STATUS OF FUELWOOD EXTRACTION AND CONSUMPTION IN RURAL NORTH KASHMIR: A CASE STUDY

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Fuelwood is one of the important sources of energy in the developing and underdeveloped countries. It constitutes a vital input for all productive economic activities and meets the basic energy requirement in both domestic and traditional industrial sectors in the rural areas (Vimal and Tyagi, 1984). An analysis of the major forms in which energy is used in rural India reveals that the share of non-commercial energy is 65%, human and animal energy 15% and commercial energy 20%. It is well reported that 80% of rural energy is met from traditional sources. The energy use pattern in the rural sector is cooking (64%), agriculture (22%), village industries (7%), lighting (4%) and transportation (3%) (Vimal, 1987).

Fuelwood alone accounts for about 60% of total fuel in the rural area (Pandey, 2002). A major consequence of inadequate supply of firewood is the burning of agricultural residue and animal dung, which otherwise would have been used for restoration of soil fertility and increasing food production. The aggregate demand of the year 1996 of fuelwood for the country was 201 million tonnes, i.e. 213 kg per capita per year. The current sustainable production of fuelwood from forests is 17 million tones and from farm forestry and other areas 98 million tonnes. There is net deficit of 86 million tonnes of fuelwood, which as a compulsion is being removed from the forests (FSI, 1996). The paradox is that forests produce 70% timber and 30% fuelwood, while the demand for wood is around 70% as fuelwood and 30% for timber. The forests have at least 5 times more pressure than what they can withstand. As the forest resource is no longer sufficient to meet the fuelwood need of the rural population, other approaches to fuelwood production namely, farm forestry, community forestry and homestead forestry have been proposed as the potential solutions to fuelwood supply shortages (Allen *et al.*, 1988). The decision on an approach for fuelwood production should be based on current patterns of fuelwood extraction and consumption, social and technical considerations and local conditions for encouraging new production. A number of estimates of fuelwood extraction/ consumptions have been made over the years (Joshi and Sinha, 1995; Mukherji, 1994; Chandra *et al.*, 2005)).

So far, no in-depth micro-level study has been made to evaluate exact account of the demand and supply of fuelwood in the region. The present study has been designed to explore extraction of fuelwood from different sources, consumption of fuelwood for different purposes, extraction/ consumption deficit and percentage contribution of different tree species in total fuelwood consumption.

Material and Methods

The present study was conducted in Kamraj Forest Division of Baramulla district in north Kashmir during 2008-09. From this Division, Sagipora village of Zaingir block under Sopore Tehsil was purposefully selected by lottery method of random sampling. A sample of 102 homesteads (33.33%) from the village was selected by simple random technique for the survey. Household heads were considered as respondents. The data on homestead level socio-economic information as well as land use pattern, fuelwood extraction from different sources, fuelwood consumption for different purposes, fuelwood extraction / consumption deficit and percentage contribution of different tree species in fuelwood consumption in the study area were collected by personal interviews of the respondents through a well structured pre-tested interview schedule and personal observations of the interviewer. Secondary data regarding general information of the study area were collected from different Governmental and Non-Governmental Organizations.

The important socio-economic attributes that were examined are age, education, family composition, size of land holding, occupation, material possession, herd size, farm implement possession and annual income. These traits were quantified using appropriate scales/ indices developed by Venkataramaiah (1990). Fuelwood extraction and consumption estimates were made at each homestead by requesting the respondents to weigh the amount of fuelwood they use day-to-day and note the tree species. The average annual per-capita fuelwood extraction and consumption were estimated using weighing system and multiplied by the appropriate weighting factor to calculate annual fuelwood extraction and consumption. Suitable statistical tests viz., mean (x)

and percentage (%) were used for analysis of data (Snedecor and Cochran, 1967).

General Information

The village Sagipora is located at a latitude of 34°16′ and 34°42′ N and longitude of 74°20′ and 74°32′ E at an elevation of 1510 m amsl. The total geographical area of the village is 176.80 hectares. The total human population is 2487 with a literacy rate of 62.60%, sex ratio of 938 female per 1000 males and population density of 1406.67 km^{-2}. The total no. of household is 307 with an average family size of 8.10. The village experiences an average precipitation of about 710 mm.

The total livestock population of the village is 729 with an average no. of livestock possession $household^{-1}$ of 2.38. The majority of the respondents interviewed during the survey are middle aged (63.70%), having family type nuclear (81.20%) and family size large (79.00%). The average size of land holding $household^{-1}$ is 0.58 hectares. About 43.00% and 22.28% of the respondents were engaged in agriculture and business respectively.

The percentage of the respondents having motor vehicle and farm implements was found to be 66.78% and 41.00% respectively. The majority of the respondents (61.89%) were found having annual income ranging between Rs. 25000 /= and Rs. 50000 /= (Table 1&2). The main land use system in the village is agriculture (49.38%). Other land use systems are silvi-horticulture plantation (34.00%), forestry (6.02%) homestead farming (6.93%) and community land (3.67%) (Table 1).

Result and Discussion

Extraction of fuelwood

The total extraction of fuelwood from different sources in the surveyed population was found to be 696.28 tonnes $year^{-1}$. Out of the total extraction, 517.25 tonnes comes from silvi-horticulture plantation, 97.48 tonnes from homestead farming, 62.67 tonnes from forest/ fuelwood depots and rest 18.88 tonnes from community forestry. As a whole, about 74.29% of the fuelwood requirement is met from silvi-horticulture plantation and for rest 25.71% of the fuelwood people rely on other sources such as homestead farming, forest/ fuelwood depots and community forestry (Table 2). The per capita extraction of fuelwood in the study area was recorded to be 0.28 tonnes $year^{-1}$.

The current production of fuelwood from social forestry, community forestry, farm forestry, homestead forestry and forest in the study area is inadequate and could not combat the fuelwood demand of population in the on-going scenario. The results of present investigation are in congruous to the findings of Chandra *et. al.* (2005) that the extraction of fuelwood from forest is 8.0% in Jorhat district of Assam whereas in Himachal Pradesh more than 80% of fuelwood requirement is met from the forests (Negi *et. al.*, 1996). In rural Kashmir, the local inhabitants are found to rely on silvi-horticultural plantations for their fuelwood requirement. This may be due to the easy accessibility of fuelwood in the silvi-horticulture systems. The forests are distantly located which is another reason for low dependency of the rural people on forests. The present study reveals that the dependence on forest/ fuelwood depots for fuelwood procurement is only 9.0% as major portion (91%) of the fuelwood is supplied from other sources. It proves beyond any doubt that there is less pressure on forests for meeting the fuelwood requirement of the villagers.

Table 1

Land use pattern in the study site.

Sl. No.	Land use	Area (hectare)	Percentage
1.	Agriculture	87.30	49.38%
2.	Forestry	10.65	6.02%
3.	Silvi-horticulture	60.10	34.00%
4.	Homestead farming	12.25	6.93%
5.	Community land	6.50	3.67%
	Total	176.80	100%

Table 2

Extraction of fuelwood from different sources in the study site.

Sl. No.	Source	Quantity (tonnes/ year)	Percentage
1.	Community forestry	18.88	2.71%
2.	Silvi-horticulture plantation	517.25	74.29%
3.	Forest/ fuelwood depots	62.67	9.00%
4.	Homestead farming	97.48	14.00%
	Total	696.28	100%

Consumption of fuelwood

The total consumption of the fuelwood in the study area is estimated to be 1044.41 tonnes $year^{-1}$. Maximum of which (438.65 tonnes) is consumed in cooking and heating (426.74 tonnes) (Table 3).

Fuelwood is the principal traditional source of energy constituting maximum share in total bio-fuels (fuelwood, dung cake, gobar gas, charcoal and crop waste) consumption in the rural Kashmir. Fuelwood constitutes a vital input for all productive economic activities. The fuelwood is consumed mostly for cooking, heating, cottage industries namely, bakery, wicker works, hotels, brick manufacture, sericulture. etc., community

functions e.g. festivals, feasts, etc. and some other purposes such as hamam, marriage, child christening etc. The local people generally depend on fuelwood for these purposes as they have less access to other energy sources such as LPG, kerosene, coal etc. The major forms in which fuelwood is consumed in domestic households and rural industries are billets, twigs, wood shavings, saw dust and even leaves.

Fuelwood extraction/ consumption deficit

The total fuelwood extraction and consumption in the study area is estimated to be 696.28 and 1044.41 tonnes year^{-1} respectively. Deficit of fuelwood in the surveyed population is 348.13 tonnes year^{-1} which account about 33.33% of the total fuelwood consumption. The extraction, consumption and deficit of fuelwood per household in the study area were found to be 2.27, 3.40 and 1.13 tonnes year^{-1} respectively (Table 4).

Table 3

Consumption of fuelwood for different purposes in the study site.

Sl. No.	Purpose	Quantity (tonnes/ year)	Percentage
1.	Cooking	438.65	42.00%
2.	Heating	426.74	40.86%
3.	Community function	32.36	3.10%
4.	Cottage industries	136.00	13.02%
5.	Others (Hamam, household rituals and religious function)	10.66	1.02%
	Total	1044.41	100%

Despite the imbalance in extraction versus consumption in the area the pressure on forest cover is less compared to other sources of fuelwood. Much of the fuelwood deficit is probably met from import of fuelwood from nearby areas. Chandra *et al.* (2005) reported that the deficit of fuelwood in Jorhat district of Assam is around 24% of the total consumption, a huge amount of which is met from forest and bamboo stead. As the population is increasing at alarming rate, it is essential to take appropriate step to cope with the situation. It is observed during the study that the people in the village are capable of fulfilling major share of their fuelwood demand from own land. Therefore, it is imperative to frame strategy to take up energy plantation programme in big way by establishing woodlots of suitable species on waste lands and un-utilized agricultural lands. Fuelwood should be converted into value added products like charcoal, ethanol and menthol which can be used as an alternative energy source.

Species contribution

It has been observed during the survey that about 15 prominent tree species excluding shrubs are mostly used as fuelwood in the study area. The tree preference for fuelwood among local people and availability of these fuelwood species in the area influences their contribution in total fuelwood consumption. The percentage contribution of *Populus* species in the total fuelwood consumption is 12.13% followed by *Salix* species (10.29%), *Ulmus wallichiana* (9.28%), *Robinia pseudoacacia* (8.68%), *Palatanus orientalis* (8.76%), *Malus domestica* (8.57%), *Morus alba* (7.34%), *Juglans regia* (6.32%), *Ailanthus excelsa* (5.94%), *Aesculus indica* (4.23%), *Pyrus communis* (4.10%), *Prunus armeniaca* (4.06%), *Celtis australis* (2.78%), *Catalpa bignonoides* (2.32%) and *Australis indica* (1.26%). These tree species

Table 5

Percentage contribution of different tree species in fuelwood consumption.

Sl. No.	Tree species	Percentage contribution
1.	*Populus* species	12.13%
2.	*Salix* species	10.29%
3.	*Ulmus wallichiana*	9.28%
4.	*Robinia pseudoacacia*	8.68%
5.	*Prunus armeniaca*	4.06%
6.	*Celtis australis*	2.78%
7.	*Palatanus orientalis*	8.76%
8.	*Malus domestica*	8.57%
9.	*Aesculus indica*	4.23%
10.	*Morus alba*	7.34%
11.	*Juglans regia*	6.32%
12.	*Ailanthus excelsa*	5.94%
13.	*Pyrus communis*	4.10%
14.	*Catalpa bignonoides*	2.32%
15.	*Australis indica*	1.26%
16.	Others (including shrubs)	3.94%
	Total	100%

Table 4

Fuelwood extraction / consumption deficit in the study site.

Sl. No.	Level	Consumption/ Demand (tonnes/ year)	Extraction/ Availability (tonnes/ year)	Deficit (tonnes/ year)	Percentage of deficit
1.	Homestead	3.40	2.27	1.13	33.33%
2.	Study area	1044.41	696.28	348.13	33.33%

accounts about 96.06% of the total fuelwood availability in the study area and rest 3.94% is contributed by shrubs and some other least used tree species (Table 5).

The local people extract a considerable quantity of fuelwood from their silvi-horticulture plantation, homestead farming and community forestry where they grow a number of economically important tree species for their day-to-day requirements. As the population is increasing in the area the dependency for fuelwood on these sources will be more in future.

If the increasing demand is not fulfilled from these sources there will be more pressure on traditional forests. The uprising situation can be mitigated by increasing fuelwood production through energy plantation of suitable species on un-utilized agricultural land, homestead and community land.

SUMMARY

The information on status of fuelwood extraction and consumption was collected in Sagipora village of Sopore tehsil under Kamraj forest division using interview schedule. Fuelwood extraction and consumption was estimated to be 0.28 and 0.42 tonnes person^{-1} year^{-1} respectively. The village was found to be experiencing fuelwood extraction/ consumption deficit of 0.14 tonnes person^{-1} year^{-1}. Silvi-horticulture plantation provided the largest proportion of annual woody fuelwood accounting 74.29% of the total availability. Major proportion (82.86%) of the total fuelwood is consumed in cooking and heating. There are 15 prominent tree species which contribute 96.06% of the total fuelwood availability in the study area. The results advocate the need to increase the local production of fuelwood by establishing woodlots of suitable species on waste lands and un-utilized agricultural lands for meeting future demand of the burgeoning population.

Key words: Fuelwood, Extraction, Consumption, Deficit, Species contribution, Kashmir.

उत्तरी कश्मीर के ग्राम्य में ईंधनकाष्ठ की निकासी की स्थिति तथा इसका उपभोग

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सारांश

कामराज वन मण्डल में पड़ती सोपार तहसील के सागीपुरा गाँव में ईंधनकाष्ठ निष्कासन और उपभोग की स्थिति विषयक जानकारी साक्षात्कार तालिका प्रणाली उपयोग में लाकर एकत्रित की गई। ईंधनकाष्ठ निष्कासन और उसका उपभोग क्रमशः 0.28 और 0.42टन प्रति व्यक्ति प्रति वर्ष अनुमानित किया गया। गाँव की ईंधनकाष्ठ निष्कासन और उसके उपयोग में 0.14 टन प्रति व्यक्ति प्रतिवर्ष की कमी झेलतेपाया गया। वन संवर्धन बागबानी से वार्षिक काष्ठीय ईंधन का सबसे बड़ा समनुपात उपलब्ध कराते पाया गया जो कुल ईंधन उपलब्धि का 74.29% बैठता है। संपूर्ण ईंधनकाष्ठ उपयोग का सबसे अधिक भाग (82.86%) खाना-पकाने और घरों को गर्म रखने में खर्च होता है। यहाँ 15 प्रमुख वृक्ष जातियां है जिससे इस अधीन क्षेत्र की कुल ईंधनकाष्ठ उपलब्धि का 96.06% भाग प्राप्त होता है। ये परिणाम बंजरभूमियों और उपयोग न की जा रही कृषि भूमियों पर उपयुक्त वृक्ष जातियों के छोटे-छोटे जंगल लगाकर भविष्य में बढ़ने वाली जनसंख्या की मांग पूरी करने के लिए ईंधनकाष्ठ का स्थानीय उत्पादन बढ़ाने की आवश्यकता समर्थित करते हैं।

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