Study of Anthropogenic Pressure on Regeneration and Deforestation to Assess the Forest Conservation Status at the Zarghoon Juniper Ecosystem in Balochistan, Pakistan

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***Abstract*— This research was carried out through field survey in surrounding forest localities of five villages named Killi Tor Shore (K.T.S.), Medadzai (M), Ghunda (G), Sarobai (S) and Killi Shaban (K.S.) in study area Zarghoon Juniper ecosystem. Different physical characteristics of Juniperus excels trees were recorded. Rate of deforestation was maximum at (K.S.) with 6.69, and minimum at (M) with 4.70, along with 5.95, 5.66 and 4.81 at (K.T.S.), (G) and (S.) respectively. Average Diameter at Breast Height (DBH) in inches measured at five locations were from highest to lowest as 37.13 at KS, 36.86 at S, 32.40 at KTS, 31.96 at G, and 29.40 at M respectively. Sheep made the dominant livestock population of 23%, donkey 2% and goat population was 75%. The community prefers to keep goats because the sheep feed on soft grasses which were not easily available in these areas. There was statistically insignificant variance in the average (DBH) in all five selected locations due to same atmospheric conditions. Old and New Regeneration ground cover percentage was less due to the high anthropogenic pressure on forest for different uses like lopping for Timber 28%, fuel wood 56%, debarking 11% and fencing 5% of juniper tree the situation was equally treacherous. Based on findings it was suggested that existing high anthropogenic pressure on ecosystem can be abridged by regulations implementations and financial assistance for sustainable recourse utilization to the unique juniper ecosystem of Zarghoon.**

***Index Term*— Anthropogenic, Regeneration, Diameter at Breast Height (DBH), Deforestation, Conservation**

I. INTRODUCTION

Juniper forests always served as an important source of wood for construction, cooking and fuel over ages but they are subjected to over exploitation, heavy grazing and fires; while silivi-cultural practices or other management practices are lacking. Juniper is the most prominent type of vegetation at or above 1600 m elevation [1].

Junipers can tolerate poor soils and can survive at extremely high and low temperatures in comparison to other forest trees. In addition, they are highly resistant and they are the last species that abandon areas in the process of deforestation [2]. The natural distribution of this species varies between 300-3500m latitudes uprightly [3] [4] [5]. Within this wide distribution area the juniper trees display great variety in different soils and climatic conditions.

Particularly in juniper forest zones with extreme climatic and soil characteristics, shoot/root ratio is fundamental for biological success. Seedlings planted in arid or semi-arid areas should have a well-developed root system for better absorption of water lost from the soil in shoots and leaves [6] [7] [8]. Afforestation studies on juniper recognized that seedlings with low shoot/root fresh or dry weight provided better results, principally in arid areas [9] [10]. In areas where summer temperatures are high, seedlings with a long root system are able to reach deeper soil layers comprising adequate moisture [7].

Population growth and urbanization are amid the foundation sources of deforestation [11] [12]. British environmentalist Norman Myers reported, 5% of deforestation is due to cattle ranching, 19% due to over-heavy logging, 22% due to the growing sector of palm oil plantations, and 54% due to slash and- burn farming [13].

Grazed and non-grazed forests express no difference in the abundance of new and old regeneration [14]. Juniperus tree is largely acknowledged for its small establishment potential under the closed canopy of mature parent trees [14] [15]. Its regeneration is adapted to forest clearing, gaps and forest edges where there is bright sunlight. Extensive re-growth is found in intensively logged over forest areas with open canopies. In the present study the old and new regeneration % age of the forest ground cover was measured in plots at five selected villages. The deforestation caused by human activities was measured by counting the number of fresh cut stumps in 15 plots selected randomly, to measure the future existence chances of this forest.

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II. GEO-CLIMATE OF ZARGHOON REGION

Zarghoon region is located to the southern part of Quetta valley lies approximately between latitude 30°39́N and longitude 67°15́E. It shields an area of about 354 sq. miles out of which 86 sq. miles is piedmont 101 sq. miles is valley floor and the rest is mountain high land. The locality has tremendous variation from hill top to valley bottoms and gentle slopes with grasses scattered trees. Rain and snow fall is dominated in winter; the mean maximum temperature in summer is 25°C and means minimum temperature in winter is -15°C.

A. Material and Methods

In Juniper forest neighboring five villages a total of 15 plots each of 2 acres at the rate of 3 plots per forest vicinity were positioned randomly. In each and every plot the density of mature trees, the individual ground cover of new regeneration seedlings up to the height of 5 inches and old regeneration saplings up to 5ft were measured, Diameter at breast height (DBH), and manmade deforestation of mature trees documented.

Average ground cover percentages of Old and New Regeneration were calculated for each location. Deforestation was calculated by calculating the number of stumps present in each plot. Data was recorded in pre-designed Performa's for each plot separately and subjected to statistical analysis ANOVA by using SPSS.

Participatory Rural Appraisal PRA techniques for instance, Semi Structured Interviews (SSI), Focused Group Discussions (FGD), transact walk, etc. were used to determine the community's dependence on the Juniper forest and the profits they acquire from the forest. The data on livelihood conditions of the community especially cattle rearing etc. were also collected using PRA.

III. RESULTS AND DISCUSSION

A. Diameter at Breast Height (DBH)

Average Diameter at breast height of the trees in three plots at each location was measured. The mean DBH calculated is shown in Fig. 1. Analysis of Variance was applied on the obtained data to check if there is a difference in the DBH of trees in the five locations.

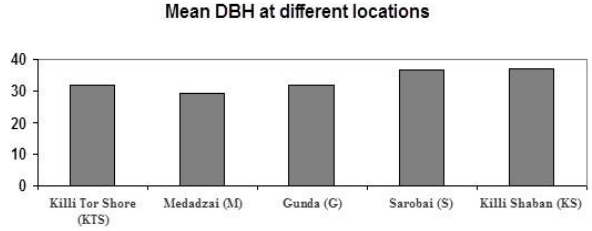

Fig. 1. Average Diameter at Breast Height (DBH) in inches

Average DBH in inches measured at five locations were from highest to lowest as 37.13 at KS, 36.86 at S, 32.40 at KTS, 31.96 at G, and 29.40 at M. The ANOVA results show that at 5% significance level, there was a significant difference in means DBH in trees of five locations. The Levene test was applied to check the homogeneity of variances (assumption of ANOVA). According to the statistical analysis it was concluded the tree population was homogenous. The ANOVA result at 5% significance level demonstrated a substantial difference in mean DBH of trees of five locations.

The Tukey's post-hoc test was used to compare the mean DBH in trees of one village to another. The mean DBH of Medadzai was found to be significant from Sarobai and Killi Shahban whereas, no significant differences were found between the mean DBH of other locations. The mean DBH of Medadzai was considerably lower than those of Sarobai and Killi Shahban.

B. New Regeneration

Average of Total ground cover percentage by new regeneration (up to the height of 5 inches) for the three plots of each location was calculated. The data is presented in Fig. 2.

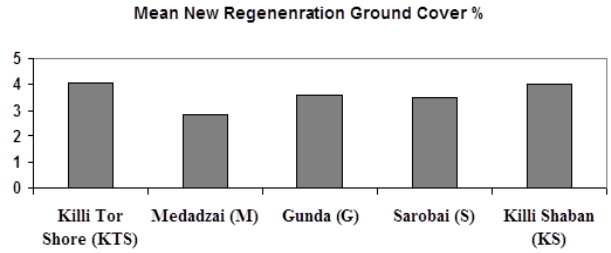

Fig. 2. Mean New Regeneration Ground Cover %age.

Average new regeneration ground cover %age measured at five locations were from highest to lowest as 4.07 at KTS, 4.03 at KS, 3.49 at Sarobai, 3.58 at G, and 2.86 at M. The ANOVA results illustrate that at 5% significance level, there was a noteworthy difference in mean new regeneration ground cover %age of five locations. The Levene test was applied to check the homogeneity of variances (assumption of ANOVA). It was found that data comes from homogenous population.

The ANOVA result exhibited that at 5% significance level, there wass a significant difference in means new regeneration ground cover %age of five locations.

The Tukey's post-hoc test was used to compare the mean new regeneration ground cover %age of one village to another. The mean new regeneration ground cover %age of Medadzai was found significant from Killi Tor Shore and Killi Shahban whereas, no significant modifications were found between the mean new regeneration ground cover %age of other locations. We can say that the mean DBH of Medadzai was significantly lower than those of Killi Tor Shore and Killi Shahban.

C. Old Regeneration

An old Regeneration sapling up to height of 5 feet Ground Cover %age was measured for trees in three plots at each location and the mean is represented in Fig. 3. The data was checked for difference in average old regeneration at five villages. The data was checked at 95% level of confidence.

There was statistically insignificant difference in old regeneration % of trees at the five locations. Moreover there

was no interaction between the Old regeneration % and the locality. The mean old regeneration ground cover % calculated from highest to lowest was 4.75 at Killi Tor Shores, 3.74 at Sarobai, 3.48 at Killi Shaban, 3.43 at Ghunda, and 3.36 at Medadzai.

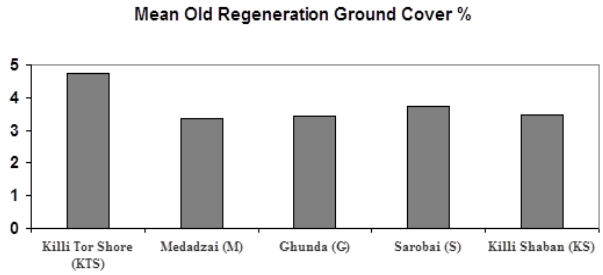

Fig. 3. Mean old Regeneration Ground Cover %age.

The ANOVA results confirm that at 5% significance level, there was a significant difference in means old regeneration ground cover %age of five locations. The Levene test was applied to check the homogeneity of variances (assumption of ANOVA). It was found that data comes from homogenous population. The ANOVA result shows that at 5% significance level, there was a significant difference in means old regeneration ground cover %age of five locations.

The Tukey's post-hoc test was used to compare the mean old regeneration ground cover %age of one village to another. The mean old regeneration ground cover %age of Medadzai was found significant from Killi Tor Shore and Killi Shahban whereas no significant differences were found between the mean old regeneration ground cover %ages of other locations. We can say that the mean DBH of Medadzai was significantly lower than those of Killi Tor Shore and Sarobai.

D. Deforestation

The data was collected for deforestation status in the three plots for each of the five locations by counting the number of fresh cut stumps present in each plot.

According to the outcomes obtained the mean deforestation status of the five selected locations was mean number of cut stumps as 6.69 at Killi Shaban, 5.95 at Killi Tor Shore, 5.66 at Ghunda, 4.81 at Sarobai, and 4.70 at Medadzai. There was statistically insignificant difference in deforestation at the five locations. Moreover there was no interaction between the deforestation and the locality. The ANOVA results express that at 5% significance level, there was a significant difference in deforestation of five locations. The Levene test was applied to check the homogeneity of variances (assumption of ANOVA). It was found that data comes from homogenous population. The ANOVA result shows that at 5% significance level, there was a significant difference in means deforestation of five locations.

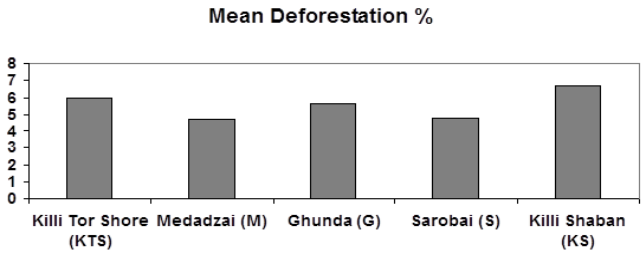

Fig. 4. Rate of Deforestation in five localities

The Tukey's post-hoc test was used to compare the deforestation of one village to another. The deforestation of Medadzai was found significant from Killi Tor Shore and Killi Shahban whereas no significant differences were found between the deforestation of other locations. Deforestation at Medadzai was significantly lower than those of Killi Shaban and Killi Tor Shore.

IV. USES OF JUNIPER TREE'S WOOD BY THE COMMUNITY

In all the five village data was also composed on the Juniper forest wood products consumption by the local communities. The data clearly directed that community consumption of the wood products was way too plentiful than the regeneration aptitude of the forest and the situation was further aggravated by the smuggling of the juniper wood and natural and other anthropogenic changes in the environment.

The data on forest wood products was collected by using PRA technique of Focal Group discussion (FGDs) and a group of 20 persons from each village were selected and a discussion was generated separately in each village on the consumption of wood. A large proportion of community population i.e., 56% used forest wood for fuel, and it was obtained in different forms for instance; by cutting the stems or branches. 28% for timber, 11% of the local population uses the tree bark of the Juniper trees that make the trees vulnerable to diseases and death ultimately. Another use of Juniper trees was for making the fencing material around the cultivated area and 5% of population (farmers).

The data clearly shows the dependency of the deprived community on the forest resources which were wrecked by the communities as the underprivileged and uninformed communities of the area were ignorant of the importance of the forest for their own livelihood in future.

Grazing was one of the major factors in the area liable for decline in regeneration %age. It was absolute that local community was dependent on the forest for feeding their livestock. According to PRA study made in the area the livestock were grazed on the forest rangeland for about 7-8 months in a year. Individual number of sheep, goats, cattle and donkeys was as in the pie chart below. Sheep made the dominant livestock population of 23%, donkey and cattle 2% and goat population was 75%.

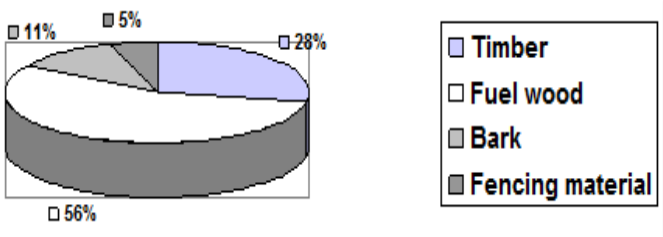

Fig. 5. Pie Chart Showing Percentage of Different Uses of Juniper Tree's Wood by the Community

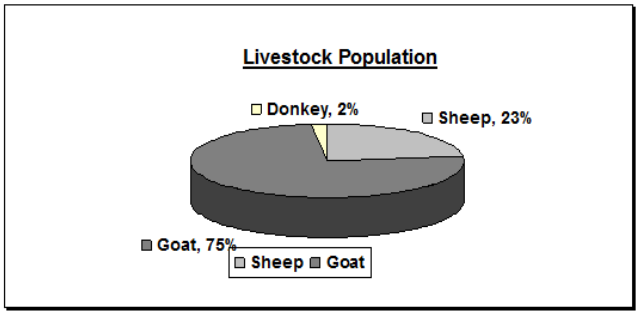

Fig. 6. Livestock population

V. DISCUSSION

Forest trees regenerate in their natural habitats. However, natural regeneration of tree species occurs in suitable environmental conditions for germination, seed production, and growth [16]. Regeneration of Junipers was seemingly very poor which is in line with the findings of [17]. Authors in [18] suggested climatic change as a possible reason for the poor regeneration of Juniperus excelsa. Natural regeneration may be affected by the difficult seed germination due to drought, increasing recreation activity through forests and over-grazing these findings are in accordance with [19] who reported that the Juniper seedlings can survive 150 mm rainfall a year, but they cannot survive a "drought" lasting longer than 2-3 weeks.

Human disturbance, grazing pressure and climatic change are the factors that could lead to poor regeneration of Juniperus as also reported by [18]. The regeneration of natural forests is possible by reforestation of the gaps in these forests with endemic species. These suggestions concurs with [20]'s thought that conservation of the natural forests need proper attention and research in these forests should focus in improving natural regeneration of the various species and conservation of bio-diversity. Juniper seedlings grow very slowly, a few centimeters a year only same was reported by [19].

Population growth and poverty are main causes of the deforestation in the study area as also asserted by [21]. Juniper trees are the main source of fuel for the local community and demand for wood greatly exceeds that which the forest resources can sustainably supply, these findings are in accord with [21] [22] [23]. Juniper forests are small and fragmented in its natural habitat due to anthropogenic pressure (mainly logging) in accord to [24].

VI. CONCLUSION

The results of the present trial specified that improving regeneration of Juniperus excelsa trees in Zarghoon Juniper forest is possible through protection of natural forest from anthropogenic disturbance. However, it can be concluded that the Juniper forest is under major threat of dilapidation due to high rate of deforestation and reasonably low rate of regeneration. Grazing and anthropogenic deforestation are only some of the important factors, there are many other natural factors like diseases and changing environment. The matchless Zarghoon juniper forest is in dire need of research for conservation and planning best management practices for sustainable consumption of forest resources.

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