# Participatory approach for linking rural energy transitions and developmental needs in Uttar Pradesh, India

*by Malini Ranganathan, Rakesh Prasad and P B Singh, Tata Energy Research Institute, New Delhi 110 003, India*

**Uttar Pradesh**

Uttar Pradesh, the fourth largest state in India, is a culturally and geographically diverse region, with dense forests, meadows, perennial rivers, and fertile soil. The region plays an important role in the politics, education, culture, industry, agriculture and tourism of India. Uttar Pradesh is surrounded by Bihar in the East, Madhya Pradesh in the South, Rajasthan, Delhi, Himachal Pradesh and Haryana in the west and Uttaranchal in the north, and Nepal touches the northern border.

The main industries in the region are cement manufacture, vegetable oils, textiles, cotton yarn, sugar, jute, locks and scissors, carpet, brassware, glassware and bangles. Known for ages for its rich ancient traditions, Uttar Pradesh abounds in places of religious importance. The state is specially known for its cultural centres, so tourism is important to the economy.

The article describes field-level experiences in four villages in North India where rural energy interventions were carried out involving energy-efficient and renewable energy devices for cooking, lighting and water pumping. A valuable lesson learned is that transitions to improved fuels and devices in rural areas can be facilitated by meaningful participation of the community, with clearly defined roles for all members. Importantly, a participatory approach ensures that the energy transitions are also in line with the developmental needs of the community and, as such, aid in meeting them.

## Introduction – why community participation?

For more than 700 million rural dwellers in India, biomass sources and kerosene continue to be mainstay fuels for meeting the domestic energy needs of cooking and lighting. The latest results from the National Sample Survey Organisation (2001) reveal that 76% of rural Indian households use firewood and wood chips as a primary source of energy for cooking and 51% use kerosene as a primary source for lighting[1].

The majority of initiatives for alleviating rural energy poverty in India have been carried out through national programmes instituted by the government. These are large-scale and target-driven in nature, often not building in sufficient channels for local participation in planning and decision making, nor ensuring adequate follow-up measures. The best known programmes include the National Program for Biogas Development, disseminating 3.3 million domestic biogas plants to date, and the National Program for Improved Cookstoves with a record of 33.8 million cookstoves to date[2].

Programmes that hinge on technology dissemination alone, however, cannot effectively bring about transitions to cleaner and more efficient fuels in rural areas. Experience has shown that a lack of user awareness rapidly erodes the efficacy of so-called improved devices. Further, the absence of community participation and feedback in planning, installing and maintaining the devices undermine the long-term sustainability of the technology transfer[3]. To this end, feedback from women – the largest beneficiaries of improved cooking technologies – is crucial in the planning and feasibility stages. Likewise, the involvement of local youth, in terms of raising awareness and providing labour inputs, ensures that all members of the community partake in and benefit from the intervention.

With regard to installation and maintenance, village-level energy management institutions empower the beneficiaries by reducing dependence on erratically available outside support. Apart from these important reasons, local participation is essential for assessing the developmental needs of the community. These needs may not be directly related to energy needs, but could benefit from improvements in household and village energy systems.

## Nature of participatory approach

TERI, New Delhi, undertook village and household-level energy interventions from 1998 onwards in four villages in Jagdishpur Block of Sultanpur District, located in the northern Indian state of Uttar Pradesh[4]. The four villages – Mangrauli, Baghmeera, Harpalpur and Purebaz – were chosen because of their location in an area where TERI has had prior field experience, and also due to the villagers' enthusiasm and willingness to co-operate. Better quality energy was a felt need among the community members.

The project was executed in a phased manner by involving various community members with specified roles. The energy devices proposed for the intervention included improved kerosene lighting devices, solar lanterns, solar home lighting systems, improved cookstoves (Figure 1), and biogas plants at the household level (in all four villages); and solar water pumps at the village level (in two of the villages) (Figure 2). The highlights of the main phases of the intervention are given below[5]:

Figure 1 Using an improved cookstove (photo: Rakesh Prasad)

Figure 2 Biogas plant installation (photo: Rakesh Prasad)

Figure 3 Children reading by the light of a solar lantern (photo: Rakesh Prasad)

## Detailed surveys and feasibility studies

Two major types of surveys were undertaken prior to installation of the devices:

1. assessing local development priorities
2. appraising household energy consumption profiles.

Input from the women household heads was crucial for the surveys. The major findings of both surveys are summarised below.

- Employment opportunities and basic infrastructure topped the list of priorities in these villages. Villagers sought additional employment and an improvement in the water and electricity supply. They were also concerned that the abundance of dung in the area was not being put to good use.
- Women complained of poor lighting for cooking meals, and the presence of smoke inside their houses.
- All villagers were using wood (4.11 kg/day/household on average), mainly collected by the female members of the house who spent 2-4 hours per day in this activity. Eighty per cent were also using dung cake for cooking (2.9 kg/day/household), which was burned in a traditional mud stove without chimney (the Improved Cookstove Program has not reached these villages).

## Designing the interventions

Based on the energy and development-related needs analysis of the preliminary surveys, appropriate energy-efficient and renewable energy technologies were selected for transfer to the villages and households. It was decided that in order to meet their need for employment, all labour and masonry work required for setting up the biogas plants and solar water pumps would be sourced from the villages. Community members were willing to undertake labour in exchange for the energy infrastructure provided through the intervention. In this process, those trained for post-installation maintenance services also drew employment from the intervention.

### *Solar drinking water*

Installation of solar drinking water pumps in the villages of Harpalpur and Purebaz was the method sought to meet the drinking water demand. This was decided on the basis of water demand in the village, calculated to be around 30 000 to 35 000 litres per day. Thus a submersible pump of 900 Wp was selected which could pump 50 000 litres per day and could work up to the total head of 30 m. Dissemination of solar home lighting systems and solar lanterns to certain households was conceived as a means to meet the need for lighting.

### *Biogas*

As mentioned above, a non-energy development concern revealed through the surveys was the issue of fertilizer wastage: although ample manure was generated in the villages, it was felt that the dung was not being utilized to its full potential. Come the rainy season, the manure is washed away, thus depriving the fields of organic fertilizer. The solution to this problem was sought through household biogas plants which use cow dung to generate cooking fuel, but also produce digested slurry that can be used as fertilizer in the fields. Those with livestock and land are ideally suited for installation of household biogas plants.

### *Cookstoves*

Finally, improved cookstoves were looked upon as an appropriate technology for this region, since they are believed to generate less smoke. Improved kerosene lanterns, being not as smoky as the conventional ones, and solar lanterns and home lighting systems that enable better light at night, were also selected for the intervention.

## Awareness generation

Where the education and exposure level of the concerned beneficiaries is low, suspicion of the technology in question is likely to be a hindering factor. Hence an important strategy in raising awareness is the actual demonstration of the technologies; in essence a 'learning by seeing' experience. Seeing the devices operated by fellow villagers has the positive effect of convincing potential users that the technologies are reliable. In our intervention, it was found that even an impromptu demonstration of solar lanterns (Figure 3) at night in a reli-

gious ceremony worked extremely well in convincing others of the efficacy of lanterns.

Other methods used to raise awareness included promotional village-level campaigns. Such campaigns include village level meetings; house-to-house contact in demonstrating the technology efficiency; cultural programmes such as puppet shows depicting real-life situations; market fairs; painting competitions; and creative slogans coined in the local dialect. Young people were involved in the campaign through environmental educational programmes in the classrooms. They were deployed to write catchy slogans and draw wall paintings proclaiming the benefits of renewable and efficient energy devices. These were put up in public places like village roads, market places, and school buildings.

## 'Willingness to pay'

Along with the awareness generation initiatives, villagers were sounded out for their willingness to pay for the technologies and devices. It was discovered that the promotional campaigns had the desired effect of raising both the minimum amount the villagers were willing to spend on the devices, as well as the number of households who expressed an interest in purchasing them. Although the project provided the energy devices at a subsidized rate to the villagers (both through the government subsidy and through a corporate sponsorship), many households were willing to meet up to 40% of the total cost of certain technologies, such as improved kerosene lanterns. While the demand for solar lanterns was only 80 prior to the campaign, it shot up to 250 after the campaign. Finally, 201 lanterns were disseminated. Similarly, while only ten households were interested in biogas plants before the campaign, 29 biogas plants were finally implemented due to an increase in demand. The demand for the improved technologies continues to increase today.

## Capacity building for village institutions and individuals

In each of the four villages selected for the intervention, a village-level 'energy management committee' was set up. These institutions consisted of local masons who were provided with on-the-job training for construction of biogas plants and cook stoves, and local technicians who were trained in the installation of solar photovoltaic systems (Figure 4). In Harpalpur and Purebaz, where solar water pumps were set up, a special committee consisting of five members was formed for ensuring proper maintenance of the pump and for holding regular meetings to discuss any problems. These committees were involved right through the intervention and were also active in motivating the youth groups and spreading awareness throughout the village. In addition, individual households received training for repair and maintenance of the improved kerosene and solar lanterns and improved cook stoves.

## Conclusions

The technologies for dissemination in the villages of Jagdishpur Block were selected due to the felt need for better quality energy, as well as the potential ways in which the provision of improved energy could be linked to developmental needs. The use of participatory methods – from the feasibility stage, to the awareness generation stage to the installation stage – ensured that the energy–development linkage could be established. Further, it ensured that the intervention was designed and executed in an appropriate manner by delineating different roles for female, youth and male members of the community. Thus each group is given an important role in the participatory method, keeping in mind the socio-cultural sensitivities of the community. For example, while women were involved to a greater degree in the decision-making processes, and youth were given greater prominence in awareness generation and promotion, men were given charge of the installation, and operation and maintenance procedures. Thus, community participation appropriate to the local norms and practices aids in achieving the ultimate purpose of the intervention, namely the transfer of energy technologies that are more efficient and advantageous for the health of the end-users.

Figure 4 Solar water pump installation in Harpalpur village (photo: Rakesh Prasad)

*The authors belong to the Tata Energy Research Institute (TERI), New Delhi. Rakesh Prasad (Research Associate) was one of the Principal Investigators of the project described above. Malini Ranganathan (Research Associate) and P.B. Singh (Research Assistant) are in the Renewable Energy Technology Applications and Rural Energy groups respectively at TERI. The article is based on field experiences and the TERI project 'Implementation of energy efficient technologies in selected villages of Jagdispur, District Sultanpur, U.P' (report no. 98RE62). The authors gratefully acknowledge the support of BPCL India Ltd. For any further questions, the corresponding authors, Rakesh Prasad and Malini Ranganathan, may be contacted at rakeshp@teri.res.in and malinir@teri.res.in.*

## Notes

1. National Sample Survey Organisation (2001) *Energy Used by Indian Households – Fifty Fifth Round,* July 1999-2000. New Delhi: Ministry of Statistics and Program Implementation.
2. Ministry of Non-Conventional Energy Sources (2002). For the latest statistics on their rural energy programmes and technology dissemination, see their website **www.mnes.nic.in**
3. For further reading on the relevance of participatory methods in rural energy planning, see Malhotra, P., Dutta, S., Ramana, V. (1998) *Participatory Rural Energy Planning – A Handbook*. New Delhi: Tata Energy Research Institute.
4. Bharat Petroleum Corporation Limited, a public sector oil company sponsored the project and provided a subsidy on the devices. This, along with the existing government subsidies and individual user contributions, met the total cost of the devices.
5. The methodology described here has been adapted from the TERI project report 'Implementation of energy efficient technologies in selected villages of Jagdispur, District Sultanpur, U.P.' (report no. 98RE62), Tata Energy Research Institute, 2000.