

Perception of Hill Women towards Plant Resources and Their Utilization in Different Watershed Areas of Nainital District, Kumaun Himalaya

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ABSTRACT:

This women centric study was conducted during 2012 & 2013 in lesser Himalayan region of Nainital district in Uttarakhand to record the traditional knowledge of women farmers about natural and cultivated plant resources, their utilization and conservation. In study area majority of the women own knowledge of those trees which are beneficial to them both in terms of livestock rearing and trade like Rhododendron, Nepalese Alder and oak trees. They are well aware about the wild (box berry, barberry and Himalayan Yellow raspberry) as well as cultivated fruits (citrus fruits like malta and lemon). Majority of women (61.33 per cent) use Rhododendron flowers, dry and green leaves of oak (58 per cent), Elephant Ear Fig leaves and fruits (52 per cent), and barberis fruits and stem bark (45.33 per cent) for their day to day livelihood. Most commonly grown crops by women farmers are potato (85 Percent), cabbage (74 percent), Pea (68.67 percent) and tomato (66.67 percent) which is beneficial to the respondents as of its suitability as off season vegetables. Majority of respondents use fodder from trees like Common fig (72.67 per cent), oak leaves, Elephant Ear Fig leaves and Biul leaves (50 to 57 per cent) mostly growing in forest. Majority of women farmers (54 per cent) had 30 to 174 trees in their farm. Women in the study area are well aware about the benefits of forest to fulfill their basic needs of livelihood. This compels them to conserve the plant resources by their involvement in major activities of conserving them.

Keywords: Hill women, plant resources, watershed, forest products

INTRODUCTION

Hill people heavily depend upon forest resources to fulfill their basic (subsistence) needs for fuel-wood, forage, timber, medicines etc, as they do not have own private forests or adequate agricultural land (Adhikari & Ghimire 2003). About 275 million poor rural people in India depend on forests for at least part of their subsistence and cash livelihoods which they earn from a range of wood and non-wood forest products such as fruits, flowers, medicinal plants etc. Seventy percent of India's rural population depends on fuel wood to meet domestic energy needs. Half of India's 89 million tribal people, the most disadvantaged section of society, live in forest fringe areas and a significant percentage of India's 471 million livestock are sustained by forest grazing or fodder collected by farmers. Most of the forests in the Mid-hills' are managed for fuel-wood and fodder and about 65 percent of these forests have predominantly small-sized trees (Acharya *et al.* 2009). Forestry represents the second-largest land use in India after agriculture covering about 21.23 per cent of the total land base

(ISFR-2013). Agricultural production systems depend on natural resources viz., land (over 55 per cent of non-forest land), water (about 80 per cent of total fresh water), biodiversity, forests, pastures, and wildlife. Farm activities can also have major impacts on the quality and availability of these resources well beyond the boundaries of the production system. Although natural resources are critical to agricultural production, farm households also frequently depend on them to meet other needs. Thus, rural livelihoods are intricately linked to the condition of natural resources, particularly for those 1.3 billion people living on fragile lands. Over the last 40 years, as food production has doubled, it created significant impacts on the natural resource base. One reason for focusing on women therefore, relates to the impact on women's lives for involving women in plant resource management and utilization. The other equally important reason is the impact on the resource themselves. Thus, a focus on women would not only address their need for increased income and a reduction in drudgery, but would also give them control over the resource they work with. This research was undertaken to develop a deeper understanding of plant resources and their management practices. The study drew on that knowledge and skills are learned and embedded in the contexts in which knowledge is obtained and applied in everyday situations. Although the researches have been done on natural resource management practices but no work has been done to explore researchable gaps and questions such as; what are the plant resources on which hill women depend; what practices are being followed by hill women for conservation of plant resources; how these resources are being utilized by hill women to meet their livelihood needs. Thus the present study was under taken to explore the answers to these questions.

METHODS AND MATERIALS

From micro-watershed of *Dolgaad*, *Dantagad* and *Khujetigad* in Nainital district of Uttarakhand state, India, covering two blocks of Nainital district viz. *Dhari* and *Oakhalkanda* were selected purposely for the study. The micro-watershed plan prepared by Uttarakhand Decentralized Watershed Development Programme (UDWDP), *Haldwani* for the selected villages, i.e., *Selalekh*, *Majyuli*, *Jalananeel pahari*, *Mahtoliyagaon*, *Thali*, *Harinagar*, *Katna* and *Suni* with number of households listed 97, 160, 45, 61, 151, 125, 121 and 212 respectively, was procured from its office. A sample of 150 women from above mentioned villages was selected using Stratified Random Sampling through proportional allocation method. Out of 150 respondents, 15 were selected from *Selalekh*, 25 from *Majyuli*, 07 from *Jalananeel pahari*, 09 from *Mahtoliyagaon*, 23 from *Thali*, 19 each from *Harinagar* and *Katna*, and 33 from *Suni*. Among the selected families, those women who shouldered the major responsibility in managing household chores and participated in plant resource management activities were selected as respondents of the study. The 'Exploratory Research Design' was used for the study. Participatory methods (such as focus group discussion, semi structured interview schedule etc.) are particularly used for exploring research questions (Mikkelsen, 1997). The objective of exploratory research is to gather preliminary information that will help define problems and suggest hypotheses. Finally, the women respondents of the study area were interviewed by researcher individually with the help of semi-structured interview schedule at household level. The statistical techniques for per cent and Percentage of Knowledgeable women were used for data analysis. Percentage of Knowledgeable women was calculated as follows:

Percentage of Knowledgeable Women (PKW)

It denotes the women who have knowledge about the plant species available in their vicinity. This was calculated using following formula:

$$\text{PKW} = \left(\frac{\text{Number of women citing species during the interview}}{\text{Total number of women interviewed}} \right) \times 100$$

RESULTS AND DISCUSSION

Tree species in the study area

The data presented in **Table 1** showed that majority of the respondents (90.67 per cent) had knowledge about buransh (*Rhododendron*). Since this tree is used widely for making 'Buransh Juice' from flowers in the study area and lot of people are engaged in picking flowers and making Juice; this tree is well known to the respondents. Nepalese Alder and oak trees are next which are known to 70.67 per cent and 80.67 per cent respondents. This is because of the fact that these two trees are well known for water conservation as well as the evergreen nature of these plants, the respondents use the dry as well as green leaves for their livestock rearing.

Table 1: Per cent knowledged women (PKW) for tree species in the study area.

Sl no	Name of Tree species		Respondents (number)	PKW
	Local	Botanical/ (English)		
1	Bhuransh	<i>Rhododendron arboretum</i> Sm. / (Rhododendron)	136	90.67
2	Banjh	<i>Quercus Spp.</i> / (Oak)	121	80.67
3	Utis	<i>Alnus nepalensis</i> D.Don / (Nepalese Alder)	106	70.67
4	Sauv	<i>Pinus roxburghii</i> Sarg. / (Pine)	80	53.33
5	Bhimul	<i>Grewia oppositifolia</i> Buch. Ham. ex Roxb. / (Biul)	23	15.33
6	Kharsu	<i>Quercus semecarpifolia</i> / (Kharsu Oak)	32	21.33
7	Dyar	<i>Cidrus deodara</i> (Roxb.) Lond. / (Cidrus)	14	9.33
8	Poplar	<i>Populus italica</i> Moench / (Poplar)	14	9.33
9	Dudhila	<i>Ficus cunia</i> Buch.-Ham. ex Roxb. / (Common fig)	31	20.67
10	Saal	<i>Shorea robusta</i> Gaertn. / (Teak)	10	6.67
11	Shesam	<i>Dalbergia sissoo</i> Roxb. / (Indian rosewood)	5	3.33
12	Tushar	<i>Debrigeasia longifolia</i> (Burm. f.) Wedd. / (Wild Rhea)	12	8.00
13	Bans	<i>Bambosua spp.</i> / (Bamboo)	5	3.33
14	Padam	<i>Prunus cerasoides</i> D. Don. / (Wild Himalayan cherry)	2	1.33
15	Tej patta	<i>Cinnamomum tamala</i> Nees. / (Bay leaf)	24	16.00
16	Timil	<i>Ficus auriculata</i> Lour. / (Elephant Ear Fig)	48	32.00

The trees like Kharsu Oak, Common fig, Biul are well known to 21.33, 20.67 and 15.33 per cent respondents respectively, which was due to the seasonal availability of green leaves as fodder for their livestock. The trees like Elephant Ear Fig and Bay leaf are well known to 32 and 16 per cent respondents. Specific parts of these trees are used for medicinal purposes which lesser known to respondents. The leaves of Bay leaf are well used only as spice and the

leaves of Elephant Ear Fig are used for fodder and fruits are eaten as laxative. Thus for the double purpose, Elephant Ear Fig tree is known to more respondents compared to Bay leaf. Other trees are known to less number of respondents (one to nine per cent) due to their limited use in the day today life of the respondents.

Fruit trees on the farm

Most of the fruit trees are also the sources of fodder in addition to fruits. The knowledge of respondents about the fruit tree is thus important for sustainability and livelihood. The respondents were having knowledge of both cultivated (thirteen trees) and wild fruits (nine). Close perusals of data in **Table 2** revealed that majority of the respondents (53.33 per cent) were well knowledgeable about wild fruit Kaphal (box berry) tree. This was mainly due to nutritious fruits which were available during summers and the leafy fodder which is available round the year as this is evergreen tree (**Rawat et al., 2012**). Next to this the percentage of knowledgeable women was 44 per cent about Kilmorah (barberry). This shrub/under tree also gives fruits during late summer or early rainy season which are eaten as a nutritious diet. In addition, the juice of it's

Table 2: Per cent knowledgeable women (PKW) for fruit trees in the study area.

Sl no	Name of fruit trees		Respondents (number)	PKW
	Local	Botanical/ (English)		
Wild fruits				
1	Hisalu	<i>Rubus ellipticus</i> Sm. /(Himalayan Yellowraspberry)	50	33.33
2	Kilmoda	<i>Berberis aristata</i> DC. /(Barberry)	66	44.00
3	Kaaphav	<i>Myrica nagi</i> Hook. f. non Thumb. (Box berry)	80	53.33
4	Ghingaru	<i>Crataegus oxyacantha</i> / (Crataegus)	24	16.00
5	Pangar	<i>Aesculus indica</i> Cloebr. / (Aesculus)	34	22.67
6	Jamun	<i>Syzygium cumini</i> Skeels. / (Java plum)	33	22.00
7	Mehal	<i>Pyrus pashia</i> Bunch-Ham /(Pyrus)	35	23.33
8	Bamor	<i>Benthamidia capitata</i> (Wall. ex Roxb.) /(Benthamidia)	31	20.67
9	Timil	<i>Ficus auriculata</i> Lour. / (Elephant Ear Fig)	30	20.00
Cultivated fruits				
10	Plum	<i>Prunus domestica</i> L. / (Plum)	32	21.33
11	Seb	<i>Malus domestica</i> Borkh. / (Apple)	30	20.00
12	Malta	<i>Citrus sinensis</i> Osbbck. / (Sweet orange)	55	36.67
13	Neebu	<i>Citrus limon</i> Burn. / (Lemon)	48	32.00
14	Amrood	<i>Psidium guajava</i> L. / (Guava)	29	19.33
15	Darhim	<i>Punica granatum</i> L. / (Pomgranate)	28	18.67
16	Aonla	<i>Emblica officinalis</i> Gaertn. / (Indian gooseberry)	23	15.33
17	Harad	<i>Terminalia chebula</i> Retz. / (Chebulic myrobalam)	33	22.00
18	Khumani	<i>Prunus armenica</i> L. / (Apricot)	29	19.33
19	Kimu	<i>Morus alba</i> L. / (Mulberry)	29	19.33
20	Aadu	<i>Prunus persica</i> L. / (Peach)	19	12.67
21	Nashpati	<i>Pyrus communis</i> L. / (Pear)	15	10.00
22	Akhorh	<i>Juglans regia</i> L. / (Walnut)	14	9.33

stem bark is commonly used by the respondents for trouble and some use as medicine to cure diabetes. These features of this plant made it more popular among respondents. Another wild tree Hisalu (Himalayan yellow respberry) was known to 33.33 per cent women for its juicy fruits. Rest of the fruit trees were known to 16-23 per cent respondents (**Table2**). Among cultivated fruits, majority of respondents (32-36 per cent) had good knowledge of citrus fruits like malta and neebu. The trees like aadu, nashpati, hararh, amrood, seb, plum were known to 19-22 per cent respondents. Since these fruits are grown in a limited space, minimum respondents told about them. Rest of the fruits mentioned in **table 2** is known to nine to 18 per cent respondents.

Use of non-wood forest products

Non wood forest products like leaves, fruits, flowers, fiber, fodder etc edible and non edible products for trade are well known to the respondents. It becomes clearly evident from **Table 3** that majority of respondents (61.33 per cent) use buransh flowers followed by dry and green leaves of oak (58 per cent), timil leaves and fruits (52 per cent), and kilmorha fruits and stem bark (45.33 per cent) for their day to day livelihood. Nearly a quarter of respondents ranging from 20 to 25 per cent were found to use non-wood forest products such as timur fruits, semal cotton and leaves, pine fruits and needles and hisalu fruits. Dependency of localites and dwellers

Table 3: Distribution of respondents according to non wood forest products used by them

Sl.No.	Non wood forest products	No. of respondents	Percent
1.	Oak (green & dry leaves)	87	58.00
2.	Timur fruits	31	20.67
3.	Timil leaves and fruits	78	52.00
4.	Adeesh	24	16.00
5.	Kanyare	12	8.00
6.	Buransh(flower)	92	61.33
7.	Bhimal (fodder & fiber)	59	39.33
8.	Semal (cotton & leaves)	38	25.33
9.	Utis leaves	13	8.67
10.	Fayat leaves	6	4.00
11.	Jhula (oak moss)	17	11.33
12.	Edible Mushroom	26	17.33
13.	Pine (gum and needles)	38	25.33
14.	Honey	13	8.67
15.	Kilmoda fruits and stem bark	68	45.33
16.	Hisalu fruit	30	20.00
17.	Kaafal fruit and leaves	22	14.67
18.	Kharsu leaves and tender twigs	9	6.00
19.	Ghingaru fruits	9	6.00

on non wood forest products has been reported by earlier works (**Tiwari et al., 2008; Chang, 2010; Lepcha and Subha, 2010**). Since these products are less available in the forest due to animal interference except for pine resin which is mostly collected and taken by forest department, the less number of respondents were found to use these products. About 14 to 17

per cent respondents were found to use kaphal fruits and leaves, adees and edible mushroom. Rest of the products as mentioned in **table3** are used by about four to eleven per cent respondents, this might be due to lesser availability and use for them. **Ray (2000)** identified the benefits derived from forests are- bamboo, fuel wood, small timber, thatch, sand, tubers, leaves, honey and other miner forest produce.

Cash crops grown

The farming system in the study area is well maintained by the residents. A close perusal of data in **Table 4** informs us that most commonly grown crop is potato which is beneficial to the respondents because of its availability in the lower elevation markets as off season vegetables. Similar is case for cabbage as it is grown by 74 per cent respondents, pea is grown by 68.67 per cent respondents and tomato by 66.67 per cent respondents. It was observed that chilli as spice is grown by comparatively less number of respondents (46 per cent) as it is not marketed as off season product due to its availability in market round the year from different sources. Bean and raddish are being grown by limited number of respondents (15.33 per cent and 18.67 per cent respectively) as these are less beneficial to the respondents. Other vegetables, cereals and pulses as mentioned in **table 4** are being grown by one to eight per cent respondents only, as these are non-economical and produce like potato, tomato, pea, cabbage are more beneficial and grown by majority of farmers/ respondents.

Table 4: Distribution of respondents according to cash crops grown.

Sl.No.	Cash crops	No. of respondents	Percentage
1	Potato	128	85.33
2	Tomato	100	66.67
3	Cabbage	111	74.00
4	Chilli	69	46.00
5	Raddish	28	18.67
6	Bean	23	15.33
7	Soybean	13	8.67
8	Pea	103	68.67
9	Groundnut	12	8.00
10	Turmeric	12	8.00
11	Ginger	13	8.67
12	Pumpkin	3	2.00
13	Rajmash	4	2.67
14	Ragi (madua)	8	5.33
15	Palak	11	7.33
16	Lahi	7	4.67
17	Gaderi (banda)	2	1.33
18	Capsicum	4	2.67

Fodders used

It is evident from the table that majority of respondents use fodder from trees mostly growing in forest. Dudhila leaves are being used as fodder by majority of respondents (72.67 per cent). This tree is found growing in farms of the respondents and also in forest. It is also considered as milk enhancing for milch animals, so used by majority of respondents. In a range of 50 to

57 per cent respondents use oak leaves, timil leaves and bhimal leaves. This is mainly due to the availability of these leafy fodders during lean period. About 34 to 41 per cent respondents use tushar and kharsu leaves. These are mainly used for spreading on the ground where animals are kept and also to a limited extent as fodder. Thus comparatively less respondents use these leafy fodders. Least preference is for gethi because of its less availability. Grasses as fodder are the second preference of use by the respondents. About 30-37 per cent respondents use local dry and elephanta grass and cultivated napier grass (**table 5**). The local dry grass (hay) is a seasonal grass which is used in lean periods. The napier or elephant grasses are perennial in nature and cultivated on bunds, slopes and margins of the farmland. Thus, even of their perennial nature, the availability is not to the extent as needed. Therefore, these grasses are used by fewer respondents. The grasses like oat, dimosea, mouse and chari are being used by nine to fourteen per cent respondents. Fewer users are due to poor biomass production of these grasses. Love grass is very less available and thus used by only three per cent respondents. Third preferred use is of crop residues among which wheat straw is used by 28 per cent respondents and millet/ pea crop residue by 14 per cent respondents only. This might be due to seasonal and low availability of these fodders. While conducting a pilot survey on fuel consumption by hilly people, **Mishra et al. (1998)** observed firewood as main source of fuel following grasses. **GOI (2000)** reported 80 per cent wood is used as fuel in rural areas.

Table 5: Distribution of respondents according to fodder used by them.

S.No.	Fodder	No. of respondents	Percentage
	Grasses		
1.	Local grasses(hay)	45	30.00
2.	Chari (cultivated jowar)	19	12.67
3.	Elephanta grass (cultivated)	45	30.00
4.	Mouse grass	14	9.33
5.	Dimosea grass (cultivated)	21	14.00
6.	Nappier grass (cultivated)	56	37.33
7.	Jwat (cultivated oat)	14	9.33
8.	Love grass	5	3.33
	Crop residues		
9.	Pea crop residue	21	14.00
10.	Wheat straw	42	28.00
11.	Millet residue	22	14.67
	Tree and other fodders		
12.	Bhimal leaves	86	57.33
13.	Quaral leaves (<i>Bahuniya variegata</i> L)	42	28.00
14.	Timil leaves	84	56.00
15.	Gethi	12	8.00
16.	Dudhila leaves	109	72.67
17.	Banjh leaves (<i>Quercus</i> Spp.)	76	50.67
18.	Kharsu leaves	62	41.33
19.	Tushar leaves	51	34.00

Availability of non-wood forest products

The respondents of the study area are well aware about the fact that forests are the main source of fuelwood and the importance of forest in environmental protection. They were also well aware that the forests are the main source of traditional medicine (Samal *et al.*, 2002) and building material which was voted by more than two third of respondents (90 per cent and 82.67 per cent respectively). About slightly more than 50 per cent respondents were well aware that the forests are the source of raw material for trade and wild fruits. Thus such information gives a view that the majority of respondents in the study area are well aware about the benefits of forest to fulfill their basic needs of livelihood. This compels them to conserve the forest by their involvement in major activities of conserving them. Out of 150 respondents interviewed about the availability of non-wood forest products from the forest, maximum respondents (89.33 per cent) voted for timber and poles followed by nearly two third (73.33 per cent) for fruits and tubers (table 6). Contrasting data was presented by Mishra (2003) that forests were used by only quarter of rural people (23.07 per cent) for timber. More than 50 per cent respondents were of the opinion that traditional medicine and honey was available from the forests. Only 32 per cent respondents were in favour of the availability of pine needles. Since few respondents/groups of respondents are using pine needle for making pine briquettes which might be the probable reason for the lesser respondents voted for availability of pine needle. Availability of non wood forest products has been reported by earlier works (GOI, 2000).

Sources of fuel used

On the basis of fuel used maximum respondents (96 per cent) were in favor of fuel wood followed by 76.67 per cent respondents in favor of kerosene. Since fuel wood is easily available and widely used by the respondents and kerosene is available by regulated distribution system of the government. Most of the respondents use these sources of fuel (Hussain, 2001). Also LPG has made available by government distribution system, that's why more than half of the respondents (54 per cent) use this source. It seems that only resource sufficient respondents are availing the fuel facility of government distribution system. Since the technology for pine briquettes is newly introduced by the UDWDP project, it is being used by few respondents (44 per cent) as is evident from table 6. Cow dung cake is being used by the least number of respondents (16.67 per cent). The easy availability of fuel wood and converting cow dung to manure (livestock excreta mixed with forest leaf litter) for crop production might be reason for its less utility by the respondents. Not a single family using cow dung cakes as fuel has been reported by Mishra *et al.* (1998).

Table 6: Distribution of respondents according to availability of non wood forest products, sources of fuel used, number of trees on the farm and meeting shortage of fodder

Sl. No.	Categories	No. of respondents	Percentage
Non wood forest products available			
1	Timber & Poles	134	89.33
2	Traditional Medicine	99	66
3	Honey	77	51.33
4	Oil Seeds	0	0

5	Fruits & tubers	110	73.33
6	Others (pine needles)	48	32
Sources of fuel used			
1	LPG	81	54
2	Fuel wood	144	96
3	Kerosene	115	76.67
4	Cow dung cake	25	16.67
5	Others (pine briquettes)	66	44
Number of trees in farm			
1	Less than 30 trees	55	36.67
2	30-174 trees	81	54
3	Above 174 trees	14	9.33
Meeting shortage of fodder			
1	Purchase from market	121	80.67
2	Cultivation	26	17.33
3	Forest	28	18.67
4	Neighbouring village	13	8.67

Trees on farm

It is evident from the table 6 that majority of respondents (54 per cent) had 30 to 174 trees in their farm followed by 36.67 per cent respondents having less than 30 trees. Minimum number of respondents (9.33 per cent) were having more than 174 trees in their farm. This indicates the women farmers of the study area are well aware with the fact that growing specific number and type of trees on the farm has dual benefit of vitalizing/ saving soil as well as easy availability of fodder and fruits.

Shortage of fodder

The information about meeting the shortage of fodder is from four sources viz., market, cultivation, forest and neighboring villages as told by the respondents in discussions (**table6**). Among these, 80 per cent respondents meet the shortage of fodder by purchasing from market. This is generally done by resourceful farms that too in lean periods. Fodder shortage from cultivation and forest source is met out by 17 to 18 per cent respondents and least respondents (eight per cent) meet out the shortage of fodder from neighboring villages. **Awasthi et al. (2001)** stressed on the need of using traditional knowledge of managing forest resources for reducing process of degradation of resources.

CONCLUSION:

In study area majority of the women own knowledge of those trees which are beneficial to them both in terms of livestock rearing and trade like Rhododendron, Nepalese Alder and oak trees. They are well aware about the wild (box berry, barberry and Himalayan Yellow raspberry) as well as cultivated fruits (citrus fruits like malta and neebu). Majority of women (61.33 per cent) use buransh flowers , dry and green leaves of oak (58 per cent), timil leaves and fruits (52 per cent), and kilmorha fruits and stem bark (45.33 per cent) for their day to day livelihood. Most commonly grown crops by women farmers are potato (85 percent),

cabbage (74 percent), Pea (68.67 percent) and tomato (66.67 percent) which is beneficial to the respondents because of its suitability as off season vegetables. Majority of respondents use fodder from trees like Dudhila (72.67 per cent), oak leaves, timil leaves and bhimal leaves (50 to 57 per cent) mostly growing in forest. Majority of women in the study area are well aware about the benefits of forest to fulfill their basic needs of livelihood. This compels them to conserve the forest by their involvement in major activities of conserving them. Majority of women farmers (54 per cent) had 30 to 174 trees in their farm. The local inhabitants and the forest dwellers have their own knowledge about the utilization and conservation of plant resources, which passes from generation to generation (**Sharma et al. 2011; Gaur and Sharma 2011**), so it is important to record such knowledge from these people for proper assessment and conservation of plant resources for future use as these resources are diminishing at faster rate with the various developmental activities in the region.

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