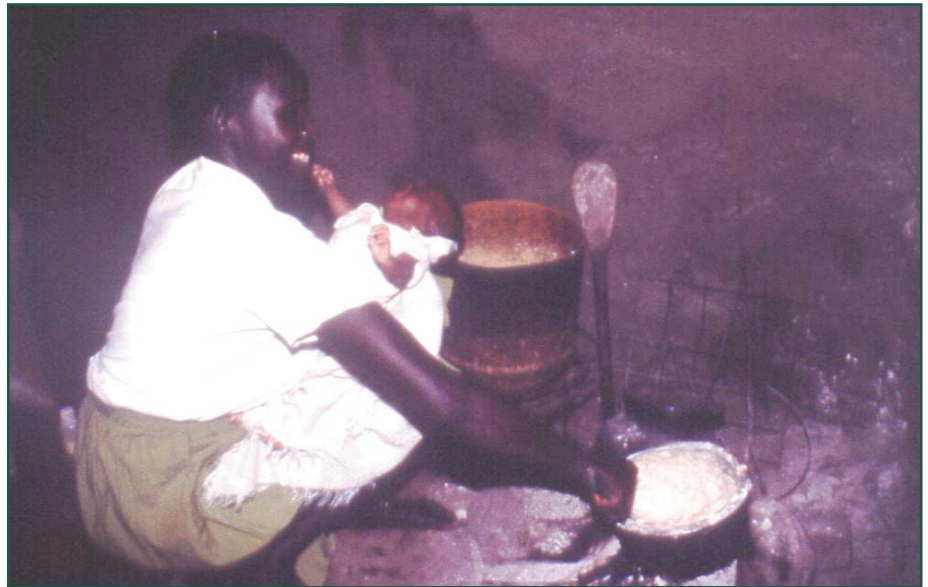


Kenya Smoke and Health Project 1998–2001

Introduction

Around 80% of people in rural sub-Saharan Africa depend on biomass (wood, dung, crop residues) for domestic energy. Burning these fuels in enclosed spaces results in indoor air pollution and there is mounting evidence that leads to an increase in common, serious health problems, including pneumonia and chronic lung disease. This particularly affects women and young children who spend many hours each day in the kitchen unless driven out by the smoke. A project involving 50 rural Kenyan households in participatory technology development, devised interventions to alleviate the pollution in people's kitchens. The baseline assessment, prior to intervention, showed mean 24-hour values for respirable particulates of $5526\mu\text{g}/\text{m}^3$ in Kajiado and $1713\mu\text{g}/\text{m}^3$ in Western Kenya. Comparing these figures with the US Environmental Protection Agency standards for annual acceptable levels of respirable particulates of $50\mu\text{g}/\text{m}^3$ it can be seen that the daily rates (which are comparable, in these societies to the annual rates) are 100 times greater in Kajiado and over 30 times greater in Western Kenya, than the accepted values.



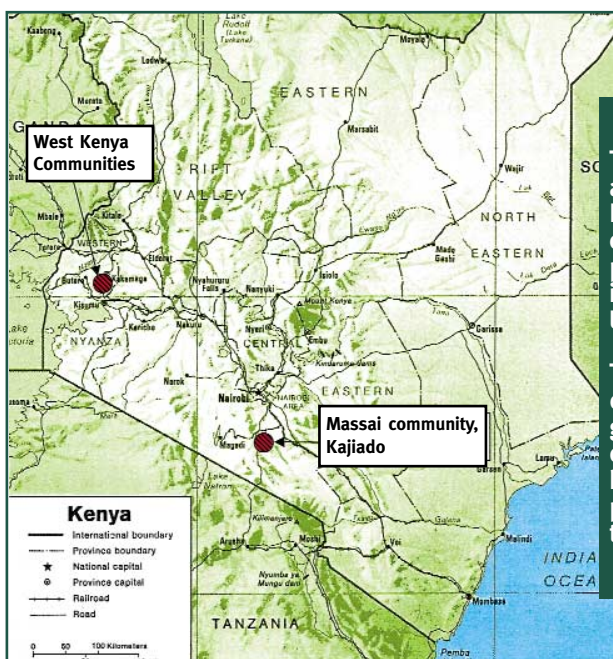
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Woman with two-week old infant, Western Kenya

Objectives

The objectives were to improve the quality of life, through reduction in indoor air pollution for households in these study areas. Communities were made aware of the risks associated with household smoke and enabling mechanisms for its alleviation. Following baseline assessment of pollution and personal exposure, fuel use and house structure, the householders and communities participated in determining ways of alleviating indoor pollution through development and installation of interventions. Interventions, in this case, meant any changes made to the kitchen with the intention of alleviating smoke levels. Interventions were installed and the outcomes assessed, in terms of pollution and exposure levels, and also community views of the process used, and the acceptability and affordability of the interventions.

Longer term objectives included national strategy development, contribution to best practice in other countries and development of a replicable participatory methodology on appropriate techniques for reducing indoor air pollution.



Two locations were selected as the basis for the project. ITDG has experience working on housing with the Maasai people in Kajiado, and introducing the improved Upesi stove in West Kenya.

These two areas are very different climatically and geographically as well as culturally (lifestyles, cooking habits and house types) and provided ideal settings for this type of study.

Map showing Kenya and location of study areas

Participation

Community participation has been a fundamental concept of this project, thus recognising that the views and opinions of members of the community are valued, and ensuring that potential solutions match their cultural, social and economic situations.

Kenyan field staff informed community women's groups of the intentions of the project and helped in identifying appropriate houses. There was no shortage of people wanting to take part in the project. The criteria applied to the selection of houses were: willingness to participate; and having children up to five years of age. In Kajiado, houses were selected which had not been improved by the Maasai Housing Project and selection was

made by ballot. In West Kenya, a range of house types was chosen from the very traditional, to houses which already had some improvements such as Upesi stoves; there were many suitable houses in West Kenya and the women's groups made the selection. In Kajiado the whole cost of the intervention was met by the project due to the extreme poverty in the area. In West Kenya, a cost-sharing element between the household owners and the project was feasible because most of the husbands were willing to provide artisanal skills in installing the interventions. The cost sharing aspect was geared to ensuring sustainability of the smoke-alleviation methods once the project was completed.

Pre-intervention discussions

Pre-intervention meetings of the focus groups identified social and health problems associated with smoke as: affects eyes, painful and tearing; respiratory infections; ear infections; breathlessness; chest pains and difficulty in breathing; giddiness and frequent headaches; general malaise; staining clothes; tall people hair messed up. Some benefits of smoke were identified as drying firewood, insect repellent and preserving cereals. The groups discussed a range of possible interventions that could be installed in the households, and these were distilled into three key interventions, ie. ventilation by enlarging the size of windows or opening eaves spaces, adding smoke hoods over the cooking area, and thirdly the option of installing improved cook stoves. In West Kenya, in most cases, husbands were involved in these discussions, which was useful, as men were actively involved in the intervention phase, through their traditional role in house building.



Maasai house, showing window (closed) and smoke coming out of chimney

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15-17 Kenya

Interventions

Group discussions (involving, in some instances, drawings of the kitchens prepared by the householders), and individual house visits, were used to identify desired positions for windows, eaves spaces, and the position of



Focus group in West Kenya

Focus groups, involving the stakeholder communities, mostly the participating women, and sometimes their husbands, met before and after the interventions were installed as part of the participatory technology development process. The final design and materials used for the interventions were determined by the members of the community and by the availability of materials: local skills were used, enhancing acceptance of the interventions and generating local income. The household members provided labour, such as assisting in wall opening and closing up of the apertures created during the window fixing process. They contributed in labour, cash and kind. Throughout the project, the community members, who are the main stakeholders, held brainstorming sessions with the facilitators; experiences were shared and suggestions made as to how best the various technologies could be made appropriate to their households.

Through the project, the skills are already in place for scaling up and commercialisation within the regions. The skills to use this type of study are also available within country for identifying smoke-alleviating interventions within other communities.

smoke hoods. Models of hoods were made with hard manila paper, dimensions were checked by artisans, who were either experienced in local manufacturing techniques or had been trained as part of the project; the designs were then transferred to sheet metal (heavy-gauge galvanised sheet) and the product manufactured. The

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hoods were tested in situ and modifications made where necessary, in consultation with the cook, to obtain maximum performance. In some cases improved stoves were included as part of the interventions exercise.

It was important that householders were trained in the proper use and maintenance of the interventions; this was mainly conducted through the women's groups, and often involved an input from other organisations such as the Ministry of Health. The hoods were initially dismantled for cleaning but women found this difficult; a technique to allow cleaning without dismantling was devised and women were more receptive to the need to perform this task. The importance of opening windows in order for them to be effective in improving combustion and removing smoke was stressed.

Baseline

The baseline study centred on a questionnaire devised to be locally appropriate and completed by a fieldworker in consultation with the household. Key aspects of people's lives which would be affected by their household energy use were recorded: size of the household, the way woodfuel was collected, means of cooking, lighting, etc., house and kitchen plan and structure including ventilation; time and activity spent in the room while the fire was lit; a basic health survey to discover the problems which the community identified as being most important. Visits to the households allowed the team to discuss any traditional beliefs that needed to be considered when selecting interventions and to gain an understanding of people's perception



External view of house – West Kenya

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13-23 Kenya



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Kitchen with window, eaves space and hood

of smoke problems and the causes of smoke.

This was followed by quantitative measurement of smoke pollution levels in the kitchen and that inhaled by the cook. The monitoring methodology aimed at obtaining high quality results while not intruding too much on the lives of women involved in the study. Two key components of smoke were measured: respirable particulates less than 10 microns diameter, using a sampling pump; and carbon monoxide using stain tubes. Measurements were taken over a 24-hour period. For each household, two rounds of monitoring were done before, and two rounds after interventions had been installed in the houses. The two rounds were to reflect the wet and dry seasons and their effect on the level of smoke in the kitchen. The carbon monoxide stain tubes were read directly by the field staff and recorded in questionnaires; the particulates were collected on filter paper and sent to the University of Nairobi for analysis. By comparing the levels of particulates and carbon monoxide before and after particular interventions had been installed, it was possible to identify which interventions reduced smoke levels appreciably. A further step was to see if the amount of smoke inhaled by the cook reduced equivalently.

According to Refa, the husband used to suffer from asthma attacks therefore never used to go to the kitchen but after the interventions were put in place, he is now willing to assist her in some domestic jobs. Nowadays, he normally wakes up at 5.30 a.m., puts his bathing water on the fire then goes to bathe as he leaves the tea getting ready on the fire. The woman is now relieved from waking up early and doing all the household chores by herself.

Outcomes

The overwhelming feedback from the community members was that the alleviation of smoke far exceeded their expectations. The acceptability of interventions to the cook was vital and the observations of members of the community were important. A longer-term goal of this project was that the benefits experienced by the participants would lead to a much wider application of interventions to alleviate indoor pollution. Although the interventions were supplied at no cost in Kajiado, with the very positive response of the men in the community, who own a few cattle and goats, it appears likely that they will pay for the interventions, especially if the manufacturing cost can be brought down a little.

Many positive benefits, based on one or more of the interventions (smoke hoods, eaves, windows and stoves) have been reported.

Improved health: focus group discussions reflected the observed overall improvement in health status of the kitchen and its occupants; reduced sweat and heat, so better sleep; fewer headaches, malaise; coughs, dizziness and chest pains relieved; reduction in aching eyes, tears and running nose; safety – smoke hoods act as a shield, preventing children and goats falling onto fire; snakes and rodents cannot hide in the house where there are windows; food free from soot contamination.

Reduced drudgery: less soot on walls, ceilings, hair, sheets, children's books and clothes; easier to wash the children and do housework; fire is easier to light and cooks faster, and can use any fuel with smoke hood so can collect fuel faster; can stay longer in the house; able to watch over calves through the windows.

Reduced expenditure: daylight through windows reduces kerosene use; food stays longer without spoiling.

Improved environment and comfort: smoke removal; improved lighting and visibility; can find lost items; smell removal; fresh air circulation, and with it a marked reduction in the number of mosquitoes; visibility improved through window; hood prevents rain dripping on fire when roof leaks; men can drink beer in the cool of the house.

Increased opportunity for income generation and improved prestige: able to sew and do beadwork in the house when weather unsuitable out-of-doors; reduction in time lost due to ill health and in collecting fuel; improved children's grades at school, as they can work indoors; women felt more confident through disseminating knowledge to their neighbours; they also felt more confident of welcoming people into their homes. Interpersonal relationships built up among the women as they worked on the project; husbands became supportive of their wives' initiatives when they realised how much the comfort of their kitchens were improved.



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Monitor being mounted in kitchen

Negative impacts

As with any innovation, there were some negative impacts, which have been, or will be, addressed. These included:

Technical problems: some people felt that kitchens were, at times, cold and draughty during inclement weather and particularly during the rainy season; for cost effectiveness, all windows were made a standard size – some house owners would have preferred different sizes; cats and dust could enter through the window – the cats were prevented by having mesh on all windows and eaves; leakage around the base of some chimneys during heavy rain – flashing was required; wick lamps blown out if windows open on very windy days, so windows needed to be closed or hurricane lamps purchased.

Thanks

Our thanks go especially to the communities in West Kenya and Kajiado, who entered enthusiastically into this project without knowing the benefits that would result, and for their kind and generous hospitality throughout the project. Our thanks go too, to Glaxo-Wellcome for substantial support to this project and to other donors including: EMC, the Veta Bailey Charitable Trust, the Ajahma Trust and individuals. ITDG is very grateful for such generous contributions, without which this important project would not have been possible. Finally, our thanks go to Emeritus Professor Paul Miller for the generous contribution of his time during the project.



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Woman doing beadwork, child doing homework because of the cleaner environment and improved light

Social factors: some women were reluctant to communicate problems as they were enthusiastic to allow the project to progress unhindered; some people felt that thugs, sneak thieves and peeping toms could see into their houses, an infringement of privacy – shutters on windows proved helpful; chimney hoods made it more difficult to lean over the pot to cook – agreed time and experience would probably solve the problem; free space was reduced with the hood – women were consulted as to its position to minimise this constraint.

Significant success - the results

Readings of respirable particulates and carbon monoxide were taken in the cooking area of each home, on two occasions before intervention and two occasions after intervention. Also the cooks' exposure to carbon monoxide was measured independently. Statistical analysis of the results shows that the introduction of hoods produced an average reduction in respirable particulates in the house of 75% and in carbon monoxide of 77%. The results from the cooks' personal monitors gave an improvement in carbon monoxide exposure of 35% despite spending more time in the kitchen.

In West Kenya, where eaves spaces, windows and stoves were

selected by the households, the reduction in particulates was 62%; and other benefits such as increased daylight and more pleasant working conditions could be attributed directly to eaves and windows.

Dissemination strategies

• The improvements have generated wide interest from neighbours and others not involved in the project. Already, in Kisii, West Kenya, each of the households in the project represented a group of not less than ten people, and all of them are now keen to have the interventions installed. In Mumias every household with whom ITDG is working presented a request. In the Kakamega Forest region, where ITDG is working on energy conservation, the local team members themselves made a special request to have the interventions in their kitchens. Also, prototypes of smoke hoods are being developed in Kisii and Mumias by stove promoters, using bricks and mud, which are more locally appropriate where space heating is not a major requirement. It is clear that a larger group needs to be targeted – this will be addressed in future project work.

• The Kenya office of ITDG has used the national press to highlight the dangers of smoke, and the project activities.

• Interest has been expressed in more interventions in the main/living houses – this will provide employment for the artisans who have been trained by the project.

• The women feel they have a responsibility to disseminate their experiences; meetings are being arranged to decide how to progress this.

• Videos have been made in both regions; these will be useful dissemination tools, allowing the women to discuss their own impressions of the changes, which the interventions have made to their lives.

• On a broader front, local leaders and government departments have been influenced to participate, and to campaign for smoke reduction.

• The project has shared experiences with institutions and organisations outside the country.

• Further dissemination through publications is planned.

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