomet Central	Kisii Central	Maragua medium	Maragua poor	Muranga medium	Muranga poor	Vihiga	Bungoma	Total
School constr. / renovation	80%		50%				40%		3
School water	85%								1
Free education					100%				1
Community Water project	100%		80%	75%	100%		80%	20%	6
Dispensary			100%	100%				100%	3
Health educat.							70%	100%	2
Nutrition educ.							40%		1
HIV/AIDS								60%	1
Roads			100%	100%	100%	100%			4
Electrification		50%	30%	25%					3
Irrigation			10%						1
Agriculture educ.			30%				50%	90%	3
Dairy, Fish, Beekeeping		1%			10%				2
Mushroom					10%	10%			2
Yoghurt making					30%				1
French beans						80%			1
Dairy goats					30%	20%			2
Dairy cows					80%				1
Poultry						40%			1
Passion fruit					50%				1
Credit facility		50%	20%	10%					3
Police Post			60%		100%				2
Merry round	40%	100%	50%				50%	100%	5
Table banking			50%	75%		75%			3
Improved Stove	80%	70%	20%	30%	90%	10%	30%	30%	8

All projects were considered relevant or very relevant for daily life, except for some of the marginal activities like bee keeping, mushroom growing and yoghurt making. Women often said that all family members' lives were improved when they were asked to group the beneficiaries, since most of the projects targeted whole families. An example from the Bomet women's group explained that school construction benefited the children, who can now go to a school nearby, but also the women, as they no longer had to smear the floor with cow dung for maintenance. Men found jobs for a short time during the construction of the school, and the whole community gained a venue for other functions like weddings, church services and fund raising meetings.

Water projects, as in Vihiga, benefited all social groups through construction of protected water sources, which provided clean and safe drinking water for the whole family. Women and girls could fetch water from near to the village, which saved them time. In Bungoma, agricultural education in Farmers' Field Schools was considered very relevant for all groups (men, women, and children), benefiting a high percentage of the population (90%). Men and women were trained to grow sweet potatoes and soya, and bananas. They were taught to grow these crops, to process them into products such as sweet potato flour, juice, and soya milk beverages, and to sell them, benefiting most people in the area.

Dairy farming in Kisii was considered not very relevant. The women there said that many could not afford to purchase cows and they assumed that the Member of Parliament was just rewarding his supporters with cows. The same was said about fish and beekeeping projects, which benefited only an estimated 1% of the population. Electrification was considered useful, even though it was only relevant for half the population. The women pointed out that their children were able to read with better lighting, that some of them had opened hairdressing salons, photocopy shops, and that some sold battery and mobile phone charging services commercially, or ran other small businesses.

The self-help saving groups, merry-go-rounds, and table banking were rated as very relevant, and important for most of the population. With facilities to save and borrow small sums of money, women can buy household items they need, start small businesses, pay school fees, buy farm inputs, or cater for priority needs as they arise. Women in Kisii found that pooling their own resources and giving them to one member at a time promotes their unity, cohesiveness and encouragement, and thus improved their social status.

Finally, women considered the introduction of improved cooking stoves. They were found to be 'relevant' or 'very relevant' for their daily lives, by all women groups. In several groups, women said that local people were trained in the new technology and could afterwards earn some money as stove installers. Women were unanimous in saying that they saved money for firewood. Some mentioned that their improved cooking stove saved time by cooking food quickly. The Bomet women's group added explicitly to these advantages that the stove reduced smoke in the kitchen, which not only reduce coughing, headaches and itching eyes, but encouraged some men to sit with them in the kitchen for a while. Women quarrelled less with their husbands over children getting burnt, delays in mealtimes, and the amount of firewood consumed. Women said they had some time to rest, or to conduct economic activities. The ICS has not reached everybody in the communities, despite being highly regarded by women's groups - in Maragua, Muranga, Vihiga and Bungoma, only 10% to 30% of the population use improved stoves for cooking.

4.4.3 Impacts on poverty

In a final step, the groups discussed the influence of all these development activities on their livelihoods, examining the four dimensions of poverty in the trend analysis. Influences were classified in five different categories from very strong (5) to very weak (1). Influences could also be nonexistent, or negative. Table 4.4.2 shows the ranking given by women from

several focus groups on selected development actions with regards to their influence on the livelihood criteria.

Table 4.4.2 Perceived influence of selected development actions on livelihood (average taken from Bomet, Kisii, Maragua, Vihiga)

4 Dimensions of poverty	Water project	School construct.	Electrification	Agricola. training	Merry go round	Improved stoves
Living standards						
Agricultural yields	4, 5, 5, 5,	1, 5, 3,	1, 0, 0,	5, 4,	5, 5, 5, 5, 4,	5, 5, 5, 5, 3,
Family income	4, 5, 5, 5,	3, 5, 3,	2, 4, 5,	4, 5,	5, 5, 5, 5, 3,	5, 5, 3, 3, 4,
Health	5, 5, 5, 5,	4, 2, 3,	3, 4, 5,	5, 5,	3, 4, 5, 5, 2,	5, 5, 5, 1, 4,
Clothing	4, 5, 4, 1,	4, 4, 1,	1, 3, 0,	5, 5,	2, 4, 5, 4, 4,	4, 3, 4, 1, 5,
Housing	5, 5, 3, 5,	3, 5, 1,	1, 2, 0,	5, 4,	2, 4, 5, 5, 5,	3, 5, 5, 1, 4,
Access to resources						
Firewood	5, 5, 1, 2,	3, 4, 1,	2, 4, 0,	2, 5,	4, 3, 5, 3, 1,	5, 5, 5, 4, 5,
Land for trees	5, 0, 1, 1,	0, 1, 1,	0, 0, 0,	4, 5,	2, 1, 5, 1, 1,	2, 1, 1, 1, 1,
Knowledge for girls and women						
Education of girls	5, 4, 3, 4,	4, 5, 5,	3, 3, 0,	0, 5,	5, 5, 5, 4, 3,	5, 4, 2, 3, 5,
Skills for women	5, 4, 2, 1,	0, 3, 1,	2, 1, 0,	5, 5,	3, 5, 5, 5, 4,	4, 5, 3, 2, 5,
Rights and Power of decision making for women						
Participation in village meetings	5, 5, 5, 1,	0, 5, 1,	2, 0, 0,	1, 4,	4, 5, 4, 1, 1,	3, 5, 3, 2, 4,
Decision making and leadership	0, 5, 2, 1,	0, 1, 1,	2, 0, 0,	3, 3,	0, 2, 1, 3, 1,	1, 5, 1, 1, 3,
Averages - (all dimensions – all groups)						
	41	27	17	45	40	39

The different women groups reported different findings on the ways that development activities had affected the four dimensions of poverty. The relative importance of some activities over others is nevertheless very clear

Projects that provided agricultural training (like NALEP) had a very positive impact on all aspects of living standards, particularly when they were combined with an access to agricultural inputs. More knowledge on improved farming methods and its application led to increased agricultural yields, which directly increased the family income as well as the women's income, particularly when the climate was favourable. As agriculture is the economic basis for most people in rural areas, investment in improving yields may increase family incomes and livelihoods substantially. Higher incomes allow people to buy clothes and materials, and to improve housing. Proceeds from sale of farm produce assisted in buying books and pens, as well as payment of school fees (until 2004). Prior to this, many girls were not sent to school because the money was not sufficient to send both boys and girls. Only, when there was an excess resulting from sales of farm produce, could school fees also be paid for girls. When communities introduced highly nutritional crops, it improved family health. When agro-forestry plants and fast growing trees were introduced, it helped to improve the availability of firewood for the future. Women acquired new farming skills, and

asking them to display their knowledge at field demonstrations encouraged them to attend further meetings. Their new knowledge helps them to make decisions, and some women became leaders of the newly formed farmers' groups.

Where water projects were carried out, women ranked them highly due to their influence on improving living conditions. Agricultural yields were increased through minor irrigation activities, which in turn improved incomes. Women engaged in more income-generating activities due to the time they saved fetching water. Health was improved through clean drinking water, which reduced water-borne diseases. Increasing the quantity of available water improved sanitation, particularly for children. Women suffered less backache, since they did not have to walk long distances to fetch water. Clothes were washed more regularly, improving their cleanliness and appearance. Households could be cleaned regularly, and general tidiness achieved. Water was used to establish tree nurseries. Girls had more time to study, and women attended more meetings, learnt more skills, and collected more fuel during the time that had saved by fetching water from nearby. In Bomet, women were invited by the project to participate in village meetings on water issues. Although they attended, they were not allowed to participate in decision making. Other women groups explained that they felt their appearance was tidier, due to having sufficient water, and this earned them more respect in public, and contributed to their participation in decision making.

Merry-go-rounds were generally initiated by the women themselves. Women regarded them as very important, together with table banking. Women could save the amount of money they could afford, and rely on receiving a loan for a fixed sum to finance their most urgent needs. These loans could be used for whatever was most urgent for the women, so these initiatives were very important. They could be used for agricultural inputs, hired labour for agricultural work, or even to lease land for farming. A family's income' and a woman's income in particular, could be improved through increased agricultural production, or by starting a small retail business. With this money, some women bought medicines, some bought foodstuffs, both of which improved health. Some women spent the extra money on hiring labour to help in the house, or with their new business. Some women bought clothes, although not much was spent on them. They bought building materials to improve housing.

The merry-go-round money was particularly used for investment in income or food generating activities. The income from these activities in turn allowed women to improve the living conditions, or it could be further invested. However, whenever the times were bad, due to poor harvests, or low income etc., the money from either merry-go-round or income generating activities had to be spent on very basic items to allow for survival. The discussions clearly showed that the livelihoods of most families in rural areas were very dependent on the climate and on the country's economic situation and thus very vulnerable to change. In one year, a family might have enough for all their needs and even be able to save and invest some surplus while in the next year they might fall deep below the poverty line. The merry-go-rounds enabled women to buy trees, but did not contribute to the accessibility of land to plant trees as the decision on how to use the land remained with the men. Other women used the money to pay for the installation of improved stoves. Some people used the money to pay fees and buy books, uniforms and paraffin for study lamps, which had a major influence on girls' education. Some mothers also give pocket money to their girls.

Women felt that the funds from the merry-go-rounds had only a moderate impact on their skills acquisition. The main contribution was through exposure of women to new ideas from others. Despite this, the women in Kisii said that the merry-go-rounds have made them masters of their own destiny because it allowed them to make their own decisions on their activities, plan strategies and implement using their own resources. They elected their own leaders, based on trust and competence.

Women were very positive about improved stoves; one could question whether women might have been biased, knowing that the survey was conducted by the stove project. Yet, the comments from the women showed that the improved stoves influenced many aspects of their daily lives. Using the poverty criteria to assess the greatest impacts, it appears that the time they saved through fast and efficient cooking, and the money they saved on firewood, were most important. Additional time was used for:

- farming - influencing agricultural yields
- income-generating activities
- studying (girls)
- women's participation in village meetings to elect leaders of their choice.
- Money saved on firewood was used other needs.

Women who had been trained on stove building, installation, marketing, and organisational development not only acquired new skills, but increased their income substantially. Any additional funds available, whether small or big, were used on purchasing agricultural inputs, foodstuff, medicine, clothes, housing materials or furniture, school fees and materials, firewood, or they were invested in small scale business activities.

Women also mentioned the improvement to their health. With much less smoke emitted in the kitchen, they reported that their levels of respiratory problems had reduced drastically. Children suffered burns less often. The overall working environment in the kitchen improved, and the reduction in soot reduced expenditure on detergents for cleaning, and decreased the corrosion of the iron sheets (roof). Women in Vihiga said that the improved stove added beauty to their kitchen. The cleaner kitchen allowed girls to study in the kitchen during cooking.

Women did not attribute access to land for tree planting, women's participation in communal meetings, decision making, or leadership functions to improved cookstoves, despite the stove giving them increased time for such activities.

Girls and boys were seen as the prime beneficiaries of the construction of classrooms and schools in the village. They no longer had to travel to attend school, and the new school provided a good and clean environment where they no longer had to swallow dust. It also reduced the workload of women and girls as they had no longer to take time smearing the schoolroom floor regularly. The schools were built by church organisations, which paid for them outright, allowing families which had been using their finances for school construction to channel the money into other much-needed items. This was reported to have had a positive impact on agricultural yields, income, health, clothing and housing. Access to firewood, land and participation of women in village meetings and decision-making processes were not influenced by this development activity.

Rural electrification did not impact on all the poverty criteria listed, and did not reach everybody in the villages. Yet, those who had access to electricity benefited from savings on kerosene and paraffin for lighting. Girls and boys could study in the morning and evening with good lighting, both at school and at home. And some schools, science facilities and computers were installed as an incentive to send children to school. Women improved their skills through electronic media such as TV and computers. Medical laboratory services were located closer to the villages. This enabled local people to save travel costs and time reaching health facilities. People with enough funds to invest in small-scale business reported using electricity for various commercial activities. No direct influence was seen on agriculture, clothing, housing, firewood, land availability or women's participation in communal meetings and decision-making processes.

5. Main conclusions

This chapter presents some of the main conclusions drawn from the results presented in Chapter 4, compares them with the anticipated impacts, and with the findings from the former 'Women and Energy Project' (WEP) and Kenyan energy goals.

5.1 Conclusions on impacts

Although two years after the beginning of a project is too early to observe the medium and long term effects of a project intervention, some conclusions were drawn about the indirect results beyond the project goal because they occurred almost immediately after improved cooking stoves were installed. Individual households and other users observed and reported these changes during the survey.

The section looks at the 'immediate' indirect results that were expected from the results chains, and sees whether they were confirmed during the survey. In most cases, the changes were observed by the enumerators, or reported by stove users. A statistically significant quantification of the changes was not possible in the context of simply-structured household and user interviews. For this, a more exhaustive survey and in-depth analysis would be needed; this was not the reason for the survey. Plausible effects of ICS use, indicators and trends are as follows:

Reduction of smoke and harmful gases in the kitchen (CO₂, PM, GHG)

Women and cooks confirmed unanimously a reduction of smoke through ICS use. This was reported in individual interviews and group discussions. Smoke reduction was considered important, particularly by restaurant owners who cooked inside the restaurant. Some women mentioned that men would chat in the kitchen, which they had not done in the past. Women reported a reduction in coughs and eye diseases, and clothes that smelt less and got less dirty.

The enumerators observed that almost half the ICS households had smoke in their kitchen when cooking. This was less than the two-thirds reported from the general household sample, but it was still rather high. It is possible that enumerators were observing the smoke that appears when lighting the fire or adding more sticks.

A study conducted in 2007 on stove emissions in Kisii region showed that improved stoves released less Particulate Matter (PM₁₀) than the three-stone-fire. Over a 24-hour monitoring period, the Jiko Kisasa achieved about 30% reduction in PM₁₀, and the Rocket Mud Stove (Rocket Mud Stove) achieved a reduction in PM₁₀ of 70% compared to the traditional three-stone-fire (700 µg/m³). Even the Rocket Mud Stove, with 24 hours Particulate Matter of 215 µg/m³ is above the maximum level of 150 µg/m³ as recommended by the United States Environmental Protection Agency standards.^{7 8}

Time and money saved on fuelwood collection and cooking

The use of ICS definitely saved time and money, as all respondents confirmed. For the women in the study households, these were the most important advantages of an improved

⁷ 'Evaluation study on the performance of cook stoves to quantify air pollution, health impacts, energy efficiency and sustainability in Kisii.' April 2007, MoA, GTZ/PSDA Kenya

⁸ <http://www.epa.gov/particles/standards.html>

stove. For restaurant owners, saving money for fuelwood was the key advantage, and the main reason for acquiring an ICS. In their kitchens, three-stone-fires have been almost completely abandoned.

Only half the households exclusively collected firewood and they collected it locally, on the way to and in their own fields, where they would pick up small twigs and branches as well as agricultural residues after harvest. No extra time was spent on this type of firewood collection as it was combined with field work. Some hours were put into chopping wood into pieces if a big tree was cut down. About 20% of households relied only on bought fuelwood, and never spent any time on collection. For them, money saved on firewood was identified as an advantage of ICS. Around one-third of households collected biomass for fuel, and bought fuel when necessary.

Reduction of firewood required for cooking

All respondents stated that ICS used less firewood than traditional stoves. Households from the general household sample spent more on their monthly firewood consumption than ICS households. Estimations made on firewood savings were insufficiently precise and were not used in the results. During the 'Air pollution, health impacts, energy efficiency and sustainability' in Kisii in 2007, ICS reduced the daily fuelwood consumption by up to 50% compared to the three-stone-fire. (Traditional stove used 1.3 kg per person, and Jiko Kisasa and Rocket Mud Stove used 0.9 kg per person. The shielded fire only consumed 0.6 kg per person and per day).

Savings from improved stoves might play a far more important role in the future than in stove dissemination fifteen or twenty years ago. Over the past years, firewood has become continuously scarcer in Western Kenya, if not in the whole country. Wood that was freely available to the public has disappeared during the past few years, with big agro-industrial enterprises installing themselves wherever there is suitable available land, and the increasing demographic pressure on land have added to shortages and scarcity of natural resources. The women's group discussions clearly indicated that conflict around wood resources has increased, particularly in places where tea factories not only occupy land for their plantations, but regularly need large quantities of firewood for drying tea. To meet their firewood demand, they bought trees from local farmers. Within families, conflicts between husband and wife occurred around family wood resources, especially over woodlots, which were considered too precious to be burnt for cooking, and were only sold when cash was needed. Conflicts were even reported on planting trees on the boundaries between lands. Furthermore, women who were desperate for fuel, because of its extreme scarcity, would take tea prunings illegally from the tea plantations.

In such a context, and when fuel switching was not a realistic option for most households, an improved stove that reduces fuelwood use became a necessity. This type of stove seems to have contributed to conflict management, alongside other measures.

Modernisation of kitchen

Some women considered their kitchen to be more modern; that the stove added beauty to it. More generally, women appreciated the better working environment, attributing it to reduced smoke emissions in the kitchen. Less money was spent on detergents for cleaning; soot and corrosion of iron sheets in the roof were reduced; girls could study in the kitchen. Although all these improvements were appreciated, modernisation of the kitchen was not been a key topic for the women themselves. The daily struggle for food, firewood, clothes, medicine and other basic needs absorbed more attention, particularly in drought years and among the poorer women.

More safety in the kitchen

Women reported that safety in the kitchen had improved in terms of fewer burns. Small children, in particular, had been exposed to the risk of getting burned by the open three-

stone-fire, and the ICS protected them. Even though burns did not happen very often, the potential danger and worry for the cook was reduced by the ICS in the kitchen.

Job creation in stove business

With the beginning of the PSDA stove project, stove businesses boomed in the three Clusters. Former stove producers were retrained and new ones were introduced to stove production and installation. Marketing groups were supported through entrepreneurship training and started operating. Existing producer groups accepted new members and new groups were founded.

The majority of stove producers have already trained others in stove production. About 86% of the men and 70% of the women have done so. On average, about 10 persons have been trained per producer. Some have trained one or two persons only, but others have trained up to 48 persons. The latter group have been in the stove business for many years and have helped a lot of trainees over the years. Usually, the trainees started as labourers to help out and were gradually initiated into all tasks.

Family members were involved in stove businesses. The majority of stove producers and installers, and even more marketers, sought the help of family members. Some stove dealers reported employing labourers for farm work as they were too occupied with stoves. Because it is very labour intensive, an increasing demand for ICS contributed to new job creation and apprenticeships in stove businesses and in farming. For many of those producing larger quantities, they not only employed additional labour for stove production but hired labour to replace their own labour force in their fields, to devote more time to their stove business.

Impacts at a higher aggregated level

These results contributed to changes at a higher aggregated level; yet it was difficult to examine the specific cause–effect relationship, as other independent confounding factors influenced these changes positively or negatively. As outlined in Chapter 3, the anticipated high level impacts for the Kenyan stove project were:

- reduction of respiratory and eye diseases (for women and girls)
- better working condition for women and children
- more education for children (particularly girls)
- economic independence (from parents / husbands)
- better housing conditions
- improved living conditions (for households and stove dealers)
- reduction of wood cutting
- climate protection

The main beneficiaries of stove projects were women, as users of improved cooking stoves and also as stove producers. Women in rural households in Western Kenya are still bound by the traditional division of labour, which confines them to their home with responsibilities for everyday household maintenance tasks and child rearing, while at the same time working on the family farm, yet without owning their land, with poor access to natural resources, and until recently, without receiving training or extension services.

Women are often restricted in their capacity to earn their own money, or to engage in civic activities. Their unpaid work includes:

- daily maintenance tasks, such as food preparation, fetching fuelwood and water, cooking, laundry, and house cleaning
 - raising and caring for children
 - growing food and caring for livestock
 - making or acquiring household goods such as pottery, clothing and medicines
 - caring for the sick, elderly and disabled
 - providing voluntary community services for schools and other organisations
- ...and they suffer from health problems due to heavy workloads and indoor air pollution.

The women felt that the improved cooking stove influenced several aspects of their daily life positively. It helped to improve their living conditions, reducing the burden of accessing fuel, and it particularly saved time on cooking, and money on buying fuel. The health of both women and girls was improved through smoke reduction in the kitchen, leading to fewer respiratory diseases, eye diseases and fewer headaches. The time saved could be used for farming, or for income-generating activities, or other work and, more rarely, for leisure. Free time also allowed them to participate in civic activities, such as community meetings, and to hold and attend public functions. Another factor making this possible was the rigorous implementation of the Kenyan Government's Gender Policy. Girls started to invest more time in studies and women in gaining new skills. Additional money from income-generating activities and/or through savings in fuelwood expenses was used on a range of items; food, medicine, school fees, materials, clothes, house improvements, or any other felt need. The poorer the household, the more basic were the needs that were covered, such as nutrition and health care. The same benefits were valid for better off households in bad seasons, when income from agricultural production was too low to cover all essential needs. Clothes, furniture, iron sheets for house improvements were only bought when extra money was available. For most households extra money was only available when agricultural yields and market prices were high and market prices for agricultural inputs and other commodities were rather low. To determine the exact amount of financial savings through ICS use, and its relative importance for improving living conditions, an in-depth analysis of household expenditure and incomes in good and bad agricultural seasons and under various market prices for commodities would be necessary.

The contribution to the protection of natural resources through a reduction of wood cuttings seems plausible for those households using collected fuelwood for their ICS. It is questionable whether results on the ecological balance in the three Clusters were really achieved, as the discussions on accessibility of firewood and land have shown. Demographic pressures on land and wood resources, and the arrival of agro-industry, have had a strong negative impact on wood supplies. These resources seemed to disappear rapidly, caused by land clearing for big plantations and family plots, and by the enormous need of firewood for tea factories. Conflicts have risen over trees in more than one locality of the survey. A more precise picture of the real situation for each cluster could be gained with data from the agricultural and forestry departments of the respective districts.

Stove dealers benefited directly from the economic upturn of stove business. Producers, installers and marketers acknowledged making a reasonable or good profit, which was no longer seen as a 'women's promotional activity'. Stove production had become a real business and as such interesting also for men who traditionally did not engage in pottery. Men had become the top earners. Stove dealers engaged family members and labourers to assist them; they were even reported to have left farm work to labourers in order to concentrate on stove business. The number of people active in stove business had increased. Formerly active producers had restarted, and new producers were initiated. Producer groups had increased their membership, and new groups had been founded. This economic activity contributed to secure livelihoods and to improved living conditions for some hundreds families in the region.

All these changes contributed to the achievement of the Millennium Development Goals with regards to the reduction of poverty and hunger (MDG 1), the improvement of education (MDG 2), gender equality and the empowerment of women (MDG 3), health of women and children (MDG 4,5 and6) and the protection of the environment (MDG 7). The significance of the stove project's contributions to these development goals is largely dependent on two aspects: the adoption rate of ICS in the region, and the number and strength of other variables influencing the anticipated changes. With an increase in the improved stoves' adoption rate from about 5% in 2006 to 38% of households interviewed (varying from 22% in Western to 40% in Central and 50% in Transmara Cluster) the project was demonstrated to

be on an upward trend towards reaching a significant impact. The main challenge for the project will be to maintain these figures or to increase them over the next years.

For other variables influencing the MDGs in Kenya, further analysis of the actual situation will have to be done. It is obvious that the livelihood of rural population in Western Kenya is based on agricultural production, which depends largely on climatic conditions and economic incentives and disincentives; on access to production factors like land, inputs, capital and knowledge, and on social peace and political stability. The influence of these factors towards the achievements of the MDGs has to be seen in the context of improved cooking stove programmes. The benefits of an ICS project are as described above – yet their relative importance for poverty alleviation and other MDGs has to be taken into consideration.

5.2 Conclusions on project strategy

The project considered the essential lessons learnt from the 'Women and Energy Project' (WEP) when detailing its strategy. While the purpose of the first project was to 'promote a better infrastructure for self-sustaining dissemination for fuel-efficient stoves in rural areas' the project somehow got trapped by its primary target of disseminating 180,000 stoves by the end of the project. Large amounts of capital for establishing production centres, distributing stove liners and setting up stockists speeded up building production capacity, but at the same time undermined the long term sustainability of the project's achievements. Producers became reliant on the project and the Home Economic Officers (MoA), who promoted the liners for them, and producers were unwilling to take over these responsibilities.⁹

The recent project applied a market approach wherever possible, refusing to financial support to the commercialization of liners and stoves. Marketing groups were trained and linked with producer groups. Extension personnel from the partner Ministry were not involved in stove commercialization. Some still bought liners from some of the producers, but doing it for their own profit (using government vehicles). The majority of liners were sold directly to marketers or stove installers and customers, without any intervention from the project or other Government services.

In 1999, when the impact assessment of the Women and Energy Project (WEP) was completed, it was already accepted that direct subsidies undermined the long term sustainability of stove activities. The WEP avoided such subsidies, but provided indirect subsidies for stove transportation and distribution. This undermined opportunities for commercial marketing. The latest stove project financed none of the transport or distribution costs for liners and stoves. Since its beginning, stove dealers have managed these cost themselves, alongside breakages, market taxes etc.

The project has not imposed any price control. This former practice was intended to help women's groups with their stove activities. Today, stove prices are freely arranged between producers and their clients. The price depends on the number of producers and consumer demand in a particular location. Stove prices vary from 100 KSh to 250 KSh (1€ to 2.50€) for Jiko Kisasas, and from 200 KSh to 250 KSh (2€ to 2.50€) for the Rocket Mud Stove one pot stoves, and from 250 KSh to 500 KSh for the Rocket Mud Stove two pot stoves (2.5€ to 5€) in the three different Clusters.

⁹ Dissemination and Commercialisation of rural stoves. Women and Energy Project experience disseminating Maendeleo stoves in Kenya 1983 – 1994. Review study in 1999' Vivienne Abbott for HEP/GTZ

All these aspects of the project's strategy may have had a positive influence on sustainability. Production of liners has been fairly high; an average of 337 pieces per producer per month. Almost all producers said that they made a reasonable profit and about half of them were already making a living out of stoves. The fact that some larger producers employed labour for both stove production (as the majority of producers did), and for farming, in order to concentrate more on stoves, showed that stove activities had become a real business to them.

The project had the opportunity to build on the achievements of the former WEP. More than half the male and one third of the female stove dealers had been producing liners before 2006. Even though most of the former producers had abandoned stove activities with the end of WEP (as collection and distribution of stoves ended as well), they had reintegrated fast into the new stove project in 2006. They received further technical training (refresher courses) and new entrepreneurship skills before starting again. The project set-up would certainly have taken more time, if it had to start at zero in the field.

Another advantage for the new project was that improved Maendeleo stoves were very widely known from earlier projects, so ICS was not a new concept for the wider public; around 10% of households interviewed possessed an earlier ICS model. The improved stoves had a good reputation; only 4% of non-ICS users said they were not interested because ICS broke easily. The others said they had no money, or that they were not at all interested. As the new project continued work where the WEP had worked, it might explain why the radio shows and short radio spots, only started late in the day, did not seem to have much of an influence on people's perceptions of ICS.

5.3 Conclusions on political relevance

National energy source data shows a heavy dependency on woodfuel and other biomass sources; 68% of the total energy consumption (petroleum 22%, electricity 9%, others 1%). Due to increased poverty, there is a significant shift to non-traded traditional biomass fuels. The proportion of households consuming biomass has risen from 73% in 1980 to 83% in 2008. The attention and increased importance given to biomass energy in national policies is clearly expressed in official policy papers.

The overall vision of the Kenyan energy policy is to promote equitable access to quality energy services at least cost, while protecting the environment. In the Energy Sessional Paper No.4 (2004), the Ministry of Energy (MOE) sets out national policies and strategies for the Kenyan energy sector in the short to long term (2004-2023). It addresses the issue of improved stoves within the Policy Objective of Woodfuel Development, which aims to ensure sufficient supplies to meet demand sustainably, whilst minimizing the environmental impacts associated with biomass energy consumption.

The Energy Act of 2006 empowers the Minister to promote development and use of renewable energy technologies for biomass among other forms of energy (Odongo F, 2007). The MOE objectives in promoting energy saving stoves are to:

- Minimize consumption of wood fuel to reduce overall demand (fuel efficiency)
- Reduce indoor pollution
- Reduce expenditure on fuel
- Increase time available for women and children to attend to more productive chores
- Give time to planted trees to mature (environmental protection)
- Provide alternative sources of income which in turn is expected to improve living standards
- Reduce incidence of burns in the cooking area

The strategy of the MOE for improved firewood stoves is to increase the rate of adoption of efficient stoves from 4% in 2000 to 30% by 2020. According to an unpublished survey done by MOE in March 2006 the rate of adoption had increased to 8% (Manyeki N, 2007). According to the same study the rate of adoption of improved charcoal stoves had not changed.

A second strategy for household stoves is to offer training opportunities for artisans at village level for the manufacture, installation and maintenance of renewable energy technologies, including efficient cook stoves. The dissemination of information on energy efficiency to consumers and the development of standards and codes of practice on cost effective energy use are both planned.

The stove project is fully in line with Kenyan energy policy. With the exception of one objective, all the other objectives of the Ministry when they promote energy-saving stoves are supported by the findings from this project. The exception is that afforestation measures might not be successful, because of the high demographic and industrial pressure on biomass resources. Environmental protection remains a challenge that has not yet been addressed, and seems to be under threat. Reduction of fuel wood consumption, indoor air pollution alleviation, reduction in time and money spent getting fuel, reduction in burns, and diversifying incomes are project impacts that were identified by this survey.

One significant impact remains to be achieved: the project area adopting at least 30% of ICS sustainably over the whole area. This survey shows that the project is well on the way to achieving its goal. Moreover, it could contribute to several of the development goals of the Kenyan Ministry of Energy.

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