

Population Increase: A Major Cause of Deforestation in District Ziarat

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Abstract

Deforestation is one of the major environmental issues. Population increase has been blamed for being the most significant factor among others, responsible for deforestation. The present study was conducted to determine the relationship between increase in population and increase in non-forest areas and the effect of population on the forest cover in Ziarat district of Balochistan. Population for the year 1998 and the annual average population growth rate of 2.47% were taken as basis for the projection of Ziarat district population for the years 2004 to 2013. For forest cover determination, three reserved forest areas namely: Batsargai Reserved Forest, Gohar Reserved Forest and Sasnamana Reserved Forest were selected. Ten sample areas were chosen from these forests. Forest covers change in these sample areas from the year 2004 to 2013, were identified and calculated with the help of softwares: the Google Earth and the Earth Point. The results showed that there was positive correlation between population increase and increase in non-forest areas. The R^2 values for the Batsargai, Gohar, and Sasnamana Reserved forests were 0.93, 0.65, and 0.85 respectively.

Key words: Population increase, deforestation, non-forest area

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INTRODUCTION

Deforestation is one of the major environmental issues, not only indirectly effect countries and locations but also from a global perspective (Marcoux, 2000). Pakistan is among the most populated countries in the world with geographic area of 307,000 square miles and a population of over 135 million. Pakistan suffers far more severe forest scarcities than the most countries in South Asia (Achakzai et al., 2013). In Pakistan deforestation is becoming an important environmental problem particularly in Ziarat district of Balochistan. The valley of Ziarat is situated in northern Balochistan which possesses one of the largest natural and rare forest types (Ahmed et al., 2006). Ziarat has the distinction of having second largest area of juniper forests in the world. Forest area is the 54% of the district total area (Agriculture Statistics, 1994-95) but deforestation is taking place as result of increase in population. Research has revealed that the population growth and

urbanization are amongst the root causes of deforestation (Achakzai et al., 2013).

Deforestation

Deforestation is the loss or continual degradation of forest habitat due to natural or human related causes, agriculture urban sprawl, and unsustainable forestry practices, mining and petroleum exploration.

Deforestation can be defined broadly to include not only conversion to non-forest but also degradation that reduces forest quality. Narrow definition of deforestation is as the removal of forest cover to an extent that allows for alternative land uses (Ahmed, 2008). Deforestation takes place when a forested area gets removed for the use of agriculture pasture; urban development logging or wasteland. When this destruction of a natural environment occurs a degraded ecosystem is likely to follow. A degraded ecosystem is result of a loss to habitat and a reduction in biodiversity (Clark, 2012).

Different researchers define deforestation in different meaning as it is the loss of original

forest for temporary or permanent clearance of forest for other purpose (Fearnside, 1993). Deforestation is a situation of complete long term removal of tree cover (Kaimowitz and Angelsen, 1999). Another definition is as a complete clearing of tree formation and their replacement by non-forest land uses (Sing et al., 1990). Thus deforestation is a complex process which is not govern by specific theory neither Neo-Malthusian or Boserupian theory has been able to explain it in a convincing way it occur on local or regional level but effects are global (Thomas and Kottak, 1993).

The Forest Cover Area

According to FAO, the forest cover areas include the land, spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach that threshold in-situ. It does not include land that is predominantly under agriculture or urban land use.

Forest is determined both by the presence of trees and the absence of other predominant land uses. The tree should be able to reach a minimum height of 5 meters in-situ, including areas with young trees that have not yet reached but which are expected to reach a canopy cover of 10% and tree height of five meters. It also include areas that are temporarily un-stocked due to clear cutting as a part of a forest management practice or natural disaster, and which are expected to be regenerated within 5 years. Local conditions may, in exceptional cases, justify that a longer time frame is used.

FAO also includes the forest roads, fire breaks and other small open areas; forest in national parks, nature reserved and other protected areas such as those of specific environmental, scientific, historical, cultural or spiritual interest; wind breaks, shelter belts and corridors of trees with an area of more than 0.5 hectares and width of more than 20 meters; area with mangroves in tidal zones, regardless whether this area is classified as land area or not; rubber wood, cork oak and Christmas tree plantations; areas with bamboo and palms provided that land use, height and canopy cover criteria are met; in forest areas.

The tree stands in agriculture production systems such as fruit tree plantation, oil palm

plantation and agro-forestry systems when crops are grown under tree cover are excluded from forest areas (FAO, 2010).

Relationship between Population and Deforestation

An assiduous debate on the role of population change in deforestation and forest degradation continuous with one group considering population growth as the main cause of deforestation while the other group terming it as inconspicuous. Former group includes scholars like Mather, Needle, Robertson, Williams, Harrison, Palo, Litho and others while in the later group Agrawal, Lohmann, Barraclough and Ghimire are prominent (Dilip and Dimacha, 2012).

The analysis demonstrated a significant relationship between forest cover and human population density. So much so that population density was selected as the independent variable of the algorithm developed to project forest cover change (Marcoux, 2000).

Demographic factors including population growth, density, distribution, migration and urbanization are important divers of deforestation. Evidence shows that rapid population growth contributes to increasing deforestation (Population Action International, 2011).

The Study Area

Ziarat is the smallest District of Balochistan. Ziarat District lies between 67° 11' 18" East (Longitude) and 30° 09' 46" North (Latitude) consisting of 2 tehsils and 7 union counsels. Location of Ziarat is at 620 km (aerial distance) South west (235 degree's bearing) of Pakistan's capital city Islamabad and 70 Km East (75 degree's bearing) from Quetta city, the provincial capital of Balochistan (Planning and Development Department, Government of Balochistan, 2011).

The total geographical area of Ziarat district is 3,670 sq km (Ziarat tehsil: 1,489 sq km, Sanjawi tehsil 2,181 sq km). The sources of water include rain, snow, tube wells, storage dams and well and karees. Precipitation received during month of January – March in winter and July – August in summer. Annual rain fall ranges 200 – 300 mm. The juniper forest in Ziarat is important in term of its age extent and global significance, it has more than 5,000 to 7,000 years old and

which are often refer as living fossils. It is the largest natural juniper forest in Pakistan Spanning 247,000 acres as well as the second oldest in the world after California. The forest lies in the mountain zone with elevation ranging from 1,181 masl to 3,488 masl.

Ziarat district has a dry temperate climate with the winter temperature ranging between -16 °C to - 20 °C. The hottest month is July 27.4 °C and the coldest is January 7.9 °C (Ransinghe and Baig, 2010).

Nagdeve (2007) examined the relationship between population to the environment in India and found that the country's population growth was imposing an increasing burden on natural resources, and all environmental problems such as water storages, deforestation, air and water pollution were result of increased population.

Hassan (2007) explain that general perception among planners is that over population is the primary cause of forest degradation and people living close to forest lands and using it for their needs but the findings were that poor forest management was the main factor behind deforestation rather than population.

Lindstrom (2011) found that the underlying drivers of tropical deforestation in Sri Lanka were poverty, population growth and lack of land. One of the underlying causes of deforestation and forest degradation in Pakistan was population pressure (Saeed, 2003).

Ziarat district is also facing the problem of deforestation as a result of increase in population. The objectives of this study were to investigate the deforestation in Ziarat district caused by the increase in population, and to examine the relationship between percentage increase in population and percentage increase in non-forest cover area of Ziarat district from the year 2004 to 2013.

MATERIALS AND METHODS

Quantitative research approach has been used in this study. The two variables, population increase and forest cover, were chosen and their relationship was analyzed by taking percentage increase in population

and percentage decrease in forest cover area.

Primary and secondary data were used in this research study. The secondary data for population until 1998, have been obtained from the Population Census Organization of Pakistan, Islamabad and from the Planning and Development Department, Government of Balochistan, and used as a baseline data for projecting the population of Ziarat district for the years 2004, 2007, 2010, and 2013. The Geometric Growth Formula (Eq. 1) with 2.47% average annual population growth rate of Balochistan province was used for population projection of the Ziarat district from the year 1999 to 2013.

$$S_o = P_t (1 + R)^n \quad (\text{Eq. 1})$$

Where:

S_o = Future population

P_t = Present population

R = Annual growth rate (%)

n = Number of years

In order to study the relationship/correlation of the increase in population to the increase in the non-forest cover areas or decrease forest cover areas, a total of 10 sample areas were randomly chosen from 3 selected reserved forests (Sasnamana Reserved Forest, Gohar Reserved Forest, and Batsargai Reserved Forest) near Ziarat town for years 2004, 2007, 2010, and 2013.

The satellite images obtained from the Google Earth for the above mentioned locations and years were used to identify the non-forest cover areas (Figure 4.4 to Figure 4.23). Then the areas of the identified non-forest cover were calculated using the software Earth Point.

The percentage increases and decreases of population and forest cover areas were calculated and tabulated according to locations and years. The relationship between these two variables has been compared in order to know the extent of deforestation affected by the increase in population in the Ziarat district.

The collected data were analyzed and tabulated according to the years, percentage increases in population, and percentage increases in non-forest areas.

RESULTS AND DISCUSSION

In the year 1998, the population of Ziarat district was 33,340 and it was taken as base value and projected population calculated for the year 1999 was 34,163. The projected populations for 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012 and 2013 were 35,006; 35,870; 36,775; 37,612; 38,592; 39,545; 40,521; 41,521; 42,546; 43,596; 44,672; 45,775; 46,905 and 48,063 respectively.

Projected population for year 2004 were 38,592 and in 2007 it was 41,521 in 2010 it was 44,672 and in 2013 it was 48,063. The percentage of increase in population was 0.00% in 2004, 7.6% in 2007, in 2010 it was 15.77% and it reached to 24.56% in 2013.

Table 1: Projected population from 1998 to 2013.

Years	Projected Population
1998	33,340
1999	34,163
2000	35,006
2001	35,870
2002	36,755
2003	37,662
2004	38,592
2005	39,545
2006	40,521
2007	41,521
2008	42,546
2009	43,596
2010	44,672
2011	45,775
2012	46,905
2013	48,063

Table 2: Percentage increase in population of Ziarat district.

S. No.	Years	Population	Percentage Increase in Population (%)
1	2004	38,592	0
2	2007	41,521	7.6
3	2010	44,672	15.77
4	2013	48,063	24.56

Result after calculation shows that there was decrease in forest cover area and increase in non-forest cover areas for the years 2004, 2007, 2010, 2013.

Batsargai Reserved Forest

Figure 1 (a & b) shows a very clear forest cover change in the sample area of Batsargai Reserved forest. The increase in non-forest area and decrease in forest cover from 2004 to 2013 was very obvious.

The total sample area and forest area was 251.5 ha. The results showed increase in

non-forest area from 0.00 ha to 34.6 ha and decrease in forest area from 251.5 ha to 216.9 ha. Percentage increase in non-forest area was 10.2%. The change in forest cover from 2004 to 2007 was 251.5 ha to 247.9 ha, 2007 to 2010 it was 247.9 ha to 233.3 ha and from 2010 to 2013 it was 233.3 ha to 216.9 ha.

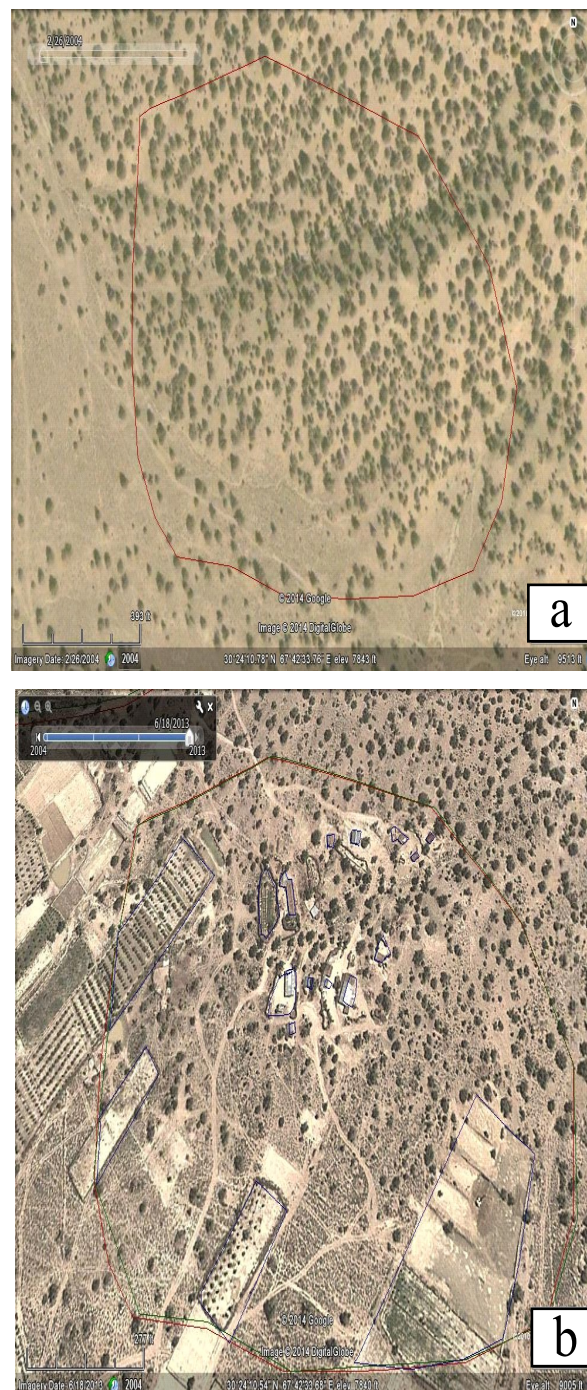


Figure 1 (a & b): Sample Area of Batsargai Reserved forest (a) in the year 2004 and (b) in the year 2013 (Source: Google Earth.com).

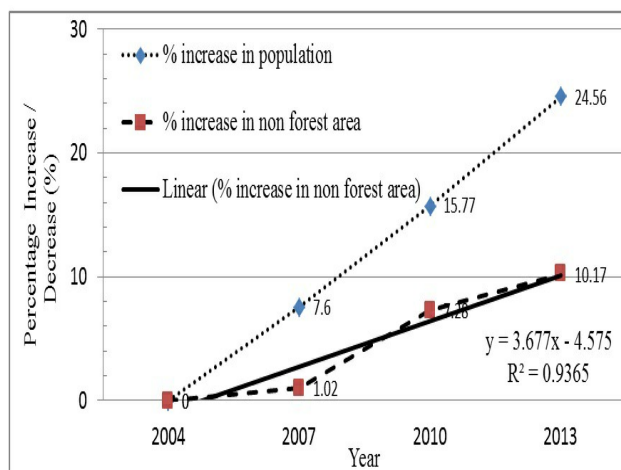


Figure 2: Relationship between population increase and increase in total non-forest area of Batsargai Reserved forest from 2004 to 2013.

Gohar Reserved Forest

The total sample area of Gohar Reserved forest was 6.50 ha. Result showed the increase in non-forest area from 0 ha to 0.42 ha. Decrease in forest cover from 6.48 ha to 6.05 ha. Percentage change in non-forest area was 0.00% to 6.47% from 2004 to 2013. The percentage decrease in forest cover was 100% to 93.32% which showed that the total change in forest cover was 6.47%.

Figure 4 explains the relationship of population and forest cover of sample area chosen from Gohar Reserved forest. Results did not show a very strong relationship between these two variables ($R^2 = 0.624$) but there was increase in the non-forest area with the increase in population.

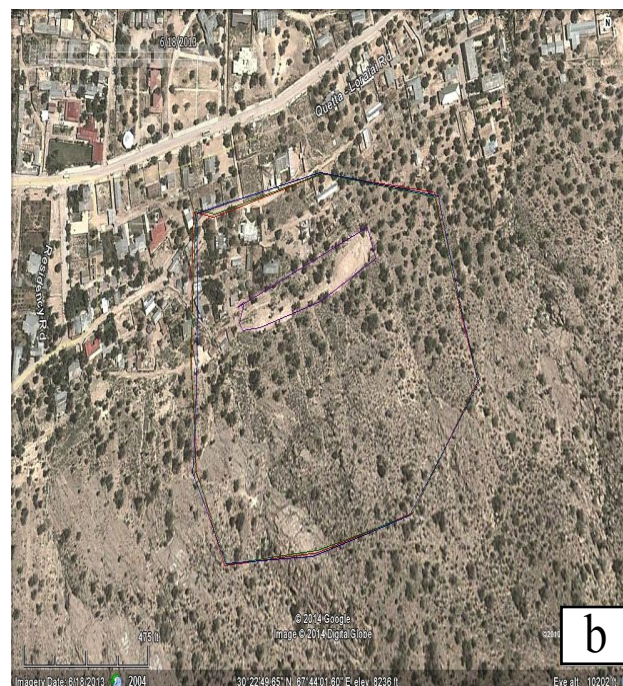


Figure 3 (a & b): Sample Area of Gohar Reserved forest (a) in the year 2004 and (b) in the year 2013 (Source: Google Earth.com)

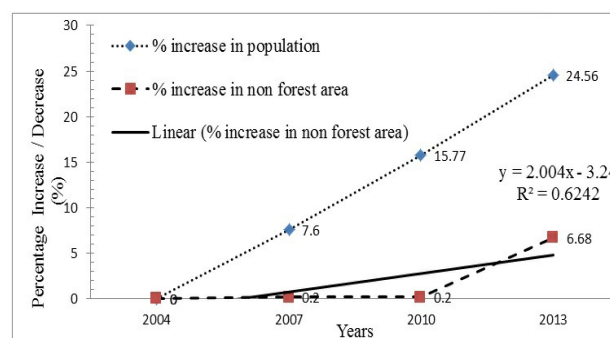


Figure 4: Relationship between population increase and increase in total non-forest area of Gohar Reserved forest from 2004 to 2013 (Source: Google Earth.com).

Sasnamana Reserved Forest

Figure 5 shows a very clear forest cover change in the sample area of Sasnamana Reserved forest as the total forest cover area decreased to 5.60 ha. It showed that in 2013 there was increase in non-forest area as compared to the year 2004.

The total forest area decreased from 27.2042 ha to 18.45 ha and the non-forest area increased from 0.00 ha to 8.95 ha. Figure 6 shows a good relationship between population increase and non-forest area increase ($R^2 = 0.864$).

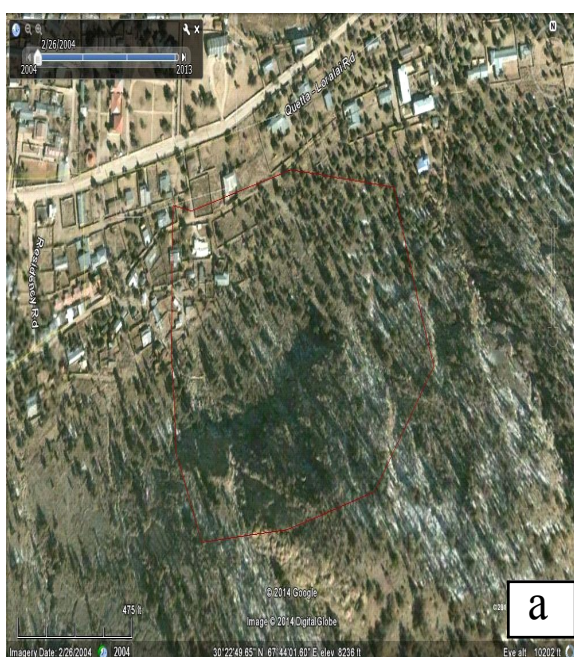




Figure 5 (a & b): Sample Area of Sasnamana Reserved forest (a) in the year 2004 and (b) in the year 2013 (Source: Google Earth.com).

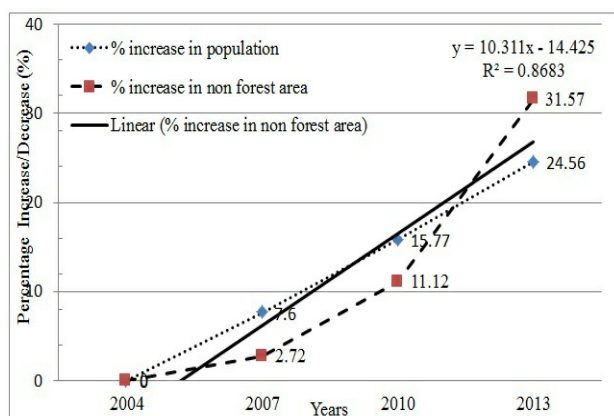


Figure 6: Relationship between population increase and increase in total non-forest area of Sasnamana Reserved forest from 2004 to 2013.

The relationship between population and non-forest cover area showed positive correlation in Ziarat District. The result showed that with the increase in population, the non-forest cover area also changed. The results of this study are in agreement with the results of a study conducted by the Dilip and Dimacha, 2012; in Kokrajhar district of Assam India. The study showed a relationship between population and forest cover and concluded that the primary factor of deforestation was population. But when the Dilip and Dimacha, 2012; applied the Forest Area Change Model for the future projections, the finding was that along with population increase, there are some other significant factors, which are contributing towards deforestation of district. They suggested that more studies be conducted to study the factors responsible for deforestation, considering the other demographic and socioeconomic factors, which could be responsible for deforestation so that effective measure could be adopted in order to control deforestation.

Mismanagement and other than population growth were held responsible for deforestation in a study conducted in northern Pakistan by Ali et al., 2005.

Allen and Barnes (1985) study results of statistical panel analysis of the causes of deforestation in developing countries showed that deforestation was related to population growth, agriculture expansion and the wood production.

The results of different studies have shown that the population growth is not solely responsible for the decrease in forest cover areas rather one of the significant factors among other such as: mismanagement, climate change, and diseases etc.

CONCLUSION

The analysis of the relationship between increase in population and increase in non-forest area was the main purpose of this study. Based on results of this research study, the below mentioned conclusions have been drawn:

- It can be concluded from the results of this study that correlation/relationship between population increase and increase in non-forest areas of

Batsargai, Gohar, and Sasnamana Reserved Forests from 2004 to 2013 did exist.

- The non-forest area increased as result of increase in population of Ziarat District.
- The satellite images showed obvious changes in forest cover.
- Data analysis and interpretation suggested a need for improvement in data collection and felt the need for inclusion of other deforestation factors in addition to the population increase. It would also bring clarity in the data in terms of occurrence/prevalence of deforestation by area and by season.

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