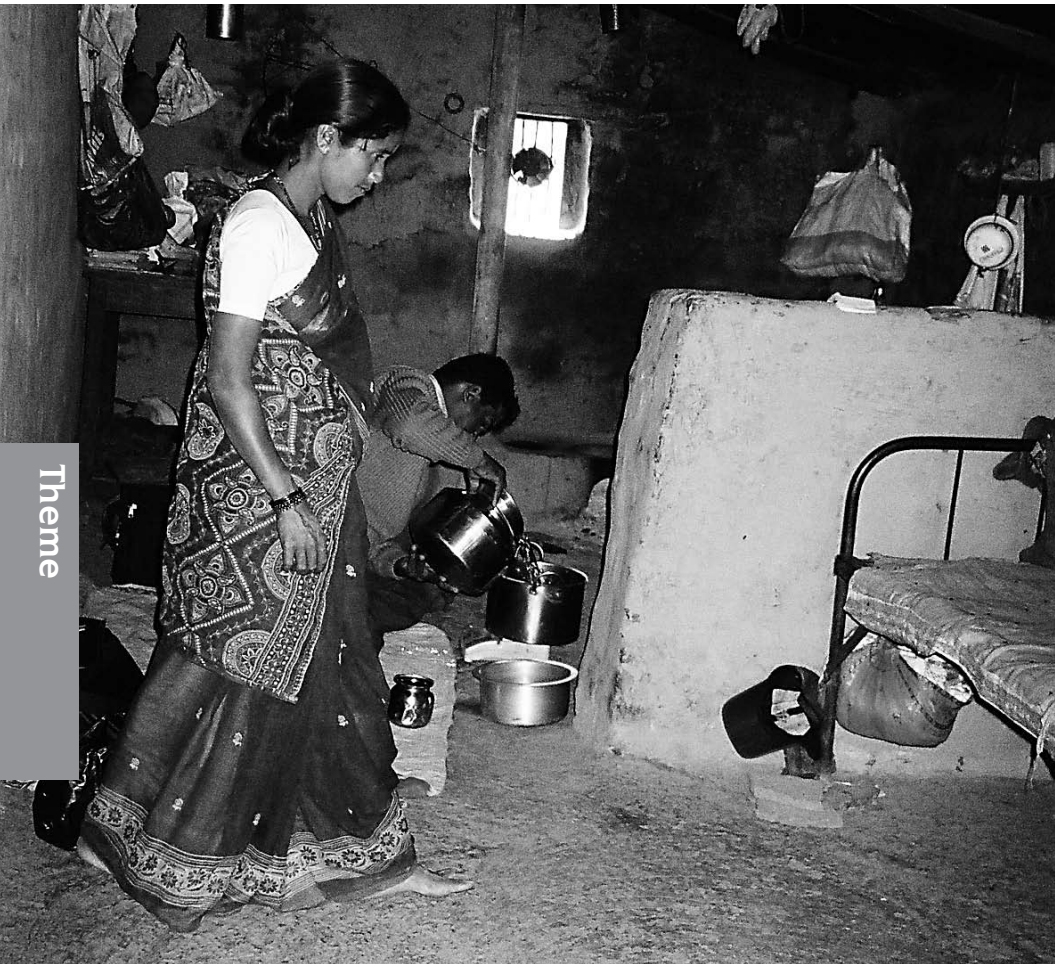

Figure 1 *A field officer installing IAP monitors (photo: the author)*

Monitoring and Evaluation: Experiences from the Field

Author
Karabi Dutta
Appropriate Rural Technology Institute (ARTI), 2nd Floor Manini Apartments, Dhayarigaon, Pune 411041, India. Telephone: +91-20-24390348 (Office) +91-09371051622 (Mobile). Email: karabi_d@sify.com

Despite the challenges, the importance of monitoring and evaluation remains critical in verifying the benefits of improved stove designs and their use. Over the last eight years the Appropriate Rural Technology Institute (ARTI), has been engaged in the Monitoring and Evaluation of improved cook stove programmes in various rural and urban settings. ARTI's Indoor Air Monitoring team usually follows the 'before and after' study design and the team has three permanent members who conduct all the qualitative studies. The rest of the monitoring team is recruited as per the demand of the study. A brief account of the study designs and methods adopted by the ARTI team are discussed in this article, along with their experiences in the field.

Poor households currently relying on biomass fuels are unlikely to switch to cleaner fuels in the near future due to a lack of affordability. There is therefore a critical need for interventions that effectively reduce exposure to high levels of indoor air pollution (IAP), including the continued development of improved cook stoves (ICS) that substantially reduce emissions, reliably improve indoor air quality (IAQ), and improve combustion. To serve this need, as well as other associated concerns in rural development, the Appropriate Rural Technology Institute (ARTI) was founded by a group of scientists and social workers in 1996 in Maharashtra, India. ARTI's mission is to serve as an instrument of sustainable rural development through the application of scientific and technological knowledge.

The first IAQ monitoring and evaluation (M&E) project conducted by ARTI was in the year 2000. The project was sponsored by MNES (Govt of India) and in the following eight years the Indoor Air Monitoring team of ARTI has worked extensively in rural Maharashtra and also in the urban slums of Kolkata in India. They have also undertaken M&E on an improved stove programme in rural Bangladesh. At present the team is involved in the monitoring and evaluation of the woodstove being developed by Philips, the consumer products company. A more detailed list of M&E projects conducted by ARTI can be found via the *@HEDON* link below.

The monitoring and evaluation of improved stoves consists of two phases. In the first phase, laboratory based stove performance tests such as the Water Boiling Test (WBT) are conducted during the design-stage of the improved stove. In the second phase, field tests provide feedback on the performance of stoves in the hands of actual users in their own kitchens. This can be extremely useful, particularly at the early stages of stove dissemination. After the improved stove has been in use for some time it is beneficial to observe long-term changes in user behaviour in order to gain an understanding of how the stove performs as it ages. Poor field performance at any time can indicate faults in the construction of the stove and poor communication between improved stove designers and users.

Successful study design

There are basically 3 study designs for determining the reduction in IAP in households:

1. Cross-sectional
2. Before & After
3. Before & After with Control group

The cross-sectional design requires the simultaneous sampling and monitoring of a large number of houses for both traditional and improved stoves, in the same geographic area. Since sampling needs to be carried out in houses that may not have necessarily received improved stoves, it creates many social and practical problems during monitoring. However, if the project period is limited then this design can be adopted.

In all ARTI projects, the study design adopted was the "before and after" pattern, except with the Shell Foundation project where a 'before and after with control" study design was used. The latter method is very helpful if health parameters are part of the work, as study periods are often short term (1 to 1.5 years) and the stoves are usually installed in the latter half of the study. As health benefits due to an improvement in indoor air can take a long time to become visible, it becomes difficult for

Figure 2 *Key informant interview with a participant (photo: the author)*

a medical practitioner to understand a change in participants' health within this short span. But if the control group is there (people who were never exposed to an improved stove), then a comparison may be made between the 2 groups that gives a greater confidence in the results.

The more simple 'before and after' study design will still provide a very good comparison of the improvements (if any) which may have been achieved by the introduction of improved stoves in the rural kitchen. It is an entirely field based study conducted in order to understand the actual performance and acceptance of the stove in the rural community. Compared to the other two designs this method requires a smaller number of households to be monitored but needs a longer sampling period. It is also not very helpful if a health study is part of the research, for reasons given above.

The quantitative studies which are conducted in the field under the before and after study design are:

Stove Performance Test

This is a WBT conducted with 2.5 litres of water as this mimics most of the cooking patterns in South East Asia (E.g. boiling rice or noodles). The aim is to understand the performance of the stove in the field and whether the stove provided by the manufacturer is as per specification.

Emission Testing

Particulates and Carbon Monoxide (CO) are monitored by placing special equipment in the kitchen room for a period of 48 hours. The electrical monitors are installed at a specified distance and height away from the stove in order to capture the actual emissions and effects of ventilation for a stove in normal daily use. Emissions are also measured during the Water Boiling Test.

Kitchen Performance Test

This is a 7 day test where a record of the total fuel used by the cook per meal is recorded, in addition to the food cooked and the total number of men, women and children present for the meal. This provides a more realistic stove fuel consumption and the comparative 'before and after' study gives the researcher a clearer picture of the fuel saving achieved by the improved stove. It also makes it easier to convince cooks about the fuel saving benefits of the improved stove.

Controlled Cooking Test

This test can be performed in the laboratory or field, with ARTI preferring the latter. The test involves cooking exactly the same meal, with the same cook, on both the traditional and improved stoves. A record is kept of the time taken, the measured amounts of food and the total quantity of fuel used to cook the meal. This particular test provides a very clear idea of the comparative improvement that has been achieved by the improved stove, in terms of savings in time and fuel as well as the ease with which each item can be cooked on each stove.

Methods – past and present

For ARTI's first project, two villages were selected about a 2 hour drive from the office by car. In total 8 project staff were involved but with no specific duties for each member, except for the project co-ordinator who directed activities. So each day two people were selected to go to the village and remain with the monitoring instruments as it was too risky to leave them unattended. The project staff were provided with survey questionnaires with which to interview households and data entry and monitor preparation was the project coordinators responsibility. The project did experience some problems as too many people were involved and there was a lack of specific responsibilities, which made it difficult to manage the process well. When combined with a project coordinator who was only able to visit site occasionally, there was a lot of confusion and although the project was completed it was unplanned and chaotic.

Based on the lessons learned from the first project and subsequent guidance from by Dr Kirk Smith, Dr Nigel Bruce and their team members under the Shell Foundation project, we have since developed a good monitoring plan.

Planning and designing

The first step is to decide on a study design and sample size based on the duration and budget of the project. Only after several visits to the area are villages or study areas selected and the cooperation of the Local Self Governing body of the village is sought before progressing. They are requested to provide a good, reliable field worker who will help with the day-to-day work. After this households are selected and only those who wish to take part are included in the survey. All the households selected for the study should share some basic common criteria. Details of study design and household selection are available in *Energy for Sustainable Development*, Vol XI No. 2 June 2007 'Design Considerations for field studies of changes in indoor air pollution due to improved stoves (pp71-81).

For monitoring and evaluation ARTI have a core staff of three people, consisting of 2 technicians, who have extensive knowledge of rural culture and social habits, and a project manager who is involved in the village and household selection process. The core staff look after the quantitative study in the field. For shorter-term projects, involving typically 1-2 villages, one field worker is appointed per village. For larger scale projects an extra field officer is made responsible for each study area of 3-7 villages, and their responsibilities include conducting awareness raising programmes, arranging for stove distribution and installation, assisting the field workers in data collection, and processing data before sending it to the programme manager. The field officer is also expected to arrange focus group discussions (FGD) and key informant interviews and also to trouble shoot any problems with the improved stoves.

The data entry work is usually outsourced and ARTI arranges for an expert from outside the institute to conduct the FGD's.

The role of the Project Manager is varied and includes the daily monitoring of staff activities and the on-site supervision of IAP monitoring and stove performance tests. The project manager usually travels to the villages to accompany the field workers 4 days a week, in order to talk to participants and resolve any outstanding problems which they may have. One day a week is kept for desk work, communications, data checking, preparation of reports etc. Other than this at least 1 hour every day is devoted to reviewing the days work and planning that of the next. Data analysis and preparation of the project report are entirely the responsibility of the programme manager but these activities are done after completion of the field work.

Daily informal meetings are held with the core staff to plan activities and resolve any problems, depending on feedback from the field staff who are in constant telephone contact. To save time these meetings are often held while travelling. The field visits are planned so that each study area is visited by core staff at least twice a week, helping to quickly resolve smaller problems such as searching for alternate houses and stove damage. A detailed weekly and monthly calendar of activities is always planned in advance with work being assigned to each staff member, keeping in mind all other work, social functions and holidays. Work is planned on a weekly rather than daily basis to allow for the invariable last minute interruptions to be more flexibly integrated into the schedule.

The instruments used for ARTI project activities are easy to use and sturdy. For current IAQ monitoring the UCB particulate monitor and the HOBO CO monitor or Drager CO Dosimeter are used. In all these instruments there is a data logger so manual data collection is not required and, since the instruments can be pre-programmed, nothing more needs to be done in the field other than instrument placement. The weighing scales, digital wood moisture meter and thermometer used when testing are battery powered digital units which allows for easy reading and use away from grid electricity.

However, in spite of such meticulous planning many problems will still have to be faced:

1. The field officer fails to visit their assigned villages for a period of weeks. A similar case happened to ARTI and this was prevented by regular visits from the programme manager.
2. The field worker is not efficient or does not have the influence in the village as previously thought. The only solution is to change the field worker since this is one of the most important project roles.
3. Participants refuse to cooperate in spite of an oral agreement. New participants have to be selected immediately and the field worker's knowledge of the village helps in quickly locating a suitable household.
4. Participants sometimes tamper with the IAQ instruments. In one extreme case a lady kept the UCB monitor inside a flour tin! Instruments can be an obstruction in the kitchen and so the field worker can inspect the equipment and deal with any problems in their daily visits.
5. The stove model selected by the participant is wrong. This may happen if a participant selects a chimney model in a high rainfall area or a non chimney model in a poorly ventilated kitchen. Field staff can try and change the participants' choice.

Conclusions

A well-designed improved cook stove programme can provide multiple benefits for end-users. However, simply introducing an improved stove does not guarantee that positive outcomes will be achieved. Ultimately the stoves introduced into people's kitchens will have to be adopted into their daily cooking practices and as such the end result of an intervention is as much a function of user preferences and behaviour as the technical design of the ICS. This is where the monitoring and evaluation of indoor air quality and stove performance plays such an important role.

Profile of the Author

Karabi Dutta is the Project Coordinator at Appropriate Rural Technology Institute (ARTI) in Pune, India. She primarily works on household energy and health projects, with a special interest in Indoor Air Pollution. She was introduced to this subject about 8 years ago, and since then it has developed into a passion and a mission to spread the awareness about Indoor Air Pollution and Health.

www.hedon.info/DUJA

- Full article online
- Author profile & latest contact details
- Extra figure: list of ARTI M&E projects

Meet us @*HEDON*

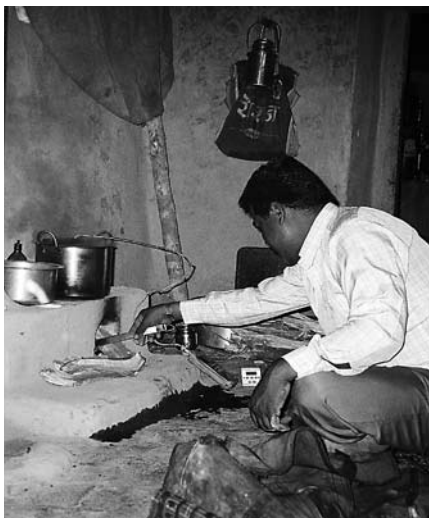

Figure 3 (above) *A water boiling test in the field (photo: The author)*

Figure 4 (below) *The monitoring team travelling to the village (photo: the author)*