

ENERGY RESOURCES IN SWAT DISTRICT

Biomass Energy

Biomass is a very important source of energy for the people of Swat. Fuelwood currently accounts for more than 92 per cent of the total energy consumed in various activities (Table 1). Fuelwood is mostly obtained from the forests within the district but trees are also grown at the sides of fields. Besides fuelwood, crop residue and cow dung are other sources of biomass energy, albeit comparatively on a much smaller scale.

Table 1: Energy Supply from Different Sources in Swat, Pakistan
(in tons of oil equivalent, 1987)

Energy Source	Energy Supplied in TOE	%
Fuelwood	969	92
Others	84	8
- Petroleum Products	34	3
- Coal	27	3
- Other Biomass	15	1
- Hydropower	8	1

Source: Water and Power Development Authority (WAPDA), Swat.

The total area under forests, along with the growing stock and yield, is given in Table 2. It can be classified into the following types:

- o scrub forests,
- o chir (*Pinus roxburghii*) forests,
- o deodar (*Cedrus deodara*) forests, deodar
- o blue pine (*Pinus wallichiana*) forests
- o silver fir (*Abies pindrow* and *Abies webbiana*) forests,
- o alpine pastures,
- o oak forests, and
- o cultivated trees or plantations.

The scrub forests lying between 2,500 to 3,000 feet have almost disappeared on account of extensive clearance for cultivation and the reckless cutting of trees to meet the timber and fuelwood demand of the population. Thick groves found in the graveyards are the remnants of what must have been the tree cover at these elevations. The main species are *phulai* (*Acacia modesta*), *Kao* (*Olea cuspidata*), and *Khair* (*Acacia catechu*) etc.

The other forests (besides alpine pastures or plantations) are basically timber forests and should only be considered as fuelwood sources to the extent of 15 to 17 per cent of the yield which is made available by thinning the trees. However, due to reckless cutting of these forests to obtain fuelwood, and, because of other malpractices, extensive damage has occurred to the forests leading, in places, to disastrous consequences.

Table 2: Forest Area with Growing Stock in Swat District, 1987

Name of Forests	Area (ha)	Growing Stock Yield (1,000 m ³)	(1,000 m ³)
Kalam Forest	24405	2,656	159.7
Swat & Swat Kohistan Forest	95477	22,765	335.6
Alppuri Forest	44405	2,797	550.0
Buner Forest	41040	2,002	800.6
Total	205327	30,220	1,845.9

Source: Aerial Inventory Section, Forest Department, Government of the NWFP.

The Union Council Survey carried out in this study reported an overall decrease in forest density. The only addition to the existing stock of trees was by their cultivation around farms, water courses, etc or in limited areas which fell within watershed management projects. Population growth leading to the heavy demand for fuelwood has been pointed out as the main reason for extensive lopping. Generally, conifers are lopped for fuelwood while broad-leaved species are lopped to augment the fodder supply. These practices are leading to the rapid extinction of forests near the villages. Illicit felling is also becoming serious. About one third of the union councils in the district reported the illicit felling and smuggling of timber to other areas.

Grazing and browsing have also been responsible for substantial damage to the forests. Large areas of pasture exist above the forest belts and flocks of cattle, sheep, and goats pass through them twice a year.

They generally start the uphill sojourn in the months of April and May and return in September. During this nomadic activity, they spend about two months in the forests and cause heavy damage to the conifers and broad-leaved species. In addition the soil is trampled hampering the regeneration of pastureland (Khan 1965). Grass cutting is also practised extensively in autumn for stall-feeding during winters. In this practice, hundreds of *chir*, *kail*, and *deodar* seedlings are cut every year, sometimes deliberately to check the reestablishment of tree growth. Torchwood extraction and forest fires are other reasons for damage to standing forests in the district.

People in Swat District have begun to show concern regarding the deterioration of the forests. They now plant some useful trees along water channels, *nullahs*, and fields and vigilantly conserve them to supplement their income and to meet their domestic fuel requirements.

Consumption of Firewood and Sources of Supply

Household sector surveys on firewood consumption show disturbing pictures. Kalam Integrated Forest Development Project conducted a survey that estimated the average per capita firewood consumption in Kalam at 3.68 kg per day in summer and 9.69 kg per day in winters (KIFDP 1984). Household surveys of five sample villages in the study area revealed that the average per capita consumption per day is 5 kg. This gives a monthly consumption rate of 1,256 kg per household, bringing a total annual consumption in the household or domestic sector of the district to 2.65 million tons. With the current population growth rate and the present annual demand, the consumption is likely to increase to 3.2 million tons.

The survey data in this study show that an average household in the hilly areas of Swat District consumes much more energy than an average household in the country. The higher energy consumption is obviously in end uses such as cooking, space and water heating, and to some extent in lighting. Table 3 gives the end uses of firewood in the five sample villages, by income groups. The average breakup shows that most of the firewood (56%) is consumed in space and water heating during the prolonged cold winters. Approximately 42 per cent of the wood is used for cooking and only about 2 per cent is used as torchwood or for lighting (Table 3). The fuelwood consumption in the winter months is more than double the amount used in summers because of space and water heating, which is done using stoves locally known as 'Bokharas'. These stoves are kept burning the whole day throughout the winter months.

**Table 3: End Uses of Firewood in the Household Sector
in Sample Villages of Swat District, 1987**

(in percentages)

Income Group by Village	Cooking	Heating	Lighting	Total
<u>Village 1</u>				
Low Income	42.1	55.3	2.6	100.0
Medium Income	47.8	50.8	1.4	100.0
High Income	48.2	51.8	0.0	100.0
<u>Village 2</u>				
Low Income	36.7	63.3	0.0	100.0
Medium Income	47.5	52.5	0.0	100.0
High Income	46.7	53.3	0.0	100.0
<u>Village 3</u>				
Low Income	49.4	50.6	0.0	100.0
Medium Income	53.3	46.7	0.0	100.0
High Income	48.3	51.7	0.0	100.0
<u>Village 4</u>				
Low Income	32.4	64.8	2.8	100.0
Medium Income	30.5	63.3	6.2	100.0
High Income	34.9	65.1	0.0	100.0
<u>Village 5</u>				
Low Income	41.8	48.2	10.0	100.0
Medium Income	44.6	48.5	7.1	100.0
High Income	47.2	52.8	0.0	100.0
<u>All Villages</u>				
Low Income	39.7	57.9	2.4	100.0
Medium Income	44.4	53.3	2.3	100.0
High Income	45.1	54.9	0.0	100.0
<u>Average</u>				
(All villages and all incomes)	42.1	56.2	1.7	100.0

Source: Primary Survey.

Fuelwood Supply

Fuelwood is supplied in the district through commercial as well as informal marketing systems. In a large part of the district it is gathered for personal use. Fuelwood is sold in firewood depots and in ordinary grocery shops in the villages.

The informal system of fuelwood use in the district is based on the right of the population to collect fallen dry twigs from the forest area and even to lop upto one-third of the trees in certain areas for their own consumption. For daily use, firewood is collected from the nearest forests by women, men, or children. For winter use, particularly at higher altitudes, firewood is collected from nearby forests or far away timber harvesting places and transported by rented trucks or pack animals to the village residents. Wood deposited by rivers and avalanches are also collected.

The poor economic level of the rural population and the scarcity of fuel has promoted the sale of collected dry twigs and firewood to inhabitants of large settlements and towns. Collection of fuelwood is usually restricted to forest areas allotted to the village. In those villages where fuelwood is brought from long distances, many buyers wait halfway along the route to purchase the bundles at cheaper rates. The dealers/shopkeepers also purchase wood from individual collectors and then resell it at higher prices. However, most of the fuelwood consumed is obtained free through collection or illegal lopping.

Tobacco curing, *gur*-making and brick kilns are the three important local industries which used considerable amount of biomass/firewood. There are about 350 tobacco-curing ovens and 33 brick kilns in the district which together use about 3,300 tons of wood annually. However, about 900 tons of wood are also used in making unrefined sugar or *gur*. The same industry also uses bagasse as fuel, amounting to about 2,070 tons per year.

Other Biomass

The other forms of biomass which help to meet the energy demand of the district include animal dung, charcoal, and agricultural residues. Surveys during this study revealed that about 15,000 tons of animal dung are being burned every year as fuel, which otherwise could be used to increase soil fertility. Bio-conversion of animal dung to biogas plants can yield methane gas for burning and sludge for manure, thus providing a renewable source of energy and fertiliser. Rough estimates show that one ton of dry organic matter can be converted into energy which is roughly equivalent to two barrels of oil or about 280 cubic metres of gas and 0.73 tons of fertiliser. Although a beginning has been made in Swat with about a dozen plants, their performance is not very satisfactory due to cold weather and also due to technical deficiencies.

Agricultural crop residues constitute another source of biomass fuel. However, crop residues are also habitually used as animal feed, manure and roofing, and construction material in Swat District. Among the major crops of the district, only maize and sugarcane residues are used as fuel. Dried cobs and sticks of maize are used by households for cooking and heating in ordinary domestic stoves and in open fire places while leaves and green stalks are fed to animals. Likewise, use of bagasse as fuel energy is common practice in the unrefined sugar or *gur*-making industries of the district. There are about 300 such factories in the district. Wheat and paddy straw and rice husks serve mainly as animal feed and also as thatching material or are mixed with mud in making walls of the houses.

Another source of biomass energy in the district is sawdust which is a by-product obtained from the saw industries. This is used mainly by the household sector for space heating in winters.