

Fodder Diversity, Availability and Utilization Pattern in Western Himalayas

ABSTRACT

Trees have been used for centuries for fodder globally. Tree foliage is substantial source of feed for livestock. As in many other regions of the world, farmers in the Himalay region depend largely on this for sustaining their livestock during winter and summer season for almost half of the year. Himalayas are remote and inaccessible; people's dependency relies mainly on forest resources to fulfill livelihood services. Fodder availability in hill villages of Uttarakhand Himalayan region is insufficient and a part of it is supplemented through lopping of tree foliage. The dependency is very high (>70%) during the period, beginning from October to February. Owing to changing climatic conditions, a farmer's preference for a particular tree species is also variable, according to the low, mid and high hill regions depending on where they live. For the present study, a questionnaire survey was conducted in different districts of Kumaon and Garhwal region of Uttarakhand.

HIGHLIGHTS

- To quantify various fodder species in Uttarakhand Himalayas.
- To conduct survey to understand utilization pattern in Uttarakhand Himalayas.
- To assess preference of people according to elevation and season.

Keywords: Trees, Fodder, Questionnaire survey, Inaccessibility, Season, Elevation

INTRODUCTION

Himalayas are the youngest fold mountain range globally and represents 18% of India's total geographical area. Himalayas are home to diverse tribes and people, living in the remote and inaccessible valleys and mountains. Due to inaccessibility, they are relying on the forest resources since inception of civilization (Rawat *et al.* 2020; Parveen *et al.* 2018). Fodder and fuel woods are two essential livelihood resources for people of the Himalayas (Ramakrishnan *et al.* 2000). Further, it is observed that livestock's mainly relies on forest wealth especially in the Himalayas (Tulchan *et al.* 2002). Fodder collection plays a critical role in the turning the wheel of hill agriculture in the mountains

of the Himalaya (Makino 2009). Forests fulfill 87% of the demand in the Himalayan region for feeding their cattle for approximately five to six months in a year (Pandey and Singh 1984). Several species of fodder yielding trees are distributed in different elevation zones in the mountains of Uttarakhand Himalaya. Due to variation in climate and elevation, a farmer's preference changes according to elevation

and season (Verma *et al.* 1989; Rawat *et al.* 2018). The in depth understanding and detailed data

on community's choice in the selection of key species is so vital importance for formulation of environmental conservation (Kala 2007). Case studies are limited in the Uttarakhand Himalaya which is conducted on fodder resources according to season, elevation and lacks comprehensiveness (Anonymous 1982; Jackson 1985; Bhatt and Rawat 1993; Singh 1985; 1989, 2002, 2005; Jodha and Shrestha 1990; Singh and Bohra 2005; Singh and Gaur 2005; Bohra 2006 and Singh and Sundriyal, 2009; Nautiya *et al.* 2018). In order to address availability and utilization pattern of fodder tree species in Uttarakhand Himalayas following objectives were framed in our case study.

1. To enlist various fodder tree species available in Uttarakhand Himalayas.
2. To conduct survey to understand fodder utilization and preference pattern according to elevation and season in Uttarakhand Himalayas.

MATERIALS AND METHODS

(a) Study area

The state of Uttarakhand was chosen as study area, which is known for its highly varied physiography and biodiversity. Uttarakhand located between coordinates E 77°34'–81°03'; N 28°43'–31°28' is among 12 Himalayan states of India.

(b) Methodology

To assess the fodder preference, elevation and seasons were chosen as criterion. To understand the effect of elevation the study area was classified into five elevation zones (Table 2). Communities were interviewed through questionnaire for collection and recording of data. Surveys were confined to two political regions Kumaon and Garhwal in duration of 2018–

2022, during different seasons of the years. Information regarding details of fodder species part used, season of lopping, locality, local names were documented by interviewing the communities and shepherds residing in study villages. To identify the fodder species, fodder collection sites were visited in company with shepherds and women's

during gathering of fodder. To understand utilization

pattern, seasonal, and species preference, surveys were carried out for each species separately in different seasons. The specimens were collected and identified from Botanical survey of India and Systematic discipline of FRI, Dehradun.

RESULTS

Diversity and availability according to elevation

Total 41 species of fodder plants representing 24 genera taxonomically belongs to 18 families were enlisted and documented (table 1). Maximum number of species belongs to family [leguminaceae](#) Fabaceae (27 spp.) trailed by Moraceae (12 spp.) (Table 1). Maximum richness of species was shown by the genus *Ficus* (8 spp.), then trailed by *Quercus* (5 spp. Each).

Table 1: Some major fodder plants enlisted during surveys from study area

Sl. No.	Botanical Name	Family	Local name
1	<i>Acacia catechu</i>	Mimosaceae	Khair
2	<i>Acercaesium</i>	Sapindaceae	Kainjal
3	<i>Aceracuminatum</i>	Sapindaceae	Kainjali
4	<i>Albizia chinensis</i>	Mimosaceae	Siris
5	<i>Albizia lebeck</i>	Mimosaceae	Siris
6	<i>Albizia procera</i>	Mimosaceae	Siris
7	<i>Anogeis latifolia</i>	Combretaceae	Daur
8	<i>Bauhinia purpurea</i>	Caesalpiniaceae	Guiral
9	<i>Bauhinia variegata</i>	Caesalpiniaceae	Kachnar
10	<i>Bauhinia semla</i>	Caesalpiniaceae	Semla
11	<i>Butea monosperma</i>	Caesalpiniaceae	Dhak
12	<i>Celtis australis</i>	Ulmaceae	Kharik
13	<i>Cinnamomum tamala</i>	Lauraceae	Dalchini
14	<i>Ficus auriculata</i>	Moraceae	Timla
15	<i>Ficus hederacea</i>	Moraceae	—
16	<i>Ficus hispida</i>	Moraceae	Ghogsu
17	<i>Ficus nerifolia</i>	Moraceae	Khilku
18	<i>Ficus palmata</i>	Moraceae	Bedu
19	<i>Ficus racemosa</i>	Moraceae	Gullar
20	<i>Ficus semicordata</i>	Moraceae	Khainu
21	<i>Ficus subincisa</i>	Moraceae	Chanchari
22	<i>Fraxinus xanthoxyloides</i>	oleaceae	Ashtree
23	<i>Grewia optiva</i>	Tiliaceae	Bhimal

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24	<i>Leucaena leucophala</i>	Mimosaceae	Subabul
25	<i>Machilus duthei</i>	Lauraceae	Kowala, Bhojo
26	<i>Mallotus phillyifolius</i>	Euphorbiaceae	Rohini
27	<i>Morus alba</i>	Moraceae	Shahoot
28	<i>Morus serrata</i>	Moraceae	Tut
29	<i>Neolitsea cupala</i>	Lauraceae	Kostermans
30	<i>Ougeinia oojinensis</i>	Fabaceae	Sandan
31	<i>Quercus semicarpifolia</i>	Fagaceae	Kharsu
32	<i>Quercus floribunda</i>	Fagaceae	Moru
33	<i>Quercus lanata</i>	Fagaceae	Rianj
34	<i>Quercus leuochotrichophora</i>	Fagaceae	Banj oak
35	<i>Quercus glauca</i>	Fagaceae	Phanat, Bani
36	<i>Robinia pseudoacacia</i>	Fagaceae	—
37	<i>Schleichera oleosa</i>	Sapindaceae	Kusum
38	<i>Swida macrophylla</i>	Cornaceae	Khagsu
39	<i>Symplocos paniculata</i>	Symplocaceae	—
40	<i>Symplocos strategoides</i>	Symplocaceae	Lodh
41	<i>Terminalia tomentosa</i>	Combretaceae	Sain

fulfilled by *Quercus* species and in lower elevation by *Grewia optiva*. In summer's season, *Leucaena leucophala*, *Subabul* and *Albizia* spp. were fodder trees available to farmers. *Quercus leuochotrichophora*, *Q. floribunda*,

Q. semicarpifolia, *Machilus duthei*, *Grewia optiva*, *Bauhinia* spp. and *Ficus* spp. are the species preferred for lopping during winter season. *C. australis*, *M. serrata*, *O. oojinensis*, *Acer* spp., *Ficus* spp., *M. duthei* were preferred for lopping during summer season (Table 3).

Table 3: Seasonal availability of primary fodder species in Uttarakhand Himalaya, India

Summer	Rainy	Winter
<i>Celtis australis</i>		<i>Grewia optiva</i>
<i>Machilus duthei</i>		<i>Quercus leuochotrichophora</i>
<i>Morus alba</i>	<i>Acer cerasium</i>	<i>Q. floribunda</i>
<i>Acer cuminatum</i>		<i>Q. semicarpifolia</i>
		<i>Ougeinia oojinensis</i>

of inhabitants (Table 2). Winter season scarcity of fodder was

Table 2: Fodder species according to elevation zone

Sl. No.	Elevation zone (m asl)	Major fodder species preferred
1	500–1000	<i>Albizia lebeck</i> , <i>Albizia chinensis</i> , <i>Albizia procera</i> , <i>T. tomentosa</i> , <i>Celtis australis</i> , <i>Leucaena leucophala</i> , <i>Robinia pseudoacacia</i> , <i>Quercus glauca</i>
2	1000–1500	<i>Grewia optiva</i> , <i>Quercus leuochotrichophora</i> , <i>Quercus glauca</i> , <i>Q. floribunda</i> , <i>Celtis australis</i> ,
3	1500–2000	<i>Quercus leuochotrichophora</i> ,
4	2000–2500	<i>Quercus leuochotrichophora</i> , <i>Q. floribunda</i> , <i>Celtis australis</i> , <i>Q. semicarpifolia</i>
5	2500–3000	<i>Fraxinus xanthoxyloides</i> , <i>Q. semicarpifolia</i>

Utilization pattern

Fodder utilization pattern and preference of species is governed by season and according to elevation zone. Variation in utilization pattern is induced due to elevation and different climatic zones present in study area. Oaks were considered as the lifeline of people in (between 1500–3000m) higher Himalayas, whereas in lower elevation (500–1000) *Grewia optiva* was species to support the livelihood

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CONCLUSION AND DISCUSSION

According to the respondents, there are seasonal variations in fodder availability. It was observed that trees foliage is preferred for feeding in summer and winter season's only. Further during rainy season, abundant herbs, shrubs, trees fodders species are available to feed livestock. Result of our case studies reveals that some species are similar with that of (Samant *et al.* (2007); Singh *et al.* (2008); Singh and Sundriyal (2009); Nautiya *et al.* (2018) in the Indian Himalayan Region. Results of recent case studies indicate species are becoming scarce because the forests and pasture lands are converted to crop agriculture and to settlement. Results of the study suggest that there is a diversity of fodder plants in Uttarakhand Himalaya but due to reductions in grazing areas it was hard to find fodder in enough quantity to fulfill the daily nutritional requirement of livestock. The present case study revealed that altitude as well as seasons significantly influences the preference of fodder by inhabitants. Moreover sites which were in higher elevation Himalayas and inaccessible were more relied on conventional forests than communities near to cities. Singh *et al.* (2012) concluded in their case study on *Q. semecarpifolia* that season and altitude influences nutrient composition. In our case study tried to fill some gaps but some more comprehensive case studies are required by

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these researchers and scientist revealing nutrient composition, preference of fodder due to altitude and season in western Himalayas.

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