

# Decentralised household energy planning for selected villages in Shivalik belt of Haryana, India

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## Background

This article is based on a household survey conducted in selected villages located near the forest area of Haryana Shivalik, India. The state of Haryana, which is located in the north-western part of India, has a meagre forest cover of 3.8% of its geographical area. About 40% of these forests are located in Shivalik belt, which lies in the foothills of the Himalayan range, and has been identified as one of the most degraded rainfed agro-ecosystem of the country (Mittal et al. 2000).

Since the early 1800s, the Shivalik Hill Forests have been used as grazing areas by neighbouring village communities. Agriculture being labour intensive, people kept large herds of cattle and grazed them in the forest. The open access nature of the forests led to severe erosion, which also affected agricultural production. Decreasing agricultural production led to increased pressure on the forest area.

The destruction of the fragile ecosystem of Shivaliks began as a result of fire, reckless felling to provide timber to the Royal Navy, and settlement by the people from the plains who brought large herds of cattle to the hills for grazing and cleared large areas for agriculture. This led to dense forests being replaced by bare hill slopes with scattered thorny bushes. Serious soil erosion became quite common and the once perennial streams became seasonal torrents washing tonnes of sand and boulders down from the hills. The sudden and violent character of floods was a clear indication of the complete denudation of the catchment areas. Degradation of forest resources in the region has been a matter of serious concern for more than half a decade.

Rural people in the area largely depend upon fuelwood, crop residues, and cattle dung for meeting their basic energy needs for cooking and heating. Meeting their energy requirements in a sustainable manner continues to be a



Figure 1 Cattle dung cake commonly used by the villagers for cooking

major challenge for them. Almost 75% of the total rural energy consumption is in the domestic sector. The average daily fuel consumption per household/family in the area is around 6.5 kg. The villages near the forest meet about 60% of their fuel requirements from government forests, about 30% from cattle dung and 10% from agricultural land (HFD, 2000). For meeting their cooking energy requirements, villagers depend predominantly on biomass fuels often burnt in inefficient traditional cook stoves. The inefficient burning of the biomass in traditional stoves creates high levels of indoor air pollution, which cause eye-related and respiratory diseases among women and children in the rural areas. To alleviate these problems, promotion is required for both efficient recycling of cattle dung, and the use of energy-efficient devices, such as improved efficient stoves, to conserve fuel wood and reduce domestic air pollution.

## Survey objective

The objective of the survey was to carry out a feasibility assessment to

popularize and pilot an energy plan of energy-efficient technologies. The main focus was on the domestic sector in selected villages near the forest areas of Pinjore and Yamuna Nagar Forest Division in Haryana.

## Project method

Four representative villages were selected in the two forests divisions in Haryana, located at a distance of 6–20 km from the district headquarters. All study villages are electrified and connected by a metalled road, and have primary and middle level schools within village boundary. The nearest markets of the villages are located within 10 km from the village boundaries.

## Energy use pattern

The energy use pattern in the selected villages is mainly based on biomass. Most of the households use biomass fuels like fuelwood (including shrubs, twigs and branches) and dung cake for cooking. The survey revealed that the fuelwood is used in all the households and dung cake is used in about 80% of the study households for cooking in all

the villages. Fuelwood, mainly from shrubs, is collected from village land and forest areas. Besides this, some of the households use kerosene stoves and liquefied petroleum gas (LPG) for cooking.

In all the study villages, no households use crop residues as a fuel, as these are used as either fodder or as organic manure in the cultivated fields. Although all the villages are electrified, some of them use kerosene for lighting, especially the local lamps (*dibris*).

Figure 2 summarizes the energy use pattern and consumption for different fuels in the selected villages. Cooking was found to be the main energy-based end-use in all the villages. The traditional two-hole mud stove (*chulha*) without a chimney was the main cooking device. The survey showed that households use kerosene for lighting and wood for cooking.

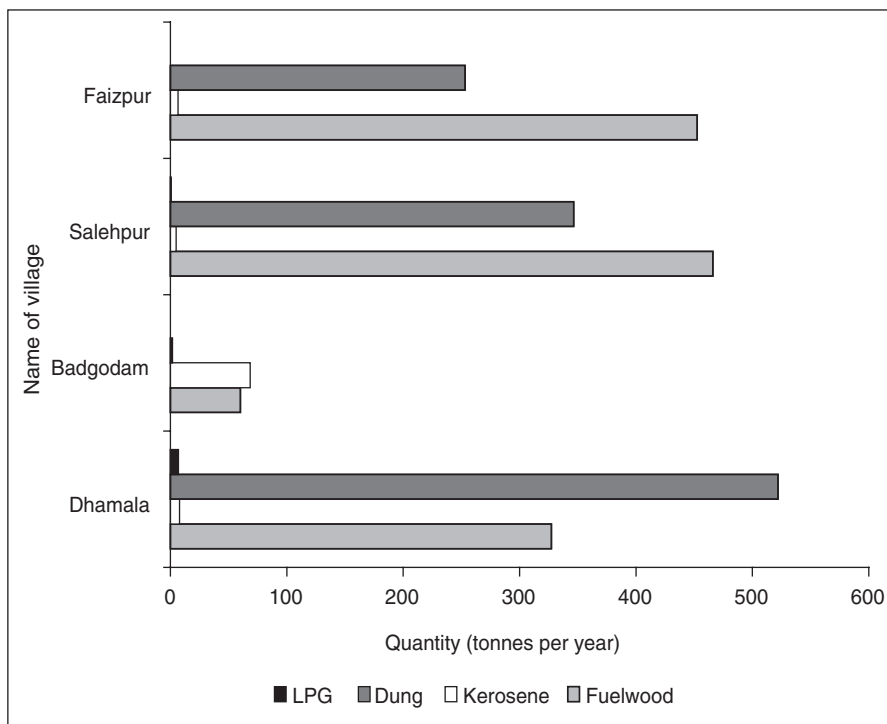


Figure 2 Fuel consumption pattern in selected villages in Haryana Shivalik  
Source: TERI, 2000

## Intervention plan

The proposed intervention plans for all the villages are based on discussions and feasibility assessment of different rural energy technologies within the villages. The emphasis of the intervention plan is largely focused on the domestic sector. Within the domestic sector, as all villages are electrified, the interventions are focused on cooking and lighting. All the villages face the problem of fuelwood collection; hence the focus was to identify alternative technologies which can meet the cooking, water heating and lighting requirements.

The intervention plan is based on the observations made, and on the response of the villages, during household and village surveys. Technologies were identified according to the preferences of the communities shown in figure 3.

It can be seen that technologies for conserving fuelwood, using improved stoves (*chulhas*), solar lanterns for lighting, and improved kerosene devices are important components of the energy intervention plan.

A summary, by village, of planned interventions is as follows:

### Dhamala village

The proposed energy plan for Dhamala village is based on a scarcity of fuel-

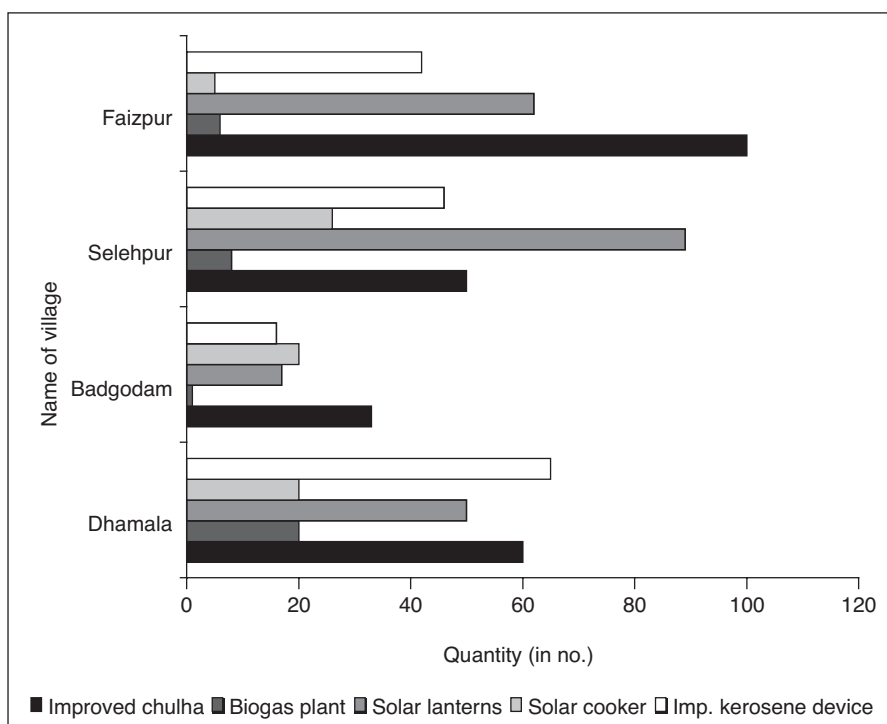


Figure 3 Technology preference of selected village  
Source: TERI, 2000

wood in the village. All the village occupants travel considerable distances to meet their fuel requirements. Due to the scarcity of wood, a few households are shifting to kerosene and LPG for cooking. The improved cook stove is one technology which can be disseminated at household level, especially in low-income house-

holds which are largely dependent on fuelwood. There is potential for biogas in households that own more than three head of cattle. Of the 39 households which expressed a preference for biogas plants, it was feasible for just 20 to have it installed (Table 1). Households in the higher economic group were found to be aware of solar

Table 1 Energy intervention plan, Dhamala village

Intervention area	Potential (Number)	Energy saving (in tonnes fuelwood/year)
Cooking	Improved cook stove (60)	2.4
	Biogas (20)	32
	Solar cooker (20)	3
Water heating	Solar water heater (1)	10
Lighting	Solar lanterns (50)	3.0
	DLS (5)	0.6

Source: TERI, 2000

Table 2 Energy intervention plan, Badgodam village

Intervention area	Potential (Number)	Energy saving (in tonnes fuelwood/year)
Cooking	Improved cook stove (33)	13
	Biogas (1)	1.6
	Solar cooker (20)	3
Lighting	Solar lanterns (17)	1.0

Source: TERI, 2000

cookers, solar lanterns and domestic lighting systems (DLS); these technologies could also be promoted.

Besides these household level interventions, a community solar water heater can be installed in the village.

#### Badgodam village

The energy plan for Badgodam includes biogas plants, improved cook stoves and management systems for an energy plantation to strengthen the supply of biomass (fuelwood). Table 2 gives the proposed set of interventions in the village.

Thirty-three improved stoves (*chulhas*) can be disseminated in households which are largely dependent on village forests (Table 2). Biogas potential is very low due to insuffi-

cient cattle. Two households gave their preference for biogas plants out of which only one can be installed. Fifty per cent of households were found to be aware of solar lanterns and wanted to adopt these devices.

#### Salehpur village

The intervention plan for Salehpur is given in table 3. The proposed plan is based on the feasibility of different technologies and demand of renewable energy devices in the village. The fuelwood demand can be suitably addressed by following interventions.

#### Faizpur village

The improved cook stove is one technology that can be disseminated in households which have low purchas-

Table 3 Intervention plan for Salehpur village

Intervention area	Potential (Number)	Energy saving (in tonnes fuelwood/year)
Cooking	Improved cook stove (50)	20
	Biogas (8)	13
	Solar cooker (26)	3.9
Water heating	Solar water heater (1)	10
Lighting	Solar lanterns (89)	5.3

Source: TERI, 2000

Table 4 Energy intervention plan, Faizpur village

Intervention area	Potential (Number)	Energy saving (in tonnes fuelwood/year)
Cooking	Improved cookstove (100)	40
	Biogas (6)	9.6
	Solar cooker (5)	0.7
Water heating	Solar water heater (1)	10
Lighting	Solar lanterns (62)	3.7

Source: TERI, 2000



Figure 4 Cook stoves presently used in the study villages

ing capacity, but large dependence on fuelwood. Six households of the total surveyed showed a preference for biogas plants. Most of the men were aware of improved cooking systems and solar lanterns and domestic lighting systems (DLS). Table 4 gives the energy intervention plan for the village.

## Conclusion

The proposed intervention plan is based on micro-level implementation focusing mainly on the domestic sector. The plan promotes conservation of biomass fuels, with consequent reduction of environmental pressures on adjoining forest areas. Added to this is the impact of improved technologies on the health of women. For implementing the energy plan, a management system will be devised with the active role of local village organizations and its capacity building role will be enhanced. Finally, it is highly desirable that both forestry and energy sector activities in the area be integrated to enhance their impact.

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