

INTRODUCTION

Background

The majority of the population in the hills of the Central Himalayan Region of India depend on traditional sources of energy such as fuelwood, agricultural wastes, etc. The consumption of commercial sources of energy such as electricity and kerosene is not significant and is mostly limited to lighting. Fuelwood is the single most important source of energy in the area. This report presents the findings of a case study on energy planning and management in Almora District which is situated in the hills of the Uttar Pradesh Province of India.

Objectives of the Study

The overall objective of this case study is to investigate issues in energy planning and management in the Almora District of the U.P. Hills in India. The specific objectives of the study are given below.

1. To assess energy resources and their pattern of use in the district for different end uses.
2. To assess energy consumption levels and to project energy demand in the district, based on available secondary information.
3. To develop appropriate energy strategies based on the available energy technology and resource management options.
4. To assess the infrastructure and management needs of decentralised energy development.

Methodology

The study mainly uses secondary data from official sources. Information and data available from other sources have also been used. The secondary data on energy resources in Almora and also on energy supply from outside the district, along with internal biomass supply, have been compiled. A further analysis has been done to obtain energy supply levels for different end uses. The resource data are analysed to estimate the potential for exploitation of these resources for energy generation. Energy consumption levels have been estimated and energy demand projections have been attempted based on secondary data. An exploratory survey of the present energy systems is carried out to evaluate the present energy situation and to arrive at a realistic energy planning strategy. Villages in the range of 1,300 to 1,500 m altitude were selected for survey in order to represent the population distribution by altitude.

Introduction to the Area of Study

This case study is on one of the mountain districts in the Kumaon Region of the Central Himalayas in India. This region is prone to landslides caused by seismicity and tectonic stress. The Central Himalayan Region is drier than the Eastern Region but is more humid than the Western Region. The contribution of winter rains to the total rainfall in this region is less than that in the west. A number of perennial and annual rivers originate here. The monsoon rainfall (mid-June to mid-September) accounts for 60 to 80 per cent of the total rainfall. The amount of monsoon rainfall is around 1,000 mm in the foothills, 2,000 mm in the middle region, and 500 mm in the higher elevation and interior regions.

According to the 1981 census, the population of eight districts of the Indian Central Himalayas was about 5.1 million, of which 3.47 million lived in the mountains. Eighty-two per cent of the mountain population was rural, with a density of 722 per km² in the rural sector and 776 per km² in the urban sector.

The mountain economy is at the subsistence level and is based mainly on agriculture and animal husbandry. About 15 per cent of the total area constitutes an agro-ecosystem (cropland, current fallow, rural houses, etc) and less than 2 per cent is an urban-industrial system, leaving 83 per cent as natural systems. While the productivity of forest ecosystems in the region is higher than in similar forests in the world, productivity of grasslands and agro-ecosystems is low. Some of the reasons for low grassland productivity in this region are excessive grazing, frequent burning, and shorter growth periods. In addition, energy inputs into agriculture are also limited.

Almora District

Almora is one of the eight hill districts of Uttar Pradesh. It has a total area of 5,385 km², most of which is hilly and lies in the upper/middle Himalayan range. The altitude of the district ranges from 750 m to above 1,800 m.

The soils in the Almora District are generally brown and acidic (pH < 5.5). One estimate of annual soil loss in the middle Himalayas is 12 tons per hectare, which is equivalent to 0.8 mm of top soil. Hence, soil erosion is a major environmental problem with implications for biomass use for energy.

The district has a maximum temperature of up to 28.5° C and a minimum of -13° C. In 1985, the annual rainfall in different parts of the district ranged from 1,045 mm to 1,224 mm. The average normal rainfall of Almora District is 1,050 mm (average from 1901 to 1950). The microclimatic conditions in different locations depend on (i) direction of ridges, (ii) degree of slope, (iii) sunny or shady aspects of slope, (iv) intensity of forest cover, and (v) nearness to glaciers.

According to the 1981 Census, the district has a population of 800,000 belonging to about 152,000 families. This amounts to an increase of 12.58 per cent in the number of families since 1971. The population grew by 14 per cent between 1951 and 1961, while the decennial growth was 17 per cent between 1961-71 and 1971-81. The density of population per m² is 141. Ninety-three per cent of the villages in the district have a population below 500.

The literacy percentage in Almora District is 38 per cent, higher than the State average. In 1981, the literacy percentage was 57 per cent for males and 20 per cent for females. Some important statistics of Almora District are given in Annex Table 1.

Agriculture. Agriculture is by far the largest economic activity in Almora District. Cultivators and agricultural labourers constitute 75 per cent of the total workforce of the district. The majority of the cultivated land lies on terraced hillsides (1,000-500 m) and is rainfed or unirrigated, producing three crops in two years. In 1984/85, approximately 107,311 hectares were under cultivation, of which 71,862 hectares were cropped more than once per year.

According to the 1981 agricultural census the total number of landholdings is around 179,000 covering an area of about 105,000 hectares which has been classified in terms of size of landholdings in Table 1. The percentage of the area under smallest landholdings (< 1 ha) is very high in the district compared to that in the hill region (23 %) or in Uttar Pradesh (26 %). This probably explains the large number of cultivators in the district. The percentage of smallest landholdings is also higher in the district.

Important crops grown in the district include paddy, maize, *madua* (millet), *samba* (millet), wheat, barley, and mustard. The total area cultivated during the Kharif (summer) season is 106,800 ha. The areas under paddy, *madua*, and *samba* constitute 35, 37, and 18 per cent of the total cropped area respectively. During the Rabi (winter) season, 72 thousand hectares of land are under cultivation. The share of wheat, the most important crop of this season, is 83 per cent, followed by barley (10%) and mustard (3%). In 1984/85 the total production of all crops was 136,298 metric tons. The production of paddy, wheat, and *madua* constituted 32, 22, and 26 per cent of the total respectively of foodgrain production. In 1984/85, 764 metric tons of chemical fertiliser were distributed in the district and this comes to about 4.26 kg/ha, far below the Indian average of 45 kg/ha.

Table 1 : Percentage of Landholdings According to Number and Area of Landholdings

Size	Number of Landholdings	Area of Landholdings (ha)
< 1 hectare	81	47
1 - 2 hectare	14	28
2 - 3 hectare	3	15
3 - 5 hectare	1	7
> 5 hectare	< 1	3

Source: Agricultural Census, 1981.

The total livestock population as per the 1978 livestock census was about 0.7 million. Cattle, goats, and buffaloes constituted 49, 25, and 20 per cent of the total livestock population respectively. Other important animals are sheep, horses, and mules. To make dairying a viable industry in this region, fodder production is being encouraged in *panchayat* forests and civil forests.

Industries, Transport, and Communications. Industrially, Almora is a very underdeveloped region. In the district, there are about 9 factories in addition to a few magnesite processing units. Other small-scale industries are mainly agriculture and forest-based. Tourism is a growing industry in Almora.

The total length of all roads in the district is 2,050 km. In 1986, 431 post offices and 87 telegraph offices were functioning. There were 19 telephone exchanges with 789 telephone connections, of which 613 were urban and 176 rural.

Forest Resources. Almora has two predominant forest types: the subtropical pine and the Himalayan moist temperate forests. Very few natural oak forests exist in the district. They have been destroyed by lopping, charcoal production, harvesting of wood for farm implements, grazing, and fire. Pine, on the other hand, is fire resistant, is not grazed, cannot make good charcoal and is not useful for making tools. Most parts of the Almora District now have *chir pine* (*Pinus roxburghii*) forests.

East Almora and West Almora are the two main forest divisions in the district. They overlap to a minor extent with other districts. Four different agencies have control over the forest resources as shown in Table 2.

Though the total forest cover in the district is about 73 per cent of the total geographical area, the crown density differs in each category of forest. Hence, the effective forest coverage in the district is reduced to 20 per cent as against the recommended cover of 60 per cent. The species and the growing stock in the district are shown in Annex Table 2.