THE ROLE OF WOMEN IN ENERGY-RELATED ACTIVITIES IN THE MOUNTAINS

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INTRODUCTION

A major challenge before the developing countries today lies in achieving the desired degree of mechanization and productivity in all sectors, with minimal energy expenditure. Traditionally, men have played a dominant role in production economics and, hence, in energy-related activities. Women, unfortunately left out of the main stream of development, are the pillars on which the future generation rests, and the roots which can stabilize the rural economy. Clear-cut correlations have been established between the education and economic status of women, and the health status of the population and fertility control. Their contribution to production is significant, albeit often hidden as non-remunerative "shadow work". Practically all the domestic work and most non-mechanized drudgery work is done by women, and whatever earnings they bring go directly for family sustenance.

Thus, seen in terms of energy, the role of women is as important, if not more important, than that of men in any habitat, and particularly mountain habitats. While the path of progress for women in general has been hindered due to sociocultural, traditional, and techno-economic constraints, problems due to harsh climatic conditions and terrain in hill areas add to their under-development. Due to inadequate employment opportunities, men often migrate to the plains, leaving the women responsible for the physical and economic well-being of the family. The general difficulties in water lifting, fuel collection, cooking, child bearing, house building and other operations faced by women in any underdeveloped region is all the more aggravated in the case of women residing in the mountains. Hence, women's upliftment is an important factor in the context of any rural development planning.

Recognizing this, the Indian government has made several policy decisions. Priority is being given to women's development through the Ministry of Human Resources Development. Programs on "Development of Women and Children in Rural Areas" (DWCRA), made as flexible as possible to suit local needs, are under implementation. The Department of Science and Technology has a special cell on "Science and Technology for Women" which is identifying and promoting technologies for women under three categories (Devendra Kumar 1983):

1. Technologies for Drudgery Reduction
2. Technologies for Health and Sanitation

3. Technologies for Employment

The Council for Advancement of Rural Technology, Department of Non-Conventional Energy Sources, and other institutions are also supporting the generation and transfer of technologies for women. Many voluntary agencies are giving special attention to women's problems.

While economic benefit through employment is the major concern, this would become possible only if women were at least partially relieved from their household chores, to which they are bound in eking out a marginal existence in a barely bearable environment. Hence, information is needed on time-budgets so the major activities sapping their energy could be identified and alternatives suggested. Only if the opportunity costs entailed do not promote involvement in other remunerative tasks, can one plan strategies for their employment and income generation. Further, this has to be matched with the local situation in terms of resources, physical environment, skill availability, practices in participating in the market economy, and in general, the status of women in the sociocultural milieu.

This paper proposes to analyze these aspects in the context of the Indian Himalaya with the help of data from studies by some authors and various other reports.

TIME AND ENERGY BUDGETING

Surveys have indicated that rural women generally spend up to 16 hours or even more on domestic as well as non-domestic activities, and hardly get enough rest even during pregnancy. Their activities can be divided into domestic and production-oriented.

Domestic Activities

Cooking fuel and fuel collection. Cooking by convention falls into the woman's domain, irrespective of economic or educational status. The majority of rural women still cook on traditional *chulhas* (stoves) which are both inefficient and smoky. High fuel consumption adds to the burden of fuel collection and also indirectly affects the environment in terms of deforestation, erosion, flooding, etc. *Chulha* smoke containing many irritants and carcinogenic compounds has been shown to be as detrimental to health as smoking several packets of cigarettes a day. The level of pollution caused by a smoky *chulha* in a kitchen is reported to be 10 times or more than that in many thickly populated urban centers of the world. Cleaning is again a woman's problem. Invariably, there is a water shortage making cleaning all the more difficult. A smoky kitchen inhibits the rest of the family from sitting around with the women. Obviously, these difficulties outweigh some beneficial effects due to smoke, such as insect control, and alternatives have to be found, such as occasional fumigation with smoke rather than continued use of inefficient *chulhas*.

The staple foods in rural areas are primarily wheat and rice. Occasionally other cereals like *jowar*, *bajra*, and maize are used. Cooking rice is relatively easy compared to other cereals such as *jowar*. It has been pointed out that efficiency of the cooking device

may indirectly lead women to choose cereals which are easily cooked but not necesarily nutritious (Agarwal 1985). To make *chapatis* for a large number of family members causes women to stay near the stove for longer times, as each *chapati* has to be cooked individually, unlike rice.

In the plains, with more intensive agriculture, agro-wastes can be used as fuel and fodder. Buffalo and cattle are kept both for agricultural and domestic use and sufficient fodder is available for them. Thus, animal dung becomes an alternative fuel. Unfortunately, hill terrains are not suitable for agriculture, nor is it easy to get fodder in spite of nearby forests. Often, smaller animals are preferred and dung availability is limited. Women have to use firewood, twigs, and leaves as fuel. Burning of dung, leaves, etc., interrupts the natural nutrient recycling system, affecting the soil fertility in the long run. Also, cowdung has much lower calorific value than wood and is more smoky. Only a few rural and urban women in the higher economic strata can get kerosene or other commercial fuels such as LPG and electricity. Many remote areas have no access to commercial fuels even if the people are able and willing to pay, since the distribution infrastructure is lacking. Hence, rural women continue to use wood, agro-wastes, cowdung, and other kinds of biomass. While the developed world is worried about the fossil fuel crisis, for the developing countries it is a question of finding low-cost or no-cost traditional fuels for cooking. It is feared that even if gains are made available by intensive agriculture, the fuel for cooking may be harder to find. Volumes have now been written on how this "secondary fuel crisis" is affecting the environment and vice-versa.

Unfortunately, in the subsistence economy closely associated with ecology, it is women who are expected to meet fuel needs. While at one time fuelwood was available at the doorstep, now a woman has to walk several hours to collect even inefficient fuels like weeds and leaves. Use of these demands continuous attention during cooking. Particularly in hill areas, deforestation is increasing due to commercial contracting of forests for firewood and for providing raw materials to various industries. Also, in certain hill areas, land availability is reduced due to rights being given for mining and other activities, without considering the effects on ecology and the people. This has increased the number of hours spent by women on fuel collection. In fact, the task has become impossible for the physically weak.

Water fetching and cleaning. Gone are the days when water was easily available in the hills. As a part of the domestic work, women and children are expected to bring water not only for cooking, but also for washing the animals, clothes, and cleaning utensils. The dwindling of water resources has resulted in long hours of walking. Availability varies with rainfall and season. Summer and drought add to the drudgery. Even where pumps or other water-lifting devices have been installed, often these do not have the desired impact due to lack of maintenance. Studies on pully systems, hydrams, and other water-lifting devices suitable for a given area are scanty at the field level, as developments remain confined to the laboratories.

The quality of water also affects the health of the population. The worst hit are the women and children, whose energies are sapped by waterborne diseases such as dysentery.

Housing and Sanitation. Due to economic and traditional sociocultural factors, most villagers live in *kachha* houses made of locally available materials. While men spend their time working outside or migrating to urban centers, women are confined more to their village and homes. Thus, any problem associated with inadequate housing, such as ventilation or leakage, affects the women most. Further, cleaning the house as well as repairing takes a lot of time and energy.

Inadequate sanitation is a direct cause of several diseases. Non-availability of toilet facilities compels the women to seek covered areas early in the morning, or late in the evening. With the receding forest cover, they have to walk longer distances and bear greater physical and mental tension. This practice also leads to poor personal hygiene, besides resulting in the spread of diseases, affecting the health of the population as a whole.

Child care. As poor men live by literally working with their hands, children are not considered an additional burden, but an economic advantage. Absence of better opportunities for using women's time on more remunerative tasks, and their low status in the family, with hardly any decision-making powers, have condemned them to repeated child bearing. The average family size is still six or more. Women continue to perform all domestic tasks even during pregnancy. Added ill-effects of poor nutrition leave the women in a state of low-energy equilibrium, with their bodies and spirits dampened by disease and conditions including anemia and protein deficiency. The migration of men to the cities adds an additional dimension to the drudgery. Women simultaneously face biological and psychological pressures in being away from their husbands for long periods, while carrying the physical load of not only keeping body and soul together, but also those of the children.

Productive Activities

Agriculture and animal husbandry. In comparison to the plains, agriculture is more difficult in hill areas. However, the climate supports horticulture. There is no tradition of taking special care of forests and planting trees, since in the past dense forest cover was available; in fact, it was necessary to reclaim land for agriculture by shifting cultivation. With the changing situation, forestry could be an area in which women can play an active role, if given the necessary organizational and financial support.

Women have always participated in agriculture and horticulture, and with the migration of men, their involvement has increased. Modernization and mechanization may raise productivity, but often also add to the drudgery because the division of labor generally leaves the more difficult and tedious tasks to the women. As for animal husbandry, in view of the fodder situation and nature of hill terrain, smaller animals like pigs and goats become more important, especially for meat production.

Other modes of employment. As discussed above, women generally spend most of their time on non-remunerative tasks, and even their participation in production-oriented activities does not bring direct monetary gain. They are also not formally trained for any kind of employment due to their low status and cultural bias against their employment. In fact, even the illiteracy level in most states is very low (Appendix 1), not to mention higher education and vocational training.

Hence, any education or training has to be taken up through non-formal modes. Since women's domestic chores bind them to their homes, normally home-based employment such as cottage industries are suitable. The custom of using local resources to make a variety of handicrafts and utility articles, such as brooms and baskets for nearby markets, is in vogue. However, lack of raw materials is now eroding this. Other skills, including weaving and embroidery, are also vanishing due to lack of proper market support. In fact, the environmental crisis and urbanization have created occupations not in existence traditionally, such as head-loading, in which women collect and sell firewood.

However, opportunities for wage earning become available when the government takes up programs such as road building or when entrepreneurs introduce new activities. Unfortunately, often the women are not paid full wages or given suitable facilities despite legislation to protect their interests. Although government rules prescribe minimum wages, employers generally do not recognize these wage structures as compatible with their profit targets.

In some castes it is considered demeaning for the family to let the women earn; women themselves tend to share this view. Thus, releasing women from domestic drudgery cannot be considered important in a male-dominated society unless her earnings outside are sufficiently lucrative. Much effort is needed to improve the situation, creating self-confidence in women.

CASE STUDIES AND REGIONAL VARIATIONS

The time schedule and energy spent on the above activities not only vary by region, but by village and household, depending on physical, environmental, socioeconomic, and cultural factors. Hence, the case studies have been grouped on a regional basis and each type of activity is discussed in detail.

Himachal Pradesh

Cooking fuel and fuel collection. A sample survey (Khosla 1985) in Mandi and Solan Districts of Himachal Pradesh showed that in these areas firewood is the principal fuel for both cooking and space heating, followed by animal dung and agricultural residues. All households collect firewood; no households in Solan use kerosene, while a few do in Mandi. The villagers unanimously felt that the shortage in firewood supply was increasing due to deforestation, but continued to consume firewood at high levels instead of trying to reduce their consumption. As shown in Table 1, there was a significant difference between the two districts.

Table 1: Fuelwood Collection and Consumption

Household Consumption			Time Spent on Collection	
Consumption (kg/Month)	% Household		Manhours per day	% Household
	Mandi	Solan		
Below 400	41	100	1 - 2	26
400 - 800	36	-	3 - 4	37
Over 800	22	-	5 - 6	37

Mandi villagers, having greater access to forest areas, use wood more liberally both for cooking and space heating, leading to an average consumption of 500 kg/month compared to 220 kg/month in Solan. The high firewood consumption is reflected in the total time spent in collecting firewood (an average of 3.7 hours per day per household). In Mandi, three meals a day are taken, while in Solan, meals only include lunch and dinner. Wherever breakfast forms a part of the food habit, many women have to start cooking before seven in the morning, while in the absence of breakfast, it is possible to start cooking lunch about ten o'clock.

Obviously, the duration of cooking depends on the number of family members. Average cooking durations of 1.9 hours for breakfast, 1.6 hours for lunch, and 2.2 hours for dinner, amounting to a total time of 5.7 hours, are reported in Mandi. In Solan, the average time spent was much less: 1.7 hours for lunch and 1.7 hours for dinner, with a total of 3.4 hours for all meals. Possibly due to less cooking time, firewood consumption in the Solan area is lower. However, more wood is consumed for space heating in Mandi.

Types of *chulhas* used in this area were also surveyed. Over 90 percent of the households in Mandi and all households in Solan possess only one *chulha*, while 8 percent in Mandi use two *chulhas*, While the first *chulha* is generally made of clay/stone, the second is often made of metal. It may be noted that especially in the Solan area, three-pot *chulhas* are common. The stone and clay *chulhas* have a reasonably long life.

A survey (Roy 1980) on the status of women was taken in some villages of Kangra District. As in other villages, the women collected wood. Seventy percent of the women travel more than 6 km/day, often accompanied by a male family member. A large majority have to go for fuelwood collection to the forest every day and spend four to eight hours/day. During monsoon, wood collection and burning are tedious, but over 80 percent of respondents collected at least 19 kg of fuelwood per week, and over half of these collected more than 40 kg.

The fuelwood collected bears a positive correlation with time as shown by a regression equation:

$$Y = 21.75 + 2.6\,X$$

where X = Time spent collecting fuelwood in hours

Y = Quantity of fuel collected

The regression coefficient was found statistically significant at one percent level of probability.

The type of fuel used is basically firewood and occasionally some households also use coke. Use of kerosene was negligible. The species of trees that are used as fuelwood are: *Bann* (*Quercus incana*); *Brah* (*Rhododendron arboreum*); *Buel* (*Grewia Optiva syn-oppositifolia*); *Ohi*(*Olbizzia stipulata*); *Fulnu* (*Lantana camara*); and *Funna* (*Ehretia acuminata*).

Women's problems in fuel collection were as follows:

	%Households
1. Forest is too far from where wood is collected	40.7
2. Large family size leads to greater fuel consumption	66.9
3. Difficulty during monsoon	100.0
4. Fuel collection is tiring	85.0
5. Fuel collection is time-consuming	92.6
6. Tools are not available for felling	33.3
7. Punishment by forest guard is too severe	40.7
8. No fuelwood depot in the village	33.3
9. Expensive to purchase trees for fuel, so it is collected	70.3

Survey (Varma 1985) data on five villages in Solan and four villages in Simla District of Himachal Pradesh are shown in Tables 2 and 3.

Table 2: Type of Fuel Used in Solan and Simla Districts

Type of	% Households	
Fuel used	Solan	Simla
Wood	100	100
Dungcake	22	-
Coal	5	-
Kerosene	7	20
Agricultural Waste	-	-

Table 3: Fuelwood Collection and Consumption

Household Consumption			Time Spent on Fuel Collection	
Consumption (kg/month)	% House Solan	% House Simla	Manhour (per day)	% House-hold
Below 400	42	61	1-2	41
400 - 800	51	21	3-4	59
Over 800	7	18	5-6	-

The major source of fuel in these villages is wood. Agricultural residues are generally not used. The average time spent on fuel collection is three to four hours with an average fuel consumption of about 450 kg/household/month. No shops sell wood or coal; fuel is only collected from

the forest. The practice of carbonizing wood into soft coke isprevalent in this area for the production of coal for home consumption.

The State Social Work Research Centre (SSWRC) in Chopal, and Social Upliftment Through Rural Action (SUTRA) in Jagjit Nagar, have taken up the propagation of improved stoves in the villages. Mostly people use two- or three-pot stoves for cooking. Only a few families have coal *angithi* (heater) for space heating. The average time spent by women in cooking is 3.5 to 4 hours.

The women's perception of difficulties and drudgery involved in cooking-related activities is seen from their responses as shown in Table 4.

Water fetching. Ponds, streams, and ground water were the main sources (Khosla 1985) of drinking water in most villages. A Public Water System was, however, available for Banan and Kumkar villages in Mandi District and a few others in Solan and Simla areas. The average distance of water sources from various houses ranged betwwen 1 and 4 km. Over half the houses in Mandi, and three-quarters in Solan, spend more than three hours/day collecting drinking water, involving several trips (Table 5).

Table 4: Women's Perception of Drudgery in Cooking

(a) Tiring Factor			(b) Wish to reduce cooking time		
Operation	% Household			% Household	
	Mandi	Solan		Mandi	Solan
Smoke	74	100	Yes	94	98
Blowing	20	-	No	6	2
Others	6		-		

Table 5: Water Fetching

Time Taken for Collection			Number of Trips		
	% Household			% Household	
	Mandi	Solan	Trips	Mandi	Solan
Zero	8	-		7	
Less than 30 min	2	2	1 - 3	6	9
30 min - 1 hr	7	1	4 - 7	18	41
1 hr - 2 hr	14	12	8 - 12	36	30
2 hr - 3 hr	11	14	Over 12	32	21
More than 3 hr	57	70			

The perception with regard to the difficulty in water fetching is seen from Table 6. Surprisingly, quite a few women do not consider this a drudgery and in fact only about 15 percent of the respondents were willing to spend over Rs. 5 per month for water.

Table 6: Perceived Extent of Effort vis-a-vis Time Taken to Collect Water

Time Taken	% Respondents		
	Not Much	Much	Too Much
Zero	100	-	-
Less than 30 min		86	14
30 min - 1 hr	69	13	19
1 hr - 2 hr	46	22	30
2 hr - 3 hr	18	26	56
3 hr	2	14	84

A similar pattern was seen in the villages near Jagjit Nagar and Chopal.

Housing and sanitation. In the villages of Solan and Simla Districts, the houses are made of wood and do not have sanitation facilities. The women generally do their washing, cleaning, and bathing outdoors. Also, they have to walk to the nearby forests for defecation. Forty-seven percent of respondents in Mandi and 97 percent in Solan District (Khosla 1985) desired covered latrines and quite a few indicated their willingness to pay for public latrines for day-to-day usage/or for building private latrines.

Productive activities. Eighty percent of the women in Mandiand 77 percent of the women in Solan (Khosla 1985) render help to men in their activities. In fact, as shown in Table 7, hardly two hours of leisure time were available to the women. In this area, about 75 percent of the women showed willingness to learn new skills and generate income. Interest with regard to various activities was in the following order:

Table 7. Available Free Hours for Women

No. of Hours	Figures in Households Percent	
	Mandi	Solan
Nil	1	7
1	14	19
2	60	48
3	19	14
4	3	4
5 or more	2	4
No comment	2	3
Average (Hrs)	2.2	2.2

Stitching > Horticulture > Knitting > Basket weaving

Activities undertaken by women in Solan and Simla area are: wool spinning, basket making, vegetable growing, and kitchen gardening. SUTRA is helping by giving vegetable seeds. The women are also involved in agriculture and animal husbandry (mainly cattle and buffalo), and labor for construction work.

Uttar Pradesh

Cooking and fuel. An energy survey (Satsangi 1981) in hill areas of U.P. in Nainital District showed that consumption of fuelwood is 2.61 m^3/capita. This is reported to be much higher than the consumption in the U.P. plains and is attributed to the need for space heating and easy access to forest wood. Cooking is done on the *chulha*, using noncommercial fuels. Though in these hill areas livestock are kept, the dung is used mainly for agriculture, rather than as fuel in the households, since the local people prefer wood to smoky dung. Similarly, vegetable waste is also used for agriculture and as cattle fodder. Seventy-one per cent of the fuelwood is used in cooking, 16 percent for space heating, and 12 percent for water heating. Almost all the households collect fuelwood and the time spent is increasing, as the villagers have to walk farther to reach the rapidly depleting forests. In some parts of the U.P. hills, women trek over 10 km a day and even camp in forests, returning the next day. School children also collect wood. The average time is 1.64 hours per household per day as compared to the plains of Nainital where it is 2.37 hours/household/day.

The consumption of firewood in Almora and Pauri Districts (Khosla 1985) is shown in Table 8.

Very few people use kerosene in Almora, while more than half the villages in Pauri District were using kerosene. While monsoon is the season of low availability of firewood, variations are not otherwise sharp, and the average collection time per household was 3.9 manhours per day.

Table 8: Fuelwood Collection and Consumption

Household Consumption			Time Spent on Fuel Collection in U.P.	
Consumption (kg/month)	% Household Almora	Pauri	Man-hours (Per day)	% Household
Below 400	78	72	1 - 2	19
400 - 800	21	23	3 - 4	56
Over 800	-	5	5 - 6	-

In Almora 98 percent of the households use two *chulhas* while in Pauri, 60 percent possessed only one *chulha* and 38 percent use two *chulhas*. A two-pot chulha was used in 60 percent of the cases in Pauri and 93 percent of the households surveyed in Almora. The average time spent on all meals in Almora was 4.1 hours, while in Pauri, it was 4.8 hours.

In the Himalayan village of Dwing in Chamoli District of U.P., on average, one or more members of each household (generally women) walk 5 km uphill and spend 6 to 10 hours per day collecting fuel (Agarwal 1985). The average time spent per household was 7.2 hours.

Pakhi is a prosperous village with a major road passing through it, but even here 86 percent of the household women collect fuelwood. The average distance travelled in collecting wood is 3.1 km,

and half the household make daily trips.

A survey of Mahua Dabra of Nainital District (Agarwal 1985) showed fuel consumption ranged from 250 to 300 kg per month, depending on the number of family members. In addition, the households use 5 to 6 kg of dungcake per day. Firewood is generally collected from nearby forests.

Water fetching. The following figures have been reported (Khosla 1985) on time spent in water collection in Almora and Pauri (Table 9). As in H.P., more than half of those spending less than three hours on water collection did not perceive the effort as drudgery. However, 83 percent of those who had to spend more than three hours on water collection felt that the effort was too much for them.

Table 9. Water Fetching

Time Taken for Collection			Number of Trips		
Time	% Households		Trips	% Households	
	Almora	Pauri		Almora	Pauri
Zero		None			
Less than 30 min	7	2	1 - 3	4	10
30 min - 1 hr	9	20	4 - 7	58	60
1 hr - 2 hr	16	40	8 - 12	35	23
2 hr - 3 hr	11	16			
Over 3 hr	57	22	Over 12	2	7

Housing and Sanitation. As in other villages, sanitation facilities were lacking but women's perceptions differed. In Almora, 85 per cent of the households desired latrines, whereas only 8 percent considered this necessary in Pauri. In fact, in these areas, very few showed willingness to pay for public latrines.

The housing pattern in various villages in these districts were similar, and generally locally available materials were used. The villagers perceived the roof structure and walls of the houses as inadequate.

Productive activities. The 1981 census shows that in U.P., female work participation rates in the five hill districts of Chamori, Tehri, Uttar Kashi, Pathoragarh, and Garhwal range from 32 to 49 percent as against the state average of 6 percent. Between 96 and 98 percent of the female workers are cultivators who do everything on the farm except ploughing. A large proportion of women did not exhibit much enthusiasm to acquire additional skills as they had less than two hours to spare. Twenty-nine percent of the women in Almora and 97 percent in

Pauri help men with their activities. Women, however, showed interest in learning knitting and stitching.

Jammu and Kashmir

A socioeconomic survey (Awasthy 1979) was conducted in the village of Jagti approximately 17 km away from Jammu and Jammu-Udhampur National Highway. The village is populated by Gujjars, Brahmins, Rajputs, Lohars, and other scheduled castes. The survey has brought out the differences in the lifestyles of women from various castes.

In the village, people mainly eat *fulka* (*chapati*, or flat bread) with milk products or vegetable/dal. Practically everybody uses firewood and a *chulha* on the ground. Only two to three families out of 45 use kerosene. No one buys firewood; it is collected from the jungle or their land. However, Rajput and Brahmin women operate in their own fields. Since wood cutting requires physical strength, in 16 out of 45 cases the male does the cutting. In the caste groups such as Rajputs and Brahmins, in more than 40 percent of the households, menfolk undertook this work because traditionally these women do not go out of their homes. The other household activities such as cooking and cleaning are done by the women. Women's contribution in dairying and agriculture is significant, except in the case of Rajput women who consider this below their dignity. Most families grow enough grain for six to eight months but since the land is dependent on rainfall and very few people can afford to dig tubewells, the land is also left fallow or ploughed once in two years.

Northeastern Hills

The northeastern states are hilly and covered with thick forests receiving high rainfall. The population density is low and more than 90 percent of the people live in villages depending on agriculture and horticulture. The people are predominantly tribal. Among most of the tribal communities the status of women is not low. In fact, in certain matrilineal tribes, women enjoy a better position than men.

A study of the villages of Shella and Tyrana in Meghalaya (Das Gupta 1984) shows that rice is the staple food. Meat forms an important item on festive occasions. As for fire and lighting, safety matches are used, while about 50 years ago the people used flint for making fire. In the age of flint, fire used to be preserved and a dry branch of orange tree was kept smouldering on the hearth all day and night.

In Shella village, for cooking, the hearth is made in a rectangular or square wooden or bamboo frame which is movable. The pit within the frame is filled with earth and three stones are embedded in it. The pot is placed on this. In Tyrana village in some houses, the hearth is contructed in a different manner. The houses are constructed using locally available materials such as bamboo and wooden poles. The roof is generally sloped and thatched with a type of palm leaves knows as *slatynrin.* In his area, heavier work like construction and repairing of houses is done by men and not by women. The families in this area are small in size, varying from two to five.

A survey (Julia 1984) of some of the villagers in the Garo Hills (such as Dadengiri or Tura) located in the interior of the state, showed that generally open fire *chulhas* are used for cooking. In this hill area, there are a lot of insects and smoke from the *chulha* helps in mosquito control and curing bamboo thatch. Further, the practice of smoking meat exists. Thus, the women do not perceive anything bad about smoke. They generally use separate fires for each cooking hole. Also, fuelwood is easily available and fuel consumption is about 4 to 5 kg/day/household. Wood and twigs are collected from the jungle, and fuel collection takes less than an hour each day. Rice is the staple food and two meals are taken. The morning meal around 10 A.M. takes about two hours of the women's time and evening meal takes two to three hours of preparation. Rice and dried fish or yam are eaten around 6 and 7 P.M. Water fetching is, however, seen as a difficult task in these villages as women have to walk 2 to 3 km, taking four to five hours for fetching water. Normally one trip is made a day. Houses in the area are made of bamboo, and durability is about three to four years.

From a survey (Srinivasan 1985) of households peripheral to Shillong, Meghalaya, it was seen that women here spend about two hours a day on cooking. Mainly two meals of rice were eaten. The time spent on firewood collection was generally less than one hour and there were two *chulhas* in most homes. Coal was used in space heating. Water fetching took one to two hours. Women went out to work in the field or did other odd vending jobs for five hours and some kept milch animals. There was no sanitation facility.

As for productive activities, in the northeastern states, the women participate mainly in agriculture and animal husbandry. Shifting cultivation is still being practiced in many places and the main crop raised is rice. In addition, various fruits and vegetables are grown. Also, small animals are kept (Singh 1985). The 1981 census shows that the proportion of women in the work force is high in most mountain areas, varying from 41 percent in Nagaland to 32 percent in Mizoram.

Geographically, Manipur can be divided (Das 1984) into the valley at the centre with the hills surrounding it. The forest trees perhaps covered the valley earlier but now they have disappeared. The rich alluvial soil is a boon to the cultivator. Terraced fields are irrigated throughout the year. However, wet cultivation practiced on a small scale seems to have an adverse effect on women's employment. Small groups, both male and female, from the same village visit the market. Now women have started selling products like dried fish, matchboxes, and sweets, but over 86 percent of the Manipur hill tribes are agriculturists (Singh 1984). They grow paddy and to some extent maize, fruits, and vegetables. The custom of keeping poultry is predominant. Houses are small, with walls of bamboo on raised floors of bamboo and wood.

STRATEGIES FOR DEVELOPMENT

The above survey has shown that the overall pattern of activities of women in the mountains is similar to those in the plains. Differences arise due to the uneven terrain and colder climates. For example, in the mountain areas,

ploughing is more difficult. Where terracing has to be done, women undergo the additional drudgery of breaking and spreading the mud mounds. They also have to climb up and down in going to their fields and also for fetching fodder, fuel, and water. Where forests are still available, the fuel problem is less acute compared to the plains, but the time required to reach forests for wood in the mountain areas has been increasing. Compared to the plains, transportation in the mountains is difficult and kerosene and other alternate fuels are not available. Even dung availability is less. Lack of infrastructure also results in non-accessibility of markets.

Within the hill areas studied, broad-based differentiations between regions are difficult to make. The economic status, caste, local geographic factors, and infrastructure availability have a great role to play. Certain traditional and cultural aspects and practices are seen to be region-specific, while others are universal. For example, cooking and cleaning as well as child care are seen as the activity of women in all areas. Fuel collection and water fetching are also done mostly by women. But in certain castes, women do not go outside their homes and any task which is not home-based has to be taken up by men. The eating habits do have some regional specificity. In the northern regions (Himachal Pradesh and Uttar Pradesh), *chapatis* form the predominant diet. This requires more cooking time. In the northeastern regions with rice eating habits, women spend less time cooking. Although deforestation is common to all the regions, in the northeastern part, wood and other biomass seem to be more easily available. Thus, the women here spend less time on fuel collection as compared to their counterparts in the northern sector. Also, in the tribal culture of the northeastern region where matrilineal social structure still prevails, women enjoy better status socially and economically.

In general, a dismal picture of the present situation of women in the mountains emerges. The basic domestic tasks of providing food, water, and fuel for the households, fodder for the animals, and tending children were not too difficult in a traditional society under better ecological conditions where the women were equal partners in resource sharing. In fact, in many primitive cultures the position of women is even better than that of men. Unfortunately, industrialization, urbanization, and advancement of the cash economy have eroded the basic biomass resources through deforestation and devegetation, but have not brought any benefit to the poor and marginal cultures like tribals and nomads. They are compelled to continue within the non-monetized biomass-based subsistence economy in an ever-eroding environment. They are divorced from the benefits of industrialization but are made to bear the brunt of all its negative impacts. In particular, the poor rural women who are caught between poverty and environmental destruction suffer most. With the migration of men, their days are marked by a double work burden, at home and outside, in an unsympathetic physical and social environment. With the added problems of inferior status, lack of control over cash and productive resources, lack of health care, sanitation and other facilities, which are biologically essential to this child-bearing sex, they

are now being pushed beyond the limits of physical endurance.

Alleviating Drudgery and Creating Leisure

The time that women spend on mundane activities, assigned in terms of their sex role, must be reduced. For example, giving access to fuels, providing them with improved *chulhas* for cooking, and giving drinking water facilities could easily create a few hours of leisure. Wherever possible, low-cost technologies should be designed and introduced for reducing their drudgery. Some examples are listed in Appendix 2.

Improving Health and Physical Environment

This can be best done through informal education, making the women literate and aware of the basic concepts of nutrition, family planning, child care, sanitation, making them conscious of their roles in development, creating self-confidence and organizing them to receive the benefits of various schemes for the upliftment of women. This calls for special efforts of dedicated voluntary agencies, working hand-in-hand with the government and Science and Technology field agencies.

Economic and Social Status

In a monetary economy, improvement of economic status and social status are interlinked. Presently, the opportunity costs prescribe involvement of women in remunerative tasks. They are not sufficiently equipped in terms of skills and training to participate in a mechanized production system and the market economy as a whole. Difficulties are added due to cultural bias with regard to their sex. Technologies suitable for home-based employment have to be propagated with the necessary managerial and market support (Appendix 2).

CONCLUSIONS

Hindu mythology visualizes the Goddess of Power and Energy as "Shakti"--woman, daughter of the Mighty Himalaya. Nothing could be more appropriate, considering that today the rural woman in the mountains is central to energy, ecology, and environment as a whole. It is through her that the human habitat interrelates with the surrounding forests, mountains, streams, waterways, and animals. It is from her strength that future generations evolve and prosper. No efforts should be spared to free her from her shackles and lift her to the heights she deserves.

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APPENDIX 1

Literacy of Women in Hill Areas (Mitra 1979)

	Percentage Literacy					
	Excluding SC/ST		SC		ST	
	1961	1971	1961	1971	1961	1971
1. Jammu & Kashmir	1.62	5.14	0.88	3.49	-	-
2. Himachal Pradesh	6.36	21.76	-	8.99	1.71	5.45
3. Uttar Pradesh	4.60	8.56	0.68	1.74	-	4.33
4. West Bengal	12.66	18.78	3.83	8.23	1.60	2.77
5. Meghalaya	-	13.85	-	12.24	-	19.65
6. Nagaland	26.35	24.14	40.00	-	9.68	4.02
7. Tripura	11.23	26.14	4.23	8.95	1.55	4.02
8. Manipur	13.00	16.03	12.28	15.71	17.48	17.59
9. Arunachal	-	12.70	-	17.59	-	1.56
10. Sikkim	13.37	-	-	6.45	-	-

SC - Scheduled Caste
ST - Scheduled Tribe

APPENDIX 2

TECHNOLOGIES FOR WOMEN
(Devendra Kumar 1985)

Drawing and Fetching Water

1. Ball-Bearing Pulley
2. Bamboo-Cement Water Tank
3. Cement Water Jar
4. Roof-water Harvesting
5. Knotted Rope Pump
6. Bamboo Water Pump
7. Bamboo Pipeline
8. Waterproofing of Small Irrigation Channels
9. Drip Irrigation

Cooking

10. Improved *Chulhas*
11. Solar Cooker
12. Biogas

Repair and Maintenance of the House

13. Non-erodable Mud Plaster
14. Fire-Resistent Thatch
15. Preservation of Bamboo
16. Rammed Earth Wall

Working on Farm and Farm Products

17. Improved Sickle
18. Wheelbarrow
19. Ball-Bearing *Chakki*
20. Groundnut Sheller
21. Paddy Thresher
22. Pulse Dehusker
23. Maize Sheller
24. *Sheetal* Pot
25. Food Processing
26. Food Preservation
27. Mud-Brick Grain Silo
28. Corn-Drying Hut
29. Improved Traditional Silo
30. *Ferrumbu*

Safe Drinking Water

31. Charcoal Water Filter
32. Traditional Water Purifying Seeds
33. Solar Water Still
34. Chlorination Pot for Walls

Sanitary Facilities

35. Trench Lavatory
36. *Sopa* Toilet
37. Toilet for Two
38. Conversion of Bucket-Privy
39. Soak-pit

Nutrition and Health

40. Breast Feeding
41. Eye Care
42. Weaning Foods
43. Dental Care
44. Birth Control
45. Oral Rehydration
46. Diahorrea and Dysentery
47. Health Salts
48. Delousing

Agro-Based Industries

49. NADEP Compost
50. Bio-Dynamic Gardening

Food-Processing Industries

51. Mud Solar Dryer
52. Solar Paddy Dryer
53. Pedal-Operated Banana Fibre Extractor

Manufacturing Industries

54. Salt-lick for Cattle
55. Low-cost Soap
56. Chalk from Lime

House Construction Industries

57. Sun-dried Mud Bricks
58. Stone Block

Biomass-Based Occupations

59. Sericulture
60. Mushroom Cultivation
61. Bee Keeping
62. Nursery Raising

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