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Underlying factors of deforestation and its effects in Sanger Valley District Swat

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Abstract

Deforestation is the removal, clearing or cutting of trees, stand or forest where the land is thereafter converted to the non-forest use. The lands conversions in study area are mostly to farm, agriculture or urban use. The study area was Sanger valley of District Swat. The region is mostly temperate region and enriched by species like *Pinus willichina* which needs proper documentation and information. The study area is mostly effected by manmade activities like deforestation of precious tree species therefore questionnaire based survey was conducted which contain all the information about the area, trees, cutting, fuel wood consumption, forest degradation and its effects and random questions were asked from local inhabitants. Forest field survey, focus group discussion and semi-structured interviews with 100 respondents was conducted for data collection. The study helped to find out the hidden mafia behind the illegal offence and lumbering activity. Stopping deforestation in the study area can control the loss of biodiversity, provide home to thousands of people and provide irreplaceable ecosystem like cultural and economic functions. Data was analyzed by percentage, frequency and simple fraction formula and Chi square test is applied on data for statistical analysis. Landsat 5 TM scenes and Landsat-8 processing were compared and Normalized difference vegetation index was examined through Arc GIS. The whole degree of the Sanger Valley were acquired from the United States Geological Survey (USGS) Earth Explorer database (USGS, 2013a). All scenes were geo-referenced (UTM, WGS84) and were remedied to USGS "Standard Terrain Correction (Level 1T)" (USGS, 2013b).

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Introduction

In the context of Reducing Emission from Deforestation and Forest Degradation (REDD) setting, Deforestation has been characterized as "A quantifiable managed diminish in crown cover" underneath 10-30% limit (Deforestation characterized in this way might be hard to gauge utilizing accessible information). While Degradation is characterized as "lost biomass thickness without an adjustment in the territory of forests cover" (i.e. diminish in crown cover that does not fall underneath the 10-30% edge), is considerably all the more difficult to quantify (Zahabu *et al.*, 2007). Pakistan is a Natural forests shortage nation with around 4.6 million ha forests estates which are proportionate to 5.23% of the aggregate land zone. The per capita woods is 0.03 ha which contrasts ominously and normal world per capita of 0.6 ha. The region secured by woods write is: conifers 42%, clean 34%, watered ranches 6%, riverain forestss 6%, mangroves 11%, mazri 0.5% and straight manors 0.5% (Bukhari and Bajwa, 2012). The greater part of the country forests are found in the northern section (40% in Khyber Pakhtunkhwa and 15.7% in Northern territories and 6.5% in Azad Kashmir). The Natural forests in the Khyber Pakhtunkhwa are appropriated over the mountains of Himalayas, Hindukush and Karakoram (Ali, 2006).

Deforestation rate in Pakistan, estimated at 0.2 per cent to 0.5 percent annually, is the highest in the world, which accounts for a 4-6 percent decline in its wood biomass per annum. The total natural forest cover has reduced from 3.59 million hectares to 3.32 million hectares at an average rate of 27,000 hectares annually (Ali, 2007). The basic dangers (common and additionally simulated) to juniper forests is populace blast, destitution, absence of mindfulness, savage cutting by local people, expulsion of undergrowth, overgrazing and trampling ailment were featured the evacuation of Natural forests tracts to develop edits by the forests inhabitants, increment of urbanization, woods cuttings for streets development, reliance of country populace on wood for fuel, overlooking of land by dairy cattle and timber mafia are a few reasons for Natural forests consumption in the

Pakistan. It is trusted that inadequate and unsustainable forests administration hones by the state forests divisions is the primary driver of Natural forests exhaustion, which have concentrated more on financial than on natural utility. Such practices likewise deny group subsistence needs (Ali, 2006).

Notwithstanding, the normal vegetation of Khyber Pakhtunkhwa has been monstrously debased after some time. Possibly, the entire of Khyber Pakhtunkhwa ought to be under tropical thistle forests in the fields, dry subtropical wide leaved woods on the drier lower regions, wet and dry calm Natural forests on the gentle mountains, and sub snowcapped forests, at the most elevated rises at which trees can survive. The tropical forests have killed basically because of the discussion of land for farming joined with touching and cutting of woody vegetation for fuel. The staying forests writes have tumbled to a small amount of their potential degree, mostly because of substantial uncontrolled brushing, tree felling and development of mountain slants (Champion Seth and Khattak, 1965). The information on forests and deforestation in Khyber Pakhtunkhwa are combative. Rural insights for Pakistan demonstrate that the woods region was 1.3 million ha in 1992 and demonstrates a 53 for every penny Natural forests increment amid the period from 1982 to 1991. This expansion ought to be the consequence of the reforestation programs. The ranger service division all-inclusive strategy appraises the aggregate region under Natural forests and trees to be 1.68 million hectare (Rahman, 2014).

Basic dangers (simulated dangers and also normal dangers) in Pakistan to juniper forests population blast, concentration and lack of mindfulness, merciless harvesting by local people, understory vegetation evacuation, more and more grazing and infections. Similarly contended the expulsion of forests to develop edits by the forests occupants, increment of over population, forests fellings for streets development, country population reliance on wood for fuel, take care of land by steers and mafia of timber are very less reasons for timberland exhaustion in Pakistan. (Sheikh, 2003).

The greater part of the country forests are found in the northern section (40% in Khyber Pakhtunkhwa and 15.7% in Northern territories and 6.5% in Azad Kashmir). The backwoods in the Khyber Pakhtunkhwa are appropriated over the mountains of Himalayas, Hindukush and Karakoram. The mountain regions particularly the locale of Dir, Swat and Mansehra comprise of numerous valleys with clean as well as coniferous forests on the high inclines, and upper fields on the sides or edges. In spite of the reality of natural forests assets of Pakistan are pitiful they contribute fundamentally to the economy of Pakistan (Khan, 2014).

Some authors trusted that insufficiency and unsustainability of forests management rehearses by the country forest offices is the initial and main driver of natural forests consumption, which have concentrated much on funds more than on ecological stability. Such activities likewise deny communities needs which are subsistent (Dauvergne, 1993).

Deforestation opens the dirt to the powers of wind and water particularly on the lower regions of the mountains. The upper layer of the dirt is dissolved away and abandons fruitless coarse sand. With substantial precipitation the dilute spouts the mountains conveying with it huge amounts of residue and limestone. Cutting of trees aggravates the indigenous habitat. The normal living space is wrecked which brings about the termination of various important species and the natural life additionally gets irritated. With less vegetation there is less evapo-transpiration. The atmosphere changes, specifically there is less precipitation, which may bring about lower edit yields (Naveh, 1973).

The eradication of forest has been happening since the Aryans initially attacked this zone around 500 B.C, yet it has incredibly escalated amid the previous century because of fast increment in human and domesticated animal's populaces, as indicated by a gauge (IIED and WRI) in 1988. In 1880 to 1980 the woods territory of the country diminished from 141530km² to 67310 in an abatement of 52% in 100 years. Amid nineteen seventies, the previous

mentioned investigation assesses a yearly reduction of 1.5 percent for every year for the entire of Pakistan; its 1992 release shows the yearly decrease of 0.4 percent. Be that as it may, these information depend on nation reports which, up to this point, were negligible assessments (Sheik, 1977).

Deforestation in the northern zones until the English control of India in the nineteenth century, the woodlands of Himalayas are considered to have been relatively unblemished, however from that point deforestation expanded in numerous parts of the Himalayas. After the British control of Punjab in 1849, the agitated Sikh govern finished and individuals began settling down in cultivating groups in the northwestern slopes. Accordingly weight on timberlands expanded for wood, development, brushing and settlements. In the meantime, requests expanded in the swamps for the timber from the hilly districts, because of joining between the marshes and the mountains. This expanded woodland misuse, particularly business timber collecting through private contractual workers, brought about the extensive loss of the backwoods cover. In this manner, corruption of normal backwoods in part of the western Himalayas long haul term process impacted by changes in the financial environment (Schickhoff, 1995).

Heavy scale of forest depletion occurred in this areas after the involvement of politics and management reforms in the era of 1970s. When need of wood increased for buildings construction of government and also bridges at the same time the work on Karakorum Highway started up previously isolated forest covered valleys resulting in the initiation of heavy scale of legal and illegal cutting of the natural forests for commercial purposes (Ives, 1991).

North West of Pakistan has been an appealing door, since times immemorial assaulting wave after flood of trespassers and workers. The sakes, the Aryans, the Greeks, the Persian and Mughals hacked consume and cleared their way the nation over, leaving a perpetual impact on the general scene of the nation. There is positively presumably the insufficient cover of vegetation in the fields and slopes of the country is

the aftereffect of gross sick and then in sixteenth century treatment given to it which was very late. In tozak the Baber record much preferable backwoods development over is found to day in the areas of Punjab and Sindh. Around the Jhelum waterway the salt range gloated of much woods to cover the developments of Alexander's armed forces. Such portrayal may appear to apply to Pabbi and presumably to low areas nation among salt reaches and Chinab. Because of the southern parts where scattered Shisham (*Dalbergia sissoo*), Kikar *Acacia nilotica*, Ber (*Zizyphus mauritiana*) and Dhak (*Butea frondosa*) are as yet found. Not in excess of one hundred years back, the Khyber slopes bragged of overwhelming tree development however now there is not all that much yet exposed shake and stones (Akhter, 2013).

Forests are an inexhaustible asset. Yet, when the reaches to a particular age it may be gathered. Notwithstanding, the normal vegetation of Khyber Pakhtunkhwa has been monstrously debased after some time. Possibly, the entire of Khyber Pakhtunkhwa lies in the tropical thistle forests in the fields, dry sub-tropical broad leaf forests on the low dry regions, dry and wet natural forests on the gentle slope of mountains, and sub snowcapped woodland, at the most elevated rises at which the survival of tree is possible. The tropical natural forests have killed basically owing to discussion of land for farming joined with disturbing and felling of vegetation and wood for fuel. The staying timberland writes have tumbled to a small amount of their potential maximum degree, mostly because of substantial out of control brushing, trees cuttings and developmental activities in mountain slants (Champion, Seth and Khattak, 1965).

The information on forests and deforestation in Khyber Pakhtunkhwa are combative. Rural insights for the country demonstrate the woods region in 1992 was 1.3 million ha and demonstrates that for every penny natural forests 53% increment achieved among the period of 1982-1991. This expansion results in the consequence of the reforestation practices and programs in the area. The quick and ranger forest services division all-inclusive strategy appraises the aggregate region under backwoods and trees to be 1.68 million hectare (Rahman, 2014).

The Social Forestry Project in Malakand has explored the cutting of forests in district Dir and Malakand utilizing information of satellite of 1972, 1978 and 1993. The understanding is trailed by serious work in field. The outcomes are not delegate for KPK but rather in demonstrative of the forests cuttings (Baig, 2008).

Forest management it is an unpredictable undertaking. The Forest Department has been overseeing Guzara woods (550000ha) since 1936, in the vicinity of 1981 and 1992; some were exchanged to the administration of their proprietor agreeable. In 1992, the Prime Minister of Pakistan suspended the task of the cooperatives, accusing them of unsustainable high rate of felling, unaccompanied by satisfactory recovery. From that point forward, agreeable of Kohistan area have been restored because of the vicious challenges of neighborhood individuals against their suspension. The present circumstance is in a condition of transition administration by the timberland office is censured by the Guzara proprietors for their aloofness to the insurance and recovery of the Guzara backwoods, and their lack of care to the necessities of the proprietors. Administration under the cooperatives is blamed for over felling, obliviousness to recovery, and a nonchalance of the requirements of the little Guzara proprietors and the non-right holder. Administration under the two frameworks is unsustainable and deforestation proceeds meanwhile (Knudsen, 2013).

The management of protected forests is additionally exceptionally unsustainable. Nearby individuals challenge the woodland possession. In a few regions, protection and keeping from planting the forest department as where development of trees have been expelled. The department of forests does not allow brushing in the ensured timberland, but rather characteristic recovery neglects to build up itself because of universal touching. The woods are not divided and the neighborhood individuals speedily any suitable size opening in the forests for development. These natural forests have just under the management of the Department of forests for as far back as twenty years (as about a century is against

the Guzara forests). The lawfulness circumstance in a considerable lot of the backwoods is questionable. The woodland task temporary workers connected by the an organization or corporation which is Forest Development Corporation for cutting and lumbering activities have bought the community groups for 60% share in the deal continues by making of advanced installments and have in this way recovered an intrigue illegal felling (Saxena, 1997).

Three parts devour forests in Pakistan i.e. household provincial utilize, modern division and business foundation. In such manner, the family unit area has developed as the biggest shopper with 81.8 percent took after by mechanical business people 14.9 percent and the business segment 3.3 percent. The yearly wood utilization in Pakistan is 43.761 million cubic meters against the yearly woodland development of 14.4 million cubic meters. In this way, it needs to endure lost 29.361 million cubic meters for each annum (Butt, 2013).

The unchecked cutting of trees has brought about quick deforestation and now the woods cover is under 5 percent. With one of the most noteworthy rates of deforestation on the planet, Pakistan's woodlands are in critical need of assurance and preservation. The real risk to Pakistan's backwoods is uncontrolled and unsustainable cutting for living purposes and timber items. There is critical need to discover substitute and supportable occupation strategies to ease weights on these valuable regular assets (Shinwari, 2010).

In Pakistan, the cover of current forest degree and deforestation rates are hostile issues among partners. As indicated by the principal complete remote detecting dependent on a national land cover appraisal under the Forestry Sector Master Plan (FSMP), the backwoods region aggregates 3.59 million ha, which is 4.1% of the aggregate land region of Pakistan (GoP, 1992). Out of this 3.59 million ha, roughly 67% of the backwoods zone exists in the region Khyber Pakhtunkhwa (1.49 million ha), the regulatory locale Gilgit-Baltistan (0.66 million ha) and the territory of Azad Jammu and Kashmir (0.26

million ha) in the Western Himalaya. Taking the FSMP contemplate as the pattern, a national woodland and range asset think about saw that yearly deforestation in normal timberlands was 27,000 ha amid 1990– 2000, giving a yearly decrease of 0.7%. The Global Forest Resource Assessment revealed woods cover to be 2.5 million ha, 2.1 million ha and 1.7 million ha for the years 1990, 2000 and 2010, individually; consequently, the backwoods cover rate of progress amid the principal decade was -1.6% per annum and -2.0% per annum amid the second decade (FAO, 2010). So also, the World Bank reports Pakistan's aggregate timberland cover to be 2.2% of its aggregate land territory (World Bank, 2016). Landsat symbolism to survey worldwide backwoods cover misfortune, demonstrating that numerous zones were losing a lot of woods cover; nonetheless, a significant number of these zones were not considered to speak to misfortunes of timberland arrive from the woodland stock point of view (Hansen *et al.*, 2010; Birdsey *et al.*, 2013).

The Malakand Social Forestry Project has explored the deforestation in Dir and Malakand Agency utilizing satellite information of 1972, 1978 and 1993. The understanding was trailed by serious field work. The outcomes are not delegate for the Khyber Pakhtunkhwa but rather are in demonstrative of the deforestation (Baig, 2008). Sangar valley is one of the remote region of area swat where there is high neediness level, poor correspondence framework, high absence of education rate, little find utilize and lesser openings for work. Additionally, there is no substitute source accessible for fuel. Neighborhood people group is to a great extent subordinate upon forests for their occupation, fuel wood and brushing of creatures. So the forests of the region are under high populace weight which prompts quick deforestation. The current explored underlying factors of deforestation in Sangar valley District Swat.

The main objectives were:

- (1) To ascertain the anthropogenic and biotic forces of deforestation in the study area.
- (2) To find out the ways and means of stopping deforestation in the study area.

Materials and methods

Study area

District Swat is located in the northern part of Khyber Pakhtunkhwa province with a total area of 5,337 square kilometers. Swat valley is located in the North of KPK, 35° North latitude 72° and 30° east longitude enclosed by high mountains. The annual average temperature of district swat is 19.3°C with long winter and short summer. Natural vegetation of district swat is mostly temperate forests in upper hill areas and lower hill areas are enriched by sub-tropical chir pine forests. Shrubby vegetation found in study area includes the species of *Berberius lyceum* and *Dodnea viscosa* while grass species are mostly *Bistorta amplexicaulis*, *Poenia emodi*, *Trillium govanianum* and *Menthe piperata*. District swat is located at a distance of 160km/100 miles from Islamabad, the capital of Pakistan. It is bound by district Chitral and Ghizer district of Gilgit-Baltistan province. On the eastern side, districts of Kohistan and Shangla are located. District Buner and Malakand protected area cover the southern boundary and on the west the area is bound by lower and upper Dir districts. The twin cities of Mingora and Saidu sharif are the district as well as divisional headquarters. The study will be conducted in Sangar valley of District Swat in KP province. Sangar valley is divided into 2 union councils namely UC jambil and UC dangram. Among them UC jambil will be randomly selected for data collection. It will be very tough job to collect data within short period of time for whole of the population. So three villages will be randomly selected, out of these selected villages interviewed will be made as per sampling designs. The vegetation of Swat district can be divided into the four major types. They are (1) Mixed silver fir, spruce, kail and broad leaved forests, (2) Pure Blue pine Forests, (3) Pure Chir Pine Forests and (4) Scrub Forests. The forests are liable to an array of damages caused by human and natural factors. The human damage often outweighs the injuries due to natural causes. Illicit cutting of trees, lopping, torchwood extraction, tapping, deodar, oil, encroachment on forestland, grazing and browsing and fires are the main human-caused injures to the crop. Encroachment upon

forestland is another threat to the forests. The forests at lower elevations near habitations and the forests on moderate slopes are cut be practice subsistence agriculture free the land for cultivation. The forests near the roads and water are also cleared for house construction. The encroachment on forestland is visible in all valleys where forests exist.

Methodology

Keeping in view the objectives of study, following methodology was adopted to perform the survey work. In view of limited time, lack of adequate transportation and mountainous area and other hard conditions the study was made limited to some areas of Sangar valley. The sampling design for data collection was random sampling. The interviews was conducted with the help of specially designed and pre-tested questionnaire. The total number of respondents to be interviewed will be fix as 100 from all the villages. In order to have same sampling intensity, the respondents of the sample three villages was calculated with the help of sampling fraction.

In order to have proportional number of respondents in each selected villages the number of households of each village was multiplied with the sampling fraction to arrive at required number of respondents and these required number of respondents was interviewed using Questionnaire. Data was analyzed by percentage, frequency and simple fraction formula.

Total observations = 100

Total household in 3 villages =

Sample Fraction = Total Observations / Total Number of Household = 100/.....=?

For statistical analysis chi square test is applied on data and all the results are found statistically significant = P-value (Alpha<0.05)

Landsat Images Processing

Landsat 5TM map and Landsat-8 map traversing the whole degree of the Sangar Valley were picked up from the United States Geological Survey (USGS) Earth Explorer database (USGS, 2013a). Both images were geo-referenced (UTM, WGS84) and were fixed to USGS "Standard Terrain Correction (Level 1T)" (USGS, 2013b). The application of multi-fleeting

satellite information for considerable zone imaging represents many problems, including geometric restore blunders, commotion emerging from environmental effects and changing information mistakes (Homer *et al.*, 2004). Therefore, pre-handling is important to limit such blunders. The pre-preparing steps utilized in this analysis involved Top of Atmosphere (TOA) reflectance change and cloud veiling. Thickness of vegetation can be approach by imaging of NDVI (common vegetation list). NDVI is the most widely recognized recipe to determine estimation of vegetation thickness (NDVI) provided data identified with necessary creation of vegetation (Pettorelli *et al.*, 2011). Vegetation gradient is a standout amongst the most helpful and used record to fast separate vegetated zones with the utilization of multispectral remote detecting information (Pirotta *et al.*, 2014). Utilizing red and close infra-red band, it can govern NDVI. NDVI fig. vegetation file reliant on red and close infra-red reflectance gotten via Landsat-5 and Landsat-8. The difference between NDVI of 1988 and 2018 make evident deforestation in the area.

Results and discussions

Age and Profession

Majority of the respondents were having the ages between (40-59) years which shows 54%, and having ages (20-39) years were 38% and remaining 8% were above 60 years (Table 1). The data indicated that 53% respondent were farmers, 11% were working on daily wages basis i.e. drivers; labour, etc whereas 16% having their shops and business activities, 7% were having govt. jobs while 13% were observed jobless. These large number of daily wagers and jobless people are either responsible for tree cutting or transportation, that could be a driving force for deforestation (Table 2).

Table 1. Age Wise Distribution of Questionnaire According to Information.

S. No	Age	Frequency	Percentage (%)
1	1 to 20	0	0
2	21 to 40	38	38
3	41 to 60	54	54
4	60 and above	8	8
Total	Total	100	100

Table 2. Profession and Activities of the Local Communities.

S. No	Profession	Frequency	%age
1	Farmers	53	53
2	Daily Wages	11	11
3	Business	16	16
4	Govt. Service	7	7
5	Jobless	13	13
	Total	100	100

Education

During the data collection different peoples having different educational qualification were studied. According to the analysis of data 40% of the whole respondents were illiterate, 32% having matriculation, 12% having intermediate qualification and the remaining 16% were observed having bachelor and master qualification combine. It shows lack of education could be a driving force of deforestation in the area. This table 3 demonstrates that there is lack of education in the study area, this is because in hilly areas access to school colleges are very less in competition with plain areas or urban areas. With a dynamic and stimulating educational environment our tradition is to accept challenges and to receive wisdom today, in order to achieve new things and new facts for tomorrow.

Table 30. Educational Level of the Local Inhabitants.

S. No	Education level	Frequency	Percentage (%)
1	Illiterate	40	40
2	SSC	32	32
3	HSSC	12	12
4	Bachelor and Above	16	16
Total	Total	100	100

Family Size and source of income

Various people were studied on the basis of different family sizes which show 50% having 10 to 18 family members, 44% were having 1 to 9 family members and 6% were having more than 18 members in single house. According to analysis it is clear that majority of the people have joint family system and dependent on single person for their daily life in the study area. Large family size could be a driving force of deforestation. This table 4 shows that families with the large number of peoples in hilly areas are very less. Most of the families consist of 9 to 18 in number. Therefore most of the average families were preferred

to interview. The data indicated 26% were dependent on (cultivation and services), 12% were dependent on (cultivation, forest wood and service), and 15% again dependent on (forest wood, livestock and services) for their livelihood. According to analysis 16% were having source of income like (business, cultivation and services), from the data it is clear that 24% people of the study area are dependent on forest as income source in addition to other sources like cultivation and business and 7% were having government jobs. In suggests that over dependence on forest could be a driving force for deforestation. This table 5 shows the income source living in the study area are mostly dependent on forest produce while the second largest source from which they earn is cultivation or they run their own business and services . The table further explains that government employment is very less in the study area.

Table 4. Family Size/ Household Strength.

S. No	Family size	Frequency	Percentage (%)
1	1 to 9	44	44
2	9 to 18	50	50
3	18 and above	6	6
Total	Total	100	100

Table 5. Source of Income.

S. No	Income source	Frequency	Percentage (%)
1	Cultivation + Service	26	26
2	Cultivation + Wood + Service	12	12
3	Livestock + Wood + Service	15	15
4	Cultivation + Business + Service	16	16
5	Forest Produce	24	24
6	Government jobs	7	7
Total	Total	100	100

Agent of Deforestation

During the data collection every walk of life were interviewed randomly, the analysis of that data shows that 56% respondent said, local people are responsible for deforestation, 34% respondent told that, Timber mafia is responsible for deforestation, whereas 10% show that Forest Department is responsible for forest depletion. . It shows that in all the above groups the local inhabitants are more

involved in deforestation. As shown in the above table 6 that local people are more responsible and are involve in the cutting and damaging to forests or tree stand. Further it explain and brings very shameful point that forest department also play a role in the cutting of forest illegally, many respondents gave their perception against forest department.

Table 6. Responsible for Forest Cutting.

S. No	Responsible	Frequency	Percentage (%)
1	Local people	56	56
2	Timber Mafia	34	34
3	Forest Department	10	10
Total	Total	100	100

Land use After Deforestation

The data indicated that 61% respondents were using the land for agriculture, 13% for construction purposes and only 26% were using the land for grazing. This indicates that the agricultural activities are more associated and is one of the major accelerator of deforestation in the study area. Expansion of agriculture at the expense of forests could be a driving force of deforestation. The table 7 illustrates that when the forests are cut down after that the barren lands are used for mostly agriculture purposes. As we know that Pakistan is agriculture based country and people get more benefits and income from agriculture crops in competition with forest crop so communities try to grow agriculture crops while some people use it for construction and grazing purposes.

Table 7. Use of Remaining Bare Land after Forest Cutting.

S. No	Land use	Frequency	Percentage (%)
1	Agriculture purpose	61	61
2	Construction	13	13
3	Grazing	26	26
Total	Total	100	100

Availability of Alternatives of fuel wood

According to data analysis 76% respondents told that there are no alternate sources of fuel wood available and they are dependent on forest for fuel wood. While 24% are using LPG and 8% using electricity as a source of fuel in addition to fuel wood. It indicates that major part of the population is dependent on

forest for fuel wood, which contributes to the driving forces of deforestation in the study area. This table 8 shows that in remote areas the availability of alternate source for fuelwood and very less availability of source like LPG and electricity. People bother and they go for the cutting of precious trees, if this condition will continue rate of deforestation will increase more in Pakistan.

Table 8. Availability of Alternate Source of Fuel wood.

S.No	Alternate sources	Frequency	Percentage (%)
1	LPG	22	22
2	Electricity	7	7
3	Population having no alternate source	71	71
Total		100	100

Livestock Status

The data indicated that 15% respondents having only cows, 16% having cows and goats and 43% having only goats, 7% respondents having buffalos, 9% having cows, goats and buffalos while 10% respondents have no livestock in the study area. All the respondents were of the view that livestock population in increasing and are dependent on the forests for their fodder. As there is no specific area for livestock grazing so it is also one of the major driver of deforestation. The above table 9 shows the population of livestock in study area, with the extent of survey it is found that local inhabitants prefer to keep goats and cows and few people are found which kept buffalos . according to answers of respondents that told that buffalos cannot survive in hilly areas and goats and cows give more benefit than buffalos.

Table 9. Types of Livestock.

S.No	Type of livestock	Frequency	%age
1	Cows	15	15
2	Goats	43	43
3	Cows and goats	16	16
4	Buffalos	7	7
5	Cows, goats and buffalos	9	9
6	No livestock	10	10
Total		100	100

Adverse Impacts of Deforestation

The analysis of data indicates that 95% of respondents were agreed that due to deforestation there is low rainfall and snow fall in the area as

compared to past and 5% were not agreed with the opinion. 76% of the respondents were agreed that there are intense rainfalls within a short period of time. All the respondents interviewed were of the opinion that is a rise occur in the average temperature due to deforestation. 87% respondents were agreed that seasonal variation occurred due to deforestation while 95% of the respondents consider deforestation as the major cause of the frequent droughts occurs in the study area.

The data indicates that 71% of respondents were agreed that due to high deforestation the shortage of fuel wood occur which ultimately increases the prices of fuel wood. 85% of the respondents told that due to deforestation shortage of timber for constructional purposes occur which leads to the rise in their prices. This table 11 shows that deforestation also effects the livelihood of the inhabitants and these effects may be mostly in the form of high prices constructional wood and shortage of constructional wood. The other crises includes shortage of fuel wood and high prices of fuelwood.

Table 10. Effects on Environment.

S. No	Effects on environment	%age agreed	%age not agree	x ²	df	p.value
1	Low rainfall and snowfall	95	5			
2	High intensity of rainfall	76	24	41.47	4	0.0001
3	Rise in temperature	100	0			
4	Seasonal variations	87	13			
5	Drought	95	5			

Table 11. Effects on livelihood.

S. No	Effects on livelihood	%age agreed	%age not agree	X ²	df	P value
1	Shortage of fuel wood	71	29			
2	High prices of fuel wood	71	29	11.42	3	0.0097
3	Shortage of constructional wood	85	15			
4	High prices of constructional wood	85	15			

Occurrence of Environmental Hazards and Effects on wildlife

The data indicates that 96% of the respondents were agreed that deforestation is responsible for flood and 90% of the respondents were agreed that landslides occurs due to deforestation while the remaining 4% and 10% respectively did not agree. The above table 12 illustrates that environmental hazards like floods and landslides are the major effects of deforestation that occur in the study area. If the deforestation continues, such types of hazards will increase and will affect the livelihood. The analysis of data indicates that 96% of population was agreed that decrease in number of wild life species occur due to loss of their natural habitat while the remaining 4% do not agreed. And 90% respondents agreed that type of population decrease due to illegal hunting and also from the loss of the natural habitat while 10% people not agreed and they are mostly hunters. The below table 14 shows that the decrease in type and number of wildlife population in the study area is rising issue and it can leads to the loss of wildlife natural habitat.

Table 12. Occurrence of Environmental Hazards.

S. No	Environmental Hazards	%age agreed	%age not agreed	X ²	df	p. value
1	Floods	96	4	2.7650	1	0.0482
2	Landslides /slips	90	10			

Table 13. Effect on wildlife.

S. No	Effect on wildlife	%age agree	%age not agree	X ²	df	p. value
1	Number of wildlife population	96	4	2.765	1	0.0963
2	Type of wildlife population	90	10			

Table 14. NDVI Mapping.

S. No	Landsat	Year	NDVI
1	5	1988	0.58
2	8	2018	0.44

NDVI Mapping

NDVI was used to map forest cover in both images. Results showed that in 1988, most of the area of Sangar valley was covered by forests while in 2018 the massive deforestation has reduced forest cover. The

Fig. 1 showed that in 2018, the forest cover was decreased so-much and anthropogenic activities has severely manipulated forests in lower of Sangar Valley. NDVI range from 0.58 in 1988 and has been reduced to 0.44 in 2018.

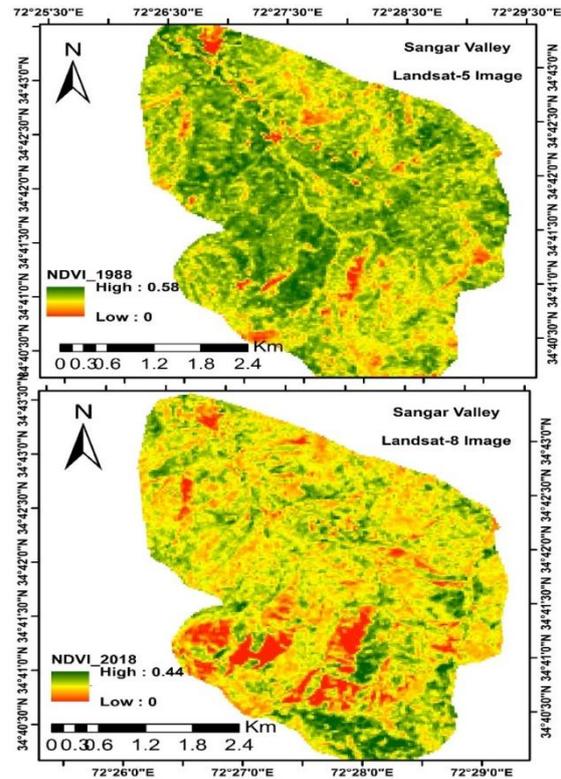


Fig. 1. NDVI Mapping.

Major Problems

The analysis of data indicated that 34% respondents, not provision of alternate of forest wood is a major problem and driving force of deforestation, 26% respondents, illegal cutting (smuggling) is another issue in the study area. Whereas respondent 20% due to poverty and unawareness cut the forests, while 10% respondents, the sudden increase in population is also a problem and driving force of deforestation in the study area. While 10% of the respondents consider illiteracy and unemployment as one of the major driver of deforestation. This table 14 shows the problems of the study area in which the main problem is lack of alternate resource and shows that illiteracy is minor problem in the study area. So if these problem are focused by the authorities these problem will be get solved.

Table 15. Problems in Sangar Valley.

S. No	Problems	Frequency % age	
1	Lack of alternate resource	34	34
2	Smuggling	26	26
3	Poverty and unawareness	20	20
4	Increase in population	10	10
5	Illiteracy	10	10

Discussion

Khan *et al.*, (2017) check out immediate reasons and underlying driving forces of deforestation and its socio economic impacts on the local community of district Swat. The observed suggested fuel wood timber series from the forest and the role of overgrazing turn out to be the main causes. Ali *et al.*, (2005) assessment about 50 percent of the forest in Basho Valley (Northern Areas) vanished after the construction of the link road. Khattak, (1994) also says "huge scale deforestation inside the Malakand Agency transformed into brought about for the duration of the seventies via tenants who considered it inequitable for landlords to assert leading advantages from forests even if they were no longer inhabitant in the locality (Khattak, 1994). The huge deforestation through the powers that be generated feeling of resentment many of the forest occupiers, who considered timber cutting as their right, and forced them to hold in immoderate wood confiscation as well (Azhar, 1993).

Rao and Marwat, (2003) talk over direct and indirect causes of deforestation within the example of Pakistan which comprise of institutional components such as land tenure, illicit activities and broader socio-economic causes inclusive of population growth and density, economic growth. Amongst the main reasons for deforestation, market fix ups and governance weaknesses are considered as most dangerous (Contreras and Hermosilla, 2000). Azhar's studies (1993) observed into the rental searching for activities of the groups existing in/across the forests as a cause of deforestation. Hasan (2001) marked that the failure of the system to establish a proper institutional set-up for forest control has moreover been blamed because the aim of forest decline.

Ali *et al.* (2006) considered that in Mansehra 90% of the respondents had been using forest wood for cooking. However 56% of the respondents were the routine of forests for timber within the same villages. Tariq *et al.* (2014) described that in Swat district, 96% of the respondents had been the use of fuel wood for cooking purposes, and 84% of the respondents used forests for their wooden needs. Ali *et al.* (2005) studied that fuel timber is an important feature of locals keep economies.

Tariq *et al.* (2015) approved out a research and said that loss of trade sources for fuel wood, timber and fodder are the main and key causes of deforestation in Dir Kohistan. According to them 83% of survey respondents the principal reason of deforestation in Dir Kohistan is loss of alternate sources in which the chief item is fuel timber. Kissinger *et al.* (2012) understood that results on worldwide patterns of deforestation indicate that timber consumption and logging activities reason for more than 70% of universal deforestation.

Ali *et al.* (2006) learned that all through northern areas, the forest wood is intensively consuming for the improvement of latest and repair of current houses as turn out to be informed by 73% of the respondents. Most of the buildings in all the villages are made-up from wood. Tariq *et al.* (2014) examined that 75% of study respondents the second one principal drive of deforestation in Dir Kohistan is being without a job detected by means of lower literacy ratio. Chakravarty *et al.* (2012) concluded that poverty and increase in population are said to be the leading reasons of forest area loss in keeping with the international corporations such as FAO and diplomatic our bodies. Mawalagedara and Oglesby, (2012) completed that bigger get entrance containing roads, rivers and railroads, to forests and market place speed up deforestation. Tariq *et al.* (2014) accomplished a research and examine that in Dir Kohistan the deforestation rate extended, the flood is also long-drawn-out. Lal, (2003) specified that deforestation in northern areas of Pakistan has a key role in soil erosion and land degradation.

Fischer *et al.* (2010) described that KPK province has the premier deforestation, which is too connected with over populace for fuel wood and further forced by large scale illicit marketable harvesting. Numerous reports state this deforestation with link of timber mafia and participant groups for financial achievements and vanishing by security forces for planned reasons. In such native level assessments, the new temporal forest protection enquiry (1968, 1990, 2007) discovered annual deforestation rates of 1.86%, 1.28%, and 0.80% in three regions of Scrub forest, agro-forest and alpine forest, separately, in district swat (Qasim *et al.*, 2011), while Qamer *et al.* (2012) detected an annual uncultivated deforestation of 0.81% in the Swat and Shangla districts of KP province throughout 2001–2009. Additional, Fischer *et al.* (2010) witnessed an annual forest concealment rate of change of 1.32% during 1996–2008 in the Malakand and Hazara regions.

Pellegrini *et al.* (2016), said that deforestation in northern Pakistan taken place often owing to departmental forget and there's a need to place in power proper forest regulator strategies. Shaheen *et al.* (2011) saw huge deforestation due to excessive fuel wood intake in the Bagh district of Azad Jammu and Kashmir. There aren't sufficient readings occur on associating great forest loss in highland place of Pakistan with herbal reasons like climate, water, landslides, weakness, etc. Qamer *et al.* (2016) drawn deforestation and forest area depletion styles in western Himalaya, Pakistan. The study assumed about 684 ha of forest has been out-of-place, which quantities to 0.38% according to annual reduce or critically ruined over the past two decades. Saeed (2003) identified underlying causes of deforestation and forest cutting in Pakistan. The main causes of deforestation are rising population pressure, dependence of urban on the fuel wood of rural families, interruption of forest area are uncontrolled in natural forests, unsystematic grazing past tactics ability of mafia, floods, fires and storms, insufficient financial inputs, stakeholders' loss of involvement of coverage making and tactics of the timber Mafia.

Ahmad *et al.* (2012) illustrated a decline in Coniferous forests from 1992 to 2010 in all parts of Pakistan. An inspection accomplished by Ali *et al.* (2005) defined the adjustment in forests cover in Basha valley by contrasting Landsat pictures of 1976 and 2002. They moreover made reference to that deforestation is caused by damage of forests and illicit gathering rather than increase in population. Siddiqui *et al.* (2004) and Abbasi *et al.* (2011) broadcasted lost 21,590 ha of riverine forests along the fields of Indus River. Mainly 85 percent misfortune has been understood in the Sindh region from 1977 to 2009. Zaitunah *et al.* (2018) assessed land use change and vegetation thickness (NDVI) someplace in the range of 2005 and 2015 and confirmed the wide-ranging of forest zone had been deteriorated in the middle of one decade. The land cover that have the ultimate amazing NDVI honor run with very thick vegetation class is the essential dry forests (0.804 to 0.876), trailed by supporting dry forests (0.737 to 0.804).

Conclusion

The major findings of the study were; 87% respondents told that seasonal variation is the negative effect of deforestation. While 95% respondents told that drought occur in study area is due to deforestation. According to 96% respondents flood is a permanent hazard throughout the study area while 90% are agreed that landslide hazards in the study area are due to deforestation. The study revealed that 71% of the respondents declared deforestation responsible for shortage and high prices of fuel wood. While 85% of the respondents told that shortage and high prices of constructional wood is the effect of deforestation. The study indicates that 96% of respondents told that due to deforestation both decrease in number and types of species of wildlife is associated with deforestation. According to collected data the main problems in the study area were; Small land use, Not provision of alternate source of fuel wood, Poverty and unemployment, Increasing population rate, Expansion of agriculture land, Illiteracy and unawareness, Increase in livestock population and Infrastructure development.

Recommendation

The main recommendation of the study were; Proper monitoring and supervision of natural resources by Forest Department and implementation of forest rules to control illegal cutting and encroachment of forest lands. Awareness programs about forest and biodiversity conservation, environmental protection and importance of other natural resources to the local community. Community participation in forest protection and management should be enhanced. Livelihood programs should be initiated through Non Timber Forest Produces (NTFPs), Eco-tourism, local industries, establishment of fruit orchards and their proper marketing for the improvement of socio-economic condition of local people. Alternative resources should be provided to local peoples like bio brackets of Nepal.

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