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RESEARCH ARTICLE

Edge Effects on Vegetation Structure and Resource Use Pattern at Two Community Forests of Surkhet, Nepal

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Highlights

- Two community managed forest of Surkhet district were studied to compare the edge effect on forest structure and their resource use pattern.
- Seedling, sapling and tree density indicated good regeneration at core forest mostly but the seedling numbers at the edge were slightly higher than the core at Furkesalli community forest (FCF).
- More density of seedlings than trees at the edge part of FCF is found to be linked with intensive cattle domestication with stall feeding system.
- A total of 26 medicinal plant species under 25 genera and 23 families were recorded.

Abstract

This study assessed the forest structure and regeneration at the edge and core parts of two community forests, Ram Janaki and Furkesalli of Surkhet district, Western Nepal, and the forest resources use pattern. Different blocks designated by community forest user groups were considered to designate edge and core strata for stratified random sampling. For vegetation analysis and regeneration of tree 15 circular plots (n = 60) of 10m radii; for shrubs 5m radius subplot and for herbs three 1 m radii subplots within the 10 m radii circular plots were considered. Semi-structured questionnaire approach was employed for the collection of ethnobotanical data. Based on importance value index dominant herbs were Ageratum haustoniaum in edge and Heteropogon contortus core part; dominant shrub were Phoenix acaulis in both community forests (RCF and FCF); and Shorea robusta was dominant tree at edge forest of both RCF and FCF whereas Lagerstroemia parviflora was dominant at FCF core-forest. The species diversity was recorded higher in core parts in both forests. The forests are rich in the diversity of medicinal plants with 26 species under 25 genera and 23 families of which root parts were mostly used as ethnomedicine and mostly for gastrointestinal disorder. Besides medicines, firewood, fodder, fruits, vegetable, timber and bedding material were the other uses of forest resources.

Keywords: *importance value index, species diversity, DBH class, resource use, livestock*

Introduction

The plant community of a particular area is the sum of plant species growing together with particular relationship among the species [1]. The plant community of particular forest area is also considered as historic fuction of abiotic and biotic factors of that ecosystem [2]. Scientific study of vegetaion structure and composition of forest system is very crucial to get in depth information about tree population, regeneration and diversity in creating plans for conservation and management related activities [3, 4, 5, 6].

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Vegetation structure, composition and phytosociology usually depends upon the reproduction potential of all species present in the ecossyem [7]. Natural regeneration of plant species is a process of formation of adult population through seedlings and saplings [8]. Regeneration is determined by reproduction potential which indicates the health and viability of forest [9]. In most cases forest regeneration is influenced by several biotic and abiotic factors they include natural and human activities such as forest fire, disease outbreak, drought, deforestation and forest degradation, grazing, developmental activities, climate change etc. [10,11,12]

Forest ecosystem are rich in natural resources and provides number of good and services to support the basic needs of local stakeholders [13]. Recent data suggests that globally about 20% people extracts naturals resources from forests [14]. With few exceptions the forest resource use pattern is almost similar throughout the world and the common resources used by local communities are food, construction materials, fuelwood, medicine, fodder etc. [15, 16, 17, 18, 19]. Some research suggests that globally more than 80% population use traditional health care system and the population is relatively higher in developing countries [20]. In Nepal about 1900 plant species has been suggested as medicinal plants [21]. Most of the medicinal plants and plants for other uses are extracted from community forests which is the main pressure on forest based natural resources of Nepal [22, 23, 24].

This study aims to explore the forest structure and regeneration at the edge and core part of two community forests of Surkhet district, Karnali Province of Nepal. The differences in forest resource use pattern at different sites i.e edge and core part of these two community forests were further investigated to know the relationships between the forest resource use and family size of household or number of domesticated animals.

Materials and Methods

Study Area

The study was carried out in two *Shorea robusta* forests of Chhinchu of Bheriganga Municipality, ward no 4 and 7 , Surkhet district, Nepal (Fig. 1, 2, 3 and 4). The Chhinchu covers an area of 261.75 km^2 and expands between 28°25'50" N to 81°43'38" E. Chhinchu is located at 500 to 900 m asl. The study area is characterized by subtropical climate. The mean annual maximum and minimum temperature of the area is 30.49^{0}C and 15.27^{0}C respectively. The area experiences the maximum average monthly temperature during April with 35.89^{0}C and minimum during December with 6.41^{0}C. Wet season in Surkhet starts from May and lasts till August. The highest precipitation was recoded in August followed by July, June, May, and September respectively. Very low precipitation occurred during October, November December and January**.** The average annual relative humidity of the area is 77.23%.

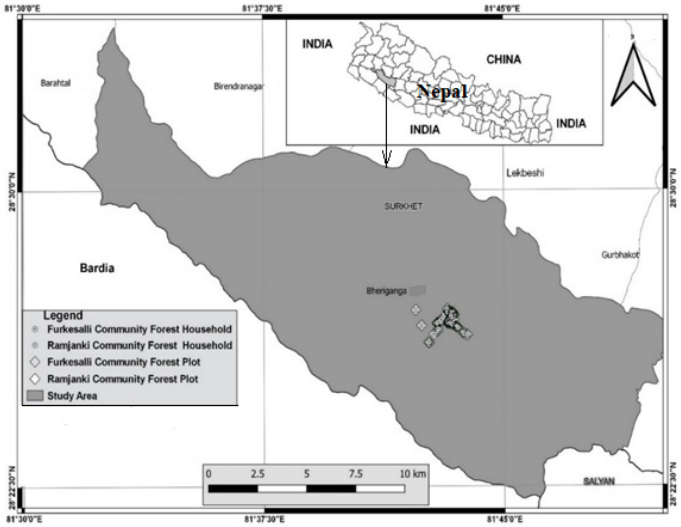

Fig 1. Map of Surkhet district showing location of study sites.

Fig 2. Yellow marks showing the sampling points at Ram Janaki community forest for edge site plots.

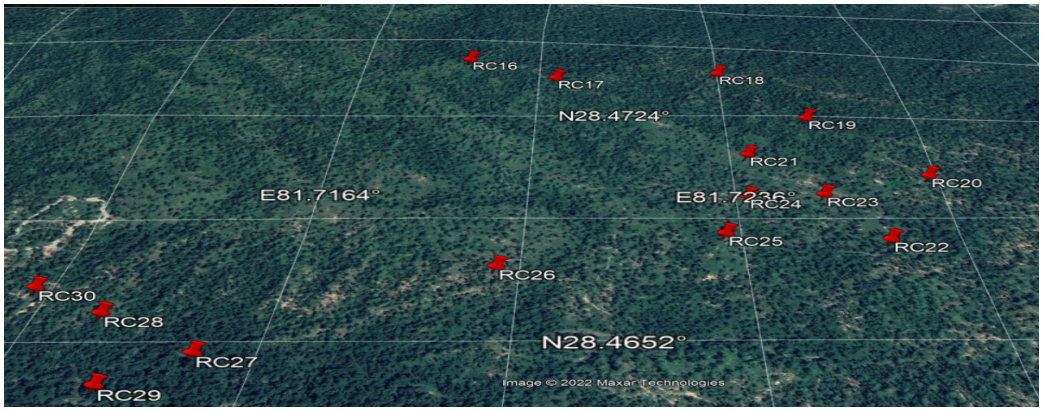

Fig 3. Red marks showing the sampling points at Ram Janaki community forest for core site plots.

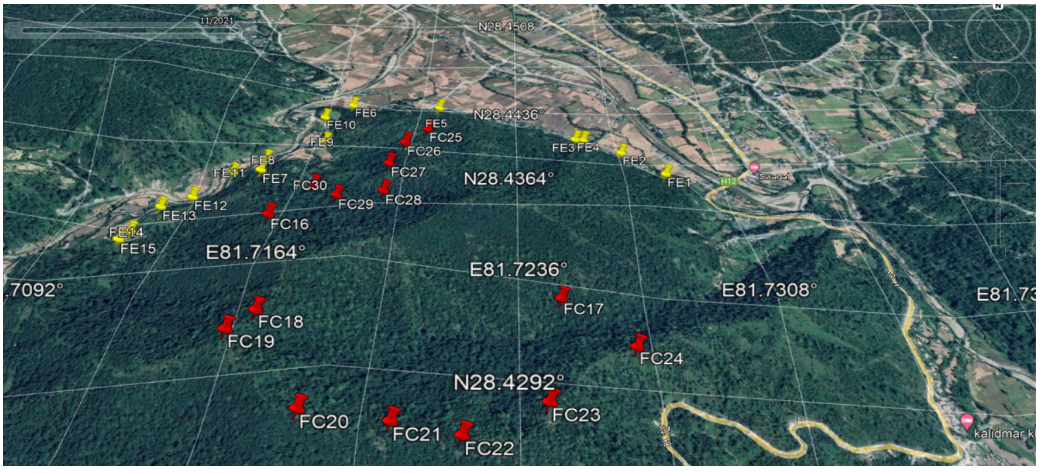

Fig 4. Edge (yellow marks) and core (Red marks) sites sampling points at Furkesalli community forest.

Study Forests

The study was conducted in Furkesalli community forest (FCF) ward number4 and Ram Janaki community forest (RCF) ward number7 of Bheriganga municipality, Surkhet. Ram Janaki Community forest is located adjacent to the Ratna highway at Chinchu, but Furkesalli community forest is located adjacent to subway road to villages from the main road. *Shorea robusta* is a dominant tree in RCF and *Lagestromia parviflora* is most dominated in FCF. Other common associated species in both forests are *Terminalia chebula*, *Terminalia tomentosa* (saj), *Syzygium cumini* (Jamun), etc. RCF was divided into 3 blocks whereas FCF was divided into 6 blocks to prevent forest from fire during summer season. FCF was handed over to community in 2054 BS (1997 AD) and covers an area of 238.47 hector with total 317 members whereas RCF was handed over to community in 2054 BS (1997 AD) and covers an area of 260.47 hector with 307 members.

Field Sampling

Vegetation sampling was conducted in the November, 2020. Stratified random sampling method was used in the sampling plots, the forest blocks designated by the CFUGS were considered as strata. Total number of plots to be sampled was proportionately distributed among the forest based on their edge and core part of the forest (Fig. 2, 3 and 4). To estimate the regeneration of tree 15 circular plots (n= 60) of 10m radii were established on both edge and core-part of each community forest. For shrubs and saplings 5m radii circular plot was established inside the main plots and for herbs and for seedling three 1m radii circular plot was established inside the main plot. Each tree species enrooted inside the plots were recorded. Trees height >1.37m with diameter10cm at breast height of all individual trees were measured. DBH tape was used to measure diameter and clinometers was used to estimate the tree height. The 10 m radii plot (quadrat) was divided into 3 sub plots of 5m radii for shrub and 3 plots with radii 1m for herbs. Individuals with DBH < 10 cm and height 1.37m as sapling similarly, individuals with height <1.37 cm were considered as seedlings [25]. Geographical location (latitude and longitude) and elevation of each plot was recorded using GPS at center of the main plot. Slope and aspect were measured by clinometers. Canopy cover for each plot was estimated by visual estimation method from the center point. Most of the specimens were identified by local respondent present with us at the time of forest sampling. Unidentified species were collected, tagged and herbarium were prepared. The herbarium were identified with the help of experts and comparing the herbarium at KATH Godavari, Nepal.

To collect forest resource used pattern data and the dependency of local people on forest resources, a semistructured questionnaire was developed. The information's were collected from ethnic group, women, people of different economic status and key persons like school teacher, community forest user groups and local body authorities.

Data Analysis

For the vegetation analysis different parameter such as density, relative density, frequency, relative frequency, importance value index (IVI), and diversity indices [26, 27] were calculated. Vegetation analysis were carried out by using Zobel *et al*., (1987) [28]. To understand the dependency of people on forest resources, Pearson correlation analysis was done between fodder/ fire wood collection with family size of the households, and also with number of deomesticated animals, using IBM SPSS version 25 .

Results and Discussion

Vegetation Structure

Altogether 107 plant species were recorded in Ram Janaki community forest of which herbs 60 species, shrub 31 species and tree 16 species. Similiarly, 96 plant species were recorded in Furkesalli community forest of which herbs 45 species, shrub 33 species and tree 18 species.

In Ram Janaki Community forest (RCF), at the core parts 9 tree species, 12 shrub species and 19 herb species were recorded but at the edge portion of the same community forests 12 tree species, 25 shrub species and 43 herbs were present. Among the species recorded *Ageratum haustoniaum* had highest IVI (66.08) and *Cyperus fibrystils* had lowest IVI (0.57) at the edge portion of the RCF. But the IVI value of *Heteropogon contortus* was highest (64.72) and of *Phyllanthus urinaria* was lowest at core part of RCF. Similarly, seedling of *Shorea robusta* was more frequent than other associated tree species at both edge and core sites. Seedlings of *Dalbergia sissoo*, *Mallotus philippensis*, *Leucaena leucocephala* species were restricted at edge part, whereas seedlings of *Lagerstoemia parviflora, Phyllanthus emblica* and *Madhuca latifolia* were restricted at core part of the RCF.

In Furkesalli community forest (FCF) at the core part 8 tree species, 18 shrub species and 23 herb species were present, but at the edge part of the same forest 15 tree species, 21 shrubs and 33 herb species were present. At the edge part of the FCF, *Ageratum haustoniaum* scored highest IVI (i.e. 104) and *Digitaria ciliaris* scored lowest IVI (i.e. 1.01) but at the core part of it *Heteropogon contortus* scored highest IVI value (i.e. 61.61) and *Setaria glauca* scored the lowest IVI (i.e. 0.93). In FCF also, seedling of *Shorea robusta* was more frequent than other associated species at both edge and core part of the forest. Seedling of *Terminalia elliptica, Syzygium cumini, Semecarpus anacardium* were most dominated in edge whereas seedling of *Lagerstroemia parviflora* was most dominated in core-forest.

In both Forests, Shannon Wiener diversity index (H) and Simpson's diversity index (Ds) value for herbs, shrubs and trees were found higher in core part of the forest than in forest edge except Simpson diversity (Ds) of shrub which was found higher in edge than core-part (Table 1).

Table 1. Shannon Wiener and Simpson index of herbs, shrubs and trees in Ram Janaki Community Forest and Furkesalli Community Forest

		Shannon's Wiener diversity index (H)		Simpson's diversity index (Ds)	
Life form	Forest part	RCF	FCF	RCF	**FCF**
Herbs	Edge	0.74	0.69	0.91	0.84
	Core part	0.8	0.8	0.9	0.92
Shrubs	Edge	0.68	0.77	0.87	0.9
	Core Part	0.7	0.7	0.86	0.83
Trees	Edge	0.55	0.79	0.582	0.83
	Core part	0.58	0.817	0.583	0.816

Table 2. Similarity index between Ram Janaki community forest and Furkesalli community forest.

Life forms	RCF edge-core part	FCF edge-core Part	RCF-FCF edge Part	RCF - FCF core part	RCF – FCF
Herb	33.33	41.16	44.44	34.48	46.73
Shrub	37.21	52.83	66.67	64	64.86
Tree	30.3	66.67	58.06	50	52.83

Forest Regeneration

In Ram Janaki community forest (RCF) density of seedling, sapling and tree of all species at the edge was 5324.84 stem/ha, 201.70 stem/ha. and 435.24 stem/ha respectively, but at core-forest it was found to be 6917.20 stem/ha, 509.55 stem/ha, and 545.15 stem/ha respectively (Fig. 5). Density of all life form of *Shorea robusta* was found to be higher than other species in both edge and core part of the forest (Fig. 6). Which was followed by *Dalbergia sissoo*, *Acacia catechu*, *Terminalia elliptica* and *Mallotus philippensis*.

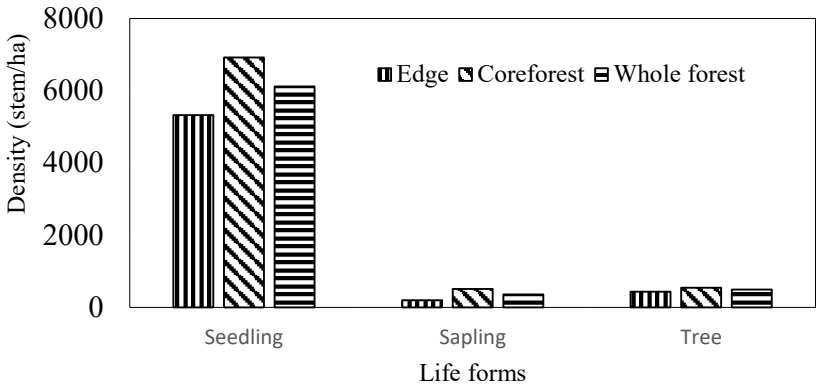

Fig 5. Different life forms of all species in of Ram Janaki Community forest.

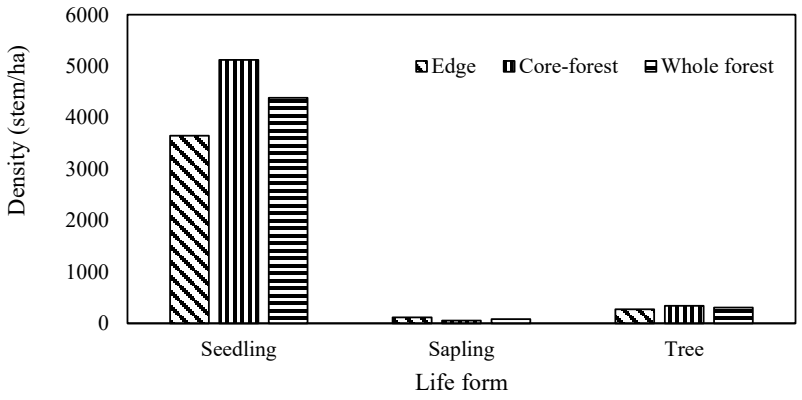

Fig 6. Different life forms of Shorea robusta in Ram Janaki Community forest.

In Furkesalli community forest (FCF) density of seedling, sapling and tree of all species at the edge sites were 3811.04 stem/ha, 1091.3 stem/ha, 271.76 stem/ha respectively whereas in core-forest it was found to be 3575.37 stem/ha, 1104.03 stem/

ha, 543.52 stem/stem respectively (Fig. 7). Similar to Ram Janaki forest density of all life form of *Shorea robusta* was higher than other species at both edge and core part of the forest (Fig. 8). Tree species dominated at the edge sites of the forest are *Ficus semicordata, Magifera indica Dalbergia sissoo* whereas tree species dominated at core sites are *Semecarpus anacardium*, *Lagerstroemia parviflora* and *Terminalia elliptica*.

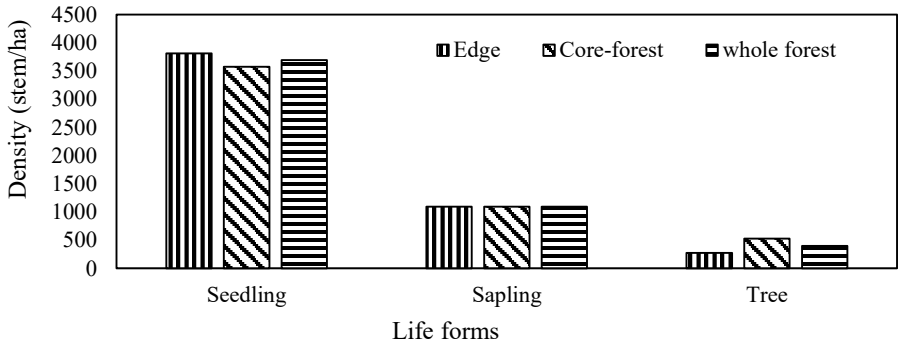

Fig 7. Different Life forms of all species in edge and core-forest of Furkesalli Community forest.

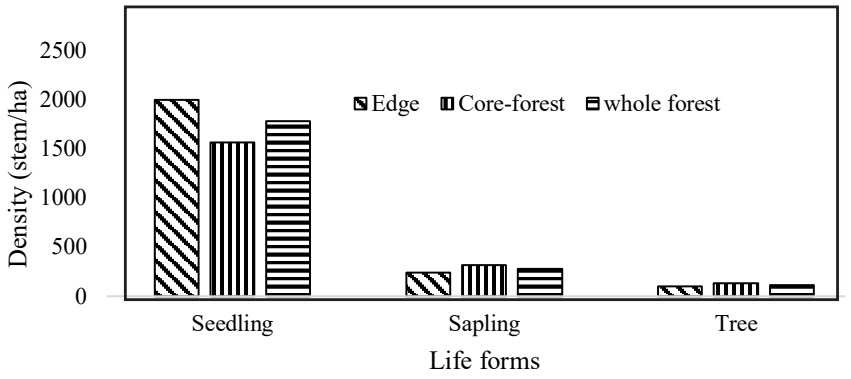

Fig 8. Different life forms of Shorea robusta in Furkesalli Community forest.

In both community forest overall regeneration is good with reverse J shaped density diameter curve (Fig. 9 and 10). In the core part of RCF density of DBH class 25-30 cm was highest, and the density of young trees having DBH from 10 to 25 cm were almost same. But at the edge of RCF, the forest was degraded as the density of regenerating young trees ranging from 10-20 cm DBH were high but the old trees (having DBH 20 – 35 cm) were very low in comparision to its core sites (Fig. 9). In comparison to RCF, the edge part of FCF was found to be degraded as the density of tress at edge part of FCF was almost half of the density than that of RCF. The density of young trees (having DBH between 10- 25 cm) at the edge part of FCF were more than 50% less than that at RCF (Fig. 9 and 10).

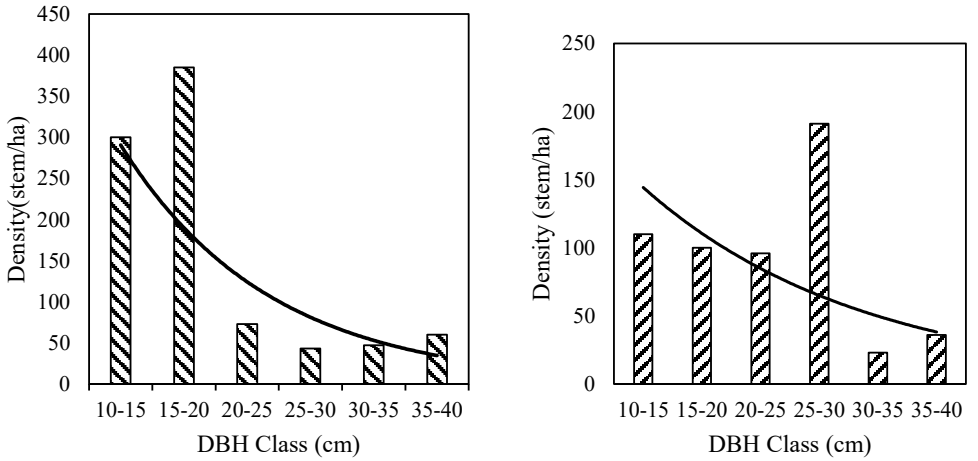

Fig 9. Density diameter (d-d) relationship of trees in Ram Janaki community forest; edge (left) and core (right) part of the forest.

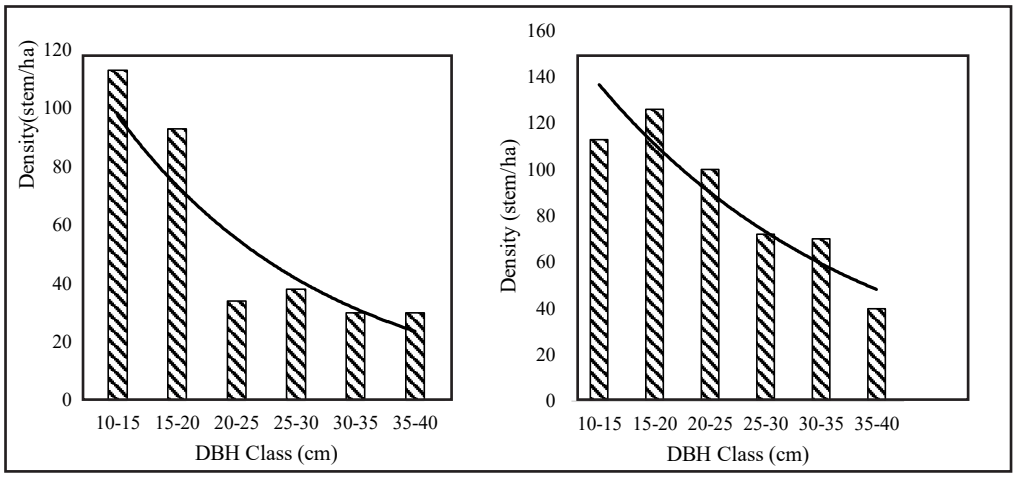

Fig 10. Density diameter (d-d) relationship of trees in Furkesalli community forest edge (left) and core (right) part of forest.

Plant Resource use Pattern

Traditional use of forest resources was enquired among 20% household of each community forest user group. The average family size of RCF was found to be 5.82 persons per household and of FCF was 5.8 persons per household (Table 4). Total number of livestock in the two community forests were almost same, but the type of animal stock at RCF were mostly goats and a few cow whereas at FCF were mostly large size animals like cow, buffalo, ox and a few goats. The average fodder consumption / household/ year was quite high at FCF than at BCF. Besides this the average fuelwood consumption/household/year at FCF was very high, almost double than that at RCF.

Table 4. Socioeconomic status of Ram Janaki Community Forest (RCF) and Furkesalli Community Forest (FCF)

Variables	**RCF**	**FCF**
Total number of households	307	317
Number of households sampled	60	60
Total population	2053	1628
Average family size (persons per household	5.82	5.92
Number of males	994	818
Number of females	1059	810
Sex ratio (females per thousand males)	1065	990
Livestock		
Total livestock population	880	890
Average number of animals/households	2.67	2.96
Livestock-owning families (%)	70	86.67
Average fodder consumed/household/Year (Kg)	134.75	190.05
Energy consumption		
Average fuelwood consumed/household/year (Kg)	422.4	800
Average LPG consumed/household/year (Kg)	50.126	56.232

In Furkesalli Community Forest, the fodder consumption per household did not show significant correlation with any parameters, but the number of livestock per household had significant ($p=0.01$) positive correlation with fuelwood consumption per household as well as average family size. Besides this fuelwood consumption per household also showed significant ($p= 0.05$) positive correlation with average family size (Table 5) at FCF. This clearly indicated that the people at FCF are more dependent

on forest for the fuelwood.

Table 5. Pearson's correlation coefficients between different parameters of Furkesalli Community Forest

Variables	1	2	3	4	5
1.Fodder consumption per household	1				
2.Number of Livestock per households	.242	1			
3.Fuelwood consumption per household	.242	1.000**	1		
4.Average family size	-.168	**.257***	**.257***	1	
5.LPG consumption per household	-.225	-.191	-.191	-.087	1

*. Correlation is significant at the p = 0.05 level (2-tailed).
**. Correlation is significant at the p = 0.01 level (2-tailed).

In Ram Janaki Community Forest the fodder consumption per household was significantly (p=0.05) positively correlated with number of livestock per household and fuelwood consumed per household. Fuelwood consumption per household shows a significant (p=0.05) negative correlation with LPG consumption per household. Number of livestock per household, fuelwood consumption per household and family size did not show any significant correlation with other parameters (Table 6).

Table 6. Pearson's correlation coefficients between different parameters in Ram Janaki Community Forest

Variables	A	B	C	D	E
A. Fodder consumption per household	1				
B. Number of Livestock's per households	**.307***	1			
B. Fuelwood consumption per household	**.387****	.062	1		
D. Family size	-.090	.081	.018	1	
E. LPG consumption per household	-.165	-.179	**-.320***	-.059	1

*. Correlation is significant at the p = 0.05 level (2-tailed).
**. Correlation is significant at the p = 0.01 level (2-tailed).

Altogether 26 medicinal plant species belonging to 25 genera and 23 families (Table 7) were documented during this investigation . Of these 26 medicinal plant species 11 were herbs, 6 shrubs, 7 trees and 1 each of fern and climber.

Table 7. Medicinal plants and their uses by local peoples

Species	Family	Parts Used	Ailments
Tinospora sinensis	Menispermaceae	Whole parts	Common cold, increase milk production in Animal
Didiymocarpus aromaticus	Gesneriaceae	Leaf	Swelling of gum, stomach disorder
Justica adhatoda	Acanthaceae	Leaf	Diabetes, leaf decoction used for asthma
Murray koenigii	Rutaceae	Leaf	Gastric
Aleuritopteris leptolepis	Pteridaceae	Leaf	Gastric
Xanthium strumarium	Asteraceae	Root, leaf	Appetite, Malaria
Urtica dioica	Urticaceae	Root,	Diabetes
Cucuma zedoraria	Zingiberaceae	Root	Natal stage
Acorus calamus	Acoraceae	Root	Common cold
Cissampelos pariera	Menispermaceae	Root	Dysentery
Ficus racemosa	Moraceae	Latex	Dysentry
Terminalia chebula	Combretaceae	Fruit, Bark	Cough, cold and respiratory problems, Diarrhoea, dysentery, cut and wounds.

Terminalia elliptica	Combretaceae	Fruit, Bark	cough, cold and respiratory problems, Cut, wounds, and skin diseases.
Phyllanthus emblica	Phyllanthaceae	Fruit,	Cough, cold and respiratory problems.
Pinus roxburghii	Pinaceae	Resin	Pain relief, reduce swelling
Woodfordia fruticosa	Lythraceae	Bark	Burnt part
Imperata cylindrical	Poaceae	Root	White worms
Magnifera indica	Anacardiaceae	Bark	Dysentry
Syzygium cumini	Myrtaceae	Bark	Diarrhoea, dysentery, cut and wounds
Centella asiatica	Apiaceae	Whole parts	Skin disease, leprosy and mental disorder
Thysanolaena maxima	Poaceae	Root	Gano jane
Datura metel	Solanaceae	Leaf	Epilepsy
Canavus sativa	Cannabaceae	Leaf	Chamre disease in goat
Euphorbia hirta	Euphorbiaceae	Whole parts	Cut and wounds
Oxalis corniculata	Oxalidaceae	Whole parts	Swellling
Rumex nepalensis	Polygonaceae	Root	Joint pains and wounds

Local people used different plant parts for different purposes. This study showed that roots of 29% (8 species), leaves of 25% (7 species), bark of 14% (4 species), Fruit 11% (3 species), Latex 3% (1 species), Resin 4% (2 species) and whole part of 14 % (4 species) were used for medicine (Fig. 11).

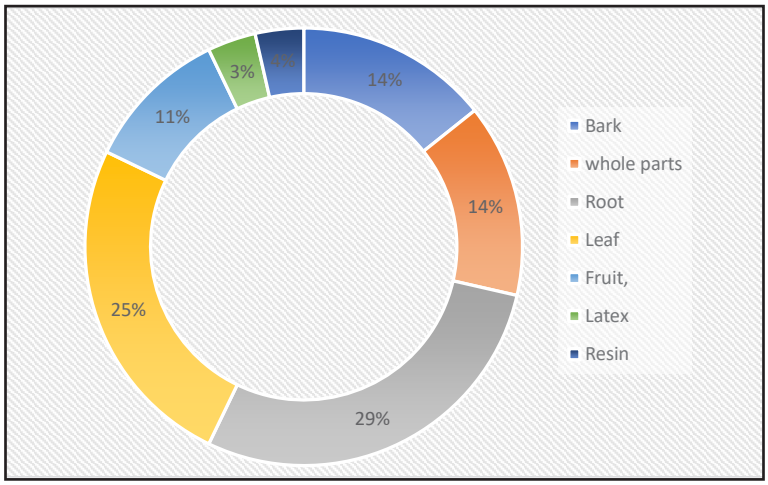

Fig 11. Percentage of total medicinal plants used by parts.

Vegetation Structure

The IVI value of trees indicates that the *Shorea robusta* are the most important and highly dominant tree species at both Ramjanaki and Furkesalli community forest. The IVI values of major plant species of these forests are similar to the results obtained in community forest of Baglung district [29] but higher as compared to Basyal (2011) [30] and lower to Joshi *et al.,* (2021) [31]. In general, high values of IVI are considered as the dominance and evolutionary success of the species for reproduction and successful establishment [32].

Ageratum haustoniaum, an invasive species, scored highest IVI at the edge site of both RCF and FCF. From this it appears that the edge site of both RCF and FCF is highly disturbed with human activities. High disturbances encourage invasive species to establish and is evident from its high IVI value obtained in the present study. Besides this, high disturbance at the edge site of FCF is also evident from the high fuelwood consumption per households along with low tree density (at the edge) than that at core area of the same forest.

The Shannon Weiner and Simpson diversity indices of herbs and shrub layer was higher as compared to tree diversity (Table 1) in both forests. Besides this, the Shannon Weiner Diversity index is high at core forest area than at edge site is possibly due

to disturbances at the edge site. Disturbances like cutting of branches for fuel wood or fodder, and also less density of trees especially at FCF, which prevails at the edge site, permit the sunlight to reach up to the ground and this possibly modified the resource availability and environmental conditions suitable for herb and shrub layer plants [33].

Forest Regeneration

The density of tree, sapling and seedling was higher at the core part of the forest than at the edge part of the forest at RCF which might be due to the high human disturbance as well as due to some impact of invasive *Ageratum haustoniaum* at edge part than at core part of the forest. As RCF is lying adjacent to Ratna highway near the Chinchu main bazar, hence chances of illegal activities like fire wood collection, grazing, fodder collection could be the reason for reduced seedling, saplings and tree density. Members at RCF mostly had goats as domesticated animals and they freely use edge part of the forest for grazing and browsing. The browsing of goat naturally reduces the number of seedlings and saplings. Besides his easy access of road at RCF also facilited people to walked throughout the forest and extract resources. Similar findings were also reported by Gautam *et al*., (2016) in Siwalik range [34]. At Furkesalli community forest the result was opposite for seedlings, where the density of seedling was higher at the edge part than at the core part of the forest. The more seedling density at the edge part of FCF might be due to low tree density at the edge, which is almost half of its core part. Low density of trees creates open canopy cover and helps sunlight to reach to the forest floor and that makes the environment suitable for seed germination [33]. Besides this ecological reason, the second reasons for high density of seedlings at the edge part of FCF is also due to the domestication of more cows, ox and buffalo rather than goat. These large domesticated animals (like Cow, ox and buffalo) were mostly stall feeded rather than the free grazing. During stall feeding the domesticated animals are also supplied with cooked grain soup (called *kudo* in Nepali), which consume more fuelwood and this could be the reasons for less tree at the edge FCF.

In the core part of RCF density of DBH class 25-30 cm was highest, which indicated that after the initiation of RCF, community forest user groups must have given good conservation effort for regeneration and establishment seedlings and saplings for some years in the initial stage only in the past. The forest conservation effort at present seems to be more relaxed, which is evident from the density of seedling and saplings density at the edge of RCF.

Most of the research suggests that forest regeneration is measured in number of seedling and sapling per hactre, in general forest is considered good if seedling and sapling density per hactre is more than 5000 and 2000 respectively [35]. As the density of seedling of RCF meets the above mentioned criteria, the regeneration of this forest is good and satisfactory in both edge and core part of the forest. However, the density of sapling is less than the above mentioned criteria at both forest which might be due to the grazing, fodder collection and fuelwood collection as noted in the forest resource use pattern. The other possible reasons could be due to looping of saplings for fodder as suggested by Basyal *et al.,* (2011) [30]. The sapling density at RCF is comparatively very less than that in FCF.

The density diameter cure indicated the history of given forest which also reveals the resource use capacity of individuals [36]. However, the poor sapling number the reverse J-shaped curves obtained in all parts of both forest is the indication of sustainable, stable and good regeneration [30, 37, 38, 39]. This study also reveals that the reduced density of trees at the edge site of FCF was due to the fuelwood consumption. The fuelwood consumption of household at FCF is almost double than those at RCF.

Forest Resource Use Pattern

In the present study 26 plants were found to have medicinal importance, but in a similar study Thapa (2012) [43] reported only nine common medicinal plant species which are in use among Raji community of Surkhet. Sigdel and Rokaya, (2011) [44] reported 85 plant species under 79 genera and 56 families having medicinal values in Dang district, West Nepal. Shrestha and Dhillion (2003) [45] have reported that medicinal herbs are found abundantly and naturally in the environment. Pangeni *et al*., (2020) [46] also found herbs of medicinal value are the most representative lifeform followed by trees, shrubs, climbers.

Medicinal uses of plants in the present study are comparable with the ethnobotanical studies carried out by Bhattarai (2018) [47] and Kunwar *et al*. (2013) [48]. Due to the high contents of biologically active substances compared to other parts, leaves, underground parts, seeds and fruits are used mostly as medicines [49]. Another reason for higher uses of root, leaves and bark might be due to their availability throughout the year.

Besides medicinal plants, timber was another mostly extracted forest resource at both community forest. The extraction of timber was found higher in Furkesalli Community Forest as compared to the Ram Janaki Community Forest which could be mainly due

to larger sized domesticated animals (cow, ox and buffalo) at FCF, which are feeded with cooked soup (called *Kudo* in Nepali). The cooking activities for domesticated animals need more fuel wood, which could be the main reason for more consumption of fuelwood (almost double of RCF) at FCF. The dependency of household at RCF on forest for fuel wood is reducing and is evident from significant negative correlation between LPG consumption per household and Fuelwood consumption.

Conclusions

From this study it is concluded that the most dominant tree species was *Shorea robusta* in both edge and core part of both Ram Janaki community forest and Furkesalli community forest. The species diversity was higher at core part than at edge part of both community forests. A total of 26 medicinal plant species belong to 25 genera and 23 families were reported from these two community forests. The tree regeneration of both community forest is good with reverse J-shaped density-diameter curve. The more seedlings at core than at the edge of RCF might be due to more browsing of goats at edge part of the forest, but more seedlings at the edge of FCF is speculated due to stall feeding practices of domesticated animals (like cow, ox and buffalo). Invasion of invasive *Ageratum haustoniaum* plant was found at the edge part of both forest and was higher at FCF. Low tree density at the edge site of FCF is found to be linked with the feeding habit of domesticated animals like cow, ox, buffalo, which needed cooked soup along with stall feeding, and the cooking activities for feeding animals needed more fuelwood. Thus the type of domesticated animals impacted edge parts of the forests and had reduced seedling density at RCF and tree density at FCF. Availability of LPG gas, an alternative to fuelwood at market place like Chinchu, near to RCF has been found to be reducing dependency of people on forest for fuelwood, which is evident from their low fuelwood consumption.

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