

Research Article

Causes of deforestation and climatic changes in Dir Kohistan

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Pakistan is on 2nd position among those countries, where deforestation rate is very high. The current work is design to highlight the facts, real causes and impacts of deforestation and forest degradation in "Dir Kohistan" of K.P.K Pakistan, by incorporating the view of local people through a questionnaire. According to this survey about 83% of the local people are dependent on these forests and contribute to deforestation in one of different ways regardless of any rule regulation. The current study shows that the extensive deforestation in the mention area occurs for household needs (cooking, furniture, heating, earning etc). Another growing cause is the cutting of these forests for livestock purposes. Along this the nonscientific grazing is a key point in the deforestation. Unemployment and poverty is another attractive factor in the degradation of these forests. However the role of black marketing and role of stake holders on these forests should not be neglected in deforestation. Meanwhile the ineffective management and ignorance of the forest department is one of the major contributing factors in deforestation. This study also highlights the climatic changes in Dir Kohistan, since 1983 to 2012. The climatic data of mention area assimilated through survey, online source and meteorological station. The climatic data show that there is increase in temperature (0.33°C), decrease in rainfall (148.2mm) and humidity (1.4%). The underlying causes of deforestation in "Dir Kohistan" need the attention of government authority to resolve these causes, implementing strong rules regulations in order to mitigate the climatic changes and save this ecosystem.

Keywords: Forest, Deforestation, Causes, Climate changes, Dir Kohistan

1. INTRODUCTION

A forest can be defined as a land with canopy cover more than 10%, straddling an area greater than 0.5 hac, including the trees with height larger than 5m (Ahmad and Abbasi, 2011). Forests provides carbon storage and other benefits while delivering a lot of environmental and social benefits, such as timber and biomass resources, clean water, wildlife habitat, and recreation (Malmsheimer et al, 2011). Forests cover was just 4 billion hac (30% of land) in 2005, 36% of which are classified as primary forests. About two third of known land-based species are in forests but now these are going to extinction. Approximately 8000 tree species which make 9% of the total number of tree species are under threat of extinction (Liaison, 2012).

Deforestation is the removal of the existing natural vegetation cover, especially where the native cover is

largely forest (Mawalagedara and Oglesby, 2012). Deforestation is the clearing away of forests by a process in which an area depleted its existing natural forest vegetation and resources (Aberé and Opara, 2012). The conversion of forest to an alternative permanent non-forested land use such as agriculture, grazing or urban development is called deforestation (Chakravarty, 2012).

High rate of deforestation is one of the major problems in Pakistan. According to different studies and surveys it is stated that forests are spread over less than 4.6 Mhac of total area. These forests undergo rapid degradation especially in the mountain area and the deforestation rate is nearly 1.5% which is very high alarming and threat to ecosystem (Ali et al, 2006). In Pakistan fuel wood covers about 53% of total annual domestic energy. This dependence on fuel wood is expected to remain high in Pakistan in the future, because the economy of our country is not so strong that shift the

traditional fuel wood to modern fuels. It is estimated that the population growth and fuel wood consumption will increase by 3% per year. The high demand for domestic fuel wood is believed to be rapidly depleting the forests (Benjaminsen and Ali, 2004).

The greater access such as roads, rivers and railroads, to forests and markets accelerates deforestation. Besides this forest fragments are more accessible than large compact forests and forests in coastal areas and islands are more accessible than others. All those forests which are far at 2 or 3 kilometers from roads are declining at slow rate of deforestation (Angelsen and Kaimowitz, 1999). The deforestation rates may increase because the population is growing and needs more land for food, fuel wood, timber, or other forest products (Angelsen and Kaimowitz, 1999). Beside this over the past 300 years, 7-11 million km² of forest has been cleared (Mawalagedara and Oglesby, 2012).

2. METHODS

To find out the causes of deforestation in Dir Kohistan since 1983 to 2012, a questionnaire was prepared. This survey questionnaire consist of 21 close ended questions about forests and causes of deforestation and covered a sample of 120 respondents from the whole population (Estimated: 25,330) of Dir Kohistan. For the selection of villages, non-probability sampling was used. Sheringal and its adjacent villages such as Samang, Dukai, Shahoor Bala and Shahoor Payin etc, were selected for 60 respondents while the remaining 60 respondents covered Patraak and its adjacent villages. To select respondents, quota sampling is used and the area is divided into five imaginary fragments for each 60 respondents. Only 12 respondents were selected for survey in each imaginary fragment of Dir Kohistan. The climatic data was obtained from an online source, survey and meteorological station of Dir, Upper. The primeval data is statistically analyzed by the Microsoft Excel for overall results and then results are shown by the tables, bar graphs and pie charts.

3. RESULTS AND DISCUSSION

Forests play a key role in the environmental stability. However there are a number of factors which decrease the density of these forests. The current study show that these forests are depleting at very high rate. A number of direct and indirect factors contribute to deforestation in Dir kohistan which include alternate resources, unemployment, lack of

judicial policies and rules, black marketing and timber mafia, infrastructural activities and over grazing of livestock as shown in **Figure 1 & Figure 2**.

Lack of alternate resources for fuel wood, timber and fodder is the main cause of deforestation in Kohistan. According to 83% of survey respondents the main cause of deforestation in Dir Kohistan is lack of alternate resources in which the main item is fuel wood as shown in **Figure 2**. The study find out that 50% of people use more than 500 mound, 37% use more than 200 mounds and only 10% of the people use less than 200 mounds of wood for heating and burning in a single year. The remaining 3% use more than 1000 mounds of wood for heating stoves in their homes which is given in **Figure 3**. Due to the extreme climate in most area of the Dir Kohistan such as in Thal, Lamoti, Kalkot and Shahoor Bala, the people use a large quantity of fuel wood throughout the year. "Average house hold need for fire wood is 15.43 kg/day in summer and 31.94 kg/day in winter, while average timber needed for a house construction is 364 cft. It is also estimated that 30% of the population migrates to lower areas during winter season and 85% of the total needs of people met from the forests. The remaining 15% needs met from scrub forests (10%), farm lands (2%), LPG/kerosine oil (2%) and from agricultural residues (1%)" (Saddozai, 1995). On average there are 16 members in each family which require more fuel wood for heating their stoves and rooms. To fulfill their requirements of heating energy they consume a large amount of fuel wood, which is a main cause of depletion of these forests. They cut down the trees in excess without any wise management or plantation (afforestation). "Findings on global patterns of deforestation indicate that timber consumption and logging activities account for more than 70% of total deforestation. Fuel wood collection, charcoal production, and to a lesser extent, livestock grazing in forests are the most important drivers of deforestation" (Kissinger et al., 2012). Mostly, where it is possible the local people of Kohistan use wood in their domestic and commercial activities such as furniture in hotels, shops and homes. They do not use any alternate for timber such as use of plastic commodity instead of wooden furniture. "Another study in northern areas, the forest wood is intensively using for the construction of new and repair of existing houses as was informed by 73% of the respondents. Most of the houses in all of the villages are made of wood. Even if the house is made of mud/stones or brick yet timber is need for the construction of roofs, doors etc" (Ali

et al, 2006).

Another main cause of deforestation in Dir Kohistan is unemployment which is given in [Figure 2](#). The literacy rate of Dir Kohistan is low which results in the unemployment of local people. Most of the young generation in Dir Kohistan is illiterate and thus have very little opportunity for employment. To fulfill their daily basic needs and requirements the unemployed and jobless people of the area use these forests as a source of income by illegal manners. "Poverty and over population are believed to be the main causes of forest loss according to the international agencies such as FAO and intergovernmental bodies" (Chakravarty et al, 2012). The poor people of Dir Kohistan cannot support the children of their large families to educate or seek them any other skill which support their life. "In addition to this, we also know that poverty, population and pollution (3Ps) are interlinked. As the population growth and poverty increases, the area is getting more polluted and the natural environment is degrading" (Zaman et al, 2011).

The next main cause of deforestation in Dir Kohistan is non-judicial policies/rules and ineffective management ([see Figure 2](#)). "In 1972 it is decided that all forests in Dir Kohistan belong to the state. Before this, out of the total sale proceed only 15% was paid to the stake holders /right holders, which is now 60%. In 1975 the Forest Act 1927 was implemented and the forests were declared as protected forests" (Saddozai, 1995). To fulfill their requirements and basic needs the local people are unable to follow the rules of local community and government. They get the benefits from the forests by illegal means. Another familiar study also shows that "The deforestation result in northern areas is due to the ineffective forest management strategies and bad governance by the provincial forest department. The forestry extension service offered by the department is quite ineffective and doesn't address the real problems" (Ali et al, 2006). So these rules/ policies are a main cause of deforestation in

Dir Kohistan.

Another main cause of deforestation in Dir Kohistan is black marketing of timber which is shown in [Figure 1](#). In a discussion with local people, they complain that the staff of FDC, Sheringal is not honest in their duty and take bribes from the smugglers. Another study also indicates that the foresters take bribe from the villagers and outsiders are allowed to cut trees. Similarly the higher forest officials take heavy amount of money from the timber smugglers and allow them to cut the trees. (Ali et al, 2006). For better control over forest protection and illegal movement of timber, forest and community check posts has been established recently. In Dir Kohistan there are two Forest Check Posts (Sawni Forest Check Post and Sheringal Forest Check Post) and four Communities Check Posts (Patrak Community Check Post, Kalkot Community Check Post, Gorrai Kandaw Community Check Post and Lar Dhog Community Check Post). Besides this, under the community participation rules of 2004, there are 21 JFMCs (Joint Forest Management Committees) has been constituted in Sheringal (FDC Sheringal report, 2012). All of the above mention management is present, but until now the smuggling and down flow of timber in Sheringal is continued.

The next main cause of deforestation in Dir Kohistan is livestock grazing and trampling ([see Figure 1](#)). The natural small vegetation is the only main source for livestock grazing in Dir Kohistan. "The link between deforestation and cattle ranching is strongest. Forest area has been reduced by almost 40 percent over the past 40 years. Over the same period, pasture areas and the cattle population increased rapidly" (F.A.O report, 2012). The livestock affect the forests by two means, one by using the vegetation as a fodder and grazing. Secondly, large number of cattle and herds crush and trample the small vegetation. Thus over grazing and trampling of livestock contributes to deforestation and has adverse effects on forests in Dir Kohistan.

3.1 Direct causes of deforestation in Dir Kohistan

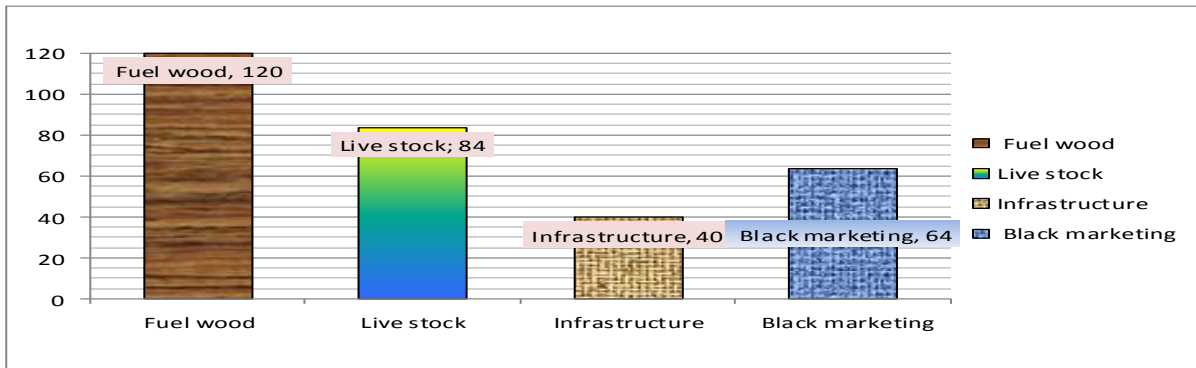


Figure1. This graph shows that for what purpose and how much the forests are used by the local people. The survey is conducted on the basis of 120 respondents to know the main usage of the forests by the local people in Dir Kohistan. Three main direct causes of deforestation are identified which are fuel wood, livestock grazing and for infrastructure. Out of the 120 respondents, 120 (100%) are using these forests for fuel wood 84 respondents (70%) use it for their livestock grazing, 40 respondents (33%) use it for infrastructure purposes while 64 respondents (53%) claim for black marketing.

3.2 Indirect causes of deforestation in Dir Kohistan

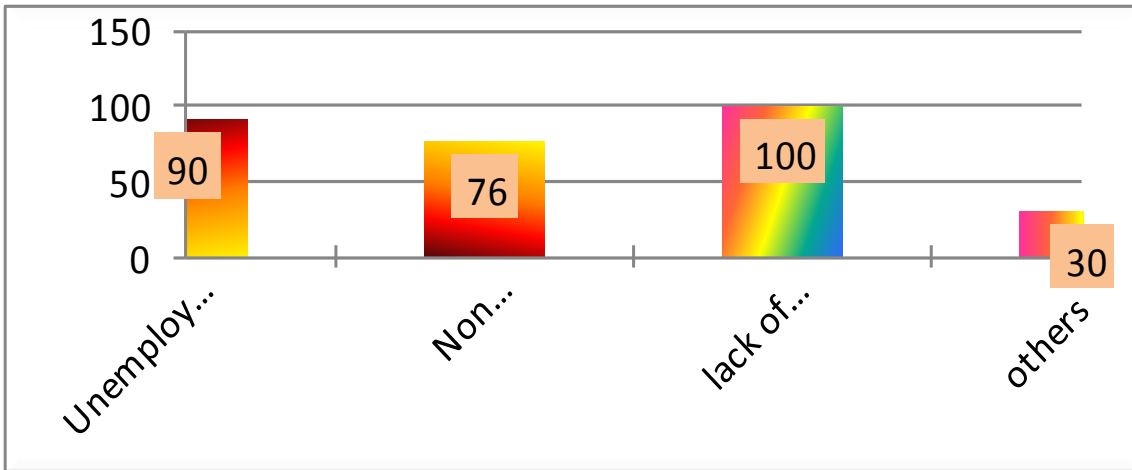


Figure:2 In a 120 respondents 83% of respondents the main indirect cause of deforestation is lack of alternate resources for fuel wood. Similarly out of the total respondents 75% answered for unemployment, 63% for non-judicial policies & rules and 25% for other reasons, which are indirect causes of deforestation in Dir Kohistan.

3.3 Annual use of fuel wood in Dir Kohistan

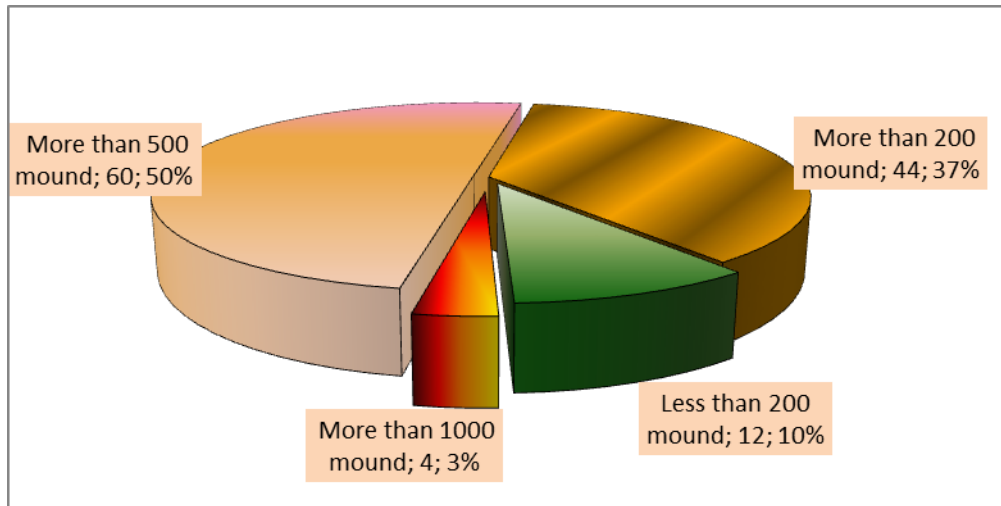


Figure 3. This graph shows the quantity and proportion of fuel wood used by 120 respondents of the survey. The study show that the average fuel wood consumption increased from 23.7 kg/day in 1995 to 51.6 kg/day in 2012, which is equal to 1.03 mounds/ day.

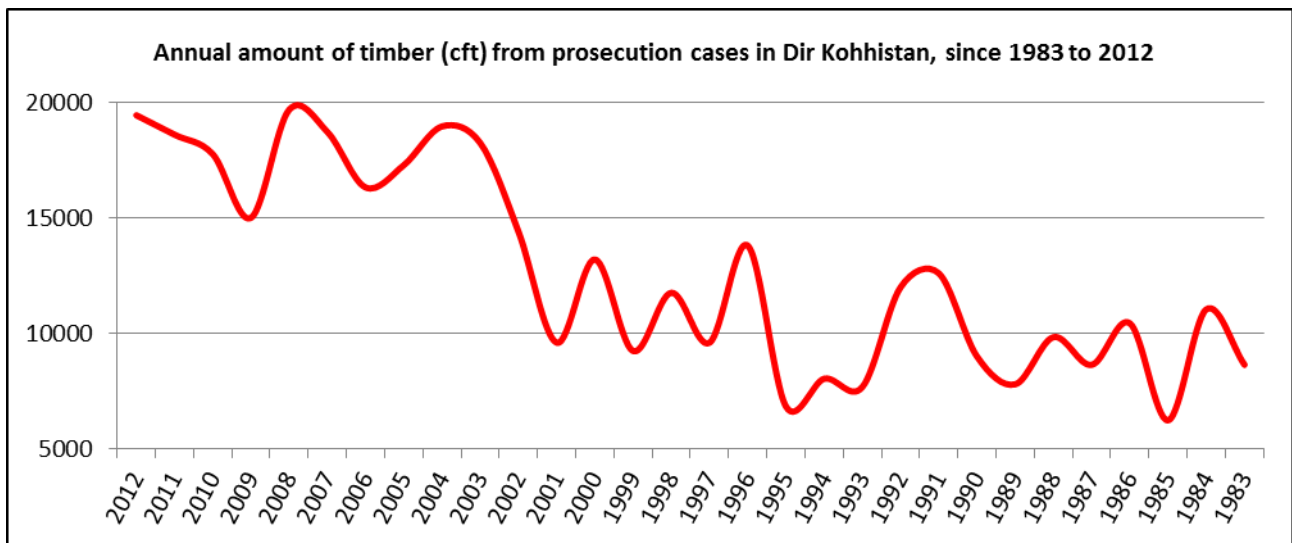


Figure4. The line shows increase in the annual timber of prosecution cases, since 1983 to 2012. The vertical axis shows the amount of wood in cubic feet (cft). The total amount of prosecution cases timber, since 1983 to 2012, is 380400 cft. The average annual amount is 12680 cft. (Source: FDC Sheringal Report, 2012)

The below table Consist of annual prosecution cases, annual amount of timber in cft and fine in Rupees. Since 1983 to 2012, total prosecution cases are 3170, total amount of timber is 380400 cft and total fine is 15,85,95,198 Rupees. Since 1983 to 2012, the average annual prosecution cases are 105, average usage of timber is 12680 cft/year and average annual fine is 52,86,506 Rupees. (Source: Report 2012, FDC Sheringal).

Year	Prosecution cases	Quantity of timber in cft	Amount of fine in Rs.
2012	162	19440	8104860
2011	155	18600	7754655
2010	148	17760	7404445
2009	125	15000	6253754
2008	164	19680	8204926
2007	156	18720	7804685
2006	136	16320	6804085
2005	144	17280	7204325
2004	158	18960	7904745
2003	152	18240	7604565
2002	120	14400	6003604
2001	80	9600	4002403
2000	110	13200	5503304
1999	77	9240	3852312
1998	98	11760	4902943
1997	80	9600	4002403
1996	115	13800	5753454
1995	57	6840	2851712
1994	67	8040	3352012
1993	64	7680	3201922
1992	100	12000	5003003
1991	105	12600	5253153

1990	75	9000	3752252
1989	65	7800	3251952
1988	82	9840	4102463
1987	72	8640	3602162
1986	87	10440	4352613
1985	52	6240	2601561
1984	92	11040	4602763
1983	72	8640	3602162
Total	3,170	3,80,400	15,85,95,198

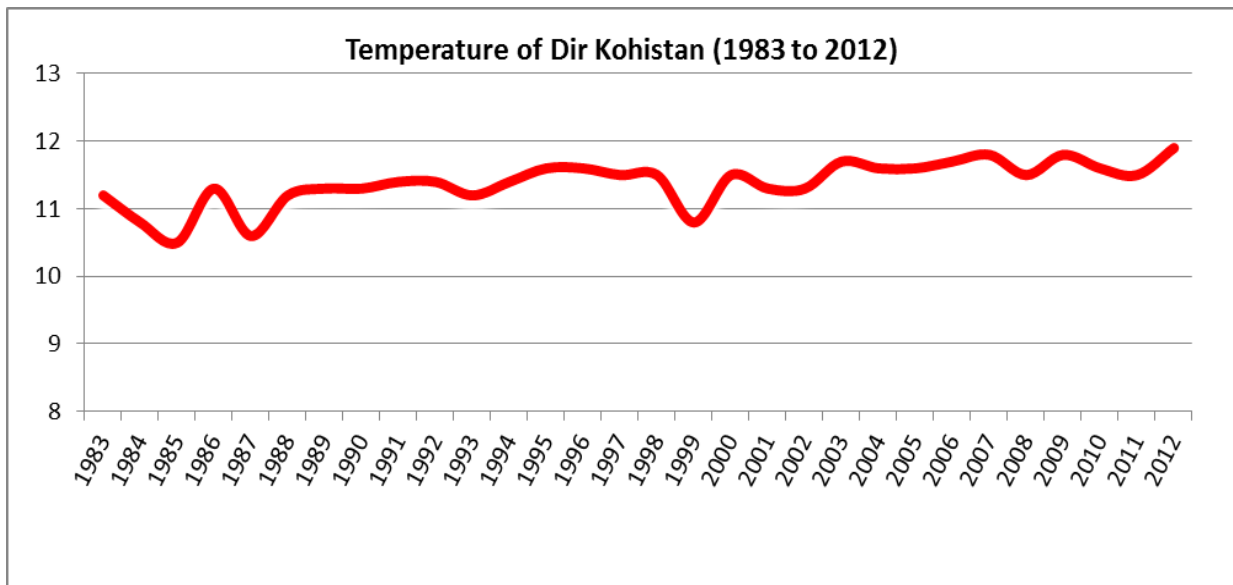


Figure 4: This graph show increase in average annual temperature. The vertical axis shows temperature in centigrade (°C) while the horizontal axis shows the years. Overall result shows increase of 0.33°C in temperature.

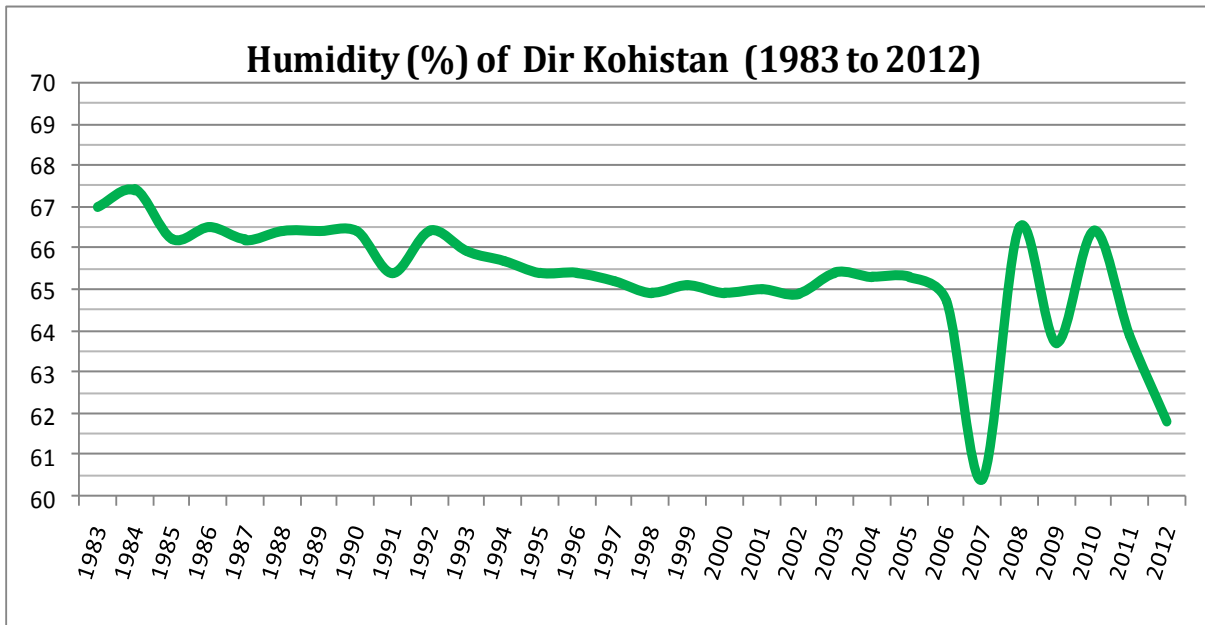


Figure 5: The vertical axis shows humidity in percentage (%) while the horizontal axis shows year. This graph shows the mean annual humidity which decreased from 1983 to 2012. Overall result shows decrease of 1.43% in humidity.

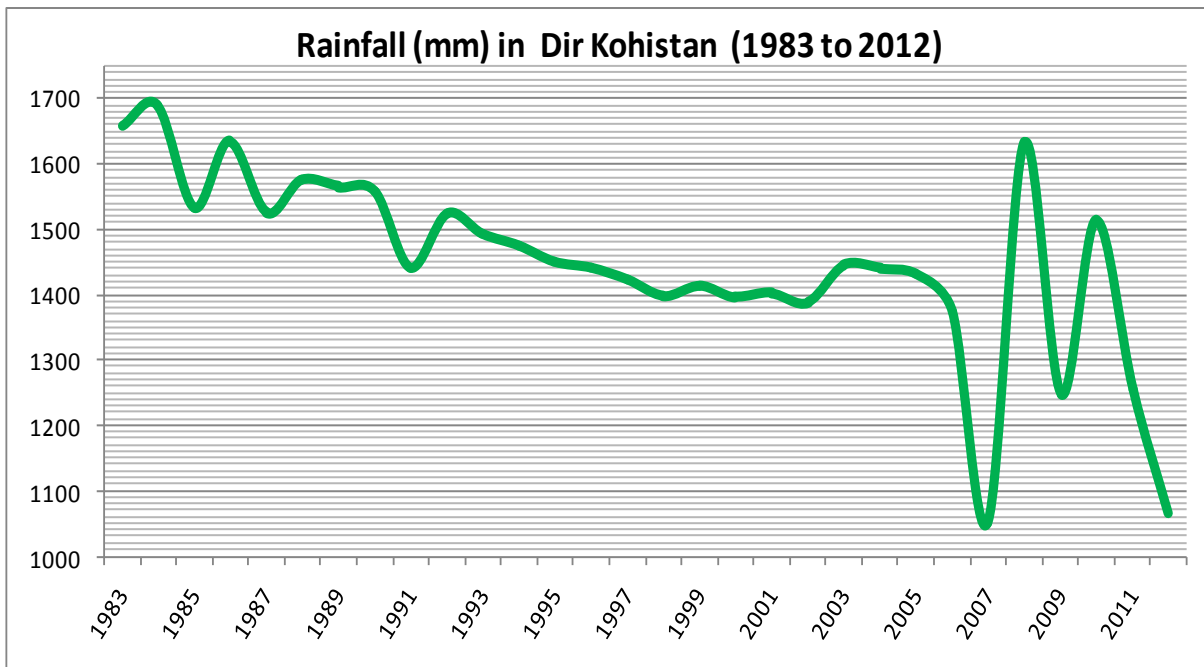


Figure 6: The vertical axis shows rainfall in millimeter while the horizontal axis shows year. Average annual rainfall is 1447.4 mm. Overall result show 148.26 mm decrease in rainfall of Dir Kohistan.

As the rate of deforestation increases, more climatic changes will be occurring (Farooqi et al, 2005). The current study shows that there is direct relation between the deforestation and climatic changes. As the forest land degrades, the climatic changes such as increase in temperature decrease in rainfall and humidity occurred. "Carbon dioxide primarily comes from the deforestation and consumption of fossil fuels. Deforestation which is mainly caused by expanding agricultural activities, accounts for 12 percent of global greenhouse gas emission" (Congressional Budget Office, 2012). Increase concentration of greenhouse gases which primarily come from deforestation cause to enhance the earth's surface temperature (Malik et al, 2012). In Pakistan, the mean annual surface temperature raised from 0.6°C to 1°C (Farooqi et al, 2005). The current study shows that in the last 30 years, there is increase of 0.33°C in temperature of Dir Kohistan as given in **Figure 4**. "Similarly monsoon rainfall increased at the rate of 18 to 32% and humidity decreased by 5% in Pakistan" (Farooqi et al, 2005). The climatic data obtained from Meteorological station and Survey show that the mention area faced decrease in rainfall, humidity and increase in incidence of diseases (see **Figure 5** and **6**). As the temperature increases the chances of diseases will be more. This is because, warm provide more suitable condition for the growth of diseases spreading worms and microorganisms. In the last 30 years in Dir Kohistan, there is decrease of 148.2 mm in rainfall and 1.4% in humidity as shown in **Figures 5** and **6**.

Conflict of Interests

Authors declared no competitive interests for the presented work.

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