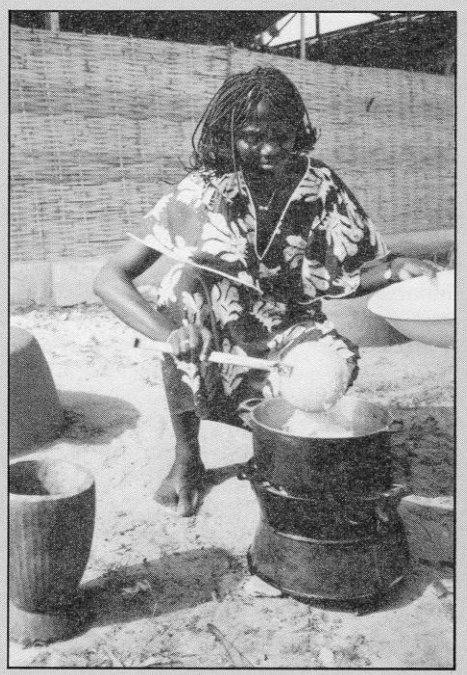
COOKSTOVES

OPEN FIRES STILL THE PEOPLE'S CHOICE

DEBORA COWLEY



At the opening of the 1981 UN Conference on New and Renewable Energy Sources, held in Nairobi, a group of village women marched before the international gathering clutching large bundles of firewood and laid them before the assembly. This one event, more than any other, focused world attention on a crisis facing most Third World countries: the serious destruction of forests threatening their sole supply of firewood.

An area of forest can supply fuel for a set population indefinitely. But population growth has violated the balance that allows the forest to be self-renewing. First, the forests are cleared to create more cropland. As a result, more people must obtain more firewood from a diminished forest area. That forest is no longer able to replace the wood harvested from it.

As more and more trees are hacked down for household fuel faster than new seedlings can grow, the major energy source for nine out of 10 Third World households is literally going up in smoke.

Crash programs to increase reforestation are already under way. But there is more chance of success if, at the same time, ways can be found to conserve existing firewood supplies. One is through the improvement of cookstoves, used extensively not only for cooking but for heat and light, in order to reduce the amount of wood fuel they consume.

SAVE FIREWOOD, REDUCE DEFORESTATION

Cookstove programs have been operating in the Third World for over two decades as part of national energy strategies. Originally, it was hoped that the newly-designed stoves would save up to half the firewood normally used and that their use would reduce the rate of deforestation.

While some of the newly-designed stoves have been successful to varying degrees, results show that, in fact, the stoves are not meeting their promoters' initial expectations. Some of the "improved" designs are no more efficient than traditional stoves. Others do perform efficiently but don't necessarily suit the user's particular needs and villagers prefer their old familiar stoves and traditional cooking techniques.

It is also becoming clear that the newly-designed stoves, while they bring some useful savings at the individual level, have little impact on reducing the overall rate of deforestation. Growing populations' demand for more timber, cropland and fuel are consuming forests at a faster rate than the new stoves can conserve it.

"Stoves which the designers have shown to be efficient under ideal conditions may actually increase wood consumption."

SAVINGS DEPEND ON USER

However, studies do show that well-designed stoves can save fuel, if the stoves are used correctly. Such fuel savings are difficult to calculate, however, and vary from one user to another depending on how often the stove is used and if it is used just for cooking or for heat and light as well. Stoves which the designers have shown to be efficient under ideal conditions may actually increase wood consumption. Stoves designed to operate efficiently by being more or less air tight may devour wood when they become cracked or the doors are left open to provide light. One study showed that people may use 33 percent more wood using the "improved" stoves than they do with open fires.

Existing patterns of fuel use are difficult to alter. In virtually all Third World countries, the open fire in its varying forms is the most common method of providing heat for cooking, light and warmth. It has many advantages. It is readily adaptable in size and shape and in the type of fuel it can burn. It requires few and inexpensive accessories, can be built wherever convenient, and is easy to start and maintain. In its simplest form, it consists of just three stones placed together to support the cooking pot which is propped over the centre of the flame. Twigs are fed through the gap in the stones and the flames fanned by simple hand bellows.

An open fire serves other functions besides cooking. It is often used for curing and drying foodstuffs, its smoke helps in the preservation of roofing and extermination of termites. It frequently is used for heating and where kerosene lamps, candles or electricity are not available, it serves as the only source of light.

However, an open fire can be dirty and dangerous to use. It is more susceptible to drafts and the air flow through the fuel bed is difficult to control. More important, it is extremely wasteful: heat radiates out in all directions rather than being directed to the bottom of the pot, so the vast majority of it heats the room, which is not always desirable.

Most traditional stoves are simple adaptations of an open fire. They may, for example, help shield the fire from drafts, or place it on a waist-high platform to make it easier to use. Others are actually adaptations of designs dating back centuries. These include the mud or pottery stove found in many Asian countries, the metal "jikos" and "fourneaux" popular in East and West Africa, and the heavy brick or mud stoves used in other countries.

HARD TO ASSESS EFFICIENCY

It is difficult to define and assess the actual fuel efficiency of cooking stoves because of the difference between their use in a laboratory and in the field. Different types of wood may be used (the moisture content of wood, for example, has a major effect on the amount of energy produced). Wood is used more sparingly when the cost is high and the supply limited. And if it is being used for light and heat as well, it will consume more fuel.

Wood consists largely of carbon compounds, water and smaller quantities of tars and resins, minerals and non-combustibles. When the surface of the wood is heated to about 150°C by a match, flame or focused sunlight, it begins to char and break down, forcing heat into the interior of the wood. This heat vaporizes the tars and resins which in turn react with the charring wood to form volatile gases which, in the presence of oxygen, will ignite.

A precise amount of oxygen is needed to mix with the gas for efficient burning.

Insufficient air results in incomplete combustion and the volatile gases will escape unburned as smoke. In open fires, or where the wood is spread out, too much air will dilute the volatile gases and lower the temperature below their ignition point. Some of the fuel is blown away as smoke before it can be burned.

Bearing these facts in mind, it is possible to suggest some improvements to existing cookstoves in order to make them more fuel-efficient.

Combustion efficiency could be improved in several ways: by insulating the firebox, the chamber where initial combustion takes place; by placing the pot where it receives a large portion of radiant energy released by the fire; and by controlling the air flow with grates or baffles.

Proper chimneys and dampers (moveable plates in the chimney which control the draft) would make the fire easier to light and would allow smoke to leave the kitchen. However, chimneys can be counterproductive if they are poorly built, fitted or maintained.

Short chimneys which discharge just above the stove are easier to maintain and cheaper to build than full length ones. They offer the advantages of having smoke in the home (curing meat, protecting the roof, killing termites) while they remove the discomforts of smoke in the eyes and lungs.

THE ROLE OF WOMEN

Improved designs should, wherever possible, be based on the use of locally available material. It is also important to encourage inventiveness and to train local people to develop their own technical skills so that they can adapt, produce, maintain and operate stoves efficiently. Women, who are the main fuel gatherers and the prime users of stoves, must be encouraged to play a major role in both the design and the dissemination of stoves.

In designing improvements to stove models, it is important to remember that what suits one user does not necessarily suit another. One stove will never suit all the individual needs of different people, places and customs. Existing patterns of wood fuel consumption and cooking procedures should be considered in relation to local religious, social and economic customs in the planning of stove programs. The cooking needs of a street vendor, a housewife and a commercial baker all suggest different types of stoves.

Finally, stove programs must be related to other development occurring in the area. Such programs work best when they are integrated into an overall scheme of development. □

Debora Cowley is an Ottawa freelance writer.

MORE CHARCOAL PER CORD

Charcoal is the most popular fuel in the urban areas of East Africa because it is easy to transport, compact and relatively smoke free. As more and more people move to the cities, the demand for charcoal rather than firewood is increasing. If the new clay or metal stoves, which can be twice as efficient as the traditional ones, are widely accepted, even more people may switch to charcoal from firewood, parafin or gas.

The overall effect would be a decrease in energy consumption and a saving of foreign exchange but the total use of charcoal might actually increase. This makes it more important than ever to make the production of charcoal as efficient as possible.

Independent villagers and small-scale farmers produce most of the charcoal in Tanzania. They use a primitive earth kiln in which the wood is dumped in a pit or pile and covered with layers of green vegetation and with earth. The layer of earth restricts the air supply and allows the incomplete combustion that results in carbonization.

Although this method is simple and inexpensive, it is also inefficient. Attempts to introduce portable metal kilns have met with little success. The metal kilns are twice as efficient as the earth ones, but they demand a large initial capital outlay, technically complicated operation and a supply of uniform wood. These factors have combined to make the kilns unacceptable to most producers.

An IDRC-funded research project is currently being conducted by the Tanzanian Timber Utilization Research Centre. Traditional earth kilns of various designs are being studied and compared for acceptability and efficiency. Minor modifications may improve the traditional method without adding unduly to the complexity or cost of the process. □

In the town of Richard Toll in the Senegal River Valley, all charcoal is produced using the traditional fire pit method.