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Assessing the Provisioning Services of Forest Ecosystem in a Bhuj Forest, Gujarat

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Abstract This research shows the general view on acquisition of forest resources by local communities. Forest not only provides provisioning services rather it is a concrete source of economic, social, political and cultural process as well. The study is conducted in Tapkeshwari Forest which is located far district of Kuch, Gujarat named as "Bhuj". The perception of community and impact of people on forest is main focal point of this research. Two villages named Haripur and Jadura which are adjoining villages near forest were sampled. The research was conducted merely on the basis of focal group discussion and prepared questionnaire which was asked to villagers. 82.5% of villagers responded that they collect firewood only from forest; 80% of households collect fodder from the forest and approximately 95% of households use the forest to graze their animals. Firewood is used as major fuel energy source for cooking at the households. A total of 82.5% of households were using firewood for cooking in the study area whereas 72.5% use Timber product. Haripur and Jadura village has together of 468 numbers of livestock which depend daily in Tapkeshwari Forest. Goats and Sheep are in large numbers that graze in forest for a longer period of time followed by cow. Detailed vegetation analysis and regeneration status of the forests are necessary as they form the basis for future plans to manage and restore these vanishing resources.

Keywords: *forest ecosystem, community, provisioning services, livestock, vegetation analysis*

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1. Introduction

Forest are important and self-regenerating ecological units, and they provide a countless of services that are essential for human survival. Ecosystems services provided by forest are derived from their functioning and are of direct value to human [1]. Forest represents 70% of terrestrial biodiversity as they regulates water cycles, maintain soil quality, and reduce the risk of natural disaster such as floods and landslides, as well as the livelihood of over 1.6 billion people on the globe. In India, exploitation of forests by the government during the British rule continued as forests were considered inexhaustible and its ecological importance remained unrecognized for long [2]. Subsequently, the Indian Forest Act was passed in 1878 and the "reserve and protected" forests were constituted. This abrogated the grazing, forest-based gathering, and forest based widen or rotational agriculture rights of local people [3].

In recent years, motivated in large part by wide- spread loss of species and natural habitats, ecological research has focused increasingly on the consequences of exploitive and long-term management activities for species diversity [4]. The dependency of community reflects some proportion of their income derived from the forest resources also the dependency on wild food and forest timber in particular for adjusting with the risk of food shortage. The timber product and fuel product and wild foods are one of the main important source of forest related income and consumption. Value of such products is not documented well till now. There is raw present of the connection between poverty and forests, and engage with the emergent, more sophisticated approaches to conceptualizing poverty and their potential implications for our understanding of the livelihoods of forest dependent community [5]. As understanding of forest structure is pre-requisite to describe various ecological processes and also to model the functioning and dynamics of forest, this research generalize the idea of vegetation composition along with tree diversity of Tapkeshwari Forest.

Tapkeshwari Forest lies within a Tapkeshwari hill range covering more than 140km^2 (14,400ha). This forest is close to Bhuj City, the district headquarters (7km) of Kuchh, Gujarat and provides a high diversity of floral species in various vegetation types or habitats like *Prosopis juliflora (Sw.) DC., 1825* scrubs, thorn mixed scrubs, open scrubs, thorn mixed forests with *Acacia senegalensis (Houtt.) Roberty*, Acacia *nilotica (L.) Willd.ex Delile 1813* and *Salvadora L.var.persica mixed*. These forests occur in the region with less than 600 mm rainfall and contain spare and stunted growth of species like Acacia and thorn bushes etc, due to which this forest is also known as Tropical thorn forest. Tapkeshwari forest shares the similar temperature and precipitation pattern as of Bhuj. The maximum absolute temperature recorded is

49°C whereas average maximum temperature is 39°C in month of May.

Provisioning services were analyzed on the basis of structured questionnaire. Nearest settlement to forest were chosen as a part of community questionnaire. Two villages namely, Haripur and Jadura were found which settled nearest to forest area. These villages were considered as they were only two villages who are benefited directly from the forest. Other remaining villages were not settled within forest area. 40 individual were questioned about their dependence on forest resources. Focal group discussion and individual questionnaire were made to know the dependency status.

2. Results

During field visit, it was found that Haripur and Jadura village has high dependency ratio on Tapkeshwari forest. The provisioning services provided by the Tapkeshwari forest were mainly firewood, Timber, Fodder etc. Haripur and Jadura villages have the total population of 112 and 106 respectively (Table 1). Infrastructure facilities such as school, health, and road were found satisfactory within these villages (Figure 1).

2.1. Forest Products

Out of 40 sampled households, 82.5% responded that they collect firewood only from forest; 80% of households collect fodder from the forest and approximately 95% of households use the forest to graze their animals. Types and quantities of various forest products used from the forest are presented in (Table 3). The large variations of ecosystem goods collected from the forest area were mainly due to human (Table 2) and livestock population (Table 4) among the villages.

2.2. Energy Source

21 numbers of households were used kerosene for burning lamps during power cut-off and other purposes such as cooking etc. Firewood is used as major fuel energy source for cooking at the households. A total of 82.5% of households were using firewood for cooking in the study area whereas 72.5% use Timber product.

Table 1. General characteristics of villages

Name of Villages	Male Population	Female Population	Children	Total
Haripar	29	27	56	112
Jadura	32	25	49	106

Figure 1. Infrastructure facilities in Jadura village (Field survey 2013)

Table 2. Type and quantities of forest products used at household

S.N.	Description	Households		Average Quantity Used (per household)	
		Number	Percent	Local Unit (per Day)	Purpose
1	Fire wood	33	82.5	4 headload	Cooking
2	Timber	29	72.5	2.5 cubic feet	Cooking, Construction
3	Fodder	32	80	3 headload	Livestock
4	Grazing	38	95	4hrs	Livestock
5	Fruits	13	32.5	0.35 kg	Food

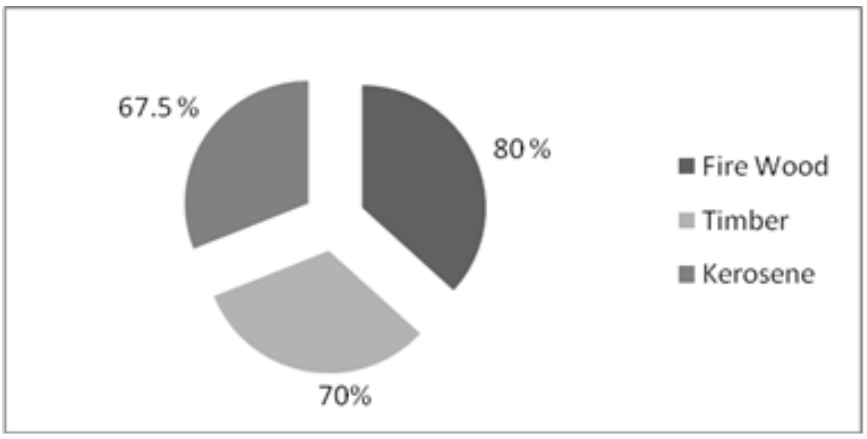

Figure 2. Daily Use of Energy Source from Forest

Figure 3. Livestock grazing in Forest (Field Survey, 2013)

Table 3. Daily Use of Energy Source from Forest

Energy Source	Household Number	Percentage
Fire Wood	33	82.5
Timber	29	72.5
Kerosene	21	52.5

Table 4. Total number of Livestock

Livestock	Jadura	Haripar	Total Number of Livestock
Buffalo	18	6	24
Cow	38	43	81
Goats/Sheep	163	143	306
Bull/Ox	26	31	57
Total			**468**

2.3. Livestock

Livestock contributes directly to nutritional security (meat and milk) and income earnings (sale of milk), and indirectly to food security (use of income generated to purchase grain or fertilizer) as well as to general well-being (health, education, etc.). Livestock helps to reduce the workload on humans (draught power), to control weeds (particularly in tree plantations), to valorize marginal lands and protected forests, and to turn crop residues and other waste products into valuable food [6]. Haripur and Jadura village has together of 468 numbers of livestock (Table 4) which graze daily in Tapkeshwari Forest. Goats and Sheeps are in large numbers that graze in forest for a longer period of time followed by cow.

3. Discussion

The distribution of tree species in the study area is contagious distribution pattern (Table 5) except *Acacia senegalensis (Houtt.) Roberty* as the distribution pattern of *Acacia senegalensis (Houtt.) Roberty* is random. According to Odum 1971, the contagious distribution pattern is the commonest pattern in nature, whereas random distribution occurs only in a very uniform environment, and regular distribution occurs when severe competition occurs between individuals. Since, regular distribution was not found in the study area which signifies that the forest is dominated completely by one or two species only. The represented dominant trees were facing severe cutting and lopping pressure for fuel wood and fodder for animals [7].

Table 5.

Tree Species	Q total	Distribution Pattern
Acacia senegal	128	random
Prosopis juliflora	43	contagious
Balanitis aegyptica	20	contagious
Zizypus mauritiana	13	contagious
Acacia leucophloea	3	contagious
Grewia tiliaefolia	3	contagious
Salvadora oleoides	2	contagious
Bauhinia recemosa	2	contagious
Acacia nilotica	1	contagious
	215	

A considerable share of local needs was met by forest resources. Mainly timber, firewood, fodder were collected from the forest area. Communities below marginalized group and medium people income group households were much depended on the forest for their firewood, fodder. Other than being dependent on forest, the village communities have no other resort than labor work. Tapkeshwari forest are valued by local people for provisioning services such as green fodder used for livestock food, quality fuel wood, wood for agricultural uses, and minor forest products. These ecosystem goods are important elements for the agro ecosystems [8]. The provisioning of fodder from study area is important for livestock, particularly when fodder from other source such as grazing land or agricultural residue is dries up during summer session [8]. The food product was also one of the major provisioning services provided by the forest. Tapkeshwari forest provides a sizable amount of edibles fruits. 0.35 kg of fruits such as *"Bor"* from *Zizypus mauritiana* per day is extracted from the Tapkeshwari forest area. Mainly, it has been seen that *"Bor"* fruits from *Zizypus* species hold maximum percentage of extraction from the forest area.

The quantity and value of provisioning and regulating services provided by this forest is considerable higher. However, this services provide by the forest may lead to the loss of other important resources. Many people of a different cultures and land-use practices live in or around forests. It has become much harder for forest-dependent people to use resources of their local forests and its products, due to deforestation, logging, population pressure or increasing government regulations including declaration of state forests, national parks, or wildlife reserves [8]. In many countries, plans to protect forest ecosystems have failed to address the needs and knowledge of local forest-dependent communities.

4. Conclusion

It is necessary to determine tree diversity for conservation and management of forest bioresearches. Detailed vegetation analyses and regeneration status of the forests are necessary as they form the basis for future plans to manage and restore these vanishing resources. Tapkeshwari forest also has many medicinal products in it but due to insufficient explore and study these products remain silent over there. The proper utilization of such products will be beneficial services provided by the forest [9]. The quantity and value of provisioning and regulating services provided by this forest is considerable higher. However, this services provide by the forest may lead to the loss of other important resources. Many people of a different cultures and land-use practices live in or around forests. It has become much harder for forest-dependent people to use resources of their local forests and its products, due to deforestation, logging, population pressure or increasing government regulations including declaration of state forests, national parks, or wildlife reserves [8]. In many countries, plans to protect forest ecosystems have failed to address the needs and knowledge of local forest-dependent communities.

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