Assessment of Forest Resource Exploitation in the Rural Communities of District Jhelum, Pakistan

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Abstract: Forest resources are deteriorating and experiencing decline around the globe due to unsustainable use and over exploitation. The present study was an attempt to determine the relationship between human activities, forest resource utilization, extraction methods and practices of forest resource exploitation in the district Jhelum of Pakistan. For this purpose, primary sources of data were used which were collected from 8 villages through structured questionnaire and tabulated in Microsoft Excel 365 and SPSS 22 was used for multiple linear regression analysis. The results revealed that farming, wood cutting, animal husbandry and agro-forestry were the major occupations in the study area. Most commonly used resources included timber 26%, fuelwood 25% and fodder 19%. Methods used for resource extraction included gathering 49%, plucking 34% trapping 11% and cutting 6%. Population growth, increased demand of fuelwood and land conversion were the main reasons behind forest degradation. Results for multiple linear regression revealed that Forest based activities, sources of energy production, methods used for wood harvesting and resource extraction and use of fuelwood for energy production contributed significantly towards extensive forest resource exploitation with *p value* <0.5 within the study area. The study suggests that effective measures should be taken by forest department to control the unsustainable use of forest resources by stringent management interventions and awareness campaigns in Jhelum district.

Keywords: Forest resources, biodiversity, exploitation, human activities, multiple regression, Jhelum.

Introduction

Forests deliver numerous ecosystem services straddling from local livelihoods and socio-economic development to global ecological and economic services. (Nwakile et al. 2017; Duguma et al., 2019). They support rural livelihoods and ensure food security through provision of critical sources of food, medicine, shelter, building materials, fuels and cash income (Iheke and Eziuche, 2016). Worldwide around 1.6 billion rural population's livelihood depends partially or fully on local forests products. These people live nearby or within to the forest and have relied on these natural and wild resources to fulfil their basic needs for livelihood and survival for many generations (Hlaing et al., 2017). Most of the Rural population depends most basically on forests in terms of subsistence, income, health, and culture. Forest resources are important for biological diversity, soil conservation, water resources all over the world and play crucial role in fulfilling requirements for the forest products both non woody and woody (Ahmad et al., 2012). Unfortunately, forests have been extensively exploited over the centuries for their valuable sources primarily wood and wildlife. The mismanagement of forest lands and excessive misuse of forest resources has led to a condition where the forests are now in rapid retreat (Judith et al., 2011; Manta and Rajbangashi, 2015). Rapid population growth and enhanced anthropogenic activities like farming, commercial hunting, fuelwood cutting, timber extraction, mining, tourism etc. are the main reasons behind forest deterioration around the world (Debel et al., 2012; Misra et al., 2014).

According to Food and Agricultural Organization (FAO, 2009) the developing Asian economies are witnessing a continuous decline in forest cover and forest resources due to expansion in agriculture and production of biofuel feed stock. In other words, increased farming practices have accelerated the forests exploitation methods to match the human needs, ultimately resulting in international forest region decline and considerable reduction in the carbon storage zone (Kiki and Akpor, 2012; Shukla et al., 2018). Similarly, increased demand for fuelwood for household consumption is a primary driver of deforestation and forest degradation in the populous regions of East Africa and South Asia (FAO, 2009). Ultimately, the depletion and degradation of forest resources have enhanced loss of biodiversity, soil erosion, global warming, flood activity, climate change etc. (Fonjong, 2008; Bryan et al., 2010).

Pakistan is among those countries of world where forest resources are scarce, yet exploitation of forest resources and products is high (Nizamani and Shah, 2004). The most important factor contributing to forest resources diminishing in the country is high demands of fuelwood and timber (Suleri, 2002). Forest goods and amenities once supposed to be much abundant but presently are known to be rare within the country. Pakistan undergoes more severe forest insufficiencies than other countries in South Asia (Nizamani and Shah, 2004). Forest degradation rate in Pakistan is projected at 0.2 to 0.5% per annum and accounts for a 4-6 % annual decrease in its wood biomass. Total natural forest cover land has declined from 3.59

million hectares to 3.32 million hectares. This decline is mainly due to the reliance of a large proportion of rural population on wood for construction and fuel. Due to limited opportunities, a large portion of the rural population in the country derives their income from the forest resources. Thus, uncontrolled and unsustainable wood cutting, and timber extraction are the main threats to Pakistan's forest resources (Zada et al., 2019).

Knowing the significance of forest protection and need of sustainability, several studies have examined the role of forest-based activities in the misuse and exploitation of forest resources at regional and international level. For instance, Wiersum (1997) examined the existing exploitation methods and management practices utilized by the local communities for tropical forests. The study recommended for using new approaches of forest resources management for a better nature-culture continuum. Another study conducted by Vasconcelos et al. (2002) demonstrated great changes and reduction in the mangroves and palm groves of Guinea Bissao during 1956 to 1998 due to over exploitation of forests. Aggarwal 2009 researched on Forest resources: degradation, livelihoods, and climate change in India. Ndoye and Tieguhong (2004) studied the association of forest resources exploitation and rural livelihoods in the Congo basin and suggested to adopt balance approach in resource utilization for environment sustainability.

Likewise, Leimgruber et al. (2005) identified an annual decline of 0.3% in the mangroves and dry forests of Myanmar during 1990 to 2000 due to increased fuelwood consumption, charcoal production and commercial logging. Another study examined the contribution of agro-forestry to biodiversity and livelihood improvement in the rural communities of southern African regions. The study concluded that undoubtedly, agroforestry contributed in the socio-economic improvement of rural population hence resulted in the deterioration of biodiversity in the region (Kalaba et al., 2010). Iheke and Eziuche (2016) examined the factors affecting the exploitation of forest resources in rural economies of Abia state of Nigeria and concluded that fuelwood cutting, bush burning, and urbanization have greatly impacted the forests within the study area. Langat et al. (2016) studied the role of forest resources in the livelihoods of local communities of east Mao, Kenya and concluded that the forests of Kenya are endangered due to unsustainable use of forest resources and land conversion for alternate uses. Furthermore, Soe and Chang (2019) examined the livelihood dependency of local communities on non-timber forest products in Myanmar. The study identified, that extensive wood cutting for bamboo and charcoal making resulted in forest degradation in the study area.

Previously very few researches are available on Jhelum who studied the patterns and trends of forest resource utilization and sustainability issues. However, the existing practices and perception of rural communities pertaining to extensive use of forest resources has not been highlighted earlier. Therefore, due to gap found in literature, the present study was conducted to assess the nature of forest-based activities and people's perception regarding the exploitation of forest resources in rural communities of district Jhelum.

Material and Methods

Study Area

The present study was carried out at Jhelum district, located in the north of Punjab province (Fig. 1). The district is located on 32°56′ N and 73°44′ E. It is surrounded by Rawalpindi to its north, Mirpur to its north east, Sargodha and Mandi Bahauddin to its south, Khushab to its south-west, Gujrat to its east, by Chakwal from west, and Jhelum river to its south. The general elevation of district is 250 meters above mean sea level, covering an area of 3,587 km^2. The district has intense climatic conditions with very hot summers and extremely cold winters and average annual rainfall about 850 mm. District Jhelum's vegetation consisted of dry deciduous scrub type, dominated by riverine and open forests. North-western slopes have very good forests while the southern slopes are mostly deprived of vegetation. Administratively, the district is divided into 04 tehsils namely Dina, Jhelum, Sohawa, and Pind Dadan Khan. The total population size of district is approximately 1,222,650 persons (GOP, 2017).
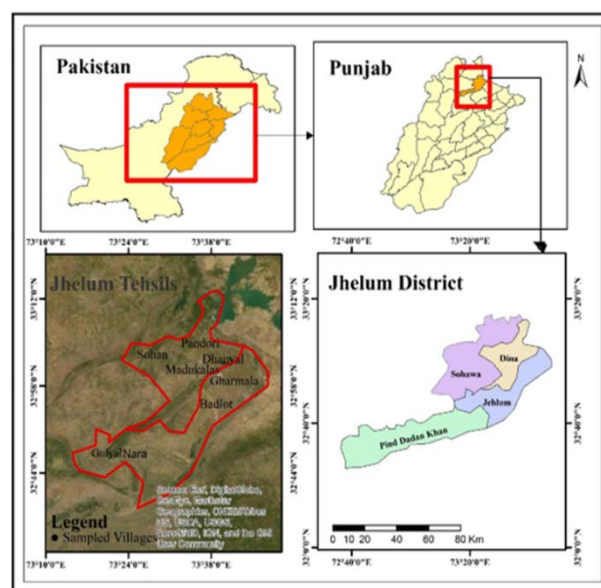

Fig. 1 Location map of study area.

Data Collection and Analysis

The present study was based on primary data sources that were mainly field survey observations and structured questionnaire. A total number of 8 villages, 4 from each of Dina and Jhelum tehsils were selected as sample sites. These villages were selected

purposefully, due to their proximity to forests and community dependency on forest resources for livelihood (Table 1). The field survey was undertaken during January to March 2019 and 200 questionnaires were filled by interviewing those local natives who were mainly involved in forest based activities. The questionnaire was based on the different aspects such as demographic information of respondents, forest based activities, forest resource utilization, sources of energy production resource extraction methods etc.

Table 1 Details of surveyed villages.

Sr.	Tehsil	Villages	Questionnaires
1	Jhelum	Badlot	45
		Gharmala	12
		Gulyal	25
		Nara	25
2	Dina	Dhanyal	45
		Madukalas	21
		Pandori	10
		Sohan	17
	Total		200

Source: Field survey (2019)

The collected data were tabulated and analyzed using Microsoft Excel 365 and SPSS 22. Demographic characteristics of respondents, and aspects regarding forest resource exploitation were depicted through descriptive statistics. Multiple linear regression was used to predict relation between extensive forest resource exploitation and other predictors. The equation of multiple linear regressions as given by Seber and Lee (2012) was used as under:

$$y = b_o + b_1 X_1 + b_2 X_2 + \ldots + b_p X_p + E$$

where

y = the predicted value of dependent variable

b = constant

X= distinct independent and predictor variable

Forest based activities, hunting, forest resource utilization, sources of energy production, methods of wood harvesting and resource extractions were taken as independent variables and forest resource exploitation was taken as dependent variable. Significance level was set at $p < 0.05$.

Results and Discussion

Demographic Characteristics of Respondents

According to results obtained from field survey, 89% of the respondents were male, while 67% of them aged between 21 to 50 years. 69% respondents were married, 86% of total respondents were local natives and the rest of 14% were migrants. Moreover, nearly 99% of the migrants were residing in the study area from last 20 years. Furthermore, 25% respondents were found illiterate, 19% were matriculates, 12% were graduates, and only 5% were master's degree

holders. 48% of the respondents had family size between 1 to 5 persons, whereas 41% of them had family size between 41%. Major occupations found were farming 37%, wood cutting 21%, animal husbandry 17%, planting 11%, hunting 3% and other activities 11% including government and some low order services (Fig. 2). Moreover, 48% of the respondents had monthly income between 31,000 to 50,000 rupees and nearly 25% of them were earning more than 50,000 rupees per month.
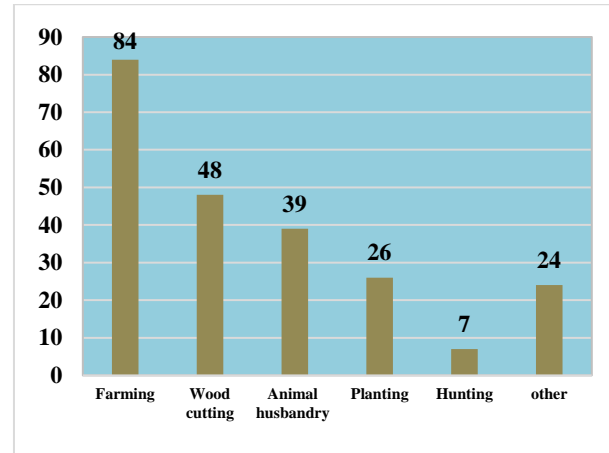
Fig. 2 Major occupations in study area.

Besides, the respondents were also involved in various forest-based activities which were a secondary source of income for them. These forest based activities included livestock grazing, agroforestry, wood harvesting for charcoal production, tree plantation and fish farming (Fig. 3).
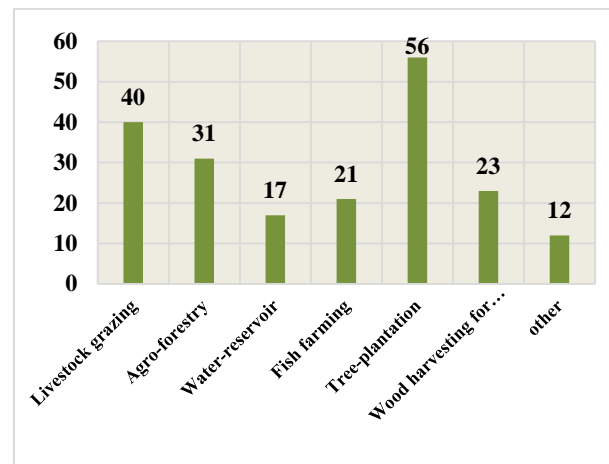
Fig. 3 Forest based activities in study area.

Forest Resource Utilization and Extraction Methods

It was found that the local communities of study area were getting various benefits from forests in the form of timber, fuel wood, fodder, honey, herbs, meat and wild eggs (Fig. 4). Most commonly used resources included timber 26%, fuelwood 25% and fodder 19%, while least commonly used resources were honey 4%

and herbs 2%. Moreover, the items used as fuel wood by respondents mainly included bushes (46%), branches (21%), shrubs (24%) and trees (9%). These items were used as a source of energy production for domestic needs (Fig. 5).

It was observed that respondents were using forest resources for different purposes. For instance, 45% of the respondents were using forest resources for personal uses, 40% of them for commercial earnings, whereas 15% were using forest resources for both personal and commercial purposes.
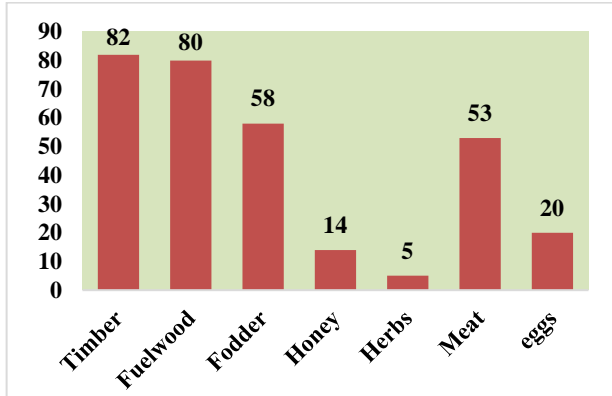

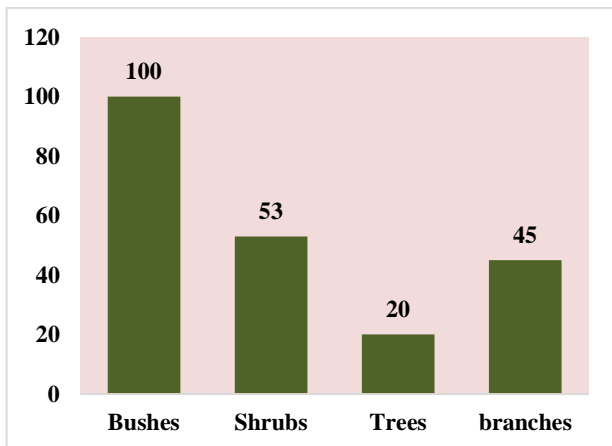Fig. 4 Forest resources utilization in district Jhelum
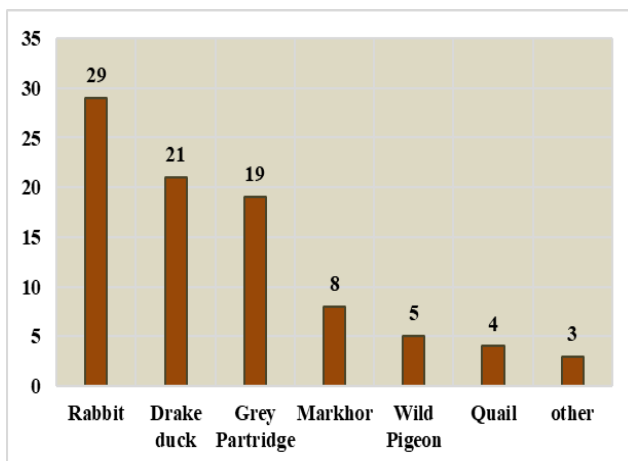

Fig. 5 Sources of energy production.

Fig. 6 Commonly hunted species in district Jhelum.

It was also found that the rural communities were using various methods to extract and acquire these forest resources. Most of the extraction methods were primitive in nature and primarily used by those respondents who exploited the forest resources for personal use. These methods included gathering, trapping, plucking, cutting etc. Most common methods included gathering and plucking that were used by 49% and 34% respondents respectively. While trapping and cutting were least used methods used by 11% and 6% people. The wild eggs and honey were mainly acquired through gathering, while fodder and herbs were extracted through plucking and cutting.

Besides, for harvesting timber and fuelwood, several other methods were used by the inhabitants of study area such as tree falling, debarking, log making. These methods were mainly used by those respondents who utilized forest wood for commercial purposes. Debarking was the most common method of fuelwood extraction used by 48% respondents. Tree falling method was applied by 27% people and log making by 6% respondents respectively.

Furthermore, commercial hunting was also found in the study area where people were hunting different wildlife species for acquiring their meat and skins. These included rabbit, markhor, drake duck, grey partridge, wild pigeon, quail etc. The most commonly hunted animals were rabbit 33%, drake duck 24% and grey partridge 21% (Fig. 6). Whereas least commonly hunted included quail 4% and other 3% that were little egret and house sparrow.

People's Perception Regarding Forest Resource Degradation

Majority of the respondents were fully aware about the forest degradation underwent in the study area due to extensive resource exploitation. According to 53% respondents, the forest resources had enormously degraded in their region during last few decades. 27% respondents were of the view that forests resources have witnessed degradation at a moderate level. However, 20% of them denied that any kind of forest degradation took place in their respective area. As per the perception of respondents, multiple reasons had contributed to the widespread forest degradation that took place in Jhelum district during last few decades (Table 2).

As the Table 2 shows, growth in population size (42%) and increased demand for fuelwood (41%) were the two most significant reasons behind forest degradation. While 34% respondents stated that conversion of forested land into farmland was the main reason behind forest degradation in their region. Other minor reasons were illegal cutting, forest fires, and overgrazing that combinedly made 13% of the total views of respondents.

Table 2 Reasons and impacts of forest degradation in district Jhelum.

Sr.	Reasons of forest degradation	No.	%
1	Growth in population size	83	42
2	Increased demand for fuelwood	81	41
3	Conversion of forest into farmland	67	34
4	Other (forest fire, illegal cutting etc.)	25	13
Sr.	Impacts of forest degradation	No.	%
1	Increased distance from energy source (fuel wood)	135	68
2	Increased temperature and climate change	89	45
3	Loss of soil fertility	83	42
4	Decrease in forest cover	67	34
5	Loss of trees and plants	63	32
6	Increased soil erosion	39	20
7	Loss of aesthetic value and natural scenic beauty	35	18
8	Diminishing native fauna	24	12

Source: Field survey (2019)

The inhabitants of sampling sites stated several impacts which occurred mainly due to forest degradation in their regions (Table 2). According to 68% respondents, distance to fuelwood sources greatly increased in the past decades because of extensive wood cutting and clearance of forest cover for other uses. 45% respondents stated that forest degradation resulted in increased temperature levels which further instigated climate changes in the region. Loss of soil fertility was reported by 42% respondents, whereas 34% respondents mentioned decrease in forested land. Additionally, 32% respondents stated loss of certain trees and plants previously that were found abundantly in their villages. The vanishing tree species chiefly included sheesham, beri, kikar, shehtoot, and phulai, while chir, deodar and bohar had also experienced rapid decline during past years.

Results of Multiple Regression Analysis

A multiple regression was performed to examine that whether forest based activities, hunting, forest resource utilization, sources of energy production etc. predict extensive forest resource exploitation within the study area (Table 3).

Table 3 Correlation Coefficients [a]

Model	B	t	Sig
(Constant)	2.492	3.235	.001
Forest based activities	.152	4.489	.000
Animal and bird hunting	.038	.427	.670
forest resource utilization	.238	1.391	.165
Benefits acquired from forest	.034	.541	.589
Use of fuelwood for energy production	-.461	-2.208	.028
Sources of energy production	-.041	-.391	.006
Methods used for wood harvesting	.315	3.203	.001
Methods used for resource extraction	.068	.522	.002
Reasons behind forest degradation	.514	5.109	.000

a. Dependent variable: Forest resources exploitation

The results of the regression indicated that the model explained 20.8% of the variance and that the model was a significant predictor of extensive forest resource

exploitation, $F_{(13, 394)} = 7.711$, p =0.000. Moreover, forest based activities (p=.000), sources of energy production (p=.006), methods used for wood harvesting (p=.001), methods used for resource extraction (p=.002), reasons behind forest degradation (p=.000), and use of fuelwood for energy production (p=.028) contributed significantly towards extensive forest resource exploitation. However, animal hunting (p=.670), benefits acquired from forest (p=-589), and forest resource utilization (p=.165) did not contribute towards forest resources exploitation in the study area.

Conclusion

The present study concludes that forest resources available in Jhelum district possess an important status in the rural people's livelihood, serving as a source of income and fulfilling their domestic requirements. However, the rate of resource exploitation has augmented in recent years thus resulting in gradual forest degradation. The traditional extraction methods used for acquiring fuelwood and timber harvesting are mainly responsible for forest decline. The local inhabitants are fully aware of the deterioration of their native forest resources yet due to lack of knowledge, are unable to utilize them in sustainable way. If the situation remains the same and unchecked, then likely the over exploitation and depletion of forest resources may lead to serious consequences, which could be disturbed ecosystem services, loss of biodiversity, high fuelwood cost and increased poverty among the rural people in the study area. Thus, it is imperative to rehabilitate degraded forest resources in order to sustain rural livelihoods. The study recommends that forest department should take serious actions for ensuring sustainable use of forest resources through effective management plans. Additionally, the authorities should impart appropriate ecological education to rural communities for sustainable environment and wildlife conservation in the study area.

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