

Improved wood-stove dissemination by village women: the case of the 'Nada chulha'

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1 BACKGROUND

Sukhomajri and Nada are two villages located close to the severely denuded Shiwalik hills in Haryana, India. The hills have been denuded at an accelerating rate during recent decades due to the pressure of human and cattle population growth.

The two villages were the subject of a project aiming at restructuring the economic relationship between villagers and the hills so that the hills would recover their green cover and the socio-economic conditions of the villagers would improve.

The Shiwalik hills stretch west from Nepal through the north Indian states of Uttar Pradesh, Haryana and Punjab forming the western foothills of the Himalayas. Until the middle of the past century, the hills were controlled by princes and Maharajahs who used them primarily as hunting preserves. They were thickly wooded with a dense undercover of shrubs and grasses. Tigers, bears and other wildlife lived there. Agriculture was confined almost exclusively to the plains below. Grazing, exploitation of timber and cultivation of crops in the Himalayan foothills were not only prohibited but were uneconomic and dangerous.

Since then, the Shiwaliks have undergone some of the severest environmental deterioration in the world. Most of the vegetative cover was destroyed late in the 19th century. The British encouraged migrants to settle in the hills and made grants of land to soldiers and other individuals. Unrestricted tree felling and grazing took place. By the 1920s, most of the dense forest had disappeared, leaving rivers lined by clay-covered banks and boulders dropping into ever-deepening bare gullies and chasms. As the soil lost its capacity to absorb and hold water, previously perennial streams and springs were transformed into ever-widening and uncontrollable river beds called *choes*. These are dry most of the year but the monsoon water comes rushing down them in torrents, destroying whatever is in its path.

The problem has worsened since India's independence in 1947. Most of the hills are now state-owned and villagers treat them as no one's

Ms Madhu Sarin was employed by the Ford Foundation to work with women in the Indian villages of Sukhomajri and Nada. The stove has been named 'Nada chulha' in acknowledgement of the contribution made by the women of Harijan Nada to its development and dissemination.

property. The policing methods of the Forest Department have mostly failed to control unrestrained grazing and illegal tree felling. The majority of villagers farm small areas of unirrigated land and rely on rain water. With the annual onslaught of floods followed by drought, land productivity is low and the small holdings continually shrink because of sub-division among growing families. The villagers eke out a living by combining their unproductive agriculture with grazing goats and cattle on the hills. Daily wage labour, when available, supplements their income.

The Sukhomajri-Nada project was an attempt to provide a viable alternative to destructive grazing. The aim has been to make villagers key participants in a process of reconstruction. Improvement in the quality of their lives is sought through better management of hill resources. Three organizations have been involved in the project: the Central Soil and Water Conservation Research and Training Institute of the Government of India, the Haryana Forest Department and the Ford Foundation which funded the project.

So far, the project has developed the use of rain water for irrigation by building earth dams across natural gullies and it has ensured an equitable distribution of all water. It has improved agricultural practices, obtained the villagers' voluntary restraint on grazing in the hills, generated employment for women, strengthened the villagers' own management organizations and started a social forestry project for raising fuel, fodder and commercial fibre for the villagers.

2 DEVELOPMENT OF THE NADA CHULHA

The Nada chulha, an improved stove which could reduce fuelwood consumption and improve the women's quality of life, was developed between June 1980 and April 1983. It emerged as a response to the women's requests for smoke removal from their kitchens. The experience of working with village women has demonstrated the importance of making technology adaptable to varying needs.

The first experimental stove was a modified version of a traditional two-holed chulha. It added a chimney pipe which removed kitchen smoke. However, one month's close observation of the stove's performance in a village woman's kitchen indicated only a marginal decrease in fuelwood consumption. In November, a second woman agreed to try out an improved version with three cooking holes, baffles, and a front and chimney damper.

This stove performed fairly well in terms of fuel consumption and smoke removal, but the third cooking hole proved unpopular. It is rare to cook more than two dishes for a meal and hot water is required only for three or four months of the year. Given the small size of kitchens,

which are also used for eating, the permanent occupation of space by a third cooking hole was inconvenient.

The next stove to be built was a small two-holed one in Sukhomajri. This was an immediate success. Its owner decorated it with animal motifs and, within days, most women in the area wanted similar ones. By February 1981, ten new stoves were functioning in Sukhomajri and another five or six in Harijan Nada. One of the stoves in Harijan Nada had been built by a local woman entirely on her own. She had made her chimney with clay to avoid any monetary cost. All the women reported substantial fuel savings and were extremely satisfied with the smoke removal.

They also said their cooking time had decreased, their utensils did not require as much scrubbing as they did not get blackened all over, the fire required little blowing and infrequent attention and, due to the enclosed firebox, they were protected from the fire heat while cooking during the summer. The general cleanliness of the house had improved as soot was no longer settling on household goods. Women using cow-dung cakes as the main fuel said they no longer required fuelwood to start off a good dung-cake fire and those with semi-enclosed kitchens said it was no longer a nightmare to cook on windy days. One woman said that her husband and children spent more time with her in the kitchen as it was no longer unpleasant to sit there, while another said that her husband could now have a daily warm bath during the winter as water could be heated on the second hole while she cooked breakfast on the first. Men expressed enthusiasm about the money saved by having to whitewash the kitchen less frequently.

Requests for the new stove started coming in from other villages. By the summer of 1981, six stoves had been built in two villages outside Sukhomajri and Nada. During this period, the Nada women helped by adapting their traditional stove building techniques to the new design.

3 VILLAGE WOMEN AS CHULHA BUILDERS

With increasing requests for the new stoves, women in Sukhomajri and Harijan Nada were encouraged to consider taking up stove-building as a vocation. The Sukhomajri women responded negatively. Their higher caste status and the important role they played in the subsistence sector of the village economy made it almost impossible for them to go out and do paid work. The men of the village forbade them and, in any case, their cattle, land and house-related work left them with little time for additional tasks.

The response of the much poorer women of Nada was more positive and they were interested in additional sources of income. They have

now built 30 stoves in the main Nada village and as many again in nearby villages. Wages for the work have been standardized and the number of skilled chulha builders in the hamlet has increased to five women and three boys. In addition, one woman and a husband-and-wife team from higher-caste Upper Nada have started working as chulha builders.

It has become clear that women are the best disseminators of the new stoves, especially when they have been using similar stoves themselves. In Nada, a woman must use the stove herself before she can be selected as a chulha builder. During the past year, three boys and a man from Upper Nada have been trained as chulha builders because of the social constraints on women travelling to unknown villages. However, the men have not made the best chulha builders. With little or no experience of cooking, they can be insensitive to the women's needs.

An improved stove-dissemination programme should provide for the natural processes of demand for new stoves, and for the reconstruction, repair and proper maintenance of existing stoves through the generation of local skills. Women users should be educated to use the technology to optimum advantage and to take care of simple maintenance and repair.

4 WORK WITH OTHER ORGANIZATIONS

As word about the Nada chulha spread, requests for information and assistance in training started to come in. The first attempts at training women from other organizations were not very successful. Most of the women had no education and the three- to four-day training period was inadequate. The women were trained at Nada, out of their own environment, and their sponsoring organizations had no idea about the type of support they would require to carry on the work.

After this unsuccessful experience, it was decided to focus on training people in their own environments. All subsequent training has been confined to workers of non-government organizations with a commitment to improved stove promotion within larger rural development programmes. Almost all this training has been given in the trainees' own environments and the results have been more rewarding, although some regional modification of the basic Nada chulha was necessary.

A special form of collaboration has been worked out with the Social Work and Research Centre (SWRC) based in Jagjitnagar in Himachal Pradesh. This Centre received funds from the Department of Science and Technology to build 100 improved stoves during 1983. As an experiment, a group of chulha builders from Nada co-operated with the Centre to build the stoves. In three months, 80 chulhas were installed in

a number of villages in Jagjitnagar block. Some of the Centre's female staff assisted with the work and were trained in chulha building. Later, they took care of necessary minor changes and of follow-up and monitoring.

This arrangement worked remarkably well. The installation of the stoves was fast as optimum use was made of skilled labour. The trained SWRC workers have already built additional stoves on their own and attempts are being made to collect information on stove performance on a systematic basis. The 98 Nada chulhas built by the organization to date have generated a demand for 500 more in neighbouring villages.

5 CONSTRUCTION TECHNIQUE

The Nada chulha is a mud stove with a chimney and an enclosed firebox connected to the chimney by one or two flues above which additional cooking holes can be provided. Baffles under the cooking holes ensure maximum heat transfer to the pots. A damper in front of the firebox is provided to regulate air intake and a chimney damper to regulate draught. The sizes and number of cooking holes, the overall size of the stove and its shape and location in the kitchen can be varied to meet individual needs.

Needs vary with household size, economic status, regional food and cooking practices and climate. In villages around Nada and Sukhomajri, a small two-holed stove has proved most appropriate. The better-off families who own a number of dairy cattle commonly thicken milk by heating it on a slow fire of cow-dung cakes for several hours. This makes butter-making easier. These fires, which generate pungent smoke for several hours, are made in a special enclosed stove called a 'hara'. A method of attaching the hara to the stove chimney has been developed and has proved extremely popular. Higher in the hills, larger three-holed stoves are more appropriate.

The stove is constructed of sun-dried mud slabs (called *chaapris*) which are 18mm thick, 175mm wide and of varying length. Simple and inexpensive moulds can be used to ensure uniform size. The mud slabs provide a skeleton structure for the flue duct and outer shape of the stove. They are joined together with the same mixture of wet clay and straw used for building traditional stoves. The dead spaces can be left hollow (in hot regions where it is undesirable for the stove to be heavy) or filled with ordinary dry earth. This results in substantial savings in the labour and time required to prepare a good clay mix and also enables the stove to dry quickly. The internal and external finishing is then done by applying the wet clay mix. If the mud slabs and the clay mix are kept ready, a Nada chulha can be built in an hour or two. It can be used after three or four days of drying.

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6 CHIMNEY, DAMPERS AND COSTS

Normally, the chimney and dampers are the only components that cost money. In Nada and Sukhomajri 75-100mm diameter asbestos cement pipes have proved popular for the chimney. Their price in Chandigarh is about \$2.50 for a three-metre length. For the hills, tin chimneys seem more appropriate as they are light and unbreakable and therefore more easily transported to remote villages. Local tinsmiths make the chimneys from used purified butter tins. The cost of an average tin chimney is about \$3.20-4. A set of metal dampers costs another \$1 or so. If the making of these components has to be arranged by individuals, the unit costs are bound to be higher. There is also the problem of transportation to the villages and the cost of skilled labour.

7 COOKING-FUEL SUPPLY

Both Nada and Sukhomajri are located next to the hills from which the villagers have a right to collect dead wood for cooking. Although they do not always confine their collections to dead wood, they do have access to fuelwood involving expenditure of only labour and time. Due to severe denudation of the hillside behind Harijan Nada, the villagers now have to walk two to three kilometres to fetch fuelwood. Consequently, the amount collected varies from family to family, depending on the availability of labour within it.

Even in the small Harijan hamlet with only 18 households, a wide variety of cooking fuels is used, including twigs and branches of trees, twigs from bushes, cow-dung cakes and agricultural residues when available. Wheat and maize are the main crops and maize stalks and cobs are useable as fuel. Of course, these are available only to the land-owning families. Landless families with cattle use dung cakes as their major cooking fuel. Landless families with no cattle have to depend on collected biomass fuels. Only one family in the hamlet used any kerosene for cooking and they have given it up since acquiring a new Nada chulha.

The situation is similar in Sukhomajri although the variety of agricultural residues there is greater. Some villagers grow small amounts of sugar cane, and various oilseeds in addition to wheat and maize. The stalks of these can be used as fuel. All cooking fuel in the two villages comes from non-commercial sources.

8 USES OF FIRE

In all the villages visited for Nada chulha training, the two main uses of fire were for cooking and warmth. In mountainous regions with a long and severe winter, warmth is more important. Only the organization

based in Dungerpur in Rajasthan has reported use of traditional chulhas for lighting as well. In no case have villagers expressed an interest in retaining smoke either for prolonging the life of thatch and timber roofs or for keeping insects away.

9 COOKING ENVIRONMENT AND PRACTICES

In Sukhomajri and Nada, nearly all families cook either in a separate kitchen or in a semi-enclosed verandah. In summer, many women prefer cooking outside as kitchens tend to be small and ill-ventilated. Only a few, usually the poorest families, cook in a living room. The same pattern seems to prevail in the villages visited in Rajasthan, Gujarat, Himachal Pradesh and another part of Haryana.

In terms of diet, India can be broadly divided into rice and wheat-eating areas. A normal meal in a wheat-eating area consists of a cooked vegetable or lentil eaten with freshly made *rotis* (unleavened bread which is partly cooked on an iron plate and then roasted directly on the fire). For an average family, this takes about three-quarters of an hour to prepare. But cooking times and duration vary hugely from season to season and family to family. The poorest families frequently cook only *rotis* and eat them with salt or a spicy, uncooked chutney. In the same village, a wealthier family might cook a vegetable, lentils, rice and *rotis*. During sowing and harvesting periods, a small farmer's family might cook only *rotis* since all family labour would be needed in the field, but a large landowner's wife would have to cook food for the workers employed for sowing or harvesting.

10 TYPES OF TRADITIONAL CHULHA

The basic three-stone fire is rare in Indian villages. On the other hand, there is a wide variation in traditional chulha designs. They range from a simple U-shaped enclosure to chulhas with a second, third or even fourth hole connected to the firebox by one or two ducts. In mountainous regions, three-hole chulhas are common. In Sukhomajri and Nada, some families have U-shaped ones while others have two-holed ones. There is also wide variation in height and width of the firebox and overall chulha size.

11 POSSIBLE STOVE DESIGNS

Given the wide variation in cooking requirements, any successful stove programme must be flexible. Serious thought has been given to pre-fabricating at least part of the chulha to simplify extension work and

ensure quality control. But this would inevitably entail some loss of flexibility as well as new problems in transporting heavy, pre-fabricated components to remote villages. Given that user education and some follow-up and monitoring should be part of a stove programme, the workers who do this might as well also build the stoves. Another advantage of this approach is that it leaves room for further design improvements or modifications based on field requirements.

12 HOW STOVES AFFECT THE DAILY LIFE OF WOMEN

An improved stove can bring about major qualitative changes in rural women's daily lives. The elimination of smoke removes a health hazard and keeps the house cleaner. If the pots fit the cooking holes well, then the pots get blackened only from below. In large families, some women spend three or four hours every day scrubbing blackened vessels. If this time is reduced even by half, it means a substantial daily time saving. Some women have remarked that for them this advantage is the most important one; others have adopted the stove primarily for this reason. The increased life of the utensils is another advantage.

Where fuel is collected from distant areas, a reduction in fuel consumption means a saving in time. Time can also be saved by cooking two or three things simultaneously. The fire is safer, easier to manage, and the chances of burn accidents are reduced. Because things can be kept warm for a considerable time with retained heat, the fire does not have to be re-lit frequently. The water heated by residual heat, which would otherwise have been wasted, results in easier washing of utensils and more frequent bathing by family members during winter.

The total saving in time for an average housewife can add up to two or three hours a day. This can mean a great deal in terms of increased leisure, better health, improved child care or higher productivity. Finally, as the women are not only the users of the technology but also its producers, it is increasing their self-confidence and pride and is giving them greater control over their lives.

13 LONG-TERM PERSPECTIVE AND FINANCING

Costs inhibit adoption of the technology on a larger scale. Many rural families cannot afford to pay a total of \$6.50-7.50 for a stove (including skilled labour costs) and many who could afford it do not know where the skills are available. In many cases, the man who controls the family's income is not willing to pay for something which largely benefits the woman. A commercial approach seems unlikely to succeed, but in cases where substantial subsidies have been provided (as by SWRC Jagjitnagar who charged the beneficiaries only about \$1.60 per stove), the pace

of adoption has been much faster. This reduces the costs of organization, supervision and delivery considerably. At present, financial support does not seem to be a problem. The Government of India is considering supplying large-scale funding.

The main constraints to be faced are the inadequate number of skilled chulha builders and the lack of an organizational infrastructure which could help them work effectively. There is a great need to develop effective training methodologies, teaching aids and organizational structures.

