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## Impact assessment of forest resources on the fauna and socio economic conditions of local community

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#### Abstract

This study was carried out in the Karaker Barikot forest of district Swat Pakistan to assess the impact of forest resources on the insects, fauna and socioeconomic conditions of local people. Total 75 out of 300 households were selected for the study. The main forest resources identified were grasses (38%), trees (29%), Shrubs (20%) and herbs (13%). Major wild life species were as; i. animals (*Canis aureus*, *Felis chaus*, and *Macaca mulatta*) ii. The major insect fauna were (*Apis cerana*, *Bombus terrestris* and *Papilio bianor*) respectively. Honey production was calculated @ 5kg/year having value of Rs. 9000. The forest provides digestible nutrients and crude protein to different number of livestock. It was concluded that forest fauna especially insects significantly contributing to the economic condition of local community. Medicinal plants provide hosting to insects while insects play role in pollination. Therefore the presence of forest resources must be preserved for the survival of insect fauna and socio economic uplift of local community.

**Keywords:** TDN, Crude protein, Fauna, Socioeconomic

#### 1. Introduction

For millennia, people have benefited and prospered from forest abundant resources. Forests offering their resources to accomplish a wide range of economic and social benefits. These forest resources always provide safety nets during the time of paucity of employment<sup>[1]</sup>. More than 100 million people are employed in forest-related jobs and many of them depend on forest enterprises<sup>[2]</sup>. Speaking of wildlife often disregards the important protein and food source of fish, shellfish and crustaceans. These resources are not just important as a subsistence resource, providing an important addition to the daily diet of many people living in or nearby forest streams or rivers, but also can provide important cash incomes<sup>[3]</sup>. Wild and naturalized plants provide a "green social security" to billions of people in the form of low cost building materials, income, fuel, food supplements and traditional medicines. In some cases the revenues earned with commercialized NTFR is the only source of cash income, which increases the dependency of the people on these commercial interesting NTFR resources<sup>[4]</sup>. Traditional ecological knowledge can provide valuable information on stewardship practices for sustainable NTFR use<sup>[5]</sup>. As regards of many other forest services, trees and insects responding to multiple economic, social and ecological needs and challenges of daily requirements<sup>[6]</sup>. Plants and insects mostly found in a give-and-take relationship. Insects are considered as inactive plant pollinator, while, plants especially flowers bearing insects nourish on it. An estimated 98 % (100,000) of insects identified are plants pollinator 90 % (250, 000)<sup>[7]</sup>. Cash income from the sale of NTFR can be very variable, however, even for the same resource category. Earnings vary from a few dollars for *ad hoc* sales to several thousand US\$ per year. In rural Madhya Pradesh, India, for example, NTFR provide 40-63% of total annual income<sup>[8]</sup>. Plant leaves and trunks make available hosting for insects for instant, Caterpillars depend on vegetation or Witchetty grubs feeds on root, Cicadas live on the branches and trunks of trees, Dung beetles thrive in soils<sup>[9]</sup>. Some insects are highly predacious, such as order Odonata (dragonflies) and Neuroptera (net-winged insects such as lacewings and antlions) beetles (Coleoptera), flies (Diptera), true bugs (Hemiptera), wasps, ants. Many Insects carry a host of ecological services fundamental to human survival. Other then pollination, it provides essential ecosystem services such as, composting, wildfire protection, and pest control<sup>[9-10]</sup>. Some insects are edible and are an excellent source of energy, amino

Acids, essential minerals and B-vitamins for instant, *Apis mellifera* [11]. Beetle larvae, flies, ants and termites, ants and termites, clean plants matter and enhancing forest waste degradation [12]. Silk and Honey are the most commonly used insect products. Bees produce estimated 1.2 million tons of commercial honey per annum [13]. Beetle larvae, flies, ants and termites, beetle larvae, ants and termites, clean plants matter that consequent to forest waste degradation [12]. The ongoing evolution has produced a wide range of arthropod species adapted to their environments. Out of 1 million described insect species, only 5 000 can be considered harmful to crops, livestock or human being [14]. The contribution of bees to

nature and agriculture is well documented [15], but their enormous potential to act as a direct and indirect source of food for humans is less understood and their multiples role are highly undermined. A limited number of studies have shown that bee brood (eggs, larvae and pupae) and adults of a number of bee families are edible, including *Bombycidae*, *Meliponidae* and *Apidae* and plants insects inter dependencies are poorly assessed [16-17]. The aim of the present study was to determine the impacts of local communities on forest resources in the uplifting of socioeconomic conditions with emphasis given direct and indirect on insects and fauna.

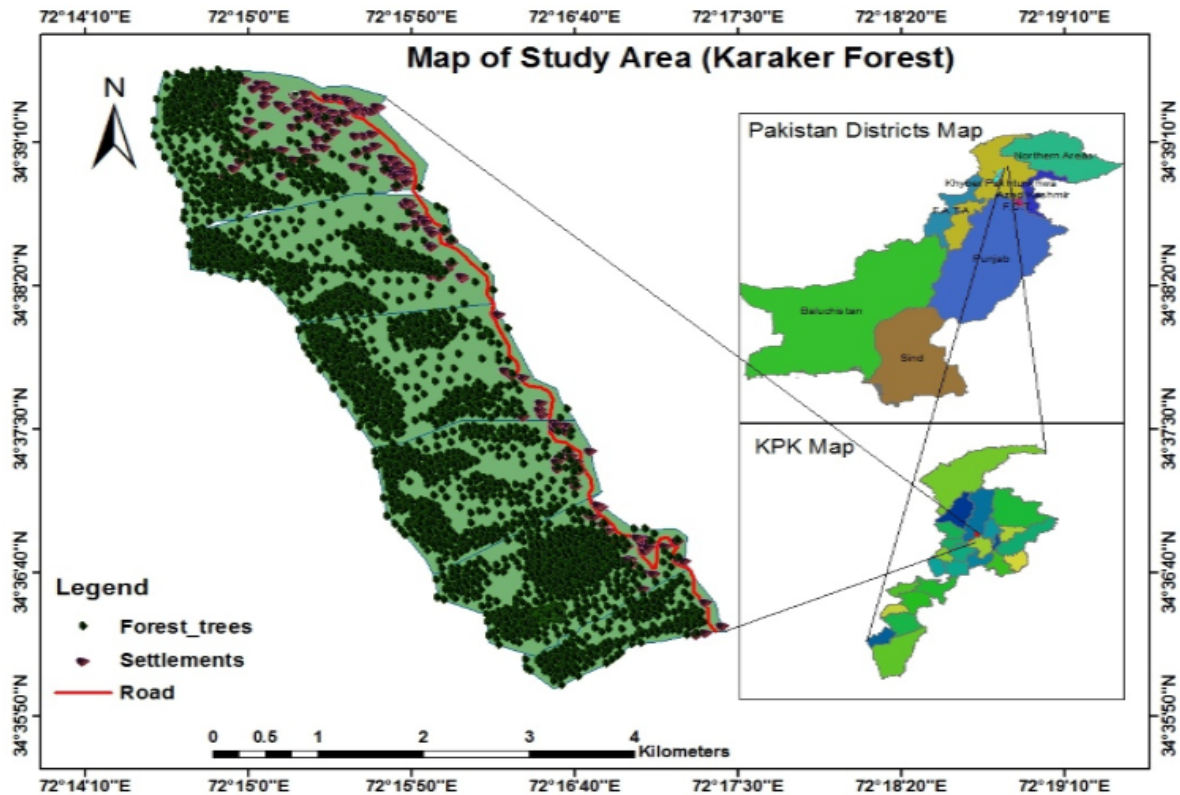


Fig 1: Map of the study area Karaker Barikot valley

## 2. Materials and Methods

### 2.1 Study area

Karaker forest is located at  $34^{\circ} 36' N$ ,  $72^{\circ} 14' E$  and  $34^{\circ} 38' N$ ,  $72^{\circ} 17' E$  coordinates, and elevation range from 800 to 1900 m from mean sea level. Present study was conducted in six compartments (957 ha) of Karaker Forest, Swat K.P.

### 2.2 Procedure

The study was conducted to assess the impact of forest resources in Karaker forest, Swat, Pakistan. The information collected through questionnaire with 25% sample intensity. Total of 75 questionnaires communicated with 300 houses. Data of forest resources and their impact on socio economic conditions of local community was collected during Aug 2013- Sep 2014, local. The forest resources, Non timber forest produce, insect fauna were assessed and specimens were identified by Zoologist, and Entomologist at the lab of University of Haripur [18].

## 3. Results and Discussion

The results of the study found that Karaker Barikot forest composed of 38 % of grasses, 29 % of trees, 20 % were shrubs and 13 % were herbs belong to 24 different families (Fig 2).

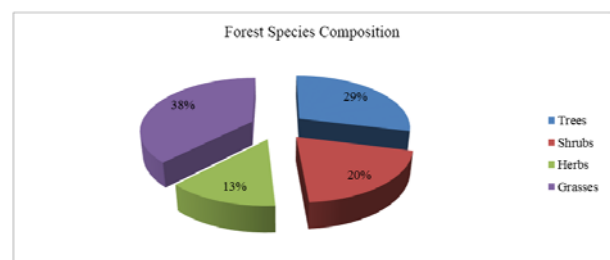


Fig 2: Forest composition of Karaker forest.

### 3.1 Socio Economic Status of local community of the study area Karaker forest

#### 3.1.1 Population Size

The result showed that a total population of 300 (N=2700) houses were living in Karaker Barikot valley that were found depended on Karaker forest resources. The average house hold size was 9. While population growing rate was found 2.7 % in the study area of Karaker valley, by adding 4 % (12) new houses every year in the study area. Projection for the next ten years the population of the study area was 420 (N=3430) houses calculated.

### 3.1.2 Profession

Data analysis revealed that 4 % were government servants, 61 % were farmers, 15 % were labors and 6 % were unemployment. The 14% of the population were students in the study area. The average income of 12% respondents was Rs.208000 of 25-34 age, 16% of respondents was Rs.192500 of 35-49 age, 64 % of respondents income were Rs.192500 of 50-64 age, and 6% income Rs. 210000 of 66-80 age ranges in figure 3. Munanura *et al.* [19] studied that most of respondents got married (>93%) at age of 30 years and their household size was 4. 18 percent of sample were 5 and 9 children in household. Most participants (62.8%) income was less than 10,000 Rwandan Francs (approximately 15 US dollars) monthly and over 31 percent had no income at all. Over 85 percent did not have livestock assets such as goats, cows.



Fig 3: Income of various age classes of the respondents

### 3.1.3 Livestock and their milk production

The total numbers of livestock were calculated in 38 houses. The numbers of buffaloes were 25, Cows were 26, and Goats were 52, average milk production was 10, 40, and 20 kg respectively. And the price per live stock sale was Rs. 90000,

Rs. 70000, and Rs. 10000, for buffaloes, cow, and goat respectively, and the average number to be sold in year were buffaloes 2, cow 1 and goats were 3 calculated in figure 4 (Table 1).

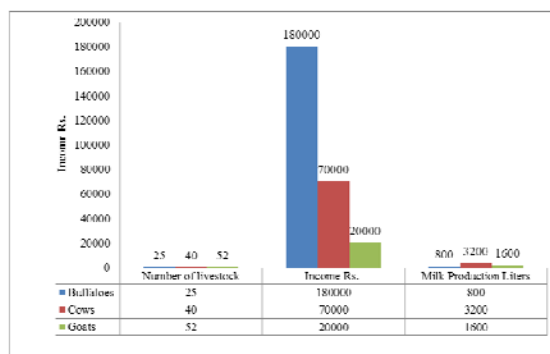


Fig 4: Livestock numbers and their income generation

Table 1: Various forest resources and their income

Livestock	Total Digestible Nutrients (TDN)		Crude Protein	
	Number of live stock	Tons/year	Tons/year	Tons/year
Buffaloes	30	60	7.8	
Cow	26	46	8.3	
Goat	4	.76	.13	
Total	50	106.7	16.2	

### 3.1.4 Wild life species of the Study area (Karker Barikot forest)

Following are the major wild life species and their impacts on forest resources.

Table 2: Major wildlife species and their impact of Karaker Barikot forest.

Common name		Scientific name	Impact
Animals	Jackal	Canis aureus	Feed on seeds of plants and role in ecological stability, seed dispersal, and predator of birds.
	Jungle cat	Felis chaus	Mouse and birds predator, balancing natural habitat.
	Porcupine	Atherurus macrourus	Medicinal values (arthritus patients use their meat), eat the roots of many plants.
	Rhesus monkey	Macaca mulatta	Important wildlife species, indicator of rich forest habitat. Feed on wild fruit.
Birds	Chukor	Alectoris chukar	National bird of Pakistan, role in pest control. Ants eater high national value, source of income. And also cultural value
	See see partridge	Ammoperdix griseogularis	Source of food, high nutritional value.
	Black partridge	Francolinus francolinus	Source of income and high nutritional value.
	Grey partridge	Francolinus poniceranus	Source food, income value.
	Whitechekek /bulbul	Pycnonotus leucogenys	Feed on seeds of plants and role in seed dispersal.
	Crow	Corvus splendens	Natural scavenger. Ecosystem stability.
	Rock pegeion	Columbia livia	Seed dispersal, hunting bird for local people.

### 3.1.5 Major insects and their role in forest resources of the study area (Karker Barikot forest)

Following are the major insects found in the study area of Karaker forest of district Swat, and their role in forest resources were discussed in table 3.

Table 3: Major insects and their role in forest resources

Insects name		Family	Order	Impact
Common Name	Scientific Name			
Bumble bees	<i>Bombus terrestris</i>	Apidea	Hymenoptera	Best pollinator of wild flowers. Also produce small amount of honey
Lady bird beetle	<i>Coccinella magnifica</i>	Coccinellidea	Coleoptera	Useful insect eats some pest in forest. Role as Biological control.
Honey bee	<i>Apis cerana</i>	Apidae	Hymenoptera	Honey bee production, and active pollinator.
Dragon fly	<i>Sympetrum flaveolum</i>	libellulidae	Odonata	Active pollinator, biological control of pest. Water cleaner of small harmful warms.
House fly	<i>Musca domestica</i>	Muscidea	Diptera	Actively involved in pollination
Forest Butterfly	<i>Papilio bianor</i>	Papilionidae	Lepidoptera	Active pollinator

### 3.1.6 Livestock and their nutrients (grasses) requirements

Data analysis revealed that three types of livestock's and their total digestible nutrients and crude protein were calculated in tones per year, requirement of TDN and protein was 7.8, 8.3, 13 tones for Buffaloes, Cows, and Goats per year. A total of number of various live stock (N=108) were there in 38 houses. Total nutrients requirement of TDN for 30 (buffaloes), 26 (cows) and 52 (goats) were 60, 46, 9.8 tons per year. And for crude protein 7.8, 8.3, and 1.7 tons per year were calculated. The market prices were (Rs. 636000) of TDN and (Rs. 106800) for crude protein per year for total number of livestock (Table 4). The production of grasses was satisfactory in fulfilling the requirements of the livestock nutrients in Karaker Barikot Valley.

**Table 4:** various forest resources and their income

Total Digestible Nutrients (TDN)		Crude Protein	
Livestock	Number of live stock	Tons/year	Tons/year
Buffaloes	30	60	7.8
Cow	26	46	8.3
Goat	4	0.76	0.13
Total	50	106.7	16.2

### 3.1.6 Medicinal Plants and Honey production

Data analysis revealed that 100 % perception was about the two types of medicinal plants, having high potential to medicinal markets *Ajuga bracteosa*, and *Artemisia maritima*. Approximately total of 25 kg of *Ajuga bracteosa*, and 35 kg of *Artemisia* were collected every year from Karaker forest. The market price per kg was Rs. 140 and Rs. 200 (Table 5). Annual production of honey 5 kg (1800 Rs. /kg) was the market price in figure 5. Honeybee keeping is common in the area. The use of plant as a source of traditional medicine was also reported by Shinwari *et al.*<sup>[20]</sup>, Ahmad *et al.*<sup>[21]</sup>

According to Choudhary *et al.*<sup>[22]</sup> about 500 families are involved in medicinal plant collection in Swat District and they collect 5000 tons of medicinal plants annually. Hamayun *et al.*<sup>[23]</sup> reported that 8 plant species (4.54%) are utilized honeybees for the production of honey. Some honeybee attractants are *Indigofera heterantha*, *Papaver somniferum*, *Plectranthus rugosus*, *Rosa brunonii* and *Rosa webbiana*. Honey collected from wild beehives is an important source of nutrition, as well as income for the dwellers of Utror and Gabral valleys. Traditional beekeeping by rearing colonies of oriental bees (*Apis cerana*) in earthen pots and log hollows fixed in the walls of the houses is popular among women living in the research area. However some professional beekeepers also visit the area during summer season along with bees kept in wooden boxes. These people can be seen on the roadsides. The honey collected is then sold in different local markets. The honey has multiple uses and is considered sacred in the Muslim community as it was the favorite dish of the Prophet Mohammad (Peace Be upon Him). The prices of honey fluctuate during different seasons of the year. On average one kilogram honey cost Rs.150 to 200 to the purchasers. It has been estimated that an average colony yields 4 to 5 kilograms of honey.

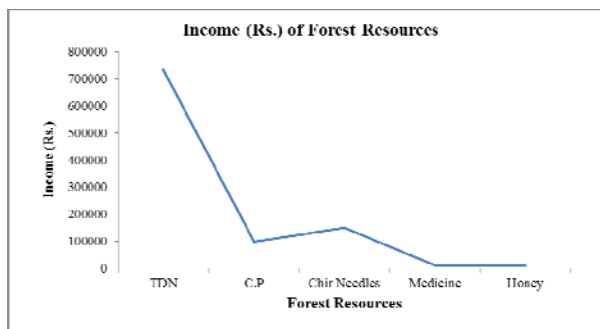
### 3.1.7 Chir pine (*Pinus roxburghii*) Needles Collection

Perception (86 %) of the population about the Chir pine needles collection and sale was that approximately fifteen (15) Dodson loads were collected in the season of Chir needle (May-July) and price per load was Rs. 10000. Total income generated by on year basis was Rs. 150000 as shown in figure 5 (Table 5). The world market for herbal products based on

traditional knowledge is now estimated to be worth US\$ 60 million WHO<sup>[24]</sup>.

**Table 5:** Non timber forest produce and their income

Different forest resources		Kg/year	Price/Kg (Rs.)	Total profit (Rs.)	Net price (Rs.)
Medicinal plants	<i>Ajuga bracteosa</i>	25	140	3500	94500
	<i>Artemisia maritima</i>	35	200	7000	
Forest resources	Chir Pine needles	15000	5	75000	
	Honey Production	5	1800	9000	



**Fig 5:** Forest resources and their income

### 3.4 Role of the local community in the forest resources management (Positive impact)

#### 3.4.1 Protection of forest resources by Shareholders (inhabitants) as compared to non share Holders

Survey revealed that 70% of respondents stated that the inhabitants in the forest have positive impact in the forest resources. But 30% said that they have negative impact on forest resources in figure 6. Small part of the forest was given the local forest villagers to protect it from being damage. The role of local community (forest villagers) was satisfactory in controlling the forest resources, because they believe that the forest resources are mines, they use it wisely as compared to the non share holders. According to the old person (Jalander) inhabitant of the compartment No. 39, he said that before 15 years the entire compartment is ruthlessly cutted timber mafia. He added that we requested to the forest department for the temporary protection of the compartment and after the establishment of the army station at the top we discuss it and called for protection, by the support of army and our efforts the forest was protected. Two mature trees were present for the regeneration on the top mound of the compartment no. 39. We strictly control the grazing in the entire forest. I personally observed number of trees and regeneration, which grow in ten years, produces approximately 1000 seedlings. Mostly it was regeneration, 25% were in the pole stage about (20 ft) height and 3-5 cm diameter. It is suggested that two mature trees can replace the vegetation quickly, it is observed that there is great site potential in the soil but it need protection.

#### 3.4.2 Stall feeding as compared to open grazing of the some forest villagers

Survey reported that 20% respondents said that forest villagers avoid to graze livestock inside the forest in figure 6. They bring the grasses either from the forest; sometimes they cut and store the grasses for the next coming season. They also feed their livestock on their agriculture fodder, as compared to

the open grazing in the forest. It was the best practice in management of forest resources, because the damage to the forest resources as compared to open grazing is less.

### 3.4.3 Artificial Regeneration

According to survey 90% of the people have great interest to regenerate the blank area inside the forest (figure 6), they have about 30 hectares blank area and they want to regenerate it but there was no availability of seedlings, according to Sanuber (Temporary supervisor of regeneration workers 2010 of Karaker forest) said that if forest department provide seedlings we will plant it without any charge from department, and he also stated that we have best potential sites for regeneration. Unfortunately there was no technical or material input from forest department. Similar study was conducted that people of Khwrba (Indonesia) were not primarily dependent on forest for food. In fact, they have protected local biodiversity, as forest-dependent communities often do (Lawrence and Sheil) [24]. They were keen to maintain their access to forest resources and protect them from outsiders.

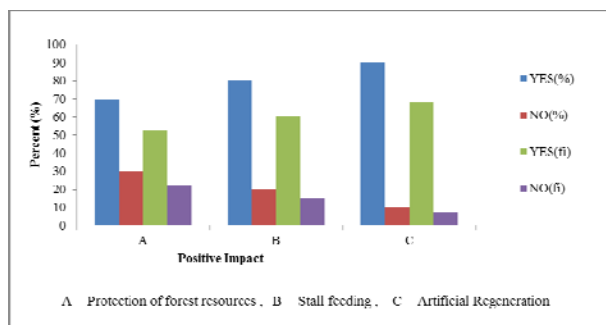


Fig. 6: Positive impact of local community on forest resources

## 5. Conclusion

The present research study was conducted to assess the role of forest resources and impact of insect fauna and other animals in socioeconomic conditions of local community in Karaker area of District Swat, Pakistan. It was found that forest resources significantly contribute towards the socioeconomic condition of people residing in that area. The collected insects were found to have great contribution in the forest ecosystem stability through pollination, pest control and honey production. Major pollinators identified were honey bee and bumble bees. Major wildlife species were (*Macaca mulatta*, *Atherurus macrourus*, and *Alectoris chukar*).

## 6. Recommendations

Based on the findings of research, it is recommended to conduct awareness campaigns in the area regarding importance of forest ecosystem, role of insects and other animals in socioeconomic condition of community. Further studies should be conducted to explore the ways and means of Non-timber forest products.

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