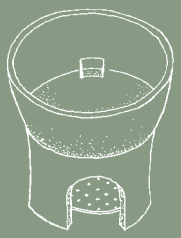
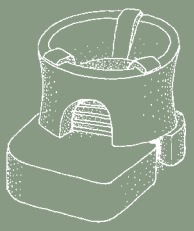
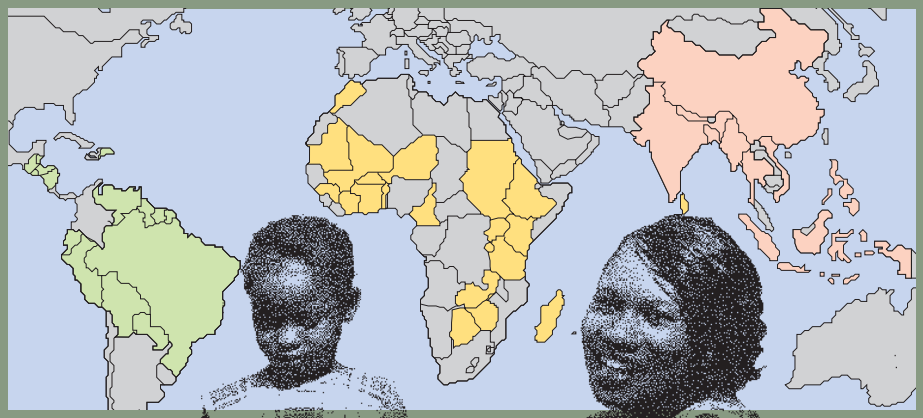
Stove Images



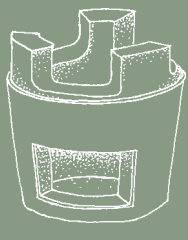

A Documentation of Improved and Traditional Stoves in Africa, Asia and Latin America


Beatrix Westhoff
Dorsi Germann










Commission of the European Communities

SfE Sozietät für Entwicklungsplanung GmbH

gtz

This publication was financed by the Commission of the European Communities, Directorate-General for Development.

Sozietät für Entwicklungsplanung GmbH (SfE) was entrusted by the Commission of the European Communities (CEC) with the task of implementing the project and publishing *Stove Images*.

Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, through its Household Energy Programme (HEP), advised us and helped to compile part of the documentation.

We also profited from the knowledge and experience of other regional and international organizations, which obtained information and photographs for us:
FWD – Foundation for Woodstove Dissemination, Nairobi, Kenya
FWD – Focal Points in Africa, Asia and Latin America
ITDG – Intermediate Technology Development Group, Rugby, UK
FAO – Regional Wood Energy Development Programme (RWEDP), Bangkok, Thailand
FAO – Food and Agriculture Organization, Rome, Italy
ABF – Association Bois de Feu, Nogent-sur-Marne, France

1st. English edition, Frankfurt am Main 1995, ISBN 3-86099-136-1

Deutsche Bibliothek – CIP Einheitsaufnahme
Stove Images: a documentation of improved and traditional stoves in Africa, Asia and Latin America / CEC Commission of the European Communities; SfE – Sozietät für Entwicklungsplanung GmbH Frankfurt am Main. (Ed.: CEC – Commission of the European Communities; SfE – Sozietät für Entwicklungsplanung GmbH). Beatrix Westhoff, Dorsi Germann, (Transl.: Nigel Rigby). 1. Engl. ed. – Frankfurt am Main: Brandes und Apsel, 1995
Franz. Ausg. u.d.T.: Foyers en Images. - Span. Ausg. u.d.T.: Estufas en Imágenes
ISBN 3-86099-136-1
NE: Westhoff, Beatrix; Germann, Dorsi; Rigby, Nigel (Übers.); Europäische Gemeinschaften/Kommission

Authors:	Beatrix Westhoff, Dorsi Germann
Translator:	Nigel Rigby
Design:	Beatrix Westhoff and StolzDesign
Drawings:	Dorsi Germann
Stove design drawings:	Mari Duffner
Layout and lithography:	StolzDesign, Schulstraße 28, D-63110 Rodgau, Germany
Publisher:	Brandes & Apsel Verlag GmbH, Frankfurt am Main, Germany
Printed by:	DAN Printing Works, Ljubljana, Slovenia

Editors:

Commission of the
European Communities
Rue de la Loi 200
B-1049 Brussels, Belgium

SfE Sozietät
für Entwicklungsplanung GmbH
Vogelweidstraße 18
D-60596 Frankfurt am Main, Germany

Stove Images

A Documentation of Improved and Traditional Stoves
in Africa, Asia and Latin America

Beatrix Westhoff
Dorsi Germann

Commission of the
European Communities
Brussels

SfE Sozietät für
Entwicklungsplanung GmbH
Frankfurt am Main

Acknowledgments

We thank the Commission of the European Communities for having financed the preparation and production of this book. Thanks are due in particular to Messrs Hans Smida, Pierre Péligry and Enrico Pironio.

We thank GTZ, and especially Mrs Agnes Klingshirn and the Household Energy Programme (HEP) for their assistance, in particular for helping us to compile the bibliography and distribute the book.

The production and dissemination of this documentation, and all the stages in its preparation, would hardly have been possible without the help and willingness to cooperate of many projects, people and organizations. We would therefore like to thank all who gave support and advice, and contributed during the preparation and organization of visits to projects in the various countries. We particularly want to mention those who demonstrated their deep commitment and thank them for their participation, interest and hospitality.

In Africa:

Mr Stephen Karekezi, Mrs Catherine Gathoga and Mr Nelson Murimi, FWD, Kenya
Mrs Noel A. Chavangi and Mr Thomas Hoerz, GTZ-RESCUE, Kenya
Mr Muiruri J. Kimani and Mr Dominic Walubengo, KENGO, Kenya
Mr Charles Gitundu, RTE, Kenya
Mr Tony Potterton and Mr Matthew Owens, Bellerive Foundation, Kenya
Mr Tom Otiti, Makerere University, Uganda
Mrs Patience Turyareeba, Forest Research Center, Uganda
Mr Philippe Simonis and Mr Augustin Hategeka, GTZ-SEP, Rwanda
Mr David Hancock and Mr Otto Gomm, GTZ-EPZ, Zimbabwe
Mr Gus le Breton, Fuelwood Crisis Consortium, Zimbabwe
Mr Silvester H. Hibajene, ISCC, Zambia
Mr Georges Yameogo, INERA-RSP, Burkina Faso
Mrs Anke Weymann, DNAS-GTZ, Mali

In Asia:

Mr Aroon Chomcharn, Mr E. Pelinck and Mr Philip Hulsebosch, FAO, Thailand
Mr Auke Koopmanns, HSE-Greenfields, Thailand
Mr Wang Mengjie, Mr Xiyo Ming Song and Mr Qian Xuhua, CAAERP, China
Mrs Nirmala Das, ASTRA, India
Mr P.P.S. Gusain, CORT, India
Mr Thomas Hochgesang, India
Mr R.C. Pal and Mr S.N. Srinivas, TERI, India
Mrs Jamuna Ramakrishna, India
Mr Aryanto Sudjarwo and Mrs Jennifer McAvoy, Yayasan Dian Desa, Indonesia
Mr Michael Wagner, Indonesia
Mr K.M. Sulpya, RECAST, Tribhuvan University, Nepal
Ms Delia Hynson and Mrs Vicky Lopez, SIBAT, Philippines
Mr Cesar Mamino, FPRDI College, Philippines
Mr Hil Padilla, AGTALON, Philippines

In Central America andthe Caribbean:

Mr Horacio Ornés Heded, Mr Nestor Sanchez, Mr Miguel Rodriguez and Mr Mathias Bischke, FUDEO, Dominican Republic
Mr Carlos Vargas, ICAITI, El Salvador
Mr Francisco A. Perdomo Lino, Mr José N. Lozo Paz, Mrs Blanca Luz García de González and Mr Cruz Hernandez y Luiz, CEL, El Salvador
Mrs Elena Rosin, CIRES, El Salvador
Mr José Manuel Tay Oroxom and Mr Oscar Alvarado, MEM, Guatemala
Mr Kajsa de Asturias and Mr Armando Cáceres, CEMAT, Guatemala
Mr Marco Augusto Recinos, Mr Arturo Manuel C. Argetta and Mrs Aldea Pachali, ECOTEC, Guatemala
Mr Marco Antonio Alvarado B., TurboMac, Guatemala
Mr Virgilio Alvarado, CDRO, Guatemala
Mr Arturo Cruz, Grupo Familial Cruz Esqueque, Guatemala
Mrs Henriette Geiger de Cuevas, GTZ-Oficina de Servicio de Administración de Proyectos, Guatemala
Mr Hans Wilhelm Grebe and Mrs Rosa del Carmen Perés, Pro Mundo Humano, Nicaragua
Mr Yves Leenaerts and Mrs Emma Lucia Gutierrez Martinez, C.E.E., Nicaragua
Mr Jazmin Ruiz, MAG-CATIE, ACDI, Nicaragua
Mr Hormógenes Zelaga, CEPAD, Nicaragua

Acknowledgments

Mrs Rosario Sotelo Contreras and Mr René Vajejos, DINOT-UNI, Nicaragua
Mrs Isaura Parédes and Mrs Armanda Morales Meza, CIPDC, Nicaragua

In South America:

Mrs Alicia Donaire Guzmán, PERRT/FAO, Bolivia
Ms Alcira Lozano Vargas, Mr Grover Alvarez Quiroga and Mr Santiago Vera, FIDA, Bolivia
Mr Carlos Calderon, PMA, Bolivia
Mrs Sudana and Mr Mauricio Morales Noboa, Mr David Sandoval, Mr Tito Narvaez and Mr Rocio Olivio, Fundación AGAPE, Ecuador
Dr. E. Klinge, GTZ/PROFORS, Ecuador
Mr Rainer Dulsch and Mr Atilio Grau, GTZ/LRE, Paraguay
Mr Cesar Colombino, BASE/ECTA, Paraguay
Mrs Corina and Mr José Malpica Medina, Peru
Mr Thomas Alza Alcantara, Proyector Algarrobo, Peru
Mrs Teresa Gianella, CCTA, Peru
Mrs Soraya Ronquillo, SEA, Peru

In Europe and the United States:

Mrs Maria Nyström and Mrs Nita Lorimer, LCHS, Sweden
Mr Peter Watts, Mr Peter Young and Mr Jean Long, ITDG, United Kingdom
Mrs Emma Crewe, United Kingdom
Mrs Anne Carton, ABF, France
Mr Jean Luc Esperou, France
Mr Micheal Gayo, EC, Germany
Mr Miguel A. Trosseró, FAO, Rome, Italy
Mr Kirk Smith, East West Center, Hawaii, USA

We wish also to express our deep appreciation to the women and families in the various countries and continents who extended such a cordial welcome to us in their homes and kitchens.

We thank all the women and girls and the male cooks who figure in the photographs for having accepted the role of principal actors in this documentation.

We thank all those on the staff of SfE who collaborated with us on this project, in particular Mrs Mari Duffner, for her dedication and unflagging assistance in the management and processing of the data of the documentation, and for the stove design drawings.

We also thank Mrs Heidi Gutsche and Mr Franz Zinner, co-author of the first collection of stove photographs, for their invaluable help and advice.

A special debt of thanks is due to Ms Eva Frank, Ms Verena Strinz and Ms Birgit Löwer, for their dedication and unstinting cooperation.

We thank our translators, Ms Françoise Gibert, Mr Nigel Rigby, and Mr Pedro Navarro, for their willingness to familiarize themselves with an unusual field.

This publication would not have been possible without the moral support of our friends and families, who gave us encouragement and shared our enthusiasm for this subject.

Contents

Acknowledgments 2
Foreword 8
Preliminaries 9
Preface 10

General Introductory Section

Stove Stories and 'Burning' Issues
Articles by Authors from 10 countries 14

The Stove, Nucleus of the Household
Integration of stoves, actors and conditions

The Stove, The Kitchen – From Simplicity to Diversity… 16
Dorsi Germann

Stoves Through the Ages
History and development of stoves

One of the Oldest Technologies in the World – from the Open Hearth to the Microwave 18
Beatrix Westhoff

The Power of the Stove
Energy, environment and economy

Environment and Economy 20
Stephen Karekezi and Nelson Murimi

Stove Trials and Tribulations

Wood-Fired Stoves in Guatemala – A Brief History 22
Manuel Tay

No Future ...?
Stove crisis, policy and financial crisis

Household Energy Projects: Success and Rationale 24
Agnes Klingshirn

"Try and Try Again – Don't Give Up Your Dreams!"
Participation, women, sustainable development

Participation and the Role of Women in Sustainable Development: The Kenyan Experience 29
Noel A. Chavangi

Participation and Women: Health and Indoor Air Pollution in India 32
Jamuna Ramakrishna

“So All You Need Is a Better Stove?”
Design, refinement, cooking habits

Improved Stoves in El Salvador: Which Model Next? 35
Carlos Vargas

Conservation Without the Cost: Saving Energy With No Stove 38
Matthew Owen

What About Kitchen Design and Architecture?
Housing, energy, kitchen, stoves

The Kitchen – Heart of the Home 40
Maria Nyström and Nita Lorimer

The Rolling Stoves 42
Dissemination, commercial and extension strategies

Dissemination Strategies and Tradeoffs: Example from the Sri Lankan ICS Experience 42
Kiran Dhanapala and Shyam Sundar

Popularization Is the Key 44
Jennifer McAvoy

Firewood-Saving Stoves in China 46
Wang Mengjie

“No Money, No Stoves”
Marketing, subsidies, credits

Commercialization of Improved Stoves: The Case of the Kenya Ceramic Jiko (KCJ) 48
Dominic Walubengo

Stove People – Let’s Come Together
Role of governmental and non-governmental organizations

The Role of State and Non-Governmental Organizations in the Dissemination of Improved Stoves in Burkina Faso 50
Georges Yameogo

Step by Step..
Project impact monitoring and evaluation (M&E)

Listening to the Cooks 54
Emma Crewe

Refugees Need Firewood and Stoves Too!
Household energy and stoves in refugee camps

GTZ-RESCUE Experience in the Dadaab Refugee Complex in Kenya 57
Muiruri Kimani

Contents

Technology Section

Index

Index of photographs and data sheets by country 61

Introduction

How to use the stove data sheets 62
Abbreviations, codes and pictograms 63

Traditional and Improved Stoves 64

Africa – Latin America – Asia

Domestic Wood Stoves

Open and three-stone fireplaces 64
Solid stoves with or without chimney 66

Domestic Wood and Charcoal Stoves

Portable ceramic or pottery stoves 112
Portable metal stoves 119
Portable ceramic/metal stoves 138

Gas and Kerosene Cookers 146

Institutional or Community Stoves

Open and three-stone fireplaces 148
Solid and metal woodstoves with or without chimney 149
Metal woodstoves with insulation liner and chimney 152
Metal gas stove 157

Kitchen Environment

Kitchens Traditional and improved kitchens 158

Other Technologies

Ovens and Kilns Traditional and improved ovens and kilns 164

Information Section

174

Bibliography

175

Contents

1. Bibliographies, Directories, Information Systems 175
2. Policy, Ecology, Socio-Economy 175
3. Energy Assessment, Strategy 177
4. Household Technologies, Cookstoves 181
5. Household Environment, Other Technologies 183
6. Business Technology – Small Businesses 184
7. Technology Development 184
8. Implementation, Management 186

Index

190
Authors 190
Corporate Authors 192
Titles 193
Regional Descriptor 198
Newsletters 199

Directory

200

Contents

200
Africa 200
Central America and Caribbean Region 205
North America 207
South America 208
Asia 211
Australia and Pacific States 214
Europe 214

Foreword

Stove Images contains a wealth of information on household energy and the use of stoves in Africa, Asia and Latin America.

It emphasizes the relationship between environmental protection and the meeting of local needs, and at the same time it gives an idea of the complexity and diversity of the energy demands of millions of families in different regions in the world.

This book relates global environmental issues, like climate change and deforestation, to the everyday lives of ordinary people.

Stove Images is based on local experiences and builds on existing practices of household energy supply. As such it presents options and examples of appropriate stoves to reduce the consumption of wood and so ease the problem of deforestation.

The provisions of the fourth Lomé Convention, and the adoption by the European Union of the recommendations of the Rio Conference, represent an important consolidation of the Union's commitment to sustainable development and provide firm legal and policy foundations for action.

In this context the Commission welcomes the search for local solutions to global environmental problems and is convinced that such solutions would contribute to the improvement of living conditions in developing countries.

It is evident that a successful policy should be based on local participation and local initiatives, for which a good knowledge of local circumstances is required. *Stove Images* gives a better understanding of this local diversity and complexity by giving an overview of household energy problems in three different continents. As such it is hoped that this book will serve as a contribution to our understanding of the third world energy crisis, and that it will both inspire and challenge its readers to continue the search for creative solutions.

Hans Smida

Director
Commission of the European Communities
Directorate-General for Development

Preliminaries

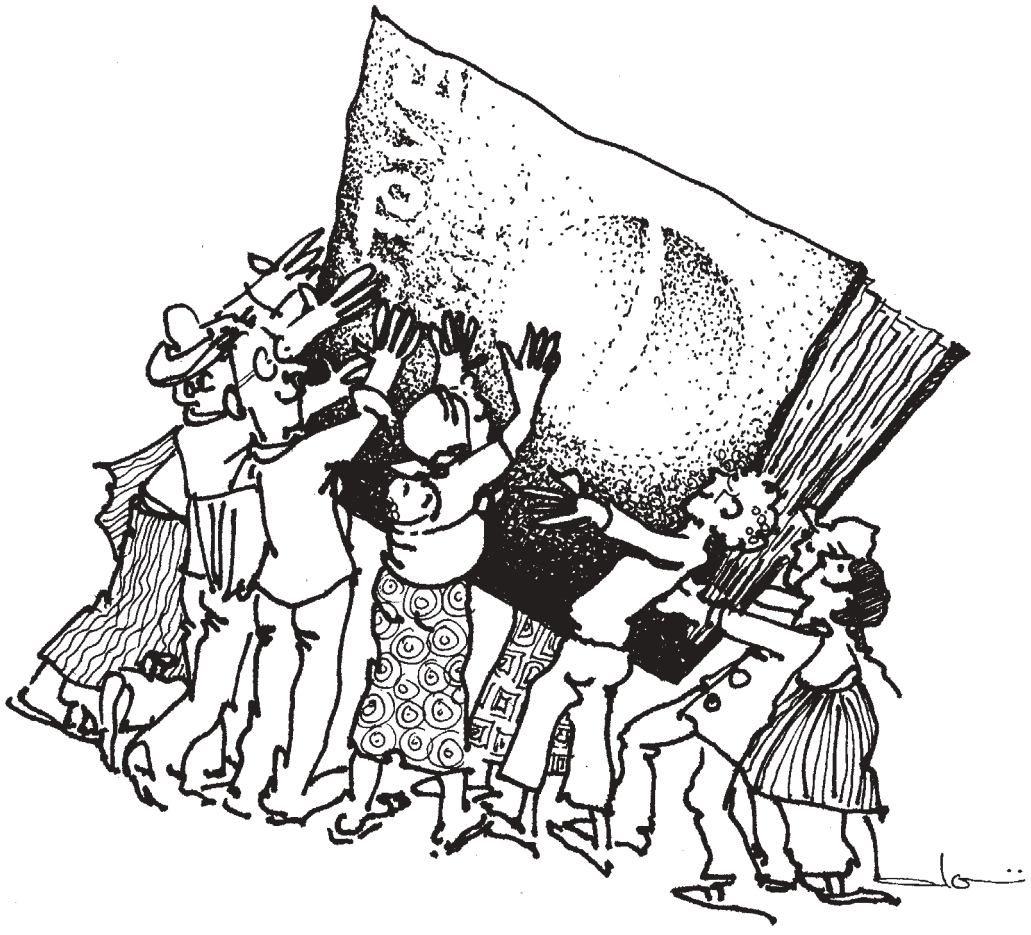
Time and again we have been asked: “How did you get the idea of putting together a book about cookstoves from around the world? That’s rather exotic”.

It’s a long story, which began more than ten years ago in smoke-filled African kitchens, on floating markets in Asia, or perhaps in Guatemala, when we were talking to women in straw-roofed cooking huts while they prepared tortillas over large fires. It was above all through working with women from third world countries that we gained a deeper insight into their everyday material culture, where things have their own language and meanings which often fascinate us, perhaps because we don’t understand them. It was for this reason that we wanted to put together a picture of this culture the way we found it - diverse, chaotic, inefficient, original, modern or traditional and usually female.

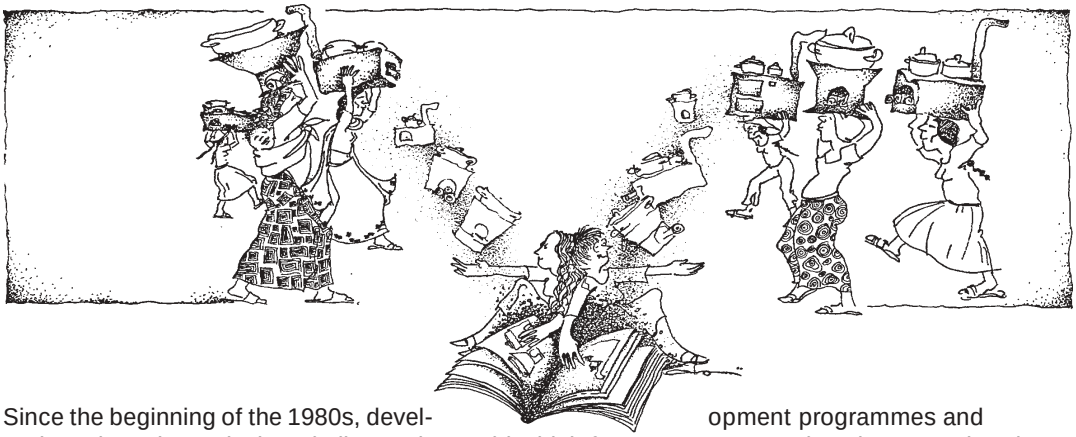
Having produced an initial collection of photographs of stoves, kitchens and household goods from four continents, which was compiled between 1981 and 1987, we wanted to update and complete the collection. This meant cooperating closely with competent and committed people working in this field, and integrating their extensive experience and knowledge.

Our concept of actively including the people being studied in the documentary and of establishing and maintaining contacts with them has proved its worth and led to the numerous contributions by projects and organizations in Africa, Asia, America and Europe.

Thus we primarily played the part of intermediaries, of journalists gathering and selecting information, making as few judgments as possible. It was an enriching experience and a fruitful collaboration, both with respect to putting together the publication and to building up relations between people.



Preface



Since the beginning of the 1980s, development programmes and projects have been designed all over the world which focus on energy and environmental problems, and on the "improvement and dissemination of cookstoves". It was against this background that SfE's first collection of photos of stoves and kitchens from several continents was compiled. Due to the rapid developments in this field at the end of the 1980s, the collection, which reflected the situation as it was in 1987, could no longer claim to be representative. Now the material has been revised, expanded and updated for publication as a comprehensive documentation.

Stove Images

Foyers en Images

Estufas en Imágenes

Stove Images hopes to contribute to and encourage improvements in the conditions in households and in environmental protection in developing countries. Energy-saving and appropriate technologies can help reduce workloads and fuelwood consumption in households. They can thus have a positive impact on economic and ecological development. The aim in publishing this documentation is to make it accessible to a wide audience and increase their awareness of the subject.

Stove Images is available in two other languages, French and Spanish.

Stove Images describes and illustrates the present state of a technology in a complex environment comprising different regions and cultures. It provides an introduction to important stove-related topics and presents a wide variety of information sources. The heart of the publication is the pictorial documentation of improved and, in particular, traditional stoves, kitchens and other technologies. These two terms were chosen to help make a rough distinction, although we are well aware that in some cases they are not altogether accurate. They are used in this way in the context of development projects, but should not be understood always as an assessment of quality. Improved does not necessarily mean "better" than traditional.

– **Traditional**, in the broadest sense, refers to technologies that developed spontaneously without any outside influences.
– **Improved** is used to describe technologies that were improved or introduced in connection with development projects or technology transfer.

***Stove Images* – Why?**

Stove Images aims to cover three key aspects which also dictate the character of the book:

Documentation **Visualization** **Awareness-raising**

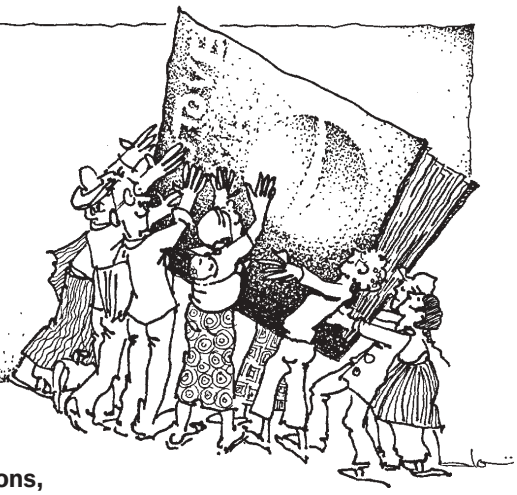
Stove Images provides a systematic and typological survey on the basis of information and technical data on traditional and improved stoves, kitchens and other technologies which are currently in widespread use in Africa, Asia and Latin America.

The photographs and drawings make *Stove Images* above all a visual reading experience. The illustrations enable the broadest possible audience to form their own, differentiated opinions – beyond verbal information – on the problems.

Stove Images wants to present information in order to facilitate communication, cooperation and exchanges of experience. The aim is to support existing networks as well as to stimulate the great potential for creativity that exists in the search for new ways and solutions. This could give rise to new approaches to cooperation and project initiatives.

***Stove Images* – For Whom?**

In brief, this question could be answered as follows: "The target groups span all occupations, from cooks to clerics". Or, if a more precise response is desired, the answer would be the following:

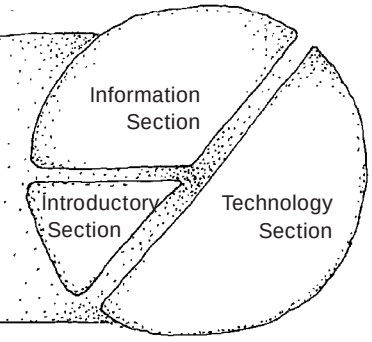


The target groups are:

National and international organizations, institutions, projects, groups and persons, who – in the northern or southern hemisphere – are active in the following fields:
energy, the environment, ecology, social services, economics and politics, research and development, education, agriculture and forestry, craft trades and industry, health, the promotion of women, rural development, international cooperation, financing etc.

How is *Stove Images* structured?

Stove Images is organized in three parts. Each is self-contained and can be read separately. Taken together, they enable the interested reader to access additional information, new areas of knowledge, and new areas of activity.



Introductory Section

17 articles by authors from 10 countries
The General Introductory Section provides information on the general conditions currently influencing the development and dissemination of household and craft-sector technologies intended to help protect the environment and promote social and economic development.

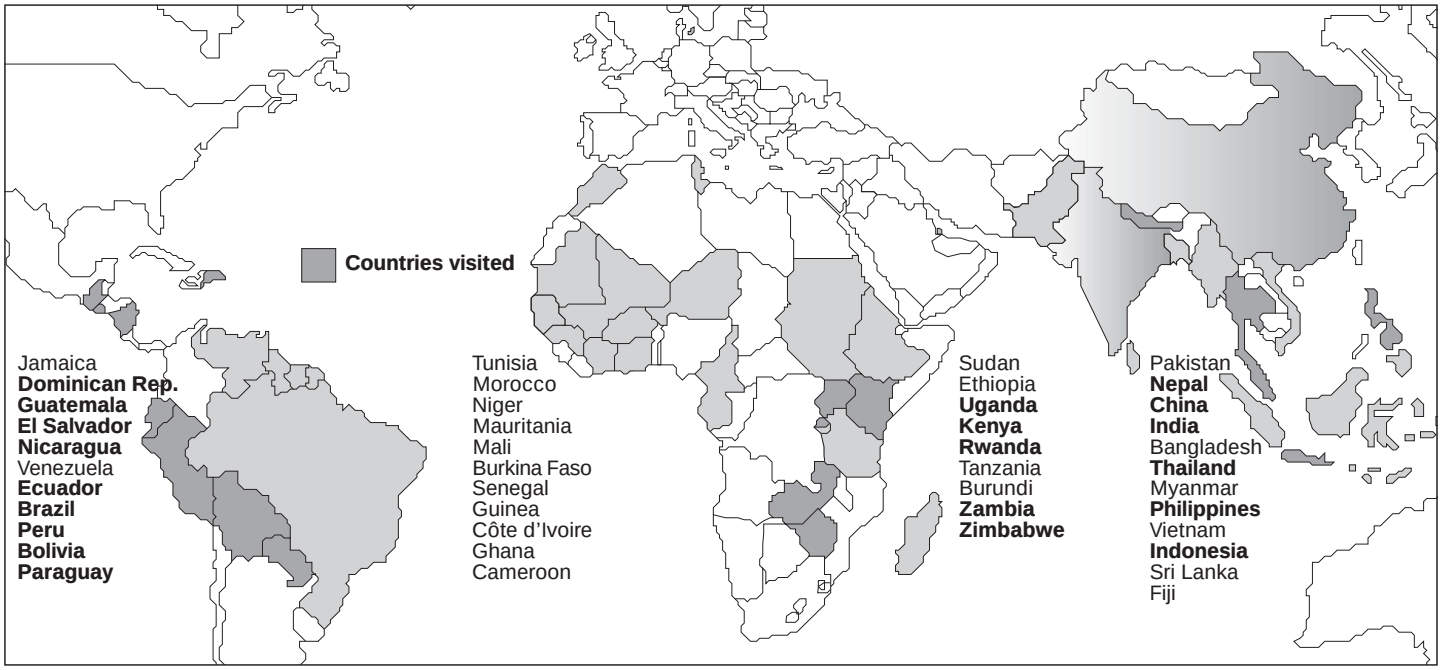
The articles were written by experts in different fields, both from the North and the South. They report at first hand on experience gained and lessons learned in developing countries. Subjects: stove projects in Africa, Asia, and Latin America as well as such other aspects as, for example, the history of stove development, integration in other areas, health, the environment, emergency aid for refugees, promotion of women and their independence, awareness-raising, dissemination strategies, design, production and marketing, commercialization, project planning, monitoring and evaluation, the role of institutions and organizations, financing, development policy etc.

Information Section

Bibliography with about 270 selected titles.
Publications, reports etc. from 76 countries world-wide organized by field (ecology, socio-economics, energy, technology, management etc.) with key words and index (authors, titles, regions/countries). Contributions to the bibliography were provided by various projects and organizations (ABF, CEMAT, FAO, FWD, ITDG etc.), others were discovered in the course of our own search for literature in different countries. In addition, a selection of the most important and up-to-date literature was made from the more than 1000 titles available in the reference library of HEP-GTZ. These contributions were reviewed together with GTZ and other consultants and compiled into a bibliography arranged by subject.

Directory with about 500 addresses
of organizations, projects and persons from 100 countries around the world. Organized by continents or countries with information on principal activities.

The Information Exchange enables the reader to delve deeper into the subject and to find information on major topics and developments, or to contact projects and organizations.



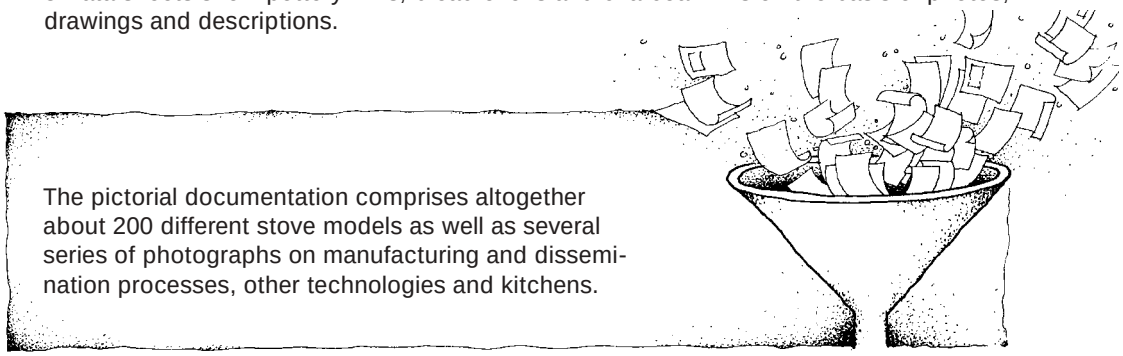
The countries covered are marked on the map.

Technology Section

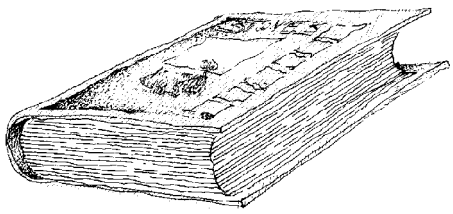
206 Photos of traditional and improved stoves in Africa, Asia and Latin America
100 Stove data sheets provide information on 35 different types of technologies and their variations in 41 countries, on the basis of photos, drawings and descriptions.

34 Photos of kitchens and other technologies in Africa, Asia and Latin America
8 Data sheets show pottery kilns, bread ovens and charcoal kilns on the basis of photos, drawings and descriptions.

How the selection was done?



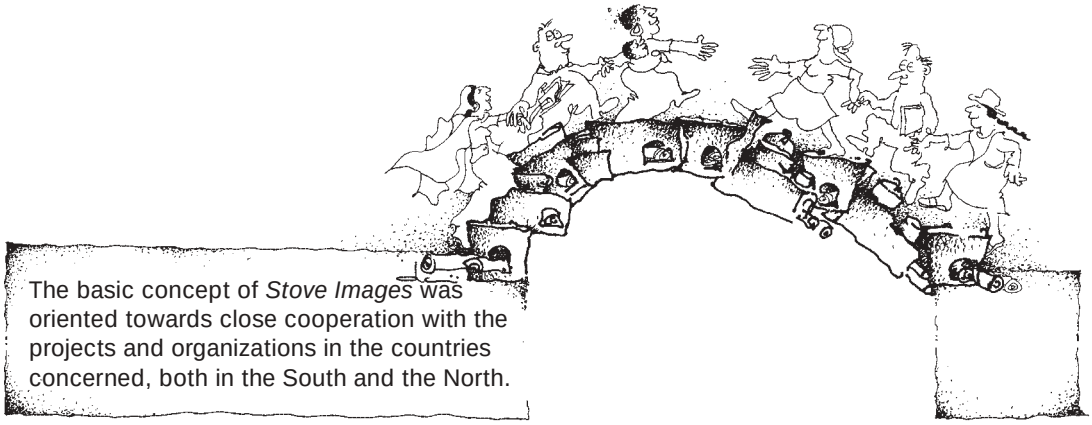
The pictorial documentation comprises altogether about 200 different stove models as well as several series of photographs on manufacturing and dissemination processes, other technologies and kitchens.



For the publication, a selection of 85 stoves, 15 kitchens and other technologies was chosen according to the following criteria:

– Widespread use and projected dissemination
– Balanced relationship regarding:
  – traditional and improved stoves;
  – continents, regions, and countries;
  – rural and urban areas;
  – technologies (pottery, metal, mud etc.);
  – dissemination systems (self-help, commercialization, subsidies, consulting, and combined systems etc.).
– Originality and/or pioneering design
– Representativeness of the cooperation projects
– Quality of the pictorial material

What models and procedures were used?



The basic concept of *Stove Images* was oriented towards close cooperation with the projects and organizations in the countries concerned, both in the South and the North.

Due to experience gained in development projects, we were able to draw on our knowledge of existing structures and relationships and on the contacts we had established. To obtain up-to-date and suitable pictures and reliable data on stove models and projects, we adopted the following course of action:

Cooperation

Initiating communication and cooperation
The most important organizations such as ABF France, FAO Italy, FWD Kenya, GTZ Germany, HEDON c/o FAO, ITDG United Kingdom, LCHS Sweden, THE Eindhoven Netherlands etc. were informed in order to
– make *Stove Images* known;
– establish a basis of trust for cooperation;
– obtain recommendations and information concerning the concept, procedure, addresses etc.

Consulting organizations, projects and individuals
By establishing contact with and writing to about 300 projects, organizations and persons around the world, we were able to obtain pictorial material as well as corresponding information on the specifications and dissemination of the different stove technologies.

Visiting projects and organizations
Following detailed situation analyses, countries and projects were selected which have long experience in the dissemination of stoves, but for which relatively little data and pictorial material were available.

We visited 108 selected projects and organizations in 19 countries in Africa, Asia and Latin America, as well as 81 stove projects in villages and towns. These visits helped us gain insights into the very different conditions and daily reality of the projects and were instrumental in intensifying the subsequent correspondence and cooperation.

The topics presented in the General Introductory Section were discussed and selected on the basis of this in-depth exchange with experts in the field in the course of and after our visits to the projects.

Documentation

Documentation, design and publication
The material (pictures, data, literature, addresses) was documented continuously, processed, structured and evaluated by means of databases.

Despite intensive research and the relatively large size of the collection, the publication does not lay claim to completeness. It is, however, one of the largest and most comprehensive documentations of this kind published to date.

Design concept

The design concept of *Stove Images* originated as a rough framework and guide for the project, its presentation as a book and its publication. In the final analysis, the design of the finished book is the result of a balancing act, a compromise between the desire to provide information as concisely but also as completely as possible, and the search for a visually emphasized and immediately understandable form. It was intended to be appropriate, as far as possible, for target groups with different cultural backgrounds. We hope that this aim has been achieved and that all readers will find *Stove Images* a useful publication.

17 articles by authors from 10 countries

The Stove, Nucleus of the Household
Integration of stoves, actors and conditions

The Stove, The Kitchen – From Simplicity to Diversity...

Dorsi Germann

If you think kitchens and stoves are women's business, you're right. But if you think that means stove projects are unimportant, simplistic, undemanding and easy to implement, then – although you may share this belief with many others – you are wrong. In the essay below I will try to point out some of the many factors that play a part in stove projects and ought to be taken into consideration.

The kitchen is more than a heart

The kitchen is more than a mere pumping station; it is more than a heart. It is the household's belly, its source of energy. The kitchen functions like a power station that transforms natural resources into vital energy. The stove, the energy supply point of every household, produces heat to prepare food. This requires an input of energy in the form of fuels as well as the work of women and girls. If the food is prepared well, it is easier to transform into life-sustaining, essential energy.

Kitchens are functional

Kitchens are functional: as a rule, the work processes carried out in them are controlled rationally. And yet kitchens are associated with more emotions than any other room or area in the house: taboos as well as cultural values and standards frequently define not only the design of stoves or the choice of food, but also the work performed in the kitchen. In some ethnic groups women are not allowed to cook while they are menstruating; in others, the kitchen is off limits to men.

Kitchens are places of female communication

Kitchens are places where food is stored and prepared, where people talk and cook and eat. They are places where women meet daily, centres of female communication, women's domains. Kitchens are female, warm, full of mysterious fragrances, and mystical. The fire in the stove symbolizes life. In some cultures stoves are sacred, while in others they are hidden away in dark corners. Some peoples cook outside, others build separate cook-houses or integrate the stove and fire in the living and sleeping area. There are as many different types of stoves, kitchens, cooking and eating habits as there are different peoples, different climatic and geographic zones. But it is always women who work there and who are the guardians of the fire.

Stove projects

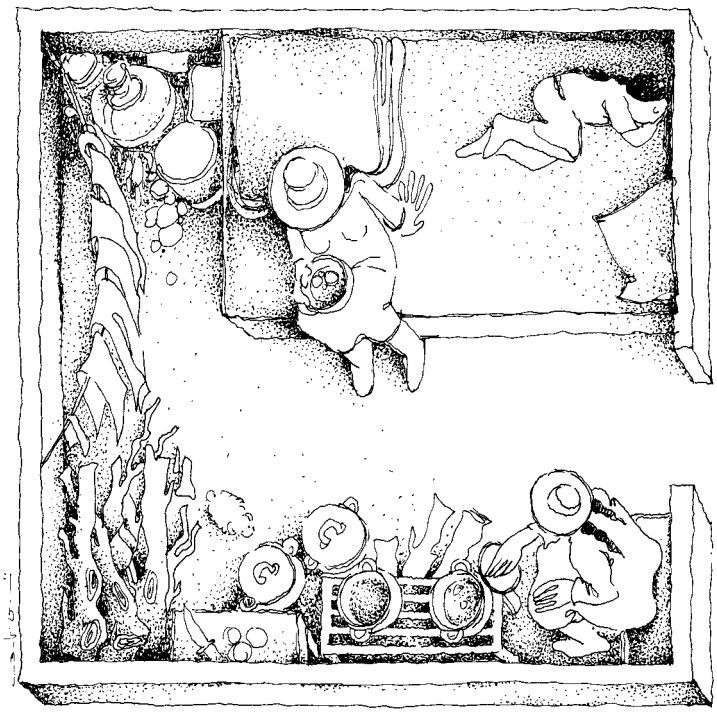
Stove projects make clear how many fields are interlinked and influence each other. To name just a few examples, there are desertification and the greenhouse effect, the broad spectrum of alternative energy sources and technologies, government and energy programs, marketing and distribution strategies, the wide field of household and household management, smoke generation and health-related issues, the processing and storage of food, the management of energy and resources in general, economic factors, conflicting interests, perspectives and emotions...

Neglecting one or more of these areas is often a cause of failure. Simple "if-then" relations no longer suffice with respect to planning and controlling or as explanations. Naturally, reduced fuelwood consumption has an impact on forest resources. Naturally, a country's energy policy influences stove development, and too much smoke is detrimental to the health of women and children – but that's not all. And for the acceptance of improved stoves, not only their degree of technical perfection, but also – and above all – the degree to which they are adapted to the users' cooking habits, to their traditions and culture, and to the types of fuel available are crucially important.

To implement a stove program successfully, the point is not to develop the most economical and technically optimized stove. There are already plenty of those available. The point is to recognize and combine as many of the influencing socio-cultural and economic factors and natural and environmentally-induced conditions as possible, in order to decide which stove model is best suited to which environment/context or how local, traditional stoves can be improved. This calls not so much for technical know-how, but more for an ability and willingness to observe, to listen and to ask questions.

So monocausality is out of date. However, not only integral thinking is necessary, but also an ability and readiness to communicate and cooperate as partners. In order to adapt different stove models to local conditions in accordance with cultural, social and economic needs and possibilities, an exchange of information is needed. To this end, women – being experts in the field – are indispensable. Stove dissemination programmes can only be implemented successfully if the local partners participate actively and equally in the various phases – and if possible in all phases – of the project.

Thus, this complexity of stove projects presupposes a capacity for integral thinking, creativity and social competence. It calls for knowledge in sociocultural, economic and technical areas. It demands a lot! Does this deter you, or is it the same intellectual and human challenge for you that it is for us?



Dorsi Germann, a sociologist and graphic artist, spent four years working on a rural development project in Senegal and published a stove documentation in collaboration with the University of Dakar. For the last twelve years she has been a freelance consultant on adult education, appropriate technologies, techniques of communication and visualization, project management, M&E and participatory methods in Africa, Asia and Latin America, working mainly for GTZ, SfE and FAKT.

Stoves Through the Ages
History and development of stoves

One of the Oldest Technologies in the World – from the Open Hearth to the Microwave

Beatrix Westhoff

500,000 years ago

Stoves represent a technology as old as the discovery of fire and human civilization itself. The oldest known stoves date from about 400,000 BC (China[1]) to 500,000 BC (Europe,[2]), where man (Homo erectus, in the Early Palaeolithic period), usually inhabited caves and made fires inside a circle of stones. In those glacial times, the purpose of the fire was very probably to provide warmth. The use of fire to prepare and preserve food only really became known in the Middle Palaeolithic, i.e. around 100,000 BC.[1]

Beginning of human civilization

It marked the beginnings of human civilization, of which the control of fire and the exploitation of energy in general were to be fundamental elements. To begin with, they played a key role in man's evolution and his survival. As a means of heating food, and above all as a method of transforming it, the use of fire was responsible for a change of diet, the basis of human development and civilization. One of the earliest methods of preparing or preserving meat in large quantities was to bake it in a kind of oven. Layers of pre-heated stones alternating with layers of meat wrapped in green leaves were placed in a pit or on an earth-covered hearth. In some parts of Latin America and Asia this method of cooking is still used. Following the development of domesticated plants and animal husbandry, and of technologies such as pottery and the construction of mud dwellings, the stove took on the familiar basic form which has meanwhile been around for some 12,000 years. It consisted of an arrangement of stones serving as a support for a cooking receptacle – a cookpot, a grill or an earthenware platter. Installed inside the house, sheltered from the wind and rain, or outside in the yard, the stove became the centre of the dwelling. It was variable in size, easy to install and multi-purpose: it served not only for boiling, frying or smoking food, but also for heating the space occupied by people and animals.

Archetypal stoves

This archetypal stove, which we refer to as "traditional", developed according to more or less the same principles throughout the world, with variants reflecting specific features of the culture in question and inevitable chronological differences. It remained predominant for thousands of years, up to the 18th century in Europe[3] and even into our own time in the rural milieu of most African, Asian and Latin American countries. In Africa, although there is some early evidence of pottery stoves (1000 BC – 16th century AD)[4], it can only be said that major research and documentation still has to be done to relate the history and utilization of stoves in the ancient cultures of the South. In Europe, from Roman times onward, some degree of organization of the kitchen started to emerge, with notable improvements in the stove itself and in cooking utensils. But even in the Middle Ages, the exhausting of smoke via a chimney and the construction of an earth or brick hearth for the iron tripod from which the cast-iron cookpot was hung were rare improvements, often the privilege of the ruling classes.[3]

When "the kitchen" originated

The technological development proper of the stove, the oven and what is now commonly known as the cooker did not begin until the Industrial Revolution in the 19th century. It was to bring about far-reaching social and economic changes in western society. It was at this time that "the kitchen" as a separate organization, construction and specialized space came into being. Previously it had been an integral part of the dwelling (farm etc.) where very large families or even the entire community took their meals. For women, cooking was one of many occupations. The food itself (rice, millet, maize), the daily preparation of it and the utensils used had remained practically unchanged for thousands of years.

Beginning of a divided world

It was only when the terms "development" and "progress" made their appearance, thanks to increased affluence and material wealth, that the world began to divide into developed and underdeveloped, industrialized and non-industrialized, urban and rural etc. This trend was to set the traditional stove in stark contrast to the modern or "improved" kitchen.

Technological development

In the general context of technological development in Europe from the 19th century onward, the key factors were, firstly, over-exploitation of the forests followed by a shortage which drove up the price of firewood; secondly, the discovery and introduction of other fuels and forms of energy, initially in industry and subsequently in households (coal, gas, oil, electricity etc.); thirdly, the development of new industrial technologies (iron-smelting, the steam engine, electric light, steel,

aluminium etc.) and the growing need to organize the household and the kitchen along practical, efficient lines. On other continents, this process took place according to the same principles, initiated, forced or influenced by the West (colonization, economic dependence, imports etc.) In those countries which today are said to be developed, the practice of cooking daily over a wood fire survives only in a few rural regions or as part of a culinary tradition. It has become a luxury or a leisure activity – an open hearth, bread or pizza baked in a wood-fired oven, barbecues etc.

Traditional stoves still predominant?

By contrast, it is estimated that 75% of the inhabitants of so-called developing countries still cook over the same kind of open, wood-fired "stoves" that our prehistoric ancestors used. The new technologies – cookers or ovens that run on gas, oil or electricity – are having some slight impact in urban areas. Yet, nevertheless, in certain regions there exist traditional wood- or charcoal-burning stoves and ovens which are of high quality and appropriate. Some of them have been exported from one region or even from one continent to another. Thus, for example, the "Jiko" metal stove was introduced in East Africa in the 19th century by Indian workers brought in to build railways. To cite another example, the "Sinco" pottery stove currently used in Mali is one result of commercial and cultural relations between African regions, where, as in the north, pottery was probably developed in prehistoric times (4). Unfortunately, in many regions, the artisanal tradition in pottery seems to be dying out. The reasons are manifold: neglect or transformation of traditions, lack of basic materials etc. Or it is the fact that all stages of technological development are now alive and present. They interact and inform each other in a process about which, as yet, very little is known.

Development aid

After the colonial era, the economic clout and the development aid policies of western nation-states laid down their law in the "under-developed" countries. Since the 1950s, the alignment and strategies of stove dissemination projects have changed frequently, reflecting political standpoints on aid. Numerous problems had to be taken into account, including epidemics, drought, desertification, the environment, the promotion of women, promotion of craft trades and industry, crisis situations (e.g. famines, natural disasters, wars), the need for emergency humanitarian aid etc..

First stove projects

It was within this context that the first projects were implemented in India and Indonesia in the 1950s. In Africa, they began in the Sahel after the terrible drought at the end of the 1970s; and in Central America after the earthquake in Guatemala in 1976. To this "first wave", which to a greater or lesser extent was due to the West's initiative, belong the solid stoves with chimneys, for two or three pans or cookpots. In general they are complicated, costly or – compared to traditional local stoves – difficult to obtain.

Second wave, better approach

The stoves introduced in the second wave, from 1980 to 1990, were better designed and addressed the problems of fuelwood consumption and the needs of users, producers and markets. This approach, better suited to local conditions as regards materials, production methods etc., was marked by open participation of specialists and grassroots organizations. The main types of stoves disseminated were, on the one hand, chimneyless, designed for a single pot, and made by the users themselves, and on the other pottery or metal stoves made by craftsmen and disseminated via traditional markets and projects (commercialization). Current efforts are aimed at achieving autonomy in stove design and dissemination, while at the same time adapting them to specific local requirements in the regions and countries of the South. Nevertheless, the archetypal, traditional stove will doubtless be the most widely used for a long time to come, even though the "modern" technologies will continue to gain ground if economic and social development permit.

References

1) Sharma, S.K. (1993) – **Improved Solid Biomass Burning Cookstoves: A Development Manual** – Bangkok, Thailand, FAO-RWEDPA, Field Document No. 44, p. 4,5.

2) Bonifay, E. (1976) – **Grottes du Mas des Caves** (Lunel-Viel, Hérault), France, Livret guide C2, UISPP, pp. 196-204.

3) Tränkle, Margarete (1992) – **Zur Geschichte des Herdes – Vom offenen Feuer zur Microwelle**, in OIKOS, Giessen Anabas Verlag, pp. 37-51.

4) Dorst, D. (1960) – **Transportable Herde in Afrika** – in Jahrbuch des Museums für Völkerkunde zu Leibzig, volume (Band) XVII/1958, Akademie-Verlag Berlin, pp. 140-157.

Beatrix Westhoff is an industrial designer. She has worked in numerous fields, including product design, environmental engineering, architecture, communications planning, graphics and marketing. For six years she was SfE adviser to the Institut Burkinabé de l'Energie (IBE), with responsibility for the development, adaptation and dissemination of cookstoves for households and small business. She is co-author of the first SfE documentation of cookstoves in Africa, Asia, and Central America (1987). Since 1990 she has worked as a freelance consultant, mainly for SfE and GTZ, on Technical Cooperation projects in Africa, gaining experience in various fields, including promotion of women, household energy, technological development and AT, and participatory methods in development cooperation.

The Power of the Stove
Energy, environment and economy

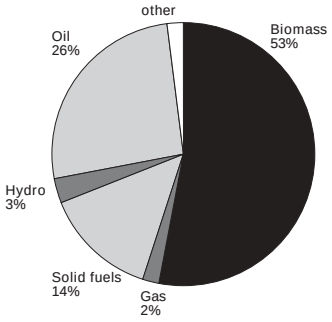
Environment and Economy

Stephen Karekezi and Nelson Murimi

Introduction

Biomass is one of the principal fuels in developing countries. In Africa, 50%-90% of total energy requirement is in the form of biomass. Biomass energy refers to any organic matter available on a renewable basis for conversion to energy. It includes forest residue; agricultural waste; wood and wood waste; animal waste; aquatic plants; and municipal waste (Karekezi 1992).

Energy demand in the region is estimated to be 267 Mtoe of which 53% is traditional fuel largely composed of unprocessed biomass (World Energy Council 1992). Biomass is produced, transformed and consumed in a multitude of ways, from the three-stone fire common in rural areas of the region to the multi-million dollar ethanol complexes (Karekezi 1994a). It is estimated that bio-fuelled cookstoves meet the bulk of cooking, heating and lighting needs of over two billion people or two-fifths of mankind.



Source:
World Energy Council, 1992

Environmental Effects

Although woody biomass has important benefits, its inefficient use in developing countries has been linked to a number of adverse environmental effects, namely deforestation and indoor air pollution.

Deforestation

Increased use of woody biomass energy in the region has led to the belief that biomass energy consumption is the major cause of deforestation. Institutional and urban biomass energy consumption, charcoal production and agricultural activities are considered to be major causes of deforestation (Karekezi 1990).

Indoor Air Pollution

In most parts of the developing world, biomass is burned in open fires or inefficient stoves in poorly ventilated kitchens. Biomass smoke contains several poisonous constituents such as respiratory particulate and carbon monoxide (CO). In some studies, indoor air pollution levels of particulates in households using bio-fuelled cookstoves have been found to be as high as 10,000 µg/m^3, over 50 times the World Health Organization recommended level of exposure (Smith 1993; Pandey et al 1989). Women and children are continuously exposed to high levels of harmful smoke which could lead to serious health problems. The table below shows the emissions by different types of stoves.

Emissions from Woodfuel Combustion (g/kg fuel)

Type of Stove: **Fuel:**	Open fire **Wood**
Purpose	Cooking
TSP	7.7
TAR	
SO_2	
NO_x	
CO	10 – 180

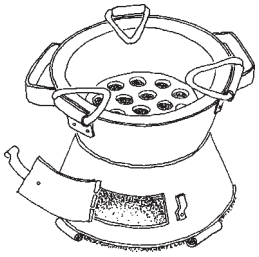
Type of Stove: **Fuel:**	Metal stove **Charcoal**
Purpose	Cooking
TSP	2.4
TAR	
SO_2	0.07
NO_x	
CO	250 - 380

Type of Stove: **Fuel:**	Metal stove **Wood**
Purpose	Space, heating
TSP	11.4
TAR	4.8
SO_2	0.4
NO_x	0.8
CO	120

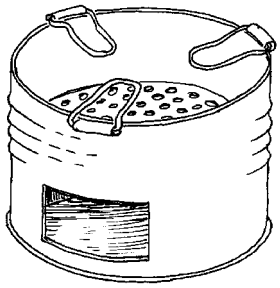
Improved Cookstoves

Cooking done traditionally over an open fire has various drawbacks: dispersion of the flames and heat during windy conditions, lack of proper control over the fire, exposure to heat and smoke as well as fire hazards (Sharma 1993). The heat and smoke, however, has benefits such as food preservation, space heating during the cold seasons and keeping the thatch dry (Smith 1991). One of the most sustained effort to modernize fuel end use technologies has been the development of an environmentally-sound and efficient improved cookstove for rural and urban households and institutions in developing countries. As mentioned earlier, the household sector is often the single largest consumer of biomass energy in developing countries. Countries relying on fuelwood consume 12 – 28 times as much energy for cooking as Japan does on a per capita basis, and are able to increase their energy efficiency several times by simply introducing energy-efficient improved stoves (GTZ 1992). There are important differences between cookstoves for rural and urban households and for institutions. Rural stoves often use various fuels ranging from wood and cow dung to numerous agricultural residues. In many cases, the fuel is collected rather than bought from the market place (Karekezi and Walubengo 1991). Urban stoves, on the other hand, are often single-fuel devices. Institutional stoves are mainly used in remote hospitals, schools, restaurants and small hotels. The distinctive features of institutional stoves include large capacity to allow preparation of food for a large number of persons. Fuel for institutional stoves is almost invariably bought, often in large consignments, which tends to facilitate the collection of the relevant fuel consumption data.

Economic Benefit



Kenya Ceramic Jiko (KCJ)



Traditional Jiko

One of the most successful urban stove projects in the developing world is the Kenyan Ceramic Jiko (KCJ) initiative (Karekezi 1993). Over 600,000 stoves have been disseminated in Kenya (Kammen and Kammen 1993). The KCJ is made of ceramic and metal components and is produced and marketed through the informal sector. One of the key characteristics of this project was its ability to utilize the existing production and distribution system of the traditional stove to produce and market the KCJ. The KCJ stove design has now been successfully replicated in Uganda, Rwanda, Tanzania, Sudan, Senegal, Ethiopia and Malawi. In Tanzania, the national stove project financed by the World Bank has disseminated over 50,000 KCJ-type Jiko Bora stoves (Otiti 1991). The KCJ has created employment by involving the local workforce and expertise in its production and marketing. It is estimated that the KCJ industry has created 50% more jobs in the stove sector compared to the Traditional Metal Stove. A skilled artisan can make 6-10 KCJs per day instead of 10 – 15 Traditional Metal Stoves per day, hence keeping more people employed (Burne 1985).

Conclusion

While the reason behind dissemination and adaptation may differ, in the final analysis both stove disseminators and end-users can achieve their objectives, particularly if both parties are involved in the R&D stages. In addition, the improved stove industry has created a large number of jobs in the developing world although absolute numbers are not available. The development of informal lending schemes is an important prerequisite for wider stove dissemination in rural areas where incomes are low and an improved stove represents a large investment. Financial support for private sector initiatives would ensure increased investments in improved stove production. Many informal private sector entrepreneurs are unaible to raise the collateral by conventional banking institutions. The development of the cooperative movement in the South and special loan schemes in commercial banks provide a more flexible channel for financing stove development activities (Karekezi 1994b). While dissemination of improved stoves has been an important development activity in the south, there is still insufficient awareness of the benefits accruing to wider dissemination of improved stoves, both among policy makers and end-users.

Improved stoves disseminated in the region

Country	Total
Burundi	> 20,500
Ethiopia	> 20,000
Kenya	> 690,000
Malawi	> 3,700
Rwanda	> 30,000
Somalia	> 15,400
Sudan	> 27,960
Tanzania	> 54,000
Uganda	> 25,200

Source:
Karekezi and Turyareeba 1994

References

Burne, S. (1985). **Charcoal Stove Development in Kenya – The Present and the Future** (Paper).

GTZ (1992). **Consolidating Development Opportunities**, Eschborn 1992.

Kammen, D. M; Kammen, A. (1993). **Energy Food Preparation and Health Care in Africa: The Role of Technology, Education and Resource Management**. In: African Technology Forum, Feb/March, 1993.

Karekezi, S. (1994a). **Disseminating Renewable Energy Technologies in Sub-Saharan Africa.** AFREPREN and FWD. Nairobi.

Karekezi, S. (1993). **Improved Charcoal Production and Fuel Efficient Cookstoves.** Stove Notes 8, FWD and Motif Creative Arts.

Karekezi, S. (1992). **African Energy Research Networks: Impact on Policy Formulation and Implementation.** In: eds A. Eberhard and P. Theron, International Experience in Energy Policy Research and Planning. Elan Press and Energy Research Institute, University of Cape Town, pp 1, 92-120.

Karekezi, S. and Murimi, N. (1994). **Household Fuels for Developing Countries** (Paper).

Karekezi, S. and Turyareeba, P. (1994). **Biomass Energy Initiatives: Experience in Eastern and Southern Africa** (Paper).

Karekezi, S.; Walubengo, D., (1991). **Household Stoves in Burundi.** Stove Notes 4, FWD and ACTS, 1991. 59p.

Otiti, T., (1991). **Improved Stoves in Tanzania.** Stoves Notes 6, FWD and ACTS Press, Nairobi, Kenya, 41p.

Pandey, M. R., Boleij, J. S. M., Smith, K. R., Wafula, E. M., (1989). **Indoor Air Pollution in Developing Countries and Acute Respiratory Infection in Children.** In: The Lancet of Feb, 25, pp.427-429.

Sharma, S. K. (1993). I**mproved Solid Biomass Burning Cookstoves: A Development Manual** FAO, ARECOP and Energy Research Centre of Panjab University. Bangkok. 1993.

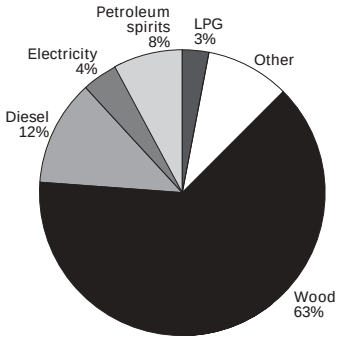
Smith, K. R., (1993). **Fuel Combustion, Air Pollution Exposure, and Health: The Situation in Developing Countries.** Annual Review of Energy Environment. 1993. 18:529-66.

World Energy Council (1992). **Energy for Tomorrow's World – the Realities, the Real Options and the Agenda for Achievement:** Draft Summary of Global Report, London: World Energy Council.

Stephen Karekezi, BSc, MSc is an energy and environment specialist and engineer with postgraduate specialization in industrial management. Karekezi is the Director of African Energy Policy Research Network (AFREPREN) and Executive Secretary of the Foundation for Woodstove Dissemination (FWD) based in Nairobi. He has written and published widely on renewable energy technologies and on energy, economy and environment policy.

Nelson Murimi is an engineer specializing in building economics. He previously worked with a charcoal briquetting company and now heads the Technical Support team of AFREPREN/FWD. His main area of interest is renewable energy technologies.

Stove Trials and Tribulations



Total energy consumption by energy source

Wood-Fired Stoves in Guatemala – A Brief History

Manuel Tay

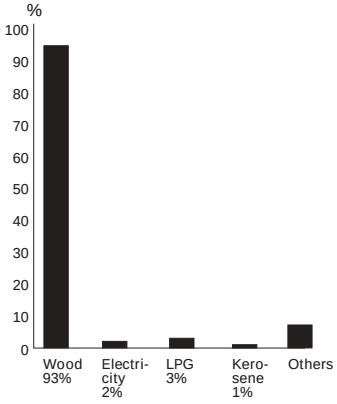
First scenario:

Guatemala, which is in the Tropics, has been known as a wooded country since time immemorial. The original inhabitants developed a culture which, for centuries, was in harmony with the environment, thus maintaining a carefully preserved balance. Of this concept of the world and of the universe, there remain traditions, writings and monuments which have defied the passage of time and the barbarism of the European cultures which came to America with new customs and the ambition to exploit, to subdue and to destroy. In the rural regions of the country, which became a natural refuge for the survivors of the Spanish invasion, and on the edges of the towns where the migrants settled, the main form of energy used was taken from the forests: wood. The equipment for cooking food was rudimentary: three stones on which to place a cookpot, and beneath the pot enough wood to cook the meal.

Second scenario:

Guatemala's history has been marked by momentous events that have influenced its development. The 1976 earthquake destroyed a large part of the country, leaving its mark on the inhabitants. International aid provided large quantities of building materials, food and medicine. At the same time, people belonging to various institutions arrived who, as was to be expected, acted in the interests of those institutions. A group of engineers who had arrived with this motivation, joined forces with a group of Guatemalan engineers, and taking advantage of the prevailing circumstances, decided that it was a good opportunity to suggest some improvements in the dwellings being rebuilt; in particular in the kitchens, where they suggested that cookstoves be installed to reduce the workload associated with preparing meals.

Thus they carried out some tests, interviewed cooks, and started sketching preliminary designs and approximations. Ultimately, they developed a definitive model which they decided to promote. This prototype was baptized 'Estufa de Lorena' – "estufa" (stove) because it did not correspond to the traditional way of cooking (over a three-stone fire), and "Lorena" because it was built from a blend of clayey earth (in Spanish 'lodo') and sand ('arena').



Total household energy consumption

Third scenario:

The next step, following completion of research into stove design, was dissemination. A leaflet was prepared, explaining the different design methods and announcing the first theoretical and practical course – to be held in the town of Quetzaltenango in Guatemala in January 1977. Attention should be drawn to the fact that the first course participants were all foreigners. The appearance of a household utensil which attracted the attention of families and groups caused institutions with different aims to join the group that was launching the new stove model – NGOs, religious groups, international organizations, grassroots teams. Once familiar with the methods of building and disseminating the prototype, they began designing, organizing and implementing stove projects, and at the same time encouraging the inflow of large sums of money. The justifications given for the interest charged on this finance were that the advantages of the cooking "equipment" was exaggerated, that an attempt was being made to achieve purely statistical objectives, and that the origin of the "invention" was beginning to be disputed. The organizations working on dissemination programmes practically awarded themselves "the patent" in order to obtain better support in the organization of the financing.

Fourth scenario:

The Lorena stove quickly became popular in Guatemala, Central America and other countries. Publications appeared in different parts of the world reporting on energy savings during cooking, using a more general term, i.e. improved stoves.

This was the hour of glory of the Lorena stove. The financial success of the project prompted the development of improved stoves on which key components were added, eliminated or modified. The procedures and construction materials also changed.

All these modifications were arguments in favour of developing new models. And even though their appearance or shape were distinctive, they always applied the same basic principle. The Lorena stove lost its personality. However, none of the modifications were a success. In technical or cultural terms they were justified, but in the long run the objectives of the movement were lost sight of. Writing this report after 18 years of daily involvement in the process, there is no alternative to simply telling the story.

Fifth scenario:

This process has been studied by engineers, anthropologists, forestry and energy specialists, as well as by people who were simply curious. Each has his or her qualified version of the events. We, the protagonists of the movement, are trying to find a standpoint that may help us to correct a tendency which is entrenched in the customs of Guatemalan society. We have seen that a large amount of finance has been invested in projects presented as successes. Doctoral dissertations and ambitious technical essays have described the intricate network of variables that make up this simple thing called fire, which heats the family and supplies the energy needed to cook food. In reports that would fill volumes, in various languages, authors have recounted their experiences. Some have praised the efforts undertaken, others have been a death sentence for the Lorena stove. We, with the best intentions in the world, or with no intentions at all, have limited ourselves to telling the story. Every opinion on this subject would be useful. It would also be certain not to be the first.

Manuel Tay is an engineer and General Director of the 'Dirección General de Fuentes Nuevas y Renovables de Energía in Guatemala' (Office of New and Renewable Energy Sources) within the 'Ministerio de Energía y Minas' of the government of Guatemala. He has long-term experience in energy and environmental projects and is the contact person responsible for the FWD Focal Point for Latin America within CEMAT.

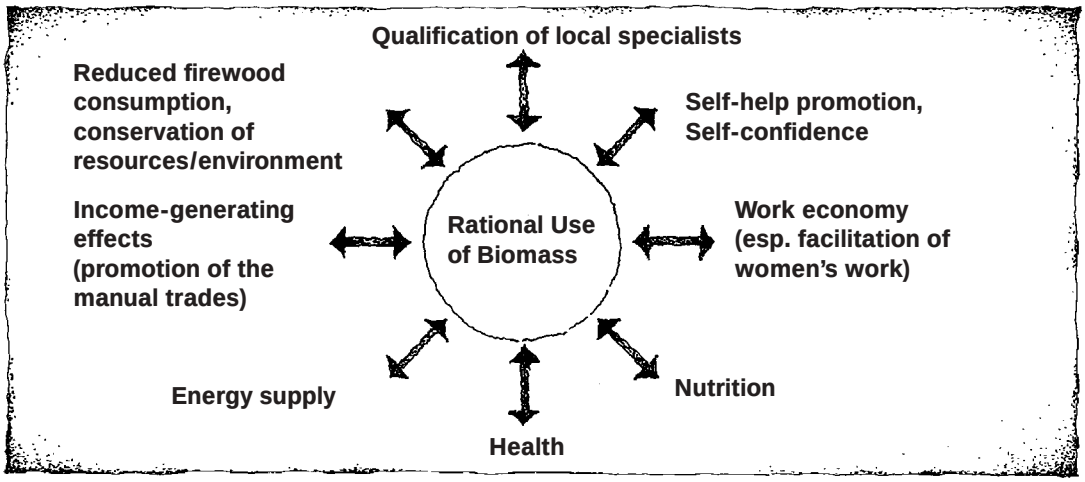
No Future ....?

Stove crisis, policy and financial crisis

Household Energy Projects: Success and Rationale

Agnes Klingshirn

Household energy programmes, mainly in the form of fuel-efficient cookstove projects, have been implemented for several decades; however, it is only in the last 10-12 years that any significant financial and technical assistance has been involved. To be sure, not in any way sufficient to keep in line with the importance of the sector; after all, household energy in the form of biomass is, as we have seen, the most important form of energy for most developing countries, with more than one-third of the world's population depending on it, the funding amounts to a meagre 2% of total investments in the energy sector. However, the support given to the various governmental or NGO projects and programmes has been enough to prove over the years that programmes, properly planned and implemented together with users, producers, and development personnel, can have a significant impact at various levels and be among the most effective development efforts. Below is a list of the benefits that can derive from a well-implemented household energy project:



What is a realistic assessment of past achievements?

A number of general assessments of household energy programmes have recently been published which had an impact on how these programmes are viewed. We shall select two. One is the World Bank assessment of ICS (Improved Cookstove) programmes, which was carried out as part of the Joint UNDP/World Bank Energy Sector Managment Assistance Programme (ESMAP) under the supervision of Kirk Smith from the East-West Center in Honolulu, with contributions from focal points of the Foundation for Woodstove Dissemination (FWD). This was selected for its global implications; the other is the internal evaluation of the GTZ Household Energy Programme (HEP); this is selected because it is where a number of very detailed studies have been carried out and where the author has personal experience. In the context of this publication it is only possible to summarize the most salient points of information.

The World Bank Global Study

The World Bank study focussed primarily on analyzing the conditions for successful ICS dissemination with a view to gaining more accurate information for policy development. Not surprisingly for insiders, they found that there are many small-scale, low-budget projects operating successfully in a limited geographical area under very specific socio-economic, socio-cultural, and political conditions, which made it difficult to make valid comparisons and emphasized the need for more context-based evaluations.

Nevertheless, some general trends emerged, which made some predictions possible concerning the sustainability of energy-saving programmes. As expected, the most successful programmes were those located in areas where fuelwood had to be bought, which had a commercial approach, received no subsidies and experienced only limited external (government) involvement (India and China, where millions of stoves have been disseminated through government intervention, are ex-

ceptions). Obviously, these programmes were mainly located in urban areas and among the somewhat better-off sections of society. However, for many of the poorer sections, especially in rural and peri-urban areas of Africa and some Asian countries, it was noted with concern that users were moving from woodfuel to lower-grade fuels like agricultural residues and dung.

Because of the negative environmental and health implications of this critical development, there is a tendency among World Bank specialists to put an even greater emphasis on energy transition to higher-grade and cleaner fuels, i.e. inter-fuel substitution. While this is principally an issue which merits support, it is difficult to foresee how such a strategy can be successfully implemented without heavy subsidies either from national governments or from the international donor community. Since subsidies of this kind are unlikely to be forthcoming (with the exception of some) and would counteract structural adjustment policy efforts, ESMAP has concentrated its involvement on supporting national governments in energy sector strategy developments. In this endeavour they assure that the traditional energy sector is included in the assessment, but the decision on remedial strategies is left to the individual country.

Who benefits? The GTZ experience

After ten years of technical assistance to ICS projects or project components in nearly twenty countries, GTZ has in recent years carried out a number of in-depth studies to assess the impacts and effectiveness of its household energy programme, in order to gain more conclusive information on which to base its future strategies.

The essence of this evaluation can be summarized in the following statement:

Through their integrated and interdisciplinary nature, coupled with a participatory approach, household energy projects can be classified as socially, economically and ecologically beneficial and, if properly managed, also viable.

Poorer sections of societies

Women and children

They compare favourably with alternative problem solutions and contribute significantly to improving the well-being of the poorer sections of rural and urban societies. As primary users, women and children are the main target group and stand to benefit more directly. In other words, many of the main development goals, such as poverty alleviation, health improvement, environmental enhancement and resource conservation, reducing the workload of women and strengthening their empowerment, are all goals which are directly addressed.

Policy discussions in the past have often focussed on whether, with their broad impact, household energy programmes should be classified under energy, rural development, resource protection, health improvement, women's programmes, skills development and job creation, or income generation. All these aspects, which most integrated household energy projects contain, are based on the production, dissemination and use of the improved cookstove as a focal point.

Entry point or catalyst for a development process

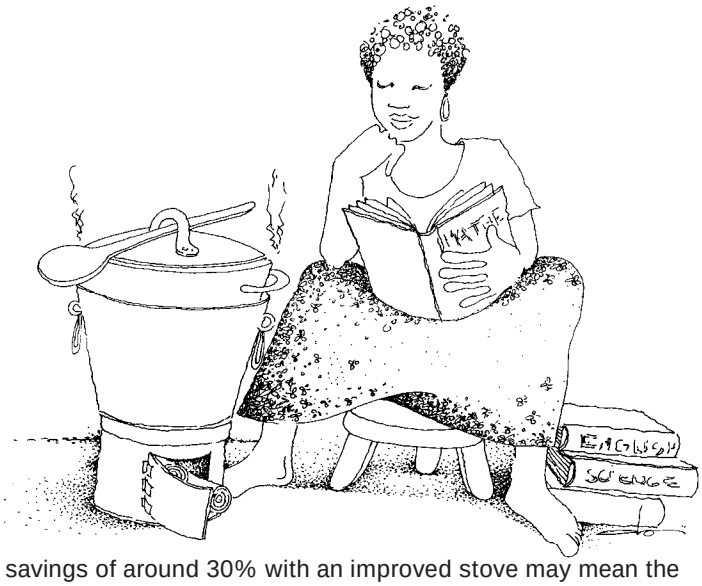
It needs to be stressed right at the beginning that although improved cookstoves are an important component of household energy programmes, their greatest value lies not necessarily in their saving potential or energy efficiency, but in the role they play as entry points or catalysts for a development process, which ideally should lead to an awareness of personal strength to improve the well-being of oneself and, in cooperation with others, of the community. The ultimate goal is changed behaviour originating from a general environmental awareness. Impact studies have shown this to be a realistic goal, provided sufficient time is allowed for the people to accept the new technology as part of their lifestyle.

Broad social impacts of Improved Cookstove Programmes

In past years there have been a number of studies by various organizations, which have demonstrated beyond doubt the broad social impacts of improved cookstove programmes. However, there are some areas which have only recently come into focus or been dealt with in detail. Among these are micro- and macro-economic benefits, health effects from indoor air pollution, and environmental impact assessment studies. In all three areas the results were far better than expected.

Some micro- and macro-economic benefits

The effects of household energy programmes can be calculated theoretically in terms of money saved or forest area preserved through the reduced consumption of firewood or charcoal. They can also be looked at in terms of forest area that does not have to be replanted.



The most directly felt impact is at the micro-level, especially in cases where fuel has to be bought. Records show that lower-income labourers in peri-urban areas of many larger African cities can spend as much as 30 – 40% of their income on fuel. Obviously, savings of around 30% with an improved stove may mean the difference between eating a cooked meal and going hungry. Depending on the price range, payback periods may be as low as three weeks. That is one of the reasons why stove acceptance is highest where fuel is scarce and costly.

At the macro-economic level figures are even more impressive. Below, the reader will find economic calculations for some of the projects supported by GTZ:

Country	Number of ICS in use[1])	Firewood-saved (%)	Annual savings on firewood[4]) (t)	Value of firewood saved [DM x 10^6/a]	Corresponding wooded area (ha)
Kenya	**100,000**	**30 – 50**	**133,000**	**4.4 – 5.9**	**1,250**
Tanzania	**1,000[2])**	**70**	**40,000**	**2.5**	**1,000**
Mali	**60,000**	**30**	**22,900**	**2.8**	**1,760**
Niger	**90,000**	**16[3])**	**11,600**	**1.4**	**844 – 1,290**

1) as of mid-year 1993
2) instituional kitchen stoves
3) Savings in Niger are lower than in the other countries, because a traditional metal cookstove offering average savings of 12% is already in widespread use and has therefore been adopted as the basis of assessment.
4) Available data vary according to reference variable (growth/ha)

Health improvements in the kitchen: the case of indoor air pollution

We do not want to repeat here what has already been written on the negative health effects of indoor air pollution from biomass smoke emissions. Rather, it is our concern to show that even with simple technologies significant improvements can be achieved. One of the great dilemmas with this subject is always that there is usually a trade-off between energy saving and clean air in the kitchen. Chimneys are seen as the obvious solution to get to the smoke out of the kitchen, but chimneys are either expensive or do not save energy, so that health has to be traded for saving money.

Two studies conducted at the University of Nairobi within the last few years show that there are other solutions. Home measurements have shown that a disseminated improved cookstove in rural areas of Kenya reduced the smoke level in the kitchen by 2.6 times to a level where women reported to have got rid of their bronchitis and did not feel that the remaining smoke was a problem for them. The choice, then, does not have to be between a high-cost stove and a smoky kitchen, but can be between a cheap and affordable stove and proper kitchen management and an almost smoke-free kitchen.

Environmental impact assessments

In view of the increasing threat to the earth's atmosphere from emissions of carbon monoxide (CO) and other pollutants (keywords: ozone hole, greenhouse effect), the ecological impacts of household energy projects have become a focus of attention in recent years. The conservation of forests as an important carbon dioxide reservoir is assigned a high priority in this context. As shown above, the energy-saving utilization of improved stoves results from the complete combus-

tion of the woody biomass, which reduces toxic emissions considerably. Investigations in Mali and Niger show, for example, that the quantity of CO_2 bound in wood amounts to 150 kg per improved stove and year in Bamako and 54 kg in Niamey (the figures vary considerably due to the fact that the amount of woody biomass preserved by the use of improved stoves, and as a consequence the rate of the forest increment, is much higher in Mali than in Niger). The use of improved metal stoves reduces the level of CO_2 emissions by as much as 946 kg per stove and year in Bamako, and up to 285 kg in Niamey.

Why funding is increasingly difficult

If it is true that all these positive impacts can be achieved through household energy projects, why, then, is it that funding for these programmes is increasingly difficult to attract or is even being reduced? As may be expected, the reasons are manifold:

Results did not match expectations

In the past some ICS programmes did not achieve the objectives they were aiming for when such high goals as combatting deforestation, for instance, or halting desertification were set. Since fuelwood use for cooking and lighting usually was not the root cause, ICS could not possibly solve these problems, but because solving them had been set as a goal the programmes were measured by it; in fact, this measurement was still applied when the programmes had long since learned to be more realistic and modest in their objectives.

Complex approach underestimated

Household energy programmes over the years have adopted complex integrated and interdisciplinary approaches, requiring a high manpower input and low inputs of sophisticated and costly technology. They are more difficult to manage; this very fact makes them less attractive not only to the various decision-makers, but also to researchers and large-scale industrial producers.

Changing habits time-consuming

A new technology usually requires a change in cooking habits, which is always most difficult to achieve among the poorest, whose margin for experiment is almost non-existent. This is especially true as long as there is a cost-free alternative, i.e. when fuel is still collected and the traditional three-stone fire serves multiple purposes. Another factor, which ties in with the last point, is that in order to develop an acceptable, cheap and locally producible technology, this technology needs to be site-specific and adapted to the materials and technological skills available; this inteprets into a grass-roots oriented, time-consuming process of awareness-raising, motivation, training and promotion; however, this process has high potential for human resources development.

Poor have no lobby

Another reason is that biomass users belonging to the poorer sections of society seldom have a lobby among either donors or national governments. Most of the people involved in the planning and implementation of household energy programmes are highly motivated persons who, because of their closeness to and involvement with grassroots situations, have neglected to draw the attention of high-level decision-makers to these problems. But it is the decision-makers who are responsible for laying down the framework conditions, including budgeting for funds. They have recognized belatedly (but perhaps not too late) that implementing projects successfully is not enough.

Success story has not been spread aggressively enough

There is no doubt that in the past, the information on these positive impacts has not been spread aggressively enough. It has been our experience that circulating publications is not sufficient. Normally they are glanced through and then put aside, because of pressure of work. Personal presentations, on the other hand, which not only transmit the factual message, but also appeal to the emotions, have proved to be much more effective. Even more effective are personal visits of decision-makers to the projects/programmes, where they get a chance to talk to the beneficiaries themselves and experience emotionally what the work means to them. One day with the users is worth a lot of lobbying time.

Other priorities or funding strategies of donors or technical development agencies

Finally, it should be pointed out that the dependency on donor funding is always subject to overriding political or strategic considerations. A striking example of this is the recently changed political situation, which has caused a high percentage of development funds to be diverted to support the economic, industrial and ecological development of societies of eastern Europe and former Soviet republics. Another reason is that general development goals of major donors often follow trends set by the World Bank or other international organizations. Understandably, these trends do not always coincide with the needs of people from the grass roots.

Future perspectives

Consolidation of impacts and development orientation

From the above we have seen that integrated household energy programmes have been shown to contain vital elements of generally accepted development goals with a wide range of impacts. They are economically viable and comparatively low-cost. The technologies disseminated are technically optimized, well accepted by the users and marketable. The education and training component has brought about a general environmental awareness and created new or better skills.

Sustainable and participatory development

In the meantime it has been widely accepted that all parties concerned - the beneficiaries or users, the producers and vendors and the development personnel - have to play an active role at all stages of a project, from the planning phase through implementation and monitoring, in order for it to become sustainable in the long term. People have to be able to afford the technology introduced, it has to suit their needs, the producers have to make sufficient profit to keep the product on the market, and the general conditions have to allow for all this.

Combination of strategies

Emphasis on cross-sectoral and interdisciplinary approach

Years of experience in this field have demonstrated that appropriate solutions for a given household energy problem always need to be based on a combination of strategies and measures, taking the socio-cultural, technical, political, economic, and ecological aspects into account. At the same time attention needs to be given to possible alternative solutions. Questions of balancing supply and demand as well as substitutions need to be considered. Thus it has been found useful in improved cookstove programmes to include on-farm or community tree-planting components, or link up with agro-forestry or social forestry programmes or to look at forms of energy which can be used as substitutes for biomass. The full range of beneficial impacts can only be realized in this way.

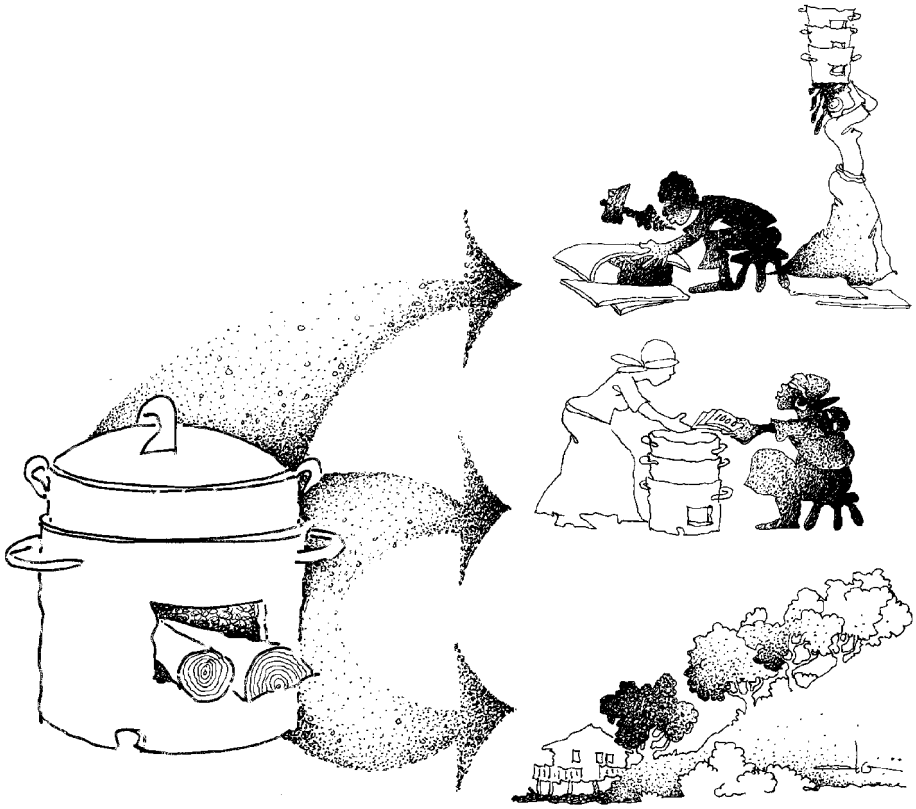
Additional research activities and long-term assessment

The longer we have been involved in the Household Energy Programme at GTZ, the more comprehensive and fascinating the work has become and the more clearly the different interrelationships have emerged. Despite this progress, an enormous amount of research work still needs to be carried out in order to truly understand the complex issues involved. What needs to be looked at urgently are such questions as the relationships between household energy scarcity and negative impacts on health, income, nutrition, environment, education, family size, etc. At the same time new strategies and methodologies need to be developed to adequately incorporate these integration efforts. On the other hand, the positive long-term effects also need to be analyzed and documented in detail in order to convince the sceptics among potential beneficiaries and decision-makers alike. Where funds are becoming scarcer, the justification for spending the money optimally has to become even more convincing.

Dr Agnes Klingshirn is the desk officer responsible for the inter-regional and regional Household Energy Programme (HEP) of Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, the German Agency for Technical Cooperation. Agnes Klingshirn worked for seven years in the GTZ Special Energy Programme Kenya and with Maendeleo ya Wanawake women's organization. She was project manager and adviser of the Women and Energy Project and participated in the development and dissemination of the Maendeleo Stove.

"Try and Try Again – Don't Give Up Your Dreams!"

Participation, women, sustainable development



Participation and the Role of Women in Sustainable Development: the Kenyan Experience

Noel A. Chavangi

"We had been trying for over a year and we were just about to give up when we received a visit from Mr Muriithi of the GTZ Special Energy Programme (SEP). And that visit brought hope to the group."

These were the words of Mrs Rachel Sabwa, Chairwoman of Keveye Women Group in Vihiga district of Western Kenya. Keveye Women Group is one of the 21 women's groups that have participated in the GTZ-funded Women and Energy Project (WEP). It is one of five women's groups successfully producing Maendeleo ceramic stove liners. The Maendeleo stove is a fuel-efficient woodstove that has been produced and disseminated in rural areas of Kenya for the last nine years. Rural women purchase the liner at an average price of KSh. 60.00. The liner is installed in the kitchen, and thus becomes the Maendeleo stove. When properly used, and taking the energy-saving package into account, the stove gives a saving of up to 50% of the fuelwood used on a three-stone fire.

Like some 20 other women's groups, the Keveye Women Group has participated in production of the liner. The question is, what is participation? Participation is understood as taking part in an activity – physically, mentally and emotionally. However, the experience of the WEP is that this alone is not sufficient to ensure sustainability in the context of rural women in Kenya. More often than not, external resources are also necessary.

What lessons have those involved learned in the course of production, marketing and dissemination of the liner?

Genuine participation

Formation of women's groups

Have the women been enthusiastic? Have they displayed self-disciplined determination? What has been their frame of mind? Has it been a natural process, a way of life? Where the individual group members had prior experience in pottery work, such as making clay pots, it has indeed been a natural process, a way of life. Hence, self-disciplined determination and enthusiasm already existed or were easily achieved. This was conspicuous in groups like Kyeni Kya Kitoo, Kabati, Wise Women, Keyo, Webolela and Mahira. Where prior experience with clays was lacking, it has been an uphill task. Keveye Women Group is a case in point. It has taken many more man-

hours for individual group members to develop the necessary skills, and at the time of writing the job was not yet over.

For women's groups, participation is very much influenced by a sense of belonging when taking part in an activity. Families or households already have an internalized or deep sense of obligation to participate in an activity for the welfare of the family or household. In women's groups this has to be nurtured. It depends very much on the reasons behind the formation of the group, the general organization of the group, the leadership qualities of the elected group leaders (and especially those of the chairwoman), and above all on the benefits to accrue to individual group members.

Sustainability of group entity

The last-mentioned factor is crucial for the sustainability of the group entity. Many people give up trying when they find that their individual input in terms of time, labour and finances does not bring any tangible benefits. However, the individual group member will keep on trying if it is clear that she stands to benefit personally to a degree corresponding to her individual resource input in the activity. For production of the liners, a system under which each member receives a higher percentage of the proceeds from sales of the liners she has produced has been found to work best, and has a high chance of sustainability. Participation on a group or community basis must go beyond the spirit of togetherness and solidarity, which is seen to make sense only when external threats to the well-being of the group are encountered.

Income-raising possibilities

The other basic factor for sustainable participation is the desire to raise some income from the activity. WEP has worked with women's groups and individuals who have been encouraged to participate by the desire to raise some income. All the beneficiaries have been people who are still living at subsistence level, mainly mothers struggling to meet their families' basic needs. Any opportunity to raise some cash is therefore very appealing and will promote genuine participation on a sustainable basis. Three areas have provided such opportunities, i.e. liner production, liner retailing and stove installation. Individual entrepreneur liner production centres have also provided employment for women.

Indigenous practice/knowledge

Working with clays has traditionally been a women's speciality, passed on to specific family members over generations. The successful participants in liner production have relied on indigenous knowledge, which had hitherto been under-utilized. The WEP input has been in the form of improving skills through training, diversifying the range of end-products, infrastructure development in the form of support for kiln and workshop construction, training of stove dissemination personnel and market promotion.

Creation of demand

WEP has learned that the best way to initiate participation on a sustainable basis is to work with the rural women through first going to them, living with them and learning with them. This was done during the research part of the project (1983 – 1985). The next stages involved planning and starting on a very small scale on the basis of what the women knew. In the ensuing process, opportunities were provided for women to debate and discuss their individual, unique situations and to start addressing requests to WEP. WEP officials looked for opportunities to give minor but effective encouragement, either through training or infrastructure development, and thus provided for demand-driven participation. In the process, women learned how to articulate their needs, tell their story and request such outside assistance as necessary – a real emancipation process.

Need for flexibility

Flexibility was inbuilt, albeit within a framework of technical guidelines that had been proven and modified over time. They included selection criteria for participation, clay sampling and testing methods, for siting production centres, and for training and a training strategy. WEP adopted a working style which was not a fixed model, but allowed improvements through adaptation to individual situations. The liner-making process also provides for flexible working hours for the already overstretched rural women.

Other important considerations: saving energy, time and money

Reducing women’s time input

The participation of women in any activity is deeply influenced by the demands the activity makes on their time. Any activity which places additional demands on women’s time without bringing them any benefit in return will have a low level of success. Use of the stove has the advantage of reducing women’s time input, because less firewood is needed, so that less time is spent gathering firewood or less money is spent buying it. Stove users who buy their firewood save up to half the amount spent on fuel for a three-stone fire. Stove users who gather their firewood spend only half the time they would take to gather fuel for a three-stone fire. When used properly, the firewood consumption of a stove is 40% to 60% lower than that of a three-stone fire. The stove is therefore an attractive investment, and is consequently in great demand.

Improved health and sanitation

Through reduced smoke emissions, the Maendeleo stove also makes a significant contribution to improving kitchen environments. Ultimately, this has a positive impact on the health of the stove user and the family as a whole, in particular the women and children. A further positive effect is the time saved annually by not having to nurse sick children and by making fewer visits to local clinics. Lower aggregate medical bills mean that money is also saved.

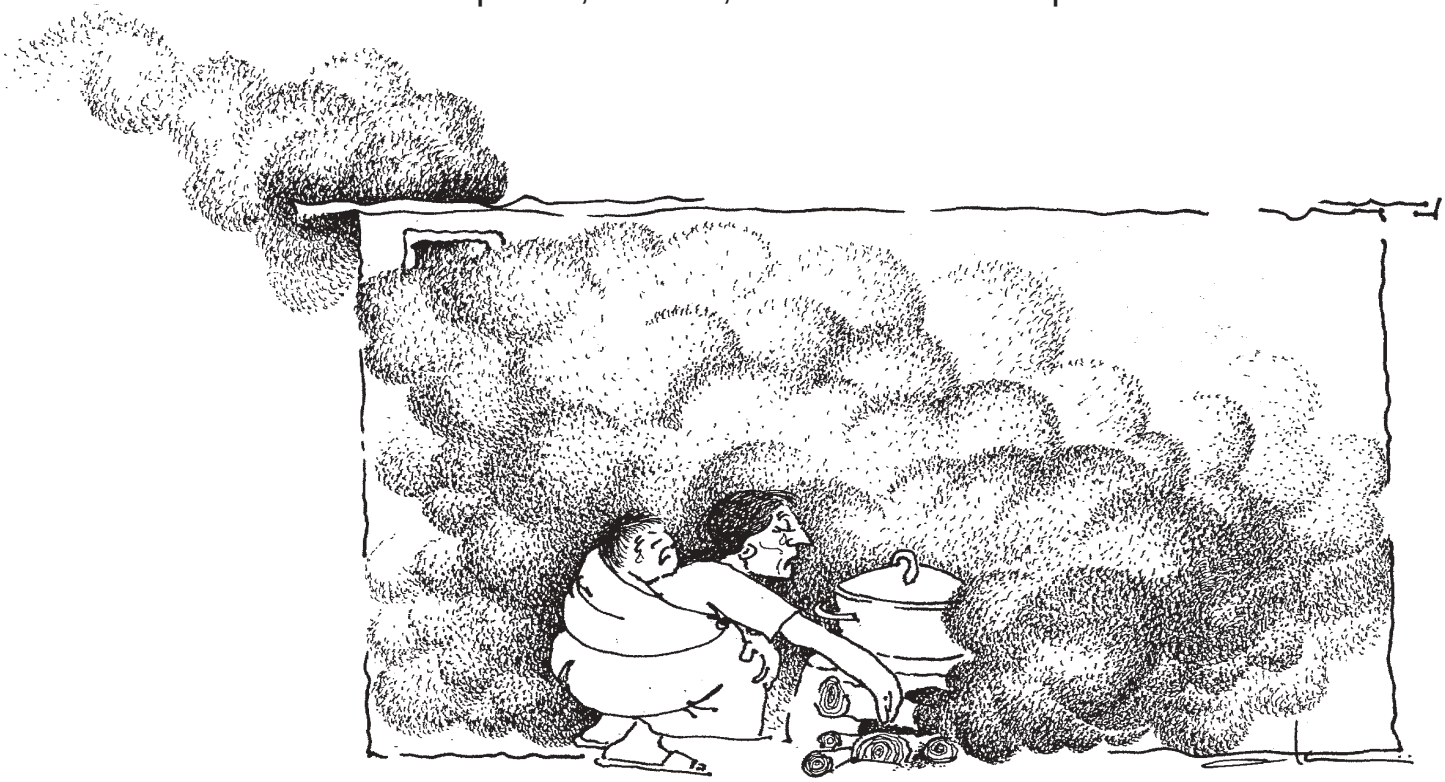
Empowering women

Making it possible for women to obtain a fair share of the benefits resulting from their participation in the production, marketing and dissemination of stoves also gives them economic power. Provided with forums for discussion at group level, women can learn to express themselves, articulate their needs and thus make requests to various agencies which are in a position to offer assistance. This is a crucial element in participation in the development process on a sustainable basis. The women simply learn to tell their story, and are helped to the realization that the future is in their hands, and that with a little help from external sources they can do things on their own. Power to the women!

Noel A. Chavangi is an agricultural extensionist with experience in livestock, agroforestry and renewable energies. She was formerly Project Manager of the GTZ Special Energy Project (SEP) and is now Regional Coordinator of the GTZ refugee-oriented programme GTZ-RESCUE in Kenya, with responsibility for rational energy supply, conservation, utilization and education.

“Try and Try Again – Don’t Give Up Your Dreams!”

Participation, women, sustainable development



Participation and Women: Health and Indoor Air Pollution in India

Jamuna Ramakrishna

History

Looking back at the history of the domestic cookstove, it would appear that perhaps no technology has been developed more participatively. The traditional designs in India alone are as varied as the types of fuels burned in the stoves, the kinds of diet adhered to, and the number of people for whom the meal is being prepared. Traditional user-designers have coaxed from their stoves an incredible variety of functions, apart from the mundane boiling, roasting, baking, and grilling functions one expects from an off-the-shelf 20th century stove. Because of their multiple (non-cooking) functions, which range from space heating, repelling mosquitoes, and preserving thatch roofs, to playing a role in the religious rituals of the household, the stoves have become integral parts of households in a way that “modern” stoves are unlikely to be.

Smoky, sooty kitchens

Yet this versatility is not attained without cost: smoky, sooty kitchens and inefficient fuel utilization are the price that many users have to pay. In technological development, improved efficiency is usually achieved by specialization. Unless one choses to adopt a different definition of efficiency altogether, one is led to the conclusion that the more functions a tool has, the more inefficient it is likely to be. So it is with the traditional stove, which, while fulfilling a long list of tasks, often turns out to be a smoky and inefficient device on which to cook. It is more than a matter of inconvenience, since the levels of smoke that users are exposed to are high, high enough to increase the probability that those exposed will eventually develop chronic respiratory obstruction, be susceptible to acute respiratory infections (ARIs), or be prone to other long-term health effects, apart from the short-term effects of headaches and eye irritation.

Traditional user-designers

Traditional user-designers have confronted this problem and have come up with at least one innovative solution that is visible in many south Indian households, both rural and urban, i.e. to place the traditional stove under a fireplace-like hood that does a very good job of removing the smoke from the kitchen. No doubt other solutions exist as well and should be explored.

"Women's technology"

Still, economical and effective solutions are not easily found. The kitchen has remained unchanged for hundreds of years in a significant number of the world's households. This has as much to do with the status of women and with economic conditions as with stove technology itself. It also has to do, perhaps, with a mindset, with a view that equates "women's" technology with technology that is unsophisticated, that is low-cost or no-cost, and that is not sturdy, and therefore not worthy of the attention of the best minds. It is a familiar tune, and will be heard repeatedly in this volume: women are not involved enough in the development of improved cookstoves or in finding solutions to the problem of indoor air pollution! Their fund of practical knowledge regarding fuels and stoves remains, for the most part, untapped. The sad part is that this dirge of protestation has been repeated so often and in so many different contexts that it no longer makes a tangible impact on the consciousness of planners, technicians, and administrators. It has become a standard objection which receives a standard, usually superficial, response. In the case of stoves, the label of "women's technology" is given, even though very few women are actually involved in the development of the technology or in decisions regarding its dissemination. At the same time, user-driven evolution of traditional stoves has reached a plateau, defined largely by the resources and materials at hand.

Were it not for the fact that many have over-generalized the connection between the fuel being burned in cookstoves and deforestation, cookstoves would probably not be getting the attention they are today. The daily drudgery of collecting and preparing fuel, the dangers of open hearths, the health hazards presented by the high concentrations of smoke not only to women but also to children and elders who might be present in the kitchen - these considerations on their own are unlikely to draw the attention and financial resources of national and international bodies. After all, traditional stoves and biomass fuels have been around a long time, and are familiar parts of the landscape. But these considerations in combination with the spectre of increasing deforestation and possible contributions of the burning of biomass fuels to greenhouse gases cannot be ignored.

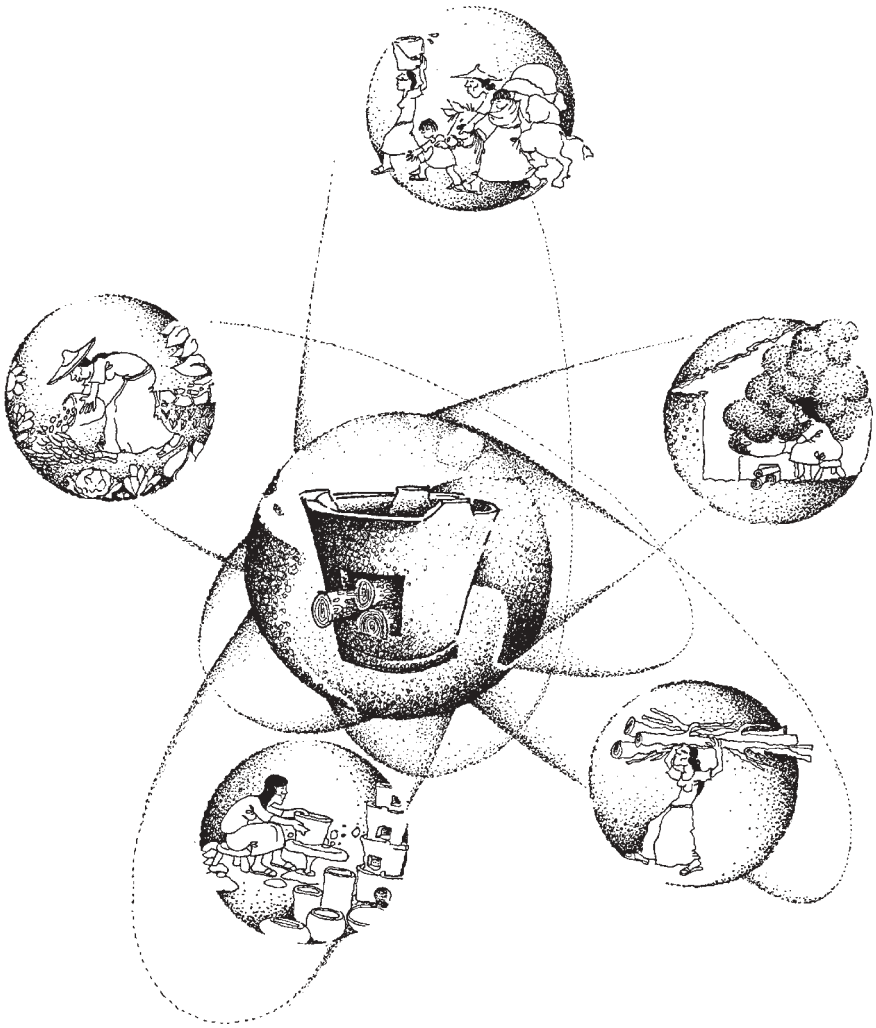
Achievements and lessons

Reduce smoke

The work of the last two decades, however, has not been without achievements and lessons. In India, work on improved cookstoves dates back 50 years. From the earliest interventions, an abiding concern has been to reduce the amount of smoke to which the cook is exposed. Most frequently, this has meant the addition of a chimney to a stove design that perhaps is also distinguished from traditional stove designs by the presence of multiple cooking ports and baffles. Experience has shown that users do appreciate a reduction in smoke levels – sometimes this is the most valued characteristic of an improved cookstove. There have been few quantitative field measurements, however, of actual reductions in smoke levels. While complete reliance on the user's perception of smoke levels is inadequate, quantitative studies of actual pollution levels are extremely time-consuming, expensive, and difficult to conduct. Those who have tried to collect data simultaneously on health status so as to show correlations have faced an even bigger challenge.

Health effects

While establishing an explicit cause-and-effect relationship between exposure to biomass smoke and health effects - whether these take the form of chronic bronchitis, cor pulmonale (heart disease secondary to lung disease), or acute respiratory infections (ARI) – is an expensive long-term task, chronic exposures to such high levels of smoke are clearly damaging to health. Side by side with epidemiological research that tries to pin down health effects (which could perhaps be undertaken by international agencies like the World Health Organization) many more local-level action programmes are needed which operate on the premise that the exposure of women, children, and the elderly to biomass smoke should be minimized. It may be important for these action programmes to recognize that women have the lowest usage rates for health services, that they usually make use of these sevices only when their health problem has reached an advanced stage, and that most readily available health services are directed toward the reproductive health of women in the child-bearing age group, rather than toward the productive health of all women. In other words, health statistics extracted from the records of hospitals and clinics do not reflect the whole picture, and health-oriented intervention must have a health outreach component that tries to fill the lacuna in health services delivery. Since it is difficult to separate out or isolate the effects of exposure to biomass smoke, given the nutrition and sanitation situation in most of rural India, it may be prudent to view the health and welfare of women holistically in a health-oriented intervention. Further, the view should include infants, since breast-feeding infants and babies carried on their mother's backs will share mother's high exposures. In areas where fuel scarcity is severe, health-oriented interventions might try to understand and address the link between declining fuel availability and nutritional standards.



Air pollution

Similarly, if one looks at the problem of indoor air pollution holistically, one might be led away from a sole focus on stoves to considering solutions that encompass fuel processing and kitchen design, to name just two options; or to develop a stove that requires some investment on the part of the user but is efficient, smokeless (or less smoky, to be realistic), and durable. Women the world over, even poor women, have demonstrated time and again their ability to save and to invest wisely. There will be a segment of society that just cannot marshal the resources for such an investment. For this segment, putting food in the pot is as problematic as the fuel under the stove or the stove itself. For this segment, perhaps, low-cost improved stoves or subsidized improved stoves would be in order. But it would be a mistake to assume that the needs and capabilities of all sections of society are the same as that of the poorest of the poor.

Equally, in a homogeneous industrialized culture, perhaps a cookstove is a consumer item, like a toaster or a coffee-maker, performing a single task – baking, grilling, or boiling. And in a homogeneous global village it will, eventually, be possible to sell cookstoves on that basis. For the moment, and for the foreseenable future, however, improved cookstove programmes would do well to consider the multiple functions of cookstoves and to build their stove designs and dissemination strategies on the input and feedback of users – women.

Jamuna Ramkrishna is an expert in natural resources and environment in Asia. She closely cooperates with the East-West-Center and the Programme on Environment in Hawaï and participated in the global survey and study on “Improved Biomass Cookstoves” of the World Bank. The subject of her PhD study is Indoor Air Pollution by biomass cookstoves. She is project manager of Hivos in Bangalore.

Improved Stoves in El Salvador: Which Model Next?

Carlos Vargas

Credibility of stoves has suffered

Improved stoves, introduced as an appropriate technology holding out the promise of wide dissemination in El Salvador's rural households, have been the object of various criticisms in recent years. As a result, dissemination has not achieved the targets fixed by the organizations promoting the stoves, and the impact they should have had on the problem of national deforestation has not been attained. For these reasons the credibility of the stoves has suffered. Fresh efforts are currently under way with the aim of addressing more efficiently the questions initially raised by the various stove-promoting organizations, focusing on the serious shortage of wood besetting the majority of the more than 400,000 Salvadoran families who use wood as a fuel.[1]

Stoves began to be introduced in the country in the early 1980s. At that time, the Save the Children Fund launched a project in rural communities in the east of the country. The model propagated was the Lorena stove, developed by the Choqui experimental centre in Guatemala. Only when this project was evaluated did it become clear that achieving a constant thermal efficiency of the stoves was more difficult than it had first seemed.

In 1981, a regional project was launched in Central America, with the financial support of the U.S. organization ROCAP (Regional Office of Central America and Panama). It was executed by ICAITI, the Central American Institute for Research and Industrial Technology. The objective of this project was to evaluate, both under laboratory conditions and in the field, five monolithic improved stove models selected from more than 15 models used in various parts of the world. In the event, this project became the spearhead of numerous joint projects to introduce the Lorena stove, which had the highest level of acceptance. In the majority of cases these projects failed to achieve all the results expected and were finally abandoned.

The premises of stove projects

The premises on which these projects were based, as well as the majority of the subsequent projects, launched during the 1980s, were as follows:

– The "build-it-yourself" method, an inherent feature of these stoves, would encourage large-scale dissemination.
– The very low cost of building the stove would make it easy even for low-income families to afford them.
– Promotion of the stoves was being handled by institutions active in rural areas, which would facilitate promotion by those institutions which provided technical assistance in stove-building.
– The construction methods had to be easy to transmit, by means of a short training course lasting 3 to 4 days.

It was later found that several of these conditions were in fact not satisfied. This had an adverse effect on the efficacy of the projects and on confidence in the stoves, because the fuel savings and the other benefits which had been hoped for were difficult to verify.

The ICAITI experience

In view of the experience gained, ICAITI introduced in the region a model known as the Pottery Stove, the main objective being to standardize the principal dimensions of the stoves.[2] This model was derived from the Lorena stove and consisted of 13 pieces of terracotta which, when correctly assembled, made up its interior. The exterior was built on afterwards. Towards the end of the 1980s, the enthusiasm that had marked the start of dissemination of these stoves had diminished appreciably. Nevertheless, it should be mentioned that following the 1986 earthquake, which severely affected the city of San Salvador, ICAITI introduced a single-pothole model that was easy to transport and was thus well suited to the precarious living conditions of many families in the capital. This model, known as the "Rocky", had been developed in Guatemala. But not long after its introduction it was also discarded, more due to a lack of financial support than to a lack of interest on the part of the institutions involved.

The Social Investment Fund (SIF) took up its activities at the beginning of the 1990s. This fund was an official aid programme with international financial support, its objective being to assist the weakest sectors of the population in the face of economic adjustment measures launched by international banks (Inter-American Development Bank, International Monetary Fund etc.). The activities of this organization included building Lorena stoves: the construction of more than 10,000 stoves was thus financed for a period of two to three years. Although ICAITI had advised SIF on measures to adopt in order to avoid disappointing results in the stove sector, SIF launched its projects and collaborated with private entrepreneurs who had no experience of improved stoves. From 1993 on, SIF suspended its stove financing programme because it had obviously failed. At present it is supporting the construction of a different model, made from kiln-fired bricks. It is believed that this stove will be more durable and will retain its standard dimensions. Also a solid, i.e. monolithic construction, it has been baptized the Chefina and, like the Rocky, was developed in Guatemala.

The CEL experience

Parallel to the SIF programme, CEL, the Executive Hydroelectric Committee of the Río Lempa, is introducing another model. It is called the Finlandia stove after the source of the funds financing the project. This is again a monolithic stove with several holes. CTA, ICAITI's Centre of Alternative Technologies, has likewise been working since 1992 on a model with a single pothole, originally designed by the Agricultural Tools Research Centre of Bardoli, in India. So far, this model has been produced by potters and by people with no experience in this field, with better results in the first of the two groups. Besides the models mentioned, some institutions have taken steps aimed at promoting no less than ten other stove models, most of them modified versions of models already analyzed.

If one of the objectives of stove projects was widespread dissemination by different mechanisms, it may be said that this objective has not been achieved – a fact which can be verified, taking into account that a study carried out by the University of El Salvador with the aid of other institutions estimates that about 12,000 improved stoves were built up to 1993 by the different projects implemented in the country.[3]

Results

In view of the results achieved by the various projects, which are far from favourable, the following causes appear relevant:

1) Adequate political support was lacking which would have enabled the official organizations participating in the projects to perform the tasks entrusted to them efficiently.
2) The domestic energy situation in the rural areas and on the peripheries of urban centres has traditionally gone unnoticed by official authorities.
3) Not enough basic technical studies were carried out to support the different models promoted in the country.
4) The finance needed for research into improved stoves was difficult to obtain.
5) Certain projects were poorly designed at implementation level and did not profit from experience gained around the world.
6) One failing of most of the projects was inadequate follow-up, which led to their being abandoned.
7) Not enough importance was attached to education in the use and maintenance of the stoves.
8) With very few exceptions the full cost of the stoves was met by the institutions promoting them, with the result that users were uninterested whether the stoves worked well or not.

Outlook for stove projects in the country
Although the conditions mentioned above to some extent still apply, it is thought that improved stove projects will have a greater social impact in the future, for the following reasons:

1) Certain international organizations at present working on the economic and social rebuilding of the country have shown interest in projects targeted on appropriate management and conservation of natural resources.
2) Since 1992, some universities and other centres of research have been supporting studies associated with improved stoves, which may help improve the technical standard of the stoves disseminated so far.
3) The rising price of wood, due to a growing shortage, increases the probability that families who use this fuel will invest in improved stoves.
4) Generally speaking, there is a greater awareness in the population of the problems arising as a result of environmental degradation. This also holds true at government level, where an agency has been set up to deal specifically with these issues. This agency, the Environment Secretariat, has made stove promotion an integral part of its strategy.
5) The stove projects currently being implemented include marketing via traditional channels of distribution.
6) Certain social communication media strongly support environmental protection measures; this could be exploited to promote the use of stoves.

Stoves for commercial use, Institutional Stoves
Efforts to develop stoves of this type have not benefited from the same financial investments as domestic stoves, even though there are some designs specifically intended for small businesses which make tortillas prepared from maize flour, which are part of the staple diet of the Salvadoran population.

In principle, the modifications of traditional methods of cooking tortillas have consisted in adding a grate to the combustion chamber and a chimney to exhaust the smoke. Under laboratory conditions a reduction in fuelwood consumption of about 40% has been achieved with the latest model as compared to traditional systems. Promotion of these models has not yet been started because field tests are still continuing. It is thought that demand for these stoves in businesses will be high, because the businesses buy their wood. It is likewise practically certain that credit terms for purchasing them will be requested because they cost between $US65 and $US80.

References

1) Comisión Ejecutiva Hidroeléctrica del Río Lema, **Primer plan nacional de desarrollo – energético integrado 1988 – 2000.** San Salvador, República de El Salvador, Centro América, January 1988.

2) Instituto Centroamericano de Investigación y Tecnología Industrial. **Estufas domésticas mejoradas: cerámica prefabricada.** Proyecto Leña y Fuentes Alternas de Energía ICATTI-ROCAP AID 1980 – 1987.

3) Archila, L. et al.. **Evaluación de la eficiencia de las estufas de fuego cerrado para cocción de alimentos en el área rural.** Tesis de graduación para optar al título de Ingeniero Químico. Universidad de El Salvador. October 1993.

Carlos Vargas is a mechanical engineer working with the Central American Research Institute for Industry (ICAITI), El Salvador. He is the coordinator of the Technology for Social Development Program, which focuses on alternative energy technologies, mainly improved woodfuel stoves and bakery ovens.

"So All You Need Is a Better Stove?"

Design, refinement, cooking habits

Conservation Without the Cost: Saving Energy With No Stove

Matthew Owen

While stoves have their rightful place in household energy projects, many organizations come across situations where the target group find them unsuitable, inflexible or just too costly. This should not be seen as a reason to give up on domestic energy intitiatives. There are many other ways to conserve fuelwood and improve kitchen environments which are simple, cost nothing and build on existing open fire systems. Indeed, in many areas of fuelwood deficit, communities can already be seen implementing such conservation measures in the absence of external interventions. A number of simple fuel economy measures have been tested under controlled conditions to determine the savings which are possible in both firewood and time. When experiencing fuelwood shortage, rural communitles in developing countries employ a range of these types of conservation practices to cope with pressure of fuelwood shortage in the absence of external Intervention. An example is provided in Rusinga Island on the edge of Lake Victoria in Kenya, which is suffering a severe and worsening fuelwood shortage. As a result of rapid population growth and associated expansion of agriculture and livestock grazing, trees and bushes have been cleared and firewood is in very short supply. In response, local people have diversified their cooking methods, show flexibility in the fuels they burn and the sources used, and employ a range of novel conservation techniques. These not only save fuel, but also improve conditions in the kitchen.

Diversification in cooking:

All households rely on firewood for cooking. The dominant system used is the Kendo mudstove, an arrangement of three stones protected by a wall of mud and dung. Cooking is usually done outside using the mudstove if the weather is favourable, but most families also have a three-stone fire or a second mudstove inside the house as a 'back-up'. Nearly all families have a non-firewood system in reserve which they employ if wood is in short supply, the weather is particularly wet or a meal must be cooked in a hurry. The most common alternative is charcoal, used either in a traditional metallic stove or a Kenya Ceramic Jiko. Locally made kerosene wick burners are also used for cooking by more than half of all households, although kerosene is principally for lighting. The result of this diversification is that families have up to five cooking systems available, including outdoor and indoor mudstoves, an indoor three-stone fire, a charcoal stove and a kerosene wick burner. Some also have an outdoor trench fire which they use for fish smoking.

Flexibility in energy supply: Families are extremely flexible in the type of wood they burn and the sources they use. Twigs, small sticks and even roots are burned, in addition to fast-growing shrubby species. Households obtain their firewood from a range of sources, depending on availability. Their own farms are commonly a source of shrubs and live wood particularly Euphorbia spp. They may also buy fuel from neighbours, collect driftwood from the lakeshore or climb to the hilltops and gather wood illegally from uncleared bush. About half of all families buy firewood on an occasional basis. Bundles are available from those who live on the hills and have bushes remaining on their land which they can clear and sell, although this wood is generally of low quality. Better firewood comes from the mainland and is sold in local markets, and some also comes by boat from nearby islands. If firewood is unavailable many families buy charcoal, sold both in 2 kg tins and by the sack by vendors who come from the mainland.

Alternative biomass fuels: Due to the shortage of firewood and the economic impossibility of relying on purchased fuels, many families are forced to turn to alternative biomass fuels which need close tending and generate considerable quantities of smoke. Half of all families burn millet stalks, maize cobs or cow dung on a seasonal basis. The dung is used mainly for domestic fish-smoking but sometimes for cooking.

Conservation practices: A range of conservation practices are employed in cooking in an effort to minimize firewood consumption. Several of these practices incidentally reduce levels of smoke and contamination of food with dirt and ash.

Preparing and storing firewood: Almost all families store their firewood for drying before it is burned. In general the pieces are left out in the sun, but in wet weather they are also lodged in the roofspace above the fire. Firewood is also stacked against outside walls and put inside separate storage buildings along with food. Most families try to dry their firewood for several weeks.

Shielding the fire: Three quarters of families protect their cooking fire by lighting it in a small depression surrounded on three sides by a wall of mud and dung. This arrangement is known as the Kendo mudstove, and has been developed locally as firewood has become scarcer. The effect is to create an efficient cooking system which saves firewood. In some cases where open fires are still in use, shielding is done using cow dung or pieces of wet wood in the process of drying.

Pre-soaking hard foods: The benefits of pre-soaking hard foods appear to be well known. One-third of households presoak certain foods, generally maize and beans. Most of those who do not presoak say that it impairs the flavour of the food, and cook maize and beans in heat-retaining clay pots instead.

Using tenderizers: Almost half of all households use tenderizers when cooking green grams maize, beans or fish, most commonly rock salt or water filtered through ash.

Cutting foods into small pieces: Two-thirds of families cut certain hard foods up into small pieces to make them cook faster. This is normally done with potatoes, cassava and bananas.

Using lids on pots: All families cover their pots with some form of lid to retain heat and keep out dust and ash. It is also common for the lid to have a stone placed on top to prevent heat from escaping. The lid used may be a metal plate, a clay pot, or even a metal pot containing water which begins to heat slowly using excess heat from the bottom pot.

Extinguishing the fire after cooking: It is common practice in areas of firewood shortage for the fire to be put out as soon as cooking is finished by removing unburned pieces of wood. In Rusinga, most families use this conservation method at least some of the time. The fuel shortage is so acute, however, that the wood being burned is often in such small, fast-burning pieces that it is not worth removing and saving for later. The practice is therefore not ubiquitous. The example of Rusinga shows that rural people using traditional systems of cooking are able to make major adaptations to the way they behave if it becomes necessary as a result of energy shortage. Significant numbers of people in rural areas have no access to improved stoves, or lack the interest or funds to buy them. Even those who purchase them often continue to use an open fire alongside. Simple conservation practices such as those described can play an important role in reducing demand for household energy if suitably promoted. The practices can also improve kitchen hygiene and safety, making them desirable even in areas of fuelwood surplus.

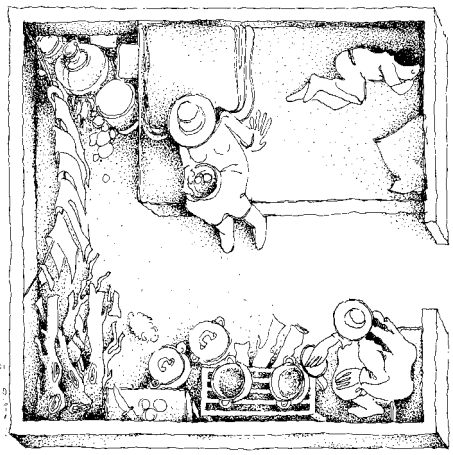
Matthew Owen, MA, a geographer, worked in natural resources consultancy in Kenya and Tanzania before joining Bellerive Foundation (BF) of Kenya as Coordinator for institutional catering projects. Bellerive Foundation has developed a number of domestic and institutional stove technologies, together with manuals for sensitization, construction and project implementation. Currently he is Energy Adviser to the ITDG Household Energy Regional (HER) project in East Africa.

What About Kitchen Design and Architecture?

Housing, energy, kitchen, stoves

The Kitchen – Heart of the Home

Maria Nyström, Nita Lorimer



The kitchen is

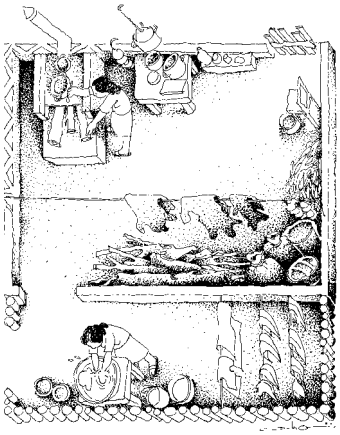
– where most household energy is used in developing countries
– where cooking and related activities are carried out
– one of the main workplaces in the home, but the one with the worst indoor environment, air pollution from smoke, high temperatures and humidity, and in general a messy and dirty place
– a hazardous and often unhealthy place where many children are burned
– an integral part of most homes, with a significant impact on the overall indoor environment if it is not in a kitchen-house
– a workplace where most activities are carried out by women and children.

Despite this, the kitchen is

– neglected, even in newer houses
– left to be designed by the occupants.

For a Swedish family, the kitchen is a pleasant and cosy area for meals, a place for the family and friends to meet and for the children to do their homework. But it should also be noted that Sweden is one of the countries where the kitchen was "discovered" in the 1920s. Research then began to focus on the kitchen environment and working conditions for women, in studies which formed the basis on which kitchen standards were defined in the 1950s. These standards saw the kitchen as a rational, comfortable, healthy and sound workplace. The modern perception of the kitchen in commercials and advertisements shows something more than a workplace – a lifestyle is portrayed, beauty, evening dinners, or a business corner.

In developing countries the situation is often totally different. At the beginning of our kitchen journey, in a project to learn about Vietnamese kitchens, we stumbled into rural kitchen-houses that were dark, sooty, smoke-filled and dusty. The temperature was over 35°C, with relative humidity exceeding 80%. There was no chimney, and the smoke from the stove escaped through the permanently open door or the unglazed window, if the kitchen-house had one. The women squatted or sat on low stools while cooking. The kitchen-house was often used as a shed for domestic animals, a garage for bicycles, a place for cooking pig feed, as sleeping quarters, as well as for cooking the family dinner. Dining in the kitchen was quite rare. In urban areas the kitchen is often neglected. A European who was going to settle for a couple of years in a South-East Asian country found to his surprise that the flat he was going to rent completely lacked cooking facilities. When he pursued the matter further, he was told that he could buy a stove and cook on the balcony or in the yard, or use restaurants.



Our approach to studying these issues is to treat the kitchen as a factory, focusing on the working process, or culinary activity chain, which is composed of the preparation of food, cooking, serving, eating, washing up and drying. To be able to do this, the kitchen has to be studied beyond its walls. Since the kitchen is a complex environment, its study requires inputs from several disciplines. Questions involving natural ventilation, water, smoke evacuation systems, behavioural studies, epidemiology, occupational risks, interior design, lighting and architecture must be considered. New methodologies have to be developed for the study of the kitchen environment in developing countries, since there are no established techniques. The location of activities (i.e. indoors or outdoors) is a basic question for architects. It is the starting point for design and for giving activities a physical form and expression. For the kitchen, the location of the stove is crucial, since it has a great impact on the overall kitchen environment and influences kitchen design. It is also important to think beyond the kitchen. If some of its functions are eliminated, for example using it as a place to keep animals and bicycles, new space has to be provided for those functions.

Reconstruction of the kitchen concept

An analysis of the kitchen should not be limited by its physical structure – its floor, walls and of the ceiling. Kitchen functions other than the central culinary chain must be identified. The kitchen should be defined from the user's perspective, her culinary activities, and the use of water and the cookstove/energy/fuel involved in the process. These factors define how much space is needed in the kitchen. Their effects on the kitchen environment, indoor climate and indoor air quality as well as function interact and should determine the design of the kitchen and its relationship to indoor and outdoor space.

You can't knit technology!

The kitchen is a part of everyday life, and it is gender-biased. A woman user's perspective is necessary, but not sufficient. At present there are neither technical solutions, nor appropriate techniques available for studying kitchen systems. Research and development that is concerned with the kitchen must be taken seriously and accepted as an established research area before changes can be accomplished. Kitchen research needs both "hardware" and "software".

Learning by comparing

The point of cooperation is not what one partner can learn from the other, but that comparison in itself offers the best potential for understanding and knowledge. Knowledge and methods cannot be transferred directly, since they are so closely bound to existing solutions. A dialogue leads to further development and adaptation. The data gathered can then be shared to the benefit of both partners.

There is no universal kitchen

Modelling the kitchen system highlights a complex series of problems; it does not provide solutions. Optimizing subsystems does not necessarily lead to a good kitchen design. The separate solutions must be brought together. For example, if the solution for thermal comfort is a ceiling fan to increase air movement, there is a risk that air quality in the entire house will suffer because smoke and soot might be spread around the room and even to adjacent rooms, instead of being exhausted through the chimney. It might be best to install an extractor fan in the chimney and take a closer look at ventilation through doors and windows. Criteria for kitchen design are not static; they are constantly changing. For example, a switch from solid fuels to cleaner energy sources such as biogas or electricity in the future would drastically alter these criteria. It is not possible to design a kitchen capable of being adapted perfectly to any future change in stove fuel and kitchen use. Rather, kitchen design should be able to accommodate such changes in such a way that working conditions remain acceptable. Kitchen designs are bound to change, but the cookstove will remain the heart of the kitchen.

References

Nyström, Maria (1992): **Contribution of Improved Kitchens/Cooking Areas – Examples from Vietnam.** In Indoor Air Pollution from Biomass Fuel – Working Papers from a WHO Consultation, June 1991. World Health Organization, Geneva, Switzerland.

Nyström, Maria (1994): FOCUS – **Kitchen Design – A Study of Housing in Hanoi.** Department of Building Science, Lund Institute of Technology, Lund University, Sweden.

World Health Organization (1992): **Indoor Air Pollution from Biomass Fuel - Epidemiological, Social and Technical Aspects of Indoor Air Pollution from Biomass Fuel.** Report of a WHO Consultation, June 1991 (WHO/PEP/92.3A). World Health Organization, Geneva, Switzerland.

Dr Maria Nyström is an architect and lecturer, Nita Lorimer is an architect and researcher at Lund University. Both are currently working within the Household Energy Programme of Lund Center for Habitat Studies LCHS. LCHS is a research centre linked to the Department of Agriculture and Development Studies of Lund University. LCHS has two major tasks – to promote research in other departments in the School of Architecture and Civil Engineering and to carry out its own research on habitat in developing countries. Household energy is one of LCHS's four programmes. Household energy deals with intra-household energy in the context of kitchen and building design, indoor climate, function and behaviour. There has been a continuous programme of cooperation with Vietnam for over ten years, as well as research projects in Burkina Faso, Nicaragua and Tanzania.

Dissemination Strategies and Tradeoffs: Example from the Sri Lankan ICS Experience

Kiran Dhanapala and Shyam Sundar

Introduction

What are dissemination strategies? They are simply ways in which stoves (or any other product) reach the end-user after production. They are often seen as two contrasting extremes-goods distributed by an organization (e.g. a charity or the state, or through subsidization), or bought in response to a felt demand/need induced by a third party (commercial approach).

In 1993, dissemination strategies were the subject of an international ICS Commercialization Workshop organized by IDEA[1] in Kandy, Sri Lanka. Most of the stove projects presented used different commercial approaches in their various areas, not restricted to dissemination, but also extending to other areas of project or product development. In spite of this overall trend, key areas of institutional activity appeared to co-exist with commercial dissemination strategies, in areas such as stove design R&D, selection and training of manufacturers, quality control, stove promotion, and awareness-raising. The attraction of commercial dissemination approaches arises from two promises – the possibility of disseminating more stoves for less money, and sustainability beyond the life of the project. In the following, the extent to which this holds true is analyzed on the basis of experience gained in stove projects in Sri Lanka.

ICS projects in Sri Lanka

The history of stove projects

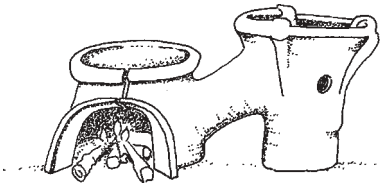
The history of stove projects dates back to the late 1970s. Given the variety of models produced and dissemination strategies adopted, it is a good example of the impact these dissemination strategies have had on project objectives. These are summarized below.

- 1979 – 83 Sarvodaya with Sarvodaya 2-piece, 2-pot wood-burning stove liner installed by trained mud-brick stove installers. Small-scale, village-level extension dissemination (extension worker/subsidy approach).
- 1984 – 89 Ceylon Electricity Board (CEB) with Sarvodaya model under National Fuelwood Conservation Programme(NFCP). Large-scale, island-wide promotion and implementation through extension workers and local government administration networks, in rural areas (extension worker/subsidy approach).
- 1987 – 89 ITDG with CEB's NFCP, commercial production of 2-pot, I-piece Anagi stoves by tile factories around urban centres. Continuing, but on diminishing scale (largely commercial approach).
- 1991 – 94 Intermediate Technology Development Group (ITDG)/IDEA with Anagi stove, produced under Stoves Marketing Project by decentralized, small scale rural potters for all consumers via market channels (commercial plus small extension worker/subsidy (EW/S) component).

Results of subsidy-oriented (EW/S) dissemination strategies

Both the Sarvodaya and NFCP stove projects relied on particular extension networks which varied in size – rural small village and national-level government administrative networks, respectively. The size of each market was limited to the respective extension networks. Both were successful in reaching their target groups (rural poor and lower middle-income groups, biased in favour of the latter), thanks to the concentration made possible by the extension networks – as compared to the more «blanket» approach that commercialization would have provided. If other user-level impacts are considered, evidence suggests a high level of use in both projects (approximately 80%). This was true of percentage of use for cooking needs, where the poorer users were less prone to use alternative cooking facilities. It appears that high user acceptability was ensured by participatory R&D, trained installers and agents for follow-up. However, it was also increased by subsidies which boosted non-need-based purchases and distribution. The dissemination strategies of the projects were not linked to their production strategies, which were both rural and decentralized. Benefits to producers corresponded to each network's "natural market reach". Benefits to middlemen are less tangible – perhaps more direct in the case of Sarvodaya extension workers, where stoves were often used to enhance the status of or legitimize the development workers, albeit over a substantial period of time.

[1]Integrated Development Association (IDEA), of Kandy, Sri Lanka, is a local NGO implementing the current ICS programme in collaboration with Intermediate Technology Development Group (ITDG) Sri Lanka.



"Anagi" Stove

EW/S strategies make use of existing extension networks (with an inherent reach or limit), thus not appearing to differ from commercial channels as far as cost is concerned. What is different is stove design and quality control: EW/S approaches tend to tailor stoves to the specific needs of target users, while also allowing for building by the user and bulky models which may optimize fuel efficiency. Also, it is relatively easy to monitor quality control if the project controls production and associated functions; decentralized production weakens this ability. In retrospect, the evidence indicates that both EW/S dissemination strategies proved unsustainable.

Results of a commercial strategy

The USP's commercial approach added to an existing product base through existing commercial networks and at little additional cost. This approach necessitated a simplified, travel-friendly design (1-piece 2-pot model), implying tradeoffs in fuel efficiency and potential user benefits from correct installation. Like the two EW/S projects (which was surprising), the reach of the tile factory producers' marketing chain was limited more or less to a particular market, i.e. urban middle-income users. Users' needs were also unfulfilled – the stoves were often merely one of several cooking options. The "natural market" was different in that the stove was better suited to the needs of urban users: the accent was on time-saving and convenience rather than fuel economy.

The production method used with the commercial strategy yielded direct if limited benefits to its (few) permanent and (more) casual workers. Despite centralized production, quality control was made relatively difficult by high labour turnover, causing difficulties in training and later also in monitoring. Also, the success of the Anagi product prompted production of "look-alike" stoves (LAS) by business-minded small-scale potters. While the commercial strategy benefited middlemen more, relatively speaking, than the EW/S approaches, the profits accrued from an addition to existing product lines (such as tiles and bricks), rather than from a potentially higher return, as with a new product line. The USP enabled tile factories to capture a market which stagnated and declined after the project ended. This may be attributed to withdrawal of support by government institutions, a decline in stove quality and a consequent fall-of in user acceptance.

Stove marketing: lessons from a mixed approach

The current project differs from the others in the way that it combines both a producer and a user focus with objectives related to their respective welfare. Initially, the project concentrated on producers, to assure production, with the emphasis on training entrepreneurial potters. Later, poor potters were targeted. A desire for greater impact subsequently led to the emphasis being shifted to users. They were reached via traditional marketing networks such as clay cookpot wholesalers. Once successful commercial channels had been established, it was noted that there was little trickle-down of stove benefits to poor users. As previously, the "natural reach" of the commercial market stopped short of poor users. A smaller, parallel EW/S initiative was started in an attempt to reach this user group. This was done in collaboration with grassroots-level NGOs and also government channels, so that subsidization measures such as payment by installment were possible. The forecast potential for sustainable stove dissemination is at present relatively high, given that the commercial approach is now established and clearly predominant. Potters continue to produce independently for the market, responding to new areas of demand.

Conclusion

The examples and the evidence suggest that the numbers of stoves disseminated do not necessarily depend on the dissemination strategy adopted, but instead on user acceptance, price and the "natural reach" of whichever network is chosen. As noted above, particular stove models and networks lend themselves to specific needs and users. In this respect each dissemination strategie has an in-built advantage: subsidy approaches allow greater focus on user type and need, and commercial approaches allow a greater potential for dissemination. However, in contexts where commercial channels are weak or hampered by long distances, commercialization is unlikely to work, due to high prices or the physical or other inability to reach users. On the other hand, bad, impractical stoves will never be used, even if they are free!

Kiran Dhanapala is a socio-economist. She has worked with ITDG's Stoves and Household Energy programme (SHE) and the Programme and Policy Unit (PPU). With a recent background in project development, she is currently working as an independent consultant active in development initiatives.

Shyam Sundar is a general management specialist specializing in institutional strengthening and marketing. At present he is manager of the Energy Programme at Intermediate Technology Development Group (ITDG), Sri Lanka. ITDG is an international NGO which provides appropriate technology support to small-scale producers worldwide.

The Rolling Stoves

Dissemination, commercial and extension strategies

Popularization Is the Key

Jennifer McAvoy

Appropriate structures

One of the most pressing dialogues to enter the cookstove arena is the dilemma over appropriate and sustainable dissemination structures. No community-oriented NGO deliberately creates a dependence among its target groups on its programs and services. And yet, in many cases, we find ourselves doing just that when it comes to the introduction of improved cookstoves. Improved cookstove design and dissemination throughout the world has been supported by a system of subsidization. The subsidies enable NGOs, or GOs to put a focus on widespread diffusion of improved cookstoves with only minimal costs to the user. However, the subsidies have a number of negative side-effects that are well recognized among improved cookstove actors today.

Examples

For example, because of an emphasis on widespread dissemination and the incentives provided to village cadres through the subsidy, users' needs and preferences are often secondary to the actual installation of the stove. In addition, the "target audience" or the potential ICS user may feel compelled to accept the installation of an improved cookstove because it is a government programme being implemented in her area and because her financial commitment is an affordable one. Willingness to accept the installation of an improved cookstove, therefore, may have little to do with real understanding of its potential benefits. In addition, in regions of the world frequented by natural disaster, cookstove promoters may find themselves back to square one, in stove installation and in funding, following typhoons and floods. Improved mud stoves get destroyed and washed away, though they may be durable for 5 years or more minus the damaging weather.

“Stove speak”

Thus, for numerous reasons, upon monitoring of improved stoves following installation, actual user rates are often discouraging. For those who are familiar with the cycles of fund-raising and project support, it goes without saying that a subsidized program for ICS dissemination is not a self-sustaining one. So, then, what to do? The “sustainable development” catchphrase has been tossed around with such frequency that it has become “stove-speak” for ICS actors around the world. But does this phrase actually carry any meaning? Can it be translated into practical programme planning? It does and it can.

Possibilities for sustainable stove dissemination

In several countries throughout the world, we can observe examples of the dissemination and popularization of improved cookstoves that utilize existing marketing and media channels. This dissemination structure generally engages local artisans for improved stove production while maintaining institutional support in the form of attracting user interest through promotion and awareness raising. However, the applicability of this dissemination structure is, by its nature, thus far limited to urban or semi-urban centres of commerce and information. Where does that leave rural stove users? Will users accept a stove in their homes just because of the visiting fieldworker (to make him or her feel good)? Can they be reached by stove agencies effectively, without having to be dependent on them, should they want to install another stove two years later? Or will they have the ability to secure their own stove, whenever they want, based on their understanding and experience of its benefits? Possibilities for sustainable stove dissemination in rural communities are visible in examples set by rural communities themselves. In at least two cases, probably more, upon receiving training and awareness on improved cookstoves, the rural people have turned their experience into micro-enterprise development by installing stoves for surrounding communities. In this case, because the stoves are relatively large mud stoves, it is the service that is sold rather than the product itself.

These two examples of rural and urban popularization of cookstoves and cookstove technology – in areas of commerce through stove enterprise development and media promotion and in rural areas through local training – have given rise to user initiatives to employ the benefits of ICS technology. By exploring this dynamic, we can take the opportunity to encourage this form of stove dissemination in other communities, in other regions of the world. Further popularization of ICS could take place through incorporating improved cookstove technology into the curriculum of educational institutions, both formal and informal. Similar ‘popularization’ has taken place in the context of other development objectives, such as family planning and environmental protection. Why not do the same with stoves?

The development of sustainable approaches to improved stove dissemination is not a quick-and-easy fix for stove agencies, however. It is a long process of identifying the broader goals of the programme, the role of the agency itself and incorporating the views of the user groups into short- and long-term objectives for ICS dissemination. Popularization is just one method of achieving more widespread public understanding within a well thought-out program for sustainable use of energy resources.

Jennifer McAvoy is currently Assistant Manager of the Asia Regional Cookstove Programme (ARECOP), a network organization which promotes and facilitates the development of programmes for the application and dissemination of improved biomass cookstove technology among Asian NGOs.

The Rolling Stoves

Dissemination, commercial and extension strategies

Firewood-Saving Stoves in China

Wang Mengjie

‘As long as the mountain is green there will be enough firewood’.

According to an old Chinese proverb, ‘as long as the mountain is green there will be enough firewood‘. What this proverb means is that, since ancient times, people in China have always been able to meet their daily energy requirements. The rapid increase in China’s population, over-cutting of wood for fuel without any effective protection of forest reserves, and in particular the use of traditional, low-efficiency stoves, have caused vast firewood resources to be wasted during the last hundred years. What a pity it is that the old proverb can only be expressed thus: “when there are no green mountains left we shall be very worried about firewood”.

Early 1970s

In the early 1970s, people in China realized that the traditional small stoves wasted a lot of energy. Naturally, the more firewood was burned, the scarcer it became. This over-exploitation of resources went on for a long time. Up to the 1990s annual timber production in China’s forests was 350 million cubic metres. However, annual consumption was 327 million cubic metres. A third of all wood produced was burned. In the past, peasants cut wood for fuel directly in front of or behind their houses. Later, they gathered firewood from nearby mountainsides. When these local fuel reserves were finally exhausted they went further afield, to distant mountains. Every day they had to walk dozens of kilometres to find firewood. In order to cope with the problem almost all the members of the peasants’ families, including their children, travelled long distances in search of firewood. Many children were no longer able to attend school – they spent all their time, all year round, climbing up and down mountains. In the course of time the mountainsides became increasingly deforested. Due to the loss of water, soil erosion, and environmental degradation caused by overexploitation of forest reserves, the sand content of the soil increased to about 30% over a very large area.

Early 1980s

In the early 1980s, large-scale research into stoves was initiated in the People’s Republic of China. Many kinds of firewood-saving stoves were produced and promoted in rural areas. These firewood-saving stoves differed from traditional stoves in a number of important ways. The combustion chamber was designed to burn the fuel more efficiently. They were fitted with a grate, ash comb and stovepipe, enabling complete combustion of the fuel. Fuel utilization efficiency increased from less than 10% to more than 25%, with a one-third to one-half saving in firewood. The often dense smoke in kitchens was eliminated, with the result that the domestic environment was vastly improved. According to a popular anecdote, one of the first questions that brides-to-be now ask is whether or not they will be cooking on a firewood-saving stove in their future husbands’ household. It is a vivid illustration of the impact of the improved stoves.

In the meantime, the Chinese government has incorporated research into, production and promotion of firewood-saving stoves in the State plan. Experimental promotion centres have been established in stages throughout the country, group by group, in the various counties. The number of stoves needed and the quality standard which had to be reached to ensure acceptance were determined. When a particular county was up to standard it could be inspected and accepted by the government, which would then issue a quality certificate to the district in question. The up-to-standard district would then be developed and managed by local units. Organizing national and

provincial technological training courses is a good way of disseminating technology efficiently, and the promotion of firewood-saving stoves and popularization of the stoves is of great strategic significance. Many exhibitions and meetings have been organized to assess firewood-saving stoves on the basis of comparison, and a large number of illustrated books have been published to give added impetus to the promotion of these stoves.

140 million stoves in 1993

The number of households replacing their stoves has risen from several million in 1980 to 140 million in 1993. In every one of these households energy has been saved and the domestic environment has been improved. In the countryside, the mountainsides are green again, the woodpiles are higher and livestock numbers have increased; trees are once more growing around the houses and birds are singing in the trees; instead of shedding tears in smoke-filled kitchens, housewives now enjoy cooking. All these minor miracles are due to the firewood-saving stove.

Successful promotion

The successful promotion of firewood-saving stoves in China may be summarized as follows: The government attaches a great deal of importance to firewood-saving stoves. Special administrative units at national, provincial and county level administer and implement the relevant State plan. Each of these units also has a special economic guarantee fund.

Scientific research

Scientific research institutions have researched and designed high-efficiency stoves that are not only suitable for local fuels but also satisfy the requirements imposed by local habits and customs. The design of firewood-saving stoves can be standardized, enabling them to be mass-produced in factories. Service to individual farming households is provided by professional technicians at provincial, county and township levels.

In a word, firewood-saving stoves play a major part in energy management and energy economy in rural areas.

Wang Mengjie is a senior engineer and Deputy Director at the Chinese Academy of Agricultural Engineering Research and Planning (CAAERP), and Director of the China Centre for Rural Energy Research and Training. Within CAAERP he is the contact person of the FWD Focal Point for East Asia.

"No Money, No Stoves"
Marketing, subsidies, credits

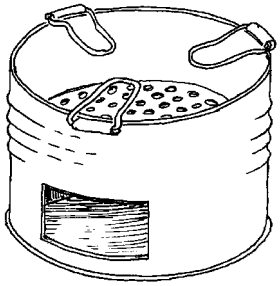
Commercialization of Improved Stoves: The Case of the Kenya Ceramic Jiko (KCJ)

Dominic Walubengo

Introduction

Since 1982, the Kenya Energy and Environment Organizations (KENGO) have spearheaded the promotion of the Kenya Ceramic Jiko (KCJ), an improved charcoal-burning stove aimed at the urban market. The KCJ has two main components: metal and fired clay. Both these parts are made by entrepreneurs; the metal part (cladding) being made by small-scale enterprises or individual artisans, while the clay part (liner) is manufactured by slightly larger and more organized enterprises or women's groups. The KCJ is sold by the artisans directly to their customers or through commercial outlets such as retail shops and supermarkets. The stove is promoted mainly by KENGO and the Kenyan Ministry of Energy, through the mass media (newspapers, radio, television); market demonstrations and trade fairs.

Because of this sustained promotion, there are now more than 200 artisans and micro-enterprises manufacturing some 13,600 improved stoves every month. To date, it is estimated that there are some 700,000 such stoves in use in Kenyan households. This represents a penetration of 16.8% of all households in Kenya, and 56% of all urban households in the country. Whenever the success story of the KCJ is told, it is often forgotten that all was not plain sailing during its inception.



Traditional Jiko

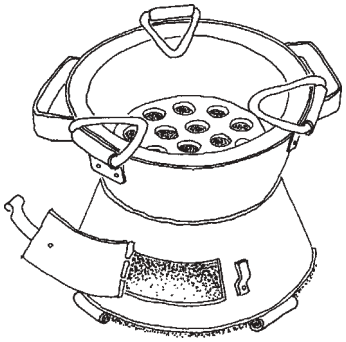
Why improved stoves?

The KCJ found another charcoal stove in use in Kenyan urban households: the Traditional Metal Stove (TMS), which had been in existence on the Kenyan scene since the 1890s, having been brought in by Indian railway builders. Thus by the 1980s, almost every urban home in Kenya, and many rural ones, had a TMS in their kitchen. What, then, made so many urban households switch to the KCJ? Economic considerations! The urban households were already paying for fuel (charcoal), the price of which seemed to be forever increasing. Therefore any effort to save money through the use of an efficient cooking device would be welcome.

KENGO's view was of course much wider than the user's view. KENGO promoted stoves because they help improve the quality of life in several ways:
– They make the kitchen atmosphere healthier, by reducing smoke
– They are safer to use, as they are insulated and therefore burns, especially to children, are reduced
– They are a source of employment for the many entrepreneurs involved in their manufacture.

Commercialization issues

From the very early days of the KCJ, a decision was made not to subsidize the production and dissemination of the stove. The promoters agreed that the private sector would take a leading role in the production and marketing of the stoves. What they did not agree upon at first, was whether this private sector was to be formal or informal. Indeed, the early KCJ stoves were produced by a formal private-sector entrepreneur, Jerri International.



Kenya Ceramic Jiko (KCJ)

However, a little later, a decision was made to separate liner production from that of the cladding. The artisans who at that time were producing traditional stoves were trained to produce KCJ claddings, and then to assemble the complete stove. These artisans subsequently used their established channels to market and disseminate the stoves. Initially the price of the KCJ was very high, in the region of US$ 15 each. This attracted more entrepreneurs and soon many artisans were manufacturing the stoves. This brought about competition, which in turn lowered the price to US$ 3.00 per stove. Thus the profit motive played a key role in disseminating the KCJ.

However, the KCJ introduced a new dimension, the ceramic liner. This could only be made by people who were already producing clay products, i.e. potters, who are generally rural-based. Thus to date, the metal part of the stove is made by informal-sector artisans at their workshops in the urban areas while the ceramic liner is produced by factories in the rural areas. The entrepreneurs who produce these liners transport them to the urban areas and sell them to the metal artisans. Occasionally, some metal artisans go out to look for the liners, but this is the exception rather than the rule.

Sustainability and subsidies

Commercially, looking at the KCJ as an example, the dissemination of stoves is sustainable. Indeed, it is the commercial interests that have kept the KCJ on the market. Institutionally, the dissemination of stoves is not sustainable, it must be subsidized, by donor or government funds. Thus those institutions which carried out the training of artisans, and conducted public education campaigns and demonstrations, depended on doner or government funds. It is important to stress that institutions like NGOs and government agencies are important in disseminating stoves. These institutions can advertise the stoves without any profit motive. As a rule KCJ manufacturers do not advertise the stove, because they fear that other entrepreneurs would benefit from the sales resulting from the advertising.

Credit systems

The whole area of credit was avoided by the stove promoters, expecially after a few entrepreneurs disappeared with their loans when the system was tried out on a pilot basis. To be sure, small-scale informal sector manufacturers in Kenya do not have a culture of servicing loans on a regular basis. Some have been known to use their loans for other uses, for example obtaining another wife.

Benefits

The benefits of the dissemination approach used in Kenya depend on various points of view. Thus the government regards the KCJ dissemination strategy as a source of employment for the artisans and so it is beneficial in that sense. The artisans are happy, because they earn a living by making and selling the KCJ. The customers are happy because they can get the improved stove from the same place where they have traditionally bought stoves. NGOs like KENGO are happy because production of the KCJ is steady and sustainability is ensured. The donors and other international agencies who invested their money and other resources in the development of the KCJ are satisfied that their efforts have paid dividends.

Quality control

There are several weaknesses in the way the KCJ is disseminated, the major one being quality control. With so many liner manufacturers, and even more cladding producers, quality control is a nightmare. As a result, KCJs come in all sorts of shapes and sizes. In addition, some liners crack on first use. KENGO has attempted to solve the quality problem by providing the liner makers with a standard liner mould; but even this can be made and supplied by anybody. KENGO has also tried to educate liner makers on correct clay mixtures. Again, while this has to a large extent succeeded, the profit motive has encouraged some liner makers to use substandard materials.

Profit motive

The second drawback of the private-sector dissemination approach is also related to the profit motive. Because many artisans are now making the KCJs, the profit margin has been eroded continuously. The artisans have therefore resorted to using thinner metal sheets for making claddings, the result being that the stoves buckle at the waist after being in use for only a short period.

Dominic Walubengo is a mechanical engineer and has ten years' experience with renewable energy projects in many African countries. He is the programme manager of the Regional Wood Energy Programme for Africa (RWEPA) and an associate Director at Kenya Energy and Environment Organization (KENGO). He has written widely on renewable energy technologies.

Stove People – Let's Come Together

Role of governmental and non-governmental organizations

The Role of State and Non-Governmental Organizations in the Dissemination of Improved Stoves in Burkina Faso

Georges Yameogo

In order to help reduce fuelwood consumption, large-scale projects have been implemented, since around 1975, to promote stoves which burn less fuel than their traditional counterparts. Several partners, including non-governmental organizations (NGOs) and state organizations, have been involved in the design and dissemination of these "improved" stoves.

Role of NGOs

In most states, the introduction of improved stoves has been handled by NGOs. Being closer to the populations concerned and familiar with their prime concerns, the NGOs were aware of a need to reduce fuelwood consumption not only to help protect ecosystems, but also to alleviate the workload of rural women, a major part of whose time is taken up by cooking and collecting wood, because of the distance they have to travel to obtain the wood. In urban centres, the percentage of the family budget earmarked for purchasing fuels has increased continuously. The NGOs, most of which were active in rural areas, supplied stoves to the inhabitants for the same reason, though with the prime objective of reducing fuelwood consumption. The majority of these stoves, designed to protect the fire from the wind, are built outdoors using locally available materials (e.g. mud bricks, terracotta), in order not to exceed the financial means of the users and the availability of materials. For dissemination purposes the NGOs involved have used local labour, often free or low-paid, especially for producing parts of stoves made of terracotta. The dissemination strategy, unique for each organization, also depends on the region in question. Thus some NGOs have opted for collective training, while others have preferred to train teams responsible for building stoves in homes.

Government organizations

Initially, government organizations intervened via reforestation projects. In addition to campaigns aimed at restoring vegetation, they introduced an improved stove dissemination component to help reduce firewood consumption. Subsequently, having realized that firewood was a major factor in deforestation, the states set up national services whose main objective was to prepare and implement national domestic energy supply and management programmes. A coherent policy in this area had to be laid down, because at the time the rural and urban populations were not sufficiently aware of the crisis. This awareness was essential to justify their spontaneous mobilization as regards efficient consumption of wood and the use of improved stoves or alternative fuels. A number of tasks were therefore identified and carried out. These included:

Research

Research to develop prototypes of stoves that would be economical and appropriate for the socio-economic conditions of the populations concerned. Research was entrusted to the official organization responsible for energy research. To facilitate comprehension of the system, the prototypes introduced by the NGOs and the reforestation project were tested with a view to understanding their principles of operation and selecting the best prototypes for dissemination and/or improvement. This work proved extremely useful and represented the point of departure for the design of efficient stoves, on the basis of which dissemination strategies were developed.

Taking into account on the one hand combustion and heat transfer data, and on the other socio-economic factors, research made possible an evolution from multi-pot stoves with chimneys to single-hole stoves without chimneys. The latter are more economical in terms of fuelwood consumption, better adapted to local requirements and cheaper. Metal and pottery stoves, improved mud brick stoves, and substitute-fuel stoves (gas, oil) have been designed on the same basis.

Training of trainers

Strategies have been formulated for training trainers and users to build and use the stoves efficiently. Training of trainers is carried out by the research organization, which acts as the principal trainer. The trainers are either officers of the dissemination organizations, or smiths, or welding businesses interested in producing improved stoves. Training of this limited group makes it possible to guarantee quality assurance at a higher level.

Preparation of tô (millet paste) on an improved three-stone stove

Training in the construction of improved three-stone stoves

Awareness-raising

The objective of the awareness-raising methods used, often accompanied by design of educational materials and commercials, was to increase the population's awareness of problems related to the use of firewood and desertification in general. The teaching materials range from models to slide projectors, backed up with T-shirts, stickers, posters and advertising hoardings. Commercials on radio and TV and press advertisements have been extremely successful in promoting acceptance of the stoves.

Dissemination

Establishment of dissemination organizations, with recruitment of extension workers.

The extension teams, who are in direct contact with the populations concerned, are responsible for raising the awareness of the users and for training them. The extension workers are employees of the projects and receive a regular monthly income. In some cases these teams are assisted by government employees (foresters, social workers etc.). They also act as intermediaries between the users, the researchers and national dissemination organizations. It has therefore proved possible to modify both the design of the stoves and the dissemination methods.

Coordination

As an integral part of research aimed at improving the efficiency of stove distribution, the states created organizations to coordinate the dissemination of improved stoves. These organizations, named "National Improved Stove Committees", are interministerial. They are made up of representatives of the Ministry of Water and Forests, Social Affairs and Scientific Research, as well as representatives of NGOs and women's organizations. These committees have been assigned the task of preparing and adopting dissemination policies and guiding activities in the context of domestic energy. As can be seen via this organization, the states have taken up the reduction of fuelwood consumption as a matter of prime concern.

Critical points of the programme

Like all other activities in the fight against desertification, and despite the concerted efforts and the means devoted to the task, the dissemination of improved stoves has showed up a number of shortcomings which should be recorded in order to make suggestions for improvements. To this end, the following points deserve consideration.

Estimation of needs

Estimation of needs and master supply plans

Dissemination of improved stoves started before needs had been estimated, either in rural or urban areas. The action taken in this contact were often sectoral (at village or town level), and therefore gave no clue as to real needs at national level. The rare cases of national estimates are unusable, because they are based on unreliable methods. This inadequacy in the estimation of needs is compounded by an inadequacy of the master plans for supplying urban centres. The trade in fuelwood is in the hands of individual wholesalers, and since most of them use old vehicles to transport the wood, they use the most easily passable routes. They thus create deforested areas along these routes, while other areas with better potential are left untouched. There is therefore good reason to estimate the needs above all of the urban centres, to prepare a development plan for natural plantations (principally as sources of fuelwood), with rationally rotated exploitation to encourage regrowth. In order to achieve this, the wholesalers who transport the wood must be made to use all plantations which can contribute to supplies for urban centres. Each wholesaler will have a quota which must not be exceeded and which will take estimated needs into account, so as not to create any surplus.

Dissemination strategy

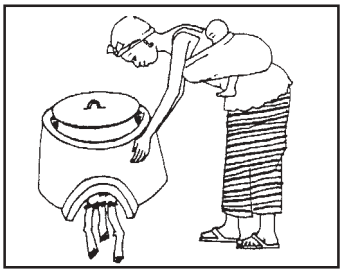
Awareness-raising to encourage acceptance of stoves

In rural areas, puppets are used to raise the awareness of groups. The presentation lasts a day. In most cases the population want the improved stoves and they are then trained to use and maintain them. After this training, there is no further increase in the number of stoves in the village, and those that are built are poorly maintained. This fact indicates that the motivation is not always sufficient and that a one-day awareness-raising session is not enough to get a technology accepted. In urban areas the greatest impact is achieved via radio and TV. It should be noted, however, that these TV and radio campaigns were not sustained for long enough. As a result the improved stoves were abandoned after a certain time. In addition, some awareness-raising activities were not followed up by provision of a sufficient number of stoves to households. There was thus often a discrepancy between the awareness-raising and the dissemination of stoves to the population.

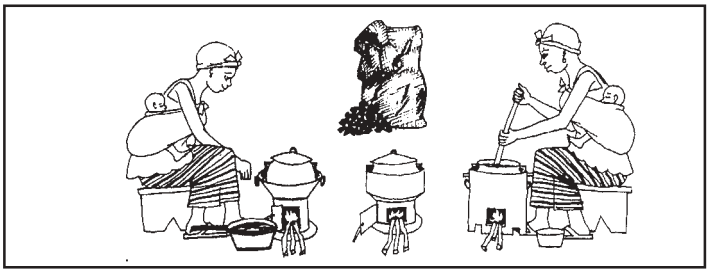
Dissemination system

"Three-stone improved" brick-built stoves

The dissemination system used for these models is based on construction by the users. While the method is good for ensuring large-scale dissemination, it has to be said that the number of days (1 - 3) devoted to training is not sufficient to ensure effective assimilation by the stove-builders. In addition, most refresher training was done a year after the original training course, meaning that those trained had often forgotten certain principles. The result of training all the people interested in a village is that the trainers cannot cope with the entire group. It would be preferable to train a limited number of stove-builders – women and men – in each village.



"Three-stone improved" stove



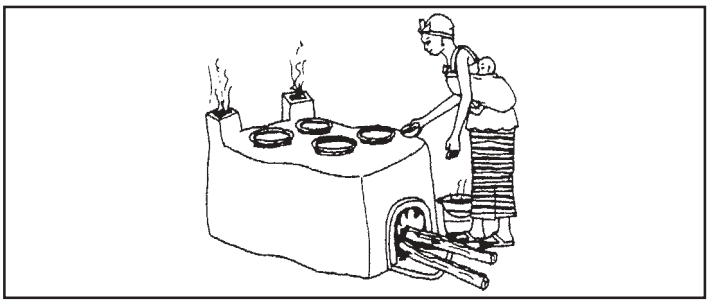
MET, Burkina Faso

Improved metal stoves: "Multimarmite", "Burkina mixte", "Ouaga métallique"

Metal stoves

The state organizations wanted to exercise some control over the dissemination of improved stoves, from the supply of the raw materials through to marketing. The stoves produced by smiths are purchased by government agencies and sold to the users. While this initially met a need to follow up quality, the entire production and marketing process should gradually have been transferred to private organizations. This would have had the advantage of bringing the product closer to the consumer, with prices freely negotiated between vendor and buyer. The role of state organizations would then have been restricted to support via training, awareness-raising and follow-up, for the reorientation of policies.

Pottery stove



MET, Burkina Faso

"Burkido" stove for preparing millet beer

National Committees

The "National Improved Stove Committees" did not function as intended. The roles were ill-defined and there was no follow-up by the various ministries. The representatives changed from one meeting to the next. Instead of the National Committees, permanent fuelwood cells (i.e. groups) should have been established, endowed with sufficient responsibility to improve the efficiency of information-gathering and processing.

At NGO level

While the NGOs may have been co-initiators of the introduction of improved stoves, they made no further contribution following the intervention of the state organizations. There was a certain lack of interest on the part of some NGOs. Co-ordination with the state organizations was not always guaranteed and the NGOs did not always take the results of research into account. Yet by virtue of their position the NGOs would have been able to contribute to dissemination of the improved stoves on a larger scale.

Conclusion

Although improved stoves alone are not a panacea in the fight against desertification, they make a contribution by reducing the consumption of firewood. It is this which justifies the mobilization of efforts by NGOs and state organizations to ensure the large-scale dissemination of such stoves. In spite of the inadequacies noted, it may be said that the dissemination of improved stoves has been marked by a high level of expansion in the countries concerned, and is contributing, via the various activities, to increased public awareness of the problems of deforestation and desertification. Structures have been established for research and dissemination. These structures must be made dynamic, because the issue concerned remains topical and efforts to resolve it should be sustained.

Georges Yameogo is a rural development engineer specializing in water and forest resources. For nine years he was a research engineer and head of the biomass department at IBE, the Burkina Research Institute, where he directed the following activities: design and development of improved stoves disseminated in Burkina and most countries of the Sahel; training, follow-up and project evaluation at national and regional level; CILSS consultant in various Sahelian countries; author of numerous reports and studies in the field of household energy, in particular on improved stoves. From 1992 on, he was agroforestry specialist in the multidisciplinary team of the project "Research into Production Systems" (RSP) at INERA, the Institute for Agricultural Studies and Research. Since 1994 he has been coordinator of the RSP project for the Central Zone of Burkina Faso.

Step by Step...

Project impact monitoring and evaluation (M&E)

Listening to the Cooks

Emma Crewe

Experience shows us that responsive and participatory monitoring and evaluation is a precondition for success, and yet, it has often been forgotten in stove projects. By monitoring and evaluating, and especially listening to stove users and producers, project staff can review progress and learn from their mistakes. M&E involves gathering, exchanging, and assessing information. The findings, when regularly fed into plans, undoubtedly help satisfy the interests of chosen beneficiary groups. This paper highlights the key M&E lessons learned by stove programmes during the last decade.

Why do Monitoring and Evaluation?

'Why can't we just get on with the project?' people might ask when faced with the job of planning M&E. 'Too often it is just a way of amassing a cemetery of data', they may add with justifiable concern. There are three main reasons for doing M&E:

Saving time and money

Good monitoring increases efficiency. By pointing out where problems lie so that they can be sorted out and where successes thrive which can then be consolidated, M&E saves time and money which makes the project cost-effective.

Communicating well

M&E offers a chance for participants to exchange information so that: well-informed managers can plan, organize and guide; staff can explain progress or setbacks, account for their actions and guide their decision-making; users/producers can flnd out about potential benefits and ensure their interests are represented; and partners/researchers can understand more about the process and impact of stove development. Communication itself also strengthens people's feeling of responsibility and commitment to working together as a team.

Pleasing beneficiaries

Efficient work and fruitful communication will lead to positive impact which pleases beneficiaries, particularly by improving their working and living conditions. M&E will provide evidence of this success, most importantly, to entice donors to give more support to new projects.

Some examples:
Design

Monitoring and evaluating Sri Lankan projects proved invaluable
During the design phase cooks were asked to test different stoves. Early stove models were inadequate because the four pot-holes (i.e., openings with rests for the cooking pots to balance upon) were difficult to use with small pots. On the basis of responses gathered during monitoring, stoves were redesigned to suit cooking practices and cooks' preferences.

Popularity	Large-scale surveys revealed that the latest improved stove, the Anagi, was popular because it cooked faster than a 'three-stone fire'. This information was used on subsequent advertising and encouraged more customers to buy the new stove.
Production training	The manager received verbal reports from the extension workers responsible for liaising with rural stove-making artisans. He was able to judge when a producer needed technical assistance and send the training officer at just the right time.
Quality control	In the commercialized programme, monitoring sales from retailers revealed that artisans were copying stoves and selling them with no project assistance. Technical monitoring showed that their stove dimensions were inaccurate, so the project offered to train these 'lookalike' producers to make a higher quality product.
Marketing	Staff also monitored the demand for stoves through retailers. They calculated that demand was already outstripping production capacity, and so postponed one of their promotional campaigns until production levels increased.
Impact and donor support	Information on the benefits of Sri Lankan stoves (gathered during M&E) was used in a World Bank global assessment of stove programmes, at conferences in Europe and the US, and in numerous publications on household energy. This has significantly raised the profile of household energy problems, needs and solutions. M&E was found to be one of the criteria for a successful stove programme. Partly as a result of the study, support for stoves is currently being re-established within the Energy Strategy Assistance Management Programme (World Bank) and other donors are expected to follow suit.

Answering Key Questions

The managers need to decide which critical questions should be answered during monitoring. The following will concern most projects:

The managers decide

– Does the project have enough resources to achieve its objectives?
– Is there good communication between people?
– Is there enough information to persuade other organizations to increase their support for household energy initiatives?

Then managers will choose which kind of information and how much is needed, to answer these questions satisfactorily. M&E is ultimately the responsibility of the managers, but it is usually the project staff who will work with the producers and users to monitor the stove development, production and distribution. The most essential questions they will be addressing are:

With the producers:

– Is production running smoothly and profitably with adequate labour, skills and capital or credit?
– Is marketing and distribution profitable, reliable and responding to demand?
– Do producers and distributors make enough money?
– Who controls the income?
– How many jobs are being created and for whom?
– Is the stove production and distribution going to last without project assistance?

With the users:

– Are the new stoves building on local skills and know-how?
– Are the new stoves popular?
– What are the benefits? Do they use more/less fuel, save/waste money, reduce/ increase women's workload, and/or improve health, safety and convenience?
– Is demand for stoves, and their dissemination, going to last?

How do you do M&E?

If M&E is used to police and constrain people, money will be wasted and staff will become exasperated. There are several useful principles to follow to make M&E responsive, efficient and useful. It should be action-oriented, participatory, and flexible.

The process

The process of doing M&E can be divided into four steps:

Step 1. Collect base-line information
Step 2. Set objectives and plan M&E as a part of project activities
Step 3. Monitor activities, store information and communicate findings
Step 4. Assess findings in relation to objectives and act on them

Before a programme begins

Before a stove programme begins it is necessary to know about at the least the following: fuel availability, consumption and shortages
– cooking practices and existing stoves
– women's workload
– households and their income and expenditure
– potential producers and distributors.

This information is required for planning, but also for M&E. It allows staff to compare situations before and after the project to see what changes occur as a result of the work.

Participation, setting objectives, planning activities

All project participants should participate in setting objectives and planning activities. Prioritizing different activities, and developing the criteria which define success, should also be negotiated participatively. Where conflicts arise, it is the managers' responsibility to find ways of resolving them. For example, stove users may wish for cheap, new technology while producers usually seek a large profit margin. Once it is decided where priorities lie, monitoring can be planned accordingly. For instance, the emphasis may be on keeping the price down to make new stoves affordable to lower-income households, in which case staff need to plan how to monitor the price of stoves and income of purchasers. Appropriate methods for M&E can only be chosen within the context of the particular project, culture, time and place (for details, see references below). The choice of methods, and regular fieldwork, can only be done effectively by permanent residents who know the culture, language and area extremely well.

What to do with information

As important as deciding how to get information is the question of what to do with it. Information, and the interpretation of it, must be packaged and communicated in ways that appeal to the audience. Potential stove users may find information about the benefits of stoves on publicity material in the marketplace or through meeting extension workers. Visual displays of findings, (e.g., wall charts of the level of production and sales), and regular feedback discussions may be more useful than lengthy reports to project staff. Donors, on the other hand, are more concerned to read about impact in written reports packed with reliable evidence of success. M&E can help to meet the needs of all these groups as long as information is communicated in timely, participative and accessible ways. If adequate resources are given to M&E, it can be indispensable for efficient planning, implementation, communication and, ultimately, securing benefits for household energy users.

For more advice on how to do M&E in stove programmes consult the GTZ/ ITDG/ FWD publication on Monitoring and Evaluation of Stove Programmes [forthcoming] and FAO's Guidelines for Planning, Monitoring and Evaluating of Cookstoves Programmes. The PACT publication on Monitoring Small Businesses Step-By-Step is extremely useful for monitoring stove enterprises.

Emma Crewe is a lecturer in social anthropology and development at the School of African and Asian Studies, Sussex University, UK.

Refugees Need Firewood and Stoves Too!

Household energy and stoves in refugee camps

GTZ-RESCUE Experience in the Dadaab Refugee Complex in Kenya

Kindling hope and restoring the dignity of women: the fuelwood factor

Muiruri Kimani

The African refugee

In most African communities the social, political and religious customs are male-dominated. In the majority of cases, men are not only the breadwinners but also the protectors and decision-makers of the family.

However, 80% of the refugees in African camps are not men, but widows, children and single parents. This majority is made up of traumatized women and children, who suddenly have to fend for themselves and head the household.

UNHCR assistance

The United Nations High Commission for Refugees has a mandate to assume responsibility for refugees in conjunction with the host country. In collaboration with other national and international agencies, UNHCR provides food, water, shelter, and health for the refugees and helps ensure their safety. UNHCR often has sufficient food and medical supplies at its disposal. When these supplies are held up, delivery mechanisms are usually the cause.

Except in a few cases, UNHCR does not provide the fuel with which to cook the food it supplies. Where this has been attempted, the results have not been outstandingly successful. The refugees therefore have to obtain the fuel themselves, and in doing so they are a potential environmental hazard.

UNHCR environmental policy

UNHCR does not have an unequivocal environmental policy. The reason for this is understandable: when the organization was set up, protection and socio-economic well-being were the priorities. Moreover, at the time of its inception UNHCR was concerned about refugees as individuals. Only later were refugees considered as members of families or communities. Another later addition was the assistance component. For UNHCR, assisting refugees is a secondary responsibility and has largely been left to other agencies collaborating with it. Unfortunately, environmental issues feature more prominently when refugees are thought of in terms of consolidated units or under such headings as "assistance to refugees" or "host countries". Another reason why environmental issues have not been seriously considered within UNHCR, alongside its primary mandate of protecting human life, is that there has been no strong lobby to draw attention to them. Environmental awareness itself has only quite recently become a global concern, and owes its propagation to strong lobbying by various organizations. However, it is fair criticism to state that with regard to environmental issues, UNHCR has not changed with the times.

UNHCR commitment to environmental conservation

Together with host governments and other collaborating agencies, UNHCR has launched some successful environmental initiatives. These include participation in afforestation activities in Ethiopia, Malawi, Sudan and Swaziland. Trends indicate that UNHCR will in future have to give serious consideration to environmental aspects in its refugee programmes.

In fact this is already happening, as has been seen in Tanzania following an enormous influx of Rwandan refugees. Two strategies are being pursued. With UNHCR assistance, the Tanzania Red Cross Society (TRCS) is facilitating organized wood collection at Lukole refugee camp, a camp with 8,000 people. TRCS also intends to set up two camps eight kilometres apart, at Limase and Mushuhura, for approximately 200,000 people, to ease the pressure on Benaco refugee camp. Although it can be argued that setting up new camps spreads environmental damage, it is probably the best option in a situation where, according to Neil Barry, logistics officer for the International Red Cross Federation, "the (refugee) population is boosted by an average of 5,000 new arrivals daily".

The Dadaab refugee complex

Towards the end of 1992, over 400,000 Somali, Sudanese and Ethiopian refugees flooded into Kenya. By mid-1994, the figure had stabilized at just under 300,000. The Dadaab refugee complex provides shelter for over 100,000 of these refugees in three camps – Dagahaley (29,000) Ifo (39,000) and Hagadera (40,000). Most of the refugees are Somalis. A few are Sudanese and Ethiopian. As expected, over 80% of them are women and children.

Kenya, refugees in Dadaab

Beatrix Westhoff

Rwanda, camp for disabled people

Firewood and rape in Dadaab

All the basic necessities are provided in sufficient quantities by UNHCR and the organizations collaborating with it. However, the package does not include fuel. Most of the fuel requirement is for cooking, and to a lesser extent for baking. This fuel is provided by the refugees themselves, and the preferred fuel in Dadaab is wood. It has to be fetched from the bush, up to 10 km from the camps.

Women and young girls gathering firewood alone in the bush, away from the camps, are easy prey for the bandits, for whom rape is a speciality. Dadaab is located in one of the most dangerous regions in Kenya. Heavily armed gangs, comprising ex-soldiers who fought in Somalia and Kenyan bandits, roam the bush practically at will. In the camps, attacks on individuals and armed hijacking of vehicles are everyday occurrences. Their victims include little girls less than 10 years of age. More than 150 cases of sexual abuse with violence have been recorded in the Dadaab camps. According to the UNHCR Social Services statistics published in April 1994, 70% of these assaults take place while the victims are gathering firewood.

In the Somali culture, virginity is defined as purity, chastity and prosperity. It is a "prized possession" of every woman. Consequently, many women who lose their virginity at the hands of rapists suffer immeasurable social and sexual trauma. In most cases they suffer a double tragedy, because they are divorced or disowned by their families and communities on account of being unclean. Such trauma is sometimes compounded by unwanted pregnancies or contraction of sexually transmitted diseases, including AIDS. When this happens, the victims often lose the will to live, as the following words of one 16-year-old victim show:

"Now I am treated like a prostitute. The only thing I want now is to be buried and disappear from this world."

Interventions in Dadaab

In March 1993, GTZ and UNHCR jointly inaugurated an energy and environment project in Dadaab. The objective of this project, named RESCUE (Rational Energy Supply, Conservation, Utilization and Education) is to ensure that refugee and indigenous community groups utilize energy-saving devices, apply energy-saving methods and participate in environmental protection measures.

Beatrix Westhoff

Kitchen in the camp

Energy-saving devices

If sufficient firewood were provided at the camps, rape associated with gathering firewood could be eliminated. Unfortunately this is not feasible. What is feasible are interventions that reduce the frequency of firewood-gathering and the distance travelled to find it.

Normally, the firewood is used to cook over open fireplaces. These fireplaces are inefficient, and so firewood consumption is high. It can be reduced by using more efficient cooking devices, i.e. stoves. This reduces the frequency of firewood-gathering and hence also the risk of rape.

Several improved stoves have been introduced, varying in size, make and price. These stoves are prefabricated in Nairobi: there are all-metal, ceramic and combined metal and ceramic versions. Families can obtain such stoves either by planting and caring for trees, or working on afforestation sites or in tree nurseries. The amount of work they have to do depends on the type of stove they want. Families are also assisted in building their own zero cost stoves. These are mud-shielded traditional three-stone or tent-peg fireplaces.

Energy-saving methods

However, improved stoves alone are not enough. They are the "hardware". The "software" comprises simple and appropriate tips on saving energy, like soaking hard foods and legumes, covering cookpots, splitting firewood, good fire and kitchen management, kitchen hygiene etc.

These tips are passed on at public 'barazas' (meetings) and by household energy, social and community extension staff during household visits.

Environmental protection measures

GTZ-RESCUE encourages refugees and the local community to plant trees. The species selected are compatible with the harsh Dadaab climate and are multi-purpose trees, i.e. they can provide firewood, live fencing, fruit, fodder and medicines.

Tree nurseries have been established in all the camps, as well as in Dadaab town, for the local population. The seedlings are distributed free. Households interested in planting and looking after a fixed minimum number of seedlings are rewarded with improved stoves. Schools are also encouraged to include environmental/afforestation education in their curricula. Competitions are held, prizes being awarded to the winning households and schools.

Conclusion

Is there any light at the end of the tunnel regarding the African refugee crisis? While it might not be possible to eliminate the crisis altogether, the countries of southern Africa, in particular Zambia and Zimbabwe, have managed to contain the refugee problem. Incredible though it may seem, the number of refugees in southern Africa is actually decreasing. Political will has played the most important role in this development.

Emergency measures

UNHCR should consider including environmental aspects in its programme. To start with, UNHCR could revamp its "Environmental Trust Fund" and include an emergency environment component. This component could then be used to mitigate initial environmental damage during the refugee emergency and relief phases. This may be a long-term endeavour. In the short term, UNHCR should encourage more of its collaborating partners to focus on environmental issues. Donors and other lobby groups, for their part, should support refugee environmental initiatives.

Limit the number of refugees per camp

UNHCR should also negotiate with host governments to limit the number of refugees per camp. Although setting up many camps would increase infrastructure costs, it would also reduce environmental impact.

Environmental policy

Lastly, an environmental policy encompassing all refugee phases should be included in UNHCR's statutes, i.e. emergency relief, development, repatriation, and rehabilitation of the host countries. The UNDP, World Bank and other bilateral and multilateral funding agencies should participate in this initiative.

Fuel supply

Comprehensive fuel supply, resource utilization and afforestation initiatives like RESCUE can no doubt play an important role in alleviating most of the risks and difficulties associated with obtaining fuel. Where, as in Dadaab, issues are involved which are closely related to matters of life and death, such initiatives deserve the same priority as the UNHCR's primary responsibility, i.e. to protect life and, in effect, restore hope and human dignity.

Refugees in sub-Saharan Africa

"In Africa you should not deceive yourself: it does not matter who you are, what you are or where you are. You are a potential refugee."

This philosophical remark was made (not exactly in the above words) by the Tanzanian president Dr Julius Nyerere while opening a regional conference in Arusha, Tanzania, in 1988. By June 1994, according to UNHCR data, Africa had seven million refugees. The refugee phenomenon in Africa is particularly distressing. Within the last decade or so,

– a million refugees entered Sudan from Chad, Eritrea, Ethiopia and Uganda;
– at about the same time, there were a million refugees in Ethiopia from Djibouti, Somalia and Sudan; and
– Malawi was hosting over a million Mozambican refugees. None of the above countries could be regarded as having sufficient resources for their own use, let alone for coping with such a large refugee population.

In Africa, influxes of refugees can be incredibly dramatic. For example,

– during the civil war in Liberia in 1990, almost 100,000 refugees sought asylum in Sierra Leone and Guinea in a single day;
– in May and June 1994, over 250,000 refugees fleeing from the civil war in Rwanda crossed the border into Tanzania. The exodus formed a human wall the width of a standard two-lane highway and eight kilometres long- men, women, children, their livestock and belongings.

In Tanzania, the host government set up 12 camps for 30,000 people each within a week. This resulted in the devastation of 50 square kilometres of vegetation. Many more Rwandan refugees escaped to Burundi, Uganda and Zaire, where the consequences for the environment were similar. However, apart from the environmental and economic impacts on the host countries, the human tragedy is immeasurable. There is not a single country in sub-Saharan Africa which has not experienced the refugee scourge, either creating or receiving refugees.

References and acknowledgments

– UNHCR information bulletins, October 1993 and May 1994
– UNHCR Social Services Department (June 1994), Dadaab
– Sub-Office (personal communication)
– Wbilinyi Abel, Repatriation Officer (June 1994), UNHCR,
– Dadaab Sub-Office (personal communication)
– Refugee No. 94, a UNHCR newsletter (Dec. 1993)
– Refugee Participation Network 15 (September 1993), Refugee Studies Programme
– Refugee Women Victims of Violence (October 1993), A Special Project by UNHCR, October 1993
– Women Victims of Violence (June 1994), training workshop materials
– CARE Refugee Assistance Programme (RAP) Social Services Department (June 1994), Dadaab (personal communication)
– Omale, Juliana (1994): **Battle ground away from the death field.** Environment article in "The Standard" newspaper, Tuesday June 21, 1994, p.8
– Hislop, Drummond and Young, Peter (1985): **Stoves and Fuels Assessment: East Sudan Refugee Camps**
– Consultancy Report for UNHCR. IT Consultants, UK
– GTZ-RESCUE (June 1994): **Annual Report April 1993 – April 1994.** Nairobi and Dadaab

Muiruri Kimani worked for over nine years with Kenya Energy and Environmental Organizations (KENGO), participating in the development and promotion of domestic and institutional improved wood and charcoal stoves. Since 1993, he has been working in GTZ-supported refugee assistance programmes in north-eastern Kenya and, recently, in Goma and Bukavu in eastern Zaire. Kimani has also taken part in consultancy missions in Sudan, Tanzania, Zambia, Zimbabwe and Ghana. He has written widely on dissemination strategies for renewable energy technologies in sub-Saharan Africa.

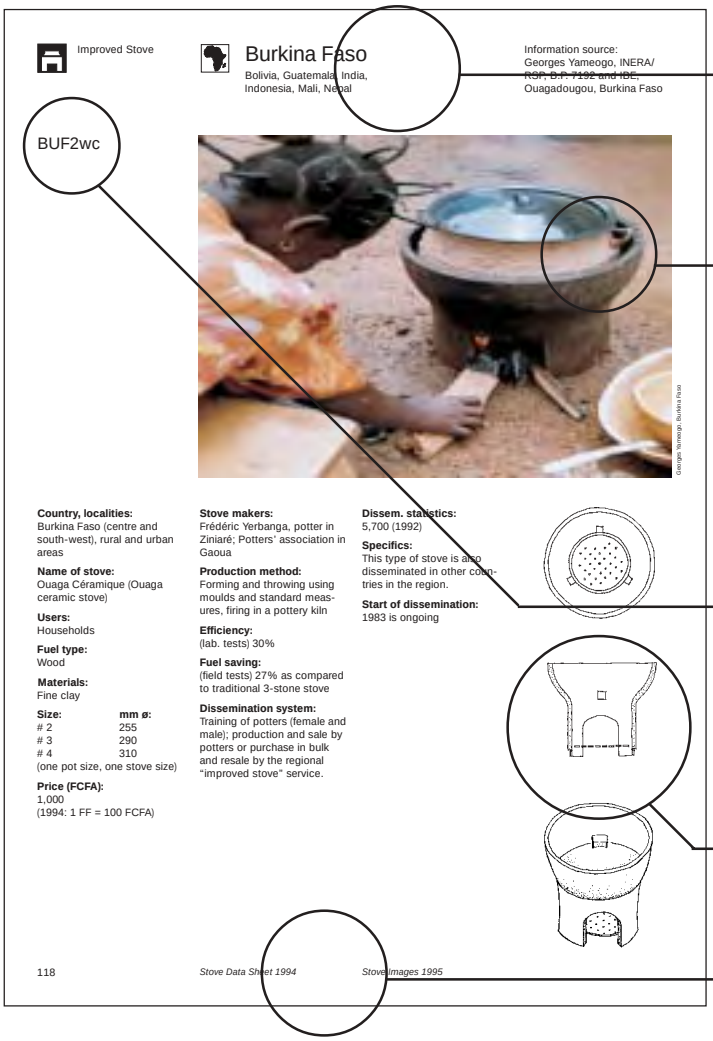
Technology Section

Index of photographs and data sheets by country

Country, continent		Traditional technologies / pages			Improved technologies / pages		
		Stoves	Kitchens	Kilns	Stoves	Kitchens	Kilns
Africa	**A**	**64, 65, 112, 113, 130-132**		**168**	**144, 145, 147, 152, 153**		
Botswana	BOT						167
Burkina Faso	BUF	64, 150	162	168	66, 118, 135, 146, 147, 151		169
Burundi	BUR						166
Cameroon	CAM				120		
Côte d'Ivoire	COI	132					
Ethiopia	ETH				68, 147		
Ghana	GHA	130, 131			137		
Guinea	GUI	130, 131			136		
Kenya	KEN	64, 130, 131			69, 139, 153, 154		170
Mali	MAL	112, 113, 124		168	123, 125		
Morocco	MAR			165			
Mauritania	MAU	132					
Niger	NIG	122, 132			66, 123, 125		
Rwanda	RWA	64, 65		171	66, 121, 152, 153		173
Senegal	SEN	64, 65			134, 146		
Sudan	SUD	130, 132					
Tanzania	TAN				152		
Tunisia	TUN			164			164
Uganda	UGA	112, 113, 130, 131, 148			138, 152, 153		
Zambia	ZAM	130-132			137, 144, 145,		
Zimbabwe	ZIM	148			96, 119, 133, 153, 163		
Asia	**A**	**64, 65, 112, 113, 130-132**		**168**	**144, 145, 147**		**172**
Bangladesh	BAN	70			75		
China	CHI	85, 149			86, 87, 116		
Fiji	FIJ						167
India	IND	71-73	160		74-79, 126-128		
Indonesia	INO	112-114		168	115		
Myanmar	MYA	132			144, 145		
Nepal	NEP		161		83, 147	161	172
Pakistan	PAK	64, 65			129		
Philippines	PHI	67, 112, 113			82, 144, 145, 147		
Sri Lanka	SRI				117		
Thailand	THI	84			140, 141, 144, 145		
Vietnam	VIE	81			80		
Latin America	**A, LA**	**64, 65, 130-132**			**106, 107, 144, 145**		**172**
Central America	CA	88, 89					
Bolivia	BOL	64, 65, 100, 130-132			106, 107, 111, 143		
Brazil	BRA				104		
Dominican Republic	DRE	88, 89			101		
El Salvador	ELS	88, 89, 132			90, 94, 95, 99, 106, 132, 145, 155		172
Ecuador	ECU		158		108		
Guatemala	GUA	88, 89, 156			98, 110, 157	163	
Jamaica	JAM	130, 131			142		
Nicaragua	NIC	64, 65, 88, 89, 91	132		92, 93		
Paraguay	PAR	102, 103			97	159	
Peru	PER		160		105-107		
Venezuela	VEN				109		

How to use the stove data sheets

Each stove model, or several model variants of the same type, are presented on a single data sheet. The data sheet contains several presentation elements, items of information and nomenclature.



Head:
The data sheet head contains the following information: stove category with corresponding pictogram (traditional, improved); continent pictogram, country of origin and other countries where the stove is in use; author (project or information source).

Photo:
Most of the photos show stoves in use in kitchens, on sale at markets or alone, as technical products. The quality of the photos varies. They were supplied by projects, or taken during our visits to projects etc.

Code:
Example: BUF2wc: Burkina Faso, improved wood-burning stove made of pottery.
Each photo has a code with the following meaning: country (BUF), stove category (2 = improved), fuel type (w = wood), design principle, materials (c = ceramic, portable). See the key to the abbreviations.

Design drawing:
The stove design drawings were standardized and redrawn on the basis of drawings supplied by the projects. They illustrate the design principles of the stoves in simplified form. No dimensions are given. People interested in building the stoves can contact the projects in question to obtain detailed instructions.

Year of data acquisition, year of publication

Description of stove:

The text, organized under section headings, describes the main features of the stove(s). The contents of the data sheets were supplied by the projects and information sources cited in the head. They were adopted "as is" and contain no value judgment. Supplementary information and additional sources are identified as such. The information supplied under the headings "Efficiency" and "Fuel saving" refers to the traditional three-stone stove when no other reference is mentioned.

Nomenclature: traditional, improved stove

Two groups or categories of stoves are presented, i.e. traditional and improved stoves. These terms are used solely to distinguish the technologies. They do not represent a judgment of the quality of stoves and are not to be understood in this way. An "improved" stove is not automatically "better" than a "traditional" stove. Broadly, "traditional" describes a technology which developed spontaneously, without any outside influence. "Improved" describes stoves introduced in the course of development projects.

Technology Section

Abbreviations, codes and pictograms

Stoves

1	Traditional Stove
1^2	Traditional Institutional Stove
2	Improved Stove
2^2	Improved Institutional Stove

Kitchens

3-1	Tradtional Kitchens
3-2	Improved Kitchens

Other Technologies

4-1	Traditional Technologies
4-2	Improved Technologies

Fuels

w	Wood and/or Biomass
h	Charcoal
k	Kerosine
g	Gas

Stove design, construction

o	Open fire, 3-stone fireplace or tripod
a	Solid with chimney
b	Solid without chimney
c	Ceramic, portable
m	metal, portable
f	ceramic or metal with chimney

Examples of hybrid construction:

ac	Solid + ceramic liner with chimney
bc	Solid + ceramic liner without chimney
cm	Ceramic liner with metal cladding

Example of stove code:

BUF2wc:
Burkina Faso = BUF
improved = 2
used with wood = w
ceramic stove = c

Continents, Countries

A	**Africa**
BUF	Burkina Faso
BUR	Burundi
CAM	Cameroon
COI	Côte d'Ivoire
ETH	Ethiopia
GHA	Ghana
GUI	Guinea
KEN	Kenya
MAL	Mali
MAU	Mauritania
MAR	Morocco
NIG	Niger
RWA	Rwanda
SEN	Senegal
SUD	Sudan
TAN	Tanzania
TUN	Tunisia
UGA	Uganda
ZAM	Zambia
ZIM	Zimbabwe

A	**Asia and Pacific Islands**
BAN	Bangladesh
CHI	China
FIJ	Fiji
IND	India
INO	Indonesia
MYA	Myanmar
NEP	Nepal
PAK	Pakistan
PHI	Philippines
SRI	Sri Lanka
THA	Thailand
VIE	Vietnam

A, LA	**Latin America**
CA	Central America
BOL	Bolivia
BRA	Brazil
DRE	Dominican Republic
ECU	Ecuador
ELS	El Salvador
GUA	Guatemala
JAM	Jamaica
NIC	Nicaragua
PAR	Paraguay
PER	Peru
VEN	Venezuela