



Full Length Research Article

Assessment of Forest Resources and their Utilization Pattern in Umagarh Village, District Nainital, Uttarakhand

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ABSTRACT

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In the entire world, forest resources have been used by humans since time immemorial. Human life cannot be imagined without the wild resources. These resources are an important part of their daily routine life and livelihood. People are using the forest resources in the form of medicine, edible/food, fodder, fuel, timber, agricultural tools and various other purposes. Keeping in view significance of these resources in terms of livelihood of people and the ecological security, efforts are needed to explore and conserve them. The present study was carried out for the assessment of forest resources and resource utilization pattern in Umagarh village of Ramgarh Block, district Nainital, Uttarakhand. Structured questionnaire was used to interview 15% of the total households in the village to gather the required information on socio economic status and resource use pattern. For vegetation analysis, two forest types were identified for conducting phytosociological study i.e. Pine (*Pinus roxburghii*) forest and Oak (*Quercus leucotrichophora*) forest. Data collection and vegetation analysis have been done by using standard ecological methods. In the present study the dependency of people on the forest resources is analyzed. An average consumption of fuelwood per day per household is 12 kg and the use increase in winter season in spite of having LPG cylinders in every house. The most easily available fuelwood species found in the study site is *Quercus leucotrichophora* commonly known as Banj Oak and *Pinus roxburghii* commonly known as Chir. In case of fodder the daily average consumption of leaf fodder is approximately 16 kg and that of grass is 9kg-10kg per day per household. The most commonly available fodder species of the village are *Quercus leucotrichophora*, *Q. semecarpifolia*, *Grewia optiva* etc. The villagers also collect non wood forest products from the forest for wild edibles, medicine, aesthetic and other use. Based on the study, need of scientific exploration of forest resources and their management strategies has been suggested.

Introduction

Forest resources are the integral part of human civilization. Human being is totally dependent on forest resources as they provide many ecosystem services to the people and their society. People are utilizing ecosystem services in the form of medicine, edible/food, fodder, fuel, timber, agricultural tools and various other purposes. Forest resources plays an important role in the economy of every country. The total forest cover of the country is 712,249 square kilometres. It is 21.67 percent of India's total geographical area. The state of Uttarakhand covers an area of 53,483 sq. km which 1.63 percent of the geographical area of the country. The forest cover in the state is 24,303 sq. km which is 45.44 percent of the state geographical area (ISFR 2019).

In the context of Indian Himalayan Region, the study on ethnobotany and utilization pattern of forest resources is very vast. The study is done by Samant et al., 1998b, Samant & Dhar, 1997 Samant, 1998a Samant et al., 1996a, 2000a; Joshi et al., 1999, 2001; Shah, 1974; Rawat & Pangtey, 1987; Pangtey et al., 1989; Samant, 1993; Samant et al., 1993; Badola, 1998; Maikhuri et al., 1998a, 1998b; Joshi et al., 1999, 2001; Borthakur, 1976; Tewari et al., 1978; Kapur & Sarin, 1984;

Srivastava et al., 1987; Shah & Jain, 1988; Kalakoti & Pangtey, 1988; Nath & Bordoloi, 1989; Paliwal & Badoni, 1990; Rai & Sharma, 1994; Shah & Joshi, 1971; Koelz, 1979; Yonzon & Mondal, 1982; Pal, 1984; Yonzon et al., 1981; Hajra & Baishya, 1980; Kak, 1983; Dam & Hajra, 1980; Sundriyal et al., 2004; Kala et al. 2004; Uniyal et al. 2006; Kumar et al. 2011; Maikhuri et al., 2000; Dhar et al., 2002; Mao et al., 2009; Kunwar et al., 2006; Kumar & Sharma, 2009; Tiwari et al., 2010; Malik et al., 2011; Gaur et al., 2010; O'Neill et al., 2017; Sharma et al., 2013; Vimala & Gricilda, 2014; Sati & Joshi, 2010; Mazid et al., 2012; Bhatt et al., 2013; Samant et al., 2000; Malik et al., 2011; Singh & Sundriyal, 2009; Khushman et al., 2011; Kumar & Sharma, 2009; Sharma et al., 2009; Tiwari & Joshi, 2009.

People's dependence on forests in the selected study area has been constant. The study area is dominated by Oak (*Quercus leucotrichophora*) and Pine (*Pinus roxburghii*) from where people collect a variety of resources for their livelihood. The resources are predominantly high in oak forests, and more pressure has been seen in it. Unsustainable utilization and overexploitation of available resources and habitat degradation,

there is a possibility of resource depletion in these forests. Due to adaptability towards the environmental conditions, pine trees may gradually affect the habitats of oak forests, may leads to the reduction of water level and soil quality of the forests. Therefore, a proper scientific exploration is required on diversity, distribution, utilization pattern, extraction pattern and indigenous uses to conserve the available natural resources and to reduce habitat degradation. This would help to make conservation and management strategies. Therefore, keeping in view the fact the present study was carried out on assessment of forest resources, utilization pattern and socio-economic structure.

Materials and methodology

The Study Area

The Study was conducted in Umagarh village of Ramgarh block, district Nainital. It lies in the Kumaun region of Uttarakhand State. Geographically Umagarh is situated at 29° 42' N longitude and 79° 54' E latitude. It is a medium size village with total 50 families residing. The village has population of 212 of which 112 are male while 100 are females as per Population Census 2011. The village has higher literacy rate compared to Uttarakhand other villages. In 2011, literacy rate of Umagarh village was 83.92 % compared to 78.8 % of Uttarakhand. In Umagarh Male literacy stands at 86.67 % while female literacy rate was 80.85%. As per constitution of India and Panchayati Raj Act, Umagarh village is administrated by Sarpanch (Head of Village).

The study area is dominated by two major forest types i.e. Oak (*Quercus leucotrichophora*) forest and Pine (*Pinus roxburghii*) forest. The village is mostly covered by oak dominated and other broad leaves forests in the 3 directions mainly East, North and South. The other species associated with Oak are mainly Ayar (*Lyonia ovalifolia*), Buransh (*Rhododendron arboreum*) etc. The local people are mainly depended for fodder, fuelwood, litter etc. on these forests.

The village is covered by Pine forest in the west of the village. The species followed by it are mainly Oak (*Quercus leucotrichophora*) Buransh (*Rhododendron arboreum*) etc.

Topographically the area is a highly rugged terrain. The hills belong to Gagar range of Kumaun and form the outer part of Nag-Tibba range of the lesser Himalayas. The physiographic features of the area, expressed as hills of varying heights dissected by a number of valleys of rivulets, rivers and nalas, and gorges, are related to and controlled by the lithology and structure of the rocks. The shape of the high ground in general tends to show elongation in one direction with tendency for flat tops.

The climate of the area is very pleasant and healthy. Average temperatures are 27°C during summer (Mid April-June) and 5°C during winter (November-January). The monsoon by westerly winds, which breaks earlier than the plains, lasts from the middle of June to the end of September, and the area receives about

1500 - 1700 mm of rainfall annually considerable snowfall takes place during the month of January.

Methods

Socio economic status and resource use pattern

Survey was conducted in Umagarh Village in Ramgarh Block of Nainital District, Uttarakhand during the year 2019. Structured questionnaire was used to interview 15% of the total households in the village to gather the required information. The gathered information was recorded and tabulated. This data was used for analysis of fuel and fodder consumption pattern of the village and to recognize the livelihood of the people within the study village. The consumption pattern of the resources was estimated on regular observation in the village. The source and supply of fodder for animals was quantified by estimation in the villages and by measuring the daily ration of food concentrates given to the animals by each household. Use of firewood by human population was also quantified under different categories viz. firewood for cooking, water heating, house warming, animal food preparation, festivals and various ceremonies. The Data was gathered on socioeconomic status of the village (literacy rate, livelihood options etc.), preference ranking of tree species for various purposes (fuel wood fodder, house building, agricultural implements etc.) and extraction and consumption pattern of the forest resources by the village people.

Vegetation analysis

For vegetation analysis, two forest types were identified for conducting phytosociological study i.e. Pine (*Pinus roxburghii*) forest and Oak (*Quercus leucotrichophora*) forest. Trees and sapling were analyzed by randomly placed 10 quadrats of 10 m x 10m size in each site. Circumference at breast height (1.37 m above the ground) of all the trees and saplings in each quadrat were measured and recorded individually. Data collection and vegetation analysis have been done by using standard ecological methods (Grieg-Smith, 1957; Kersaw, 1973; Muller-Dombois & Ellenberge, 1974; Curtis and McIntosh, 1950; Whitford, 1949; Phillips, 1959; Curtis, 1959).

Results

Socio-economic status

The Umagarh Village consists of 50 Households residing total population of 212 persons of which 112 are male and 100 are female (Table 1 & Fig. 1). The people are mainly cultivators and agricultural labors. The source of income of villagers includes milk selling, labor income, horticulture and other works. The literacy rate of the village is 83.92%. Most of the village people have their own land and it is found under cultivation i.e. horticulture. Almost most of the village people are using LPG for cooking purposes as transportation of LPG is available in the area. Most of the females are indulged in household works such as cooking, rearing animals and collection of fuel and fodder from agricultural fields and from the forests. The main feed of the livestock is collected from the fields as well as from the forests. The main species that is collected for fodder is mainly Banj Oak (*Quercus leucotrichophora*), Kharsu (*Quercus semecarpifolia*), Ayar (*Lyonia ovalifolia*) etc.

Table 1. Socioeconomic parameters of the Umagarh village

Parameters	Male	Female	Total
Household	-	-	50
Population	112	100	212
0-6 Age	7	6	13
Literate	91	76	167
Illiterate	21	24	45
Total Workers	61	24	85
Main Workers	61	23	84

Cultivators	13	1	14
Other Workers	48	22	70
Non-Workers	51	76	127

Source: Census of India, 2011

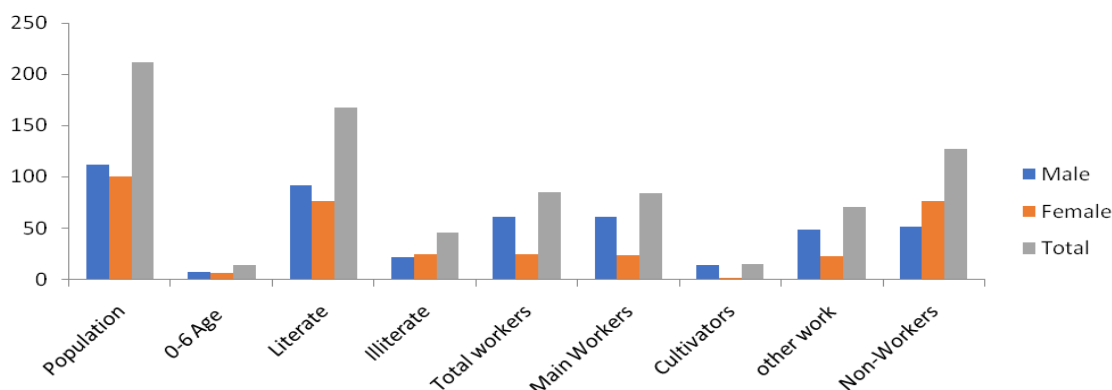


Fig. 1. Socioeconomic parameters of the Umagarh village

Resource utilization pattern

Fuel wood

Fuel wood in the study area was mainly collected from the agricultural fields and from the forests as well. Despite of having LPG the village people are still engaged in the collection of fuelwood. Fuelwood is mainly used for heating and cooking purposes. The extraction of fuel wood is maximum in winter season and is also stored for future use by the village people in the form of a heap. The average extraction of fuelwood per household in a day is 22.68kg and the average consumption of fuelwood is 12kg per day per Household. The wood extracted from the forests and agricultural fields is also used to give support to the crops (Fig. 2 a&b).

Fodder

The fodder species was collected from the forests and from the agricultural fields as well apart from this seasonal grass was also collected in the form of heaps also known as *Lutas* and is collected in the month of October. Even for making *Lutas*

branches of pine were used. Sometimes mixture of wheat flour and barley was also cooked together to feed the livestock. The average extraction of fodder that is of leaf also known as Charapatti is 16kg per day and that of grass is approximately 14kg per day. The average consumption of fodder that is of leaf is 9 kg/day and of grass is 10kg/day (Fig 2 a&b).

Litter

The litter is mainly collected from the forests in two forms and i.e. in the form of broad leaves litter and pine needles. The litter collected from the forests is mainly used for bedding of the animals of the village people and for the packaging of Fruits to sell in the market. The oak litter is also collected by the village people for making Farm Yard Manure. The average extraction per household of pine needle is 29.06kg/day and that of broad leaves is 30kg/day. The average consumption of pine needle litter is approximately 17kg/day and that of broad leaves is approximately 14 kg/day per Household (Fig. 2 a&b). Some of the fodder and fuelwood species are listed as follows in Table 2.

Table 2. Local names, parts used and indigenous uses of fuelwood and fodder species

Family/Taxa	Local Name	Parts Used	Indigenous use
Fagaceae <i>Quercus leucotrichophora</i> A. Camus	Banj Oak	Wood and Leaf	Agricultural implements, Fodder and Fuelwood
Fagaceae <i>Quercus semecarpifolia</i> Sm	Kharsu	Leaf and wood	Fodder and Fuelwood
Caesalpinaceae <i>Bauhinia variegata</i> Linn	Kwairal	Flowers and Leaf	Wild edible and Fodder
Malvaceae <i>Grewia optiva</i> J.R.Drumm	Bhimal	Leaf	Fodder
Ericaceae <i>Rhododendron arboreum</i> Smith	Buransh	Flowers and Leaf	Medicine in heart problems
Pinaceae <i>Pinus roxburghii</i> Sarg	Chir	Pine needles and Wood	Fuelwood and Litter
Ericaceae <i>Lyonia ovalifolia</i> var. <i>ovalifolia</i>	Ayar	Wood	Fodder
Sapindaceae <i>Acer oblongum</i> Wall ex.Dc	Putli	Leaf	Fodder
Rosaceae <i>Prunus cerasoides</i> D. Don	Paiyyan	Leaf and Wood	Aesthetic, Medicine and Fodder

Non-Wood Forest Products

The region is important source of many wild edibles (*Rhododendron arboreum*, *Myrica esculenta*, *Bauhinia variegata* etc.). The village people are also dependent on the

forest for wild edibles, medicine, aesthetic use etc. The village people use the bark of *Myrica esculenta* for filling the holes of wooden utensils, Flowers of *Rhododendron arboreum* for its juice as it helps in many heart diseases. Likewise, the Tree

species there are some herbaceous plants which are of so much importance to the village people and are listed in the Table 3.

Table 3. Non-Wood Forest Products species used by the people of Umagarh village

Family/Taxa	Local Name	Part Used	Indigenous Uses
Rosaceae <i>Rubus ellipticus</i> Sm	Hisalu	Fruit, Leaf, Root and Yung shoot	Wild edible fruit and medicine for fever etc.
Berberidaceae <i>Berberis asiatica</i> Roxb. ex DC	Kilmora	Fruit, Bark and Root	Root used for the treatment of blood pressure and sugar and bark used in fever, jaundice etc.
Crassulaceae <i>Bryophyllum pinnatum</i> Lamarck	Pattherchatta	Root	Medicine in treatment of kidney stones
Rutaceae <i>Zanthoxylum armatum</i> DC	Timur	Branch and Twigs	Medicine
Moraceae <i>Ficus palmata</i> Forssk	Bedu	Fruit	Wild edible and medicine
Urticaceae <i>Urtica dioica</i> U.urens	Bichchu	Bulbs and Leaf	Medicine and wild edible vegetable
Caesalpiniaceae <i>Bauhinia variegata</i> Linn	Kwairal	Fruit	Flower used as edible
Myricaceae <i>Myrica esculenta</i>	Kaphal	Fruit and Bark	Edible fruit and bark used in filling holes of wooden utensils
Ericaceae <i>Rhododendron arboretum</i> Smith	Buransh	Flower	Flower is edible and used as medicine for heart patients

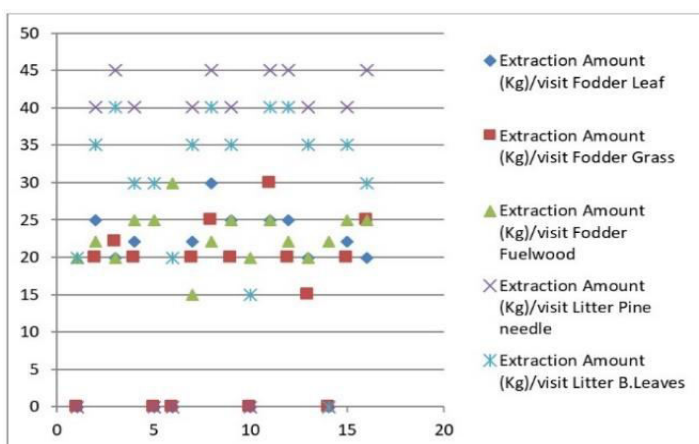


Fig. 2 a. Representation of extraction pattern of resources

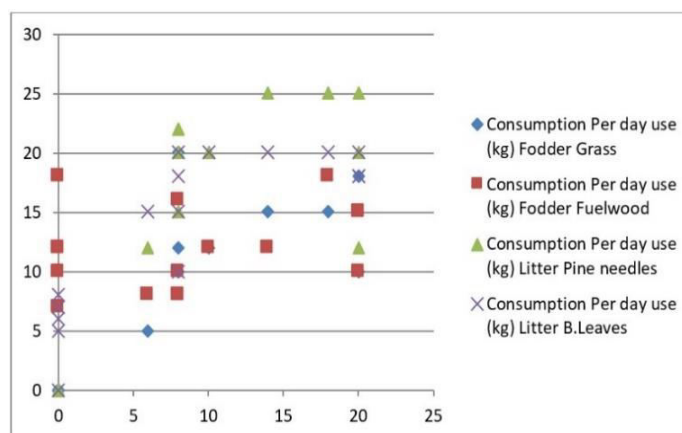


Fig. 2 b. Representation of consumption pattern of resources

Pine Forest Site

Total 4 species, *Pinus roxburghii*, *Quercus leucotrichophora*, *Lyonia ovalifolia* and *Rhododendron arboreum* were present in the study site. The total tree density was 630 ind.ha⁻¹ of which *Pinus roxburghii* showed a maximum density 430 ind. ha⁻¹ followed by *Quercus leucotrichophora* (70) and *Rhododendron arboreum* (90). The total basal area was 81.48m²ha⁻¹ of which

Pinus roxburghii showed a maximum basal area of 63.41m²h⁻¹ followed by *Quercus leucotrichophora* basal area 9.42 m²h⁻¹. The *Pinus roxburghii* showed a maximum IVI 187.74 and *Lyonia ovalifolia* showed minimum IVI 26.03. The total concentration of dominance was 1. The species diversity index for the Pine forest site is -0.96 (Table 4 & Fig. 3a).

Table 4. Phytosociological analysis of Pine forest site

Name of species	D (Ind/ha ⁻¹)	F (%)	A	A/F Ratio	TBA	IVI	H'	CD
<i>Pinus roxburghii</i>	430	100	4.3	0.043	63.41	187.74	-0.26	0.68
<i>Rhododendron arboreum</i>	90	50	1.8	0.036	6.20	42.73	-0.28	0.14
<i>Lyonia ovalifolia</i>	40	40	1	0.025	2.45	26.03	-0.18	0.06
<i>Quercus leucotrichophora</i>	70	50	1.4	0.028	9.42	43.50	-0.24	0.11
Total	630	240	8.5	0.132	81.48	300.00	-0.96	1.00

Abbreviations used: D= Density; F= Frequency; A- Abundance; A/F= Abundance/Frequency; BA= Basal area; IVI= Importance value index; H'= Species diversity; CD= Concentration of dominance

Oak Forest Site

Total 6 species, *Quercus leucotrichophora*, *Quercus semecarpifolia*, *Pinus roxburghii*, *Rhododendron arboreum*, *Lyonia ovalifolia* and *Cedrus deodara* were present in the study site. The total tree density was 1410 ind. ha⁻¹ of which *Quercus leucotrichophora* showed a maximum density 720 ind.ha⁻¹ followed by *Rhododendron arboreum* (190) and *Quercus semecarpifolia* (290). The total basal area was 68.34 m²ha⁻¹ of

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which *Quercus leucotrichophora* showed a maximum basal area of $28.5\text{m}^2\text{ha}^{-1}$ followed by *Rhododendron arboreum* with basal area (23.75) m^2ha^{-1} . The *Quercus leucotrichophora* showed a maximum IVI 119.09 and *Pinus roxburghii* showed minimum

IVI 10.5. The total concentration of dominance (CD) was 1. The species diversity index for the Oak forest site is -1.34 (Table 5, Fig. 3b).

Table 5. Phytosociological analysis of Oak forest site

Name of species	D (Ind/ha ⁻¹)	F (%)	A	A/F Ratio	TBA	IVI	H'	CD
<i>Quercus leucotrichophora</i>	720	100	7.2	0.072	28.51	119.09	-0.34	0.51
<i>Rhododendron arboreum</i>	290	90	3.22	0.035	23.76	79.02	-0.33	0.21
<i>Quercus semecarpifolia</i>	190	80	2.37	0.029	6.72	44.35	-0.27	0.13
<i>Pinus roxburghii</i>	30	20	1.5	0.075	2.13	10.50	-0.08	0.02
<i>Lyonia ovalifolia</i>	150	70	2.14	0.03	5.00	36.38	-0.24	0.11
<i>Cedrus deodara</i>	30	20	1.5	0.075	2.23	10.66	0.08	0.02
Total	1410	380	17.93	0.316	68.34	300.00	-1.34	1.00

Abbreviations used: D= Density; F= Frequency; A- Abundance; A/F= Abundance/Frequency; BA= Basal area; IVI= Importance value index; H'= Species diversity; CD= Concentration of dominance

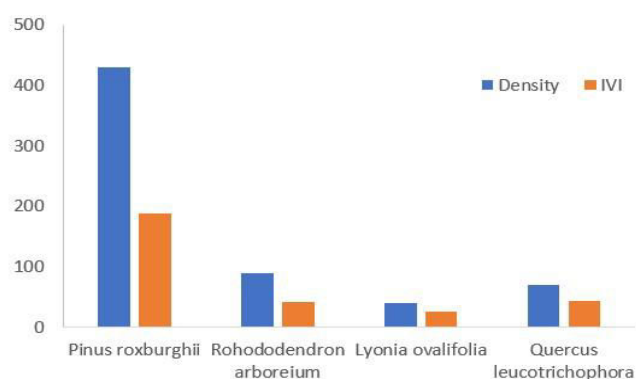


Fig. 3a. Graphical representation Pine Forest Site

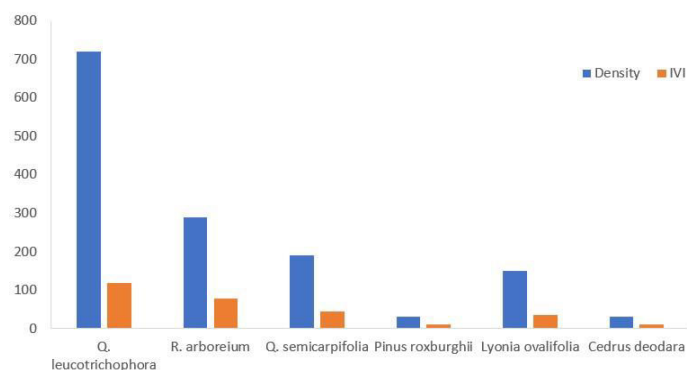


Fig. 3b. Graphical representation Oak Forest Site

Discussion

Fuel wood and fodder species depends on the quality, accessibility, availability and also the human population in the surrounding villages (Singh et al., 1988). Fodder and fuel wood are collected by lopping the vegetative biomass. Moreover, in Uttarakhand hills, it is well known that women are mainly responsible for the collection of fuelwood and fodder. The dependency of continuously growing population on resources and lack of viable technologies to mitigate mountain specificities and enhance production to meet demand are depleting resources.

In the present study it is analyzed that the people are still dependent on the forest for the fulfillment of their day to day needs. An average consumption of fuelwood per day per household is 12 kg and the use increase in winter season in spite of having LPG cylinders in every house. The most easily available fuelwood species found in the study site is *Quercus leucotrichophora* commonly known as Banj Oak and *Pinus roxburghii* commonly known as Chir. In case of fodder the daily average consumption of leaf fodder is approximately 16 kg and that of grass is 9kg-10kg per day per household. Mainly the seasonal grass is extracted by the villagers in the month of October for future use. They make a heap of grass also called Lutas and secure them for future use. The most commonly available fodder species of the village are *Quercus leucotrichophora*, *Q. semecarpifolia*, *Grewia optiva* etc.

In case of NWFPs the villagers collect medicinal herbs from herbaceous plants such as *Rubus ellipticus*, *Zanthoxylum armatum*, *Urtica dioica*, vegetables, aesthetic resources, flowers of *Rhododendron arboreum* and various medicinal roots. Resource extraction especially fuelwood and fodder in the study

area takes place throughout the year as per the need of the people. Fuelwood collection was observed to be high during winters. The selection of species was based on its accessibility and wood quality. In this present survey it was seen that the species which were used as fodder were also used in fuelwood. The selective preference of species creates pressure and there is a chance of scarcity and depletion of those species.

Conclusion

Utilization of forest resources of is very important for local residents in social, economic and cultural context. Resources like edible, fuel; fodder, timber etc. are obtained from the forest itself. But due to the ever-increasing need of these are declining. Over exploitation of these resources may lead to the ecological imbalance and affect the livelihood of people. Conservation and management of forest resources may be achieved through sustainable use of resources. Management strategies have to be developed on the basis of scientific assessment of status and resource utilization pattern for conservation and management of these resources.

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