



Socio-economic influence of grazing and utilization of Pothwar plateau range area on local community

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Abstract

Two research studies were conducted in Khairi murat Forested area and Khairi murat Range area during 2015-16 in Pothwar Plateau district Rawalpindi. Main aims were to assess the relative species composition and find out the socio-economic perspectives of local communities and their impacts over the rangelands. 11 grass species and 6 plants and shrubs species were identified which were dominating at that study area. Line transect method was used during 3 consecutive seasons (spring, summer, winter) of 2015-16. The average plant density was 324781/ha in forest and 106170/ha in range area; 395634/ha in forest and 110759/ha in range area while 323111/ha in forest and 90431/ha in rangeland during spring, summer and winter season respectively. Vegetation cover was recorded as 37.65% in forest and 28.5% in rangeland; 44.42% in forest and 29.89% in rangeland while 35% in forest and 25% in range area during spring, summer and winter season respectively. Questionnaire and farmer discussion held for field survey. The current study viewed the division of village area woodland among different stakeholders and concluded that there is great difference in density and vegetation of forested area and village range area. On the same time, there is great difference between life standards of different stakeholders. Higher rate of illiteracy and dependency of local people on livestock ruin the range area of village.

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Introduction

Rangeland known as the sequential, spatial and environmental continuity between different lands cover. Generally, it is known as area covered by vegetation of grasses, bushes, crops and little woody plants, depending on biophysical aspect of climatic variability, fire, grazing, browsing pressures, human stress, succession phase of land used and population densities (Homewood and Brockington, 1999). Rangelands exists in areas having low rainfall, substantial limitations, uneven land, less water availability and extreme temperature (Stoddart and Smith, 1975).

Pakistan is a developing country and its economy rate is rising day by day. Range areas plays vital role in its rapid economy rise. Latitude and longitude of Pakistan is 24° 37' North and 61° 76' South covering as a whole 796096 km² area, out of which 62% covers rangeland (Quraishi *et al.*, 1993). The most serious problem for human in the future 50 years will be over population and their means of survival (Chirspeels and Sadava, 1997). Agriculture and livestock are the traditional sources of income in Pakistan (GOP, 2007). It has been exposed that 38% of feed requirement of all animals in Pakistan is taken from range areas (Hajra *et al.*, 1995). Local and nomadic animals graze and browse the nutritional foliage and leave weeds unattended. Hogg *et al.* (1997) indicated that about 40 % of national cattle, 50% of small ruminants and almost all camels are found in pastures. Controlled grazing and reseeding of nutritional forage plants can reduce this problem (Khan *et al.*, 1999).

Livestock heads add 11.45% of GDP in nation's economy and effects lives of about 30 to 35 million people living in village areas (GOP, 2010-11). Out of 11.45%, 55% comes directly from rangeland (Mohammad, 1984). However range management is seen pitiable in almost all range areas of Pakistan due to which many livestock generate are of poor quality and quantity (Anonymous, 2010).

Ahmad *et al.* (2009) reported that a downward trend has been seen in different rangeland conditions due to over exploitation as there are 20 million livestock heads in single province (Baluchistan) and their survival depends on range areas. A total of 90% of livestock's daily forage need is fulfilled via rangeland grazing (FAO, 1983). Vegetative cover of rangelands declined mainly due to over grazing but drought, erosion and stress caused by human also reduced it (Durrani *et al.*, 2010).

Management and improvement of range lands is always a problematic mission due to relations between different factors as biological, social and environmental. While mostly local communities ignore the social and environmental aspects due to which rangeland ruin (Ahmad and Islam, 2011). Locality has influence on range conditions. For proper management it is important to know about effect of locality on plants (Tamartash *et al.*, 2010).

The effect of such studies on the appropriation of income and frequency of destitution has highlighted unmistakably in the advancement era. It stimulate out of the concern that these financial studies in the creating nations had frequently at first prompted to a declining of the circulation of income and an expansion in the rate of neediness since individuals of the region need to deal with their use as indicated by their nearby needs and requests. With the specialized data sources and logical administration of the rangelands, nearby group can overcome their financial issues, which join with a change in income dispersion, easing of neediness and a change in the welfare of helpless gatherings in the study region. This scheme concentrates on deciding the effect of rangelands on poor people and helpless gatherings of the general public. The concentrate additionally looks at the effect of these rangelands on the degree of interest of various stakeholders in the territory (Chaudhry *et al.*, 2012).

Pakistan is a bone-dry nation with a lot of its rangelands regular in nature which give scrounge amid spring and summer period of improvement yet not skilled to make accessible of sustain in harvest time and winter, these occasional varieties trouble the domesticated animals creation.

Over utilization, decline in vegetation cover, death of forage and poor survival of local communities, all these were the absolute most critical issues and inconveniences for sustenance wellbeing in the state. There is a need to comprehend that what sort of grazing pattern is utilized at the rangelands and what is the extent of the operation of forage at the range and which socio economic aspects are possessed for the acts of rangeland administration. Individuals don't know about the right utilization of rangelands and due to be shy of data about the assets they are harming them and winning nothing. Despite its extraordinary significance in the economy, rangeland administration has to a great extent stayed disregarded in all locales of Pakistan. This is halfway as a result of the absence of coordination, line organizations, for example, ranger service, and domesticated livestock advancement and agribusiness offices. Additionally low research is led with respect to rangelands in Pakistan. Less people know about the effect of rangeland grazing and its utilization on local community's social life and their role to recover the grazed area for rehabilitation.

Hypothesis of current study is that Socio-economic influence of grazing and utilization of Pothwar plateau range area on local community exists. According to hypothesis made, objectives of study were to estimate; range vegetation density, cover, composition and frequency; obtainable range resources and grazing pattern followed in Pothwar range areas; utilization of range areas by different stakeholders; and socio-economic influence of grazing on local communities.

Materials and methods

Research Site

Current research was done in the duration of 1 year (March, 2015 to February, 2016) at Khairimurat Reserve Forest and Range lies in Attock district, Pakistan which is 33 ° N and 72 ° E with elevation of 780 m above sea level. Temperature reached at its peak (32.5 °C) in May-June while highest precipitation (133.2 mm) occurred in July-August (Fig. 1, 2).

Study area falls in scrub forest with arid conditions and thorny plants. Total forested area is 414 km² while rangeland area is 866km². Vegetation is occasional throughout the year including thorny plants as *Acacia modesta* and *Olea ferrugineae* dominantly. Undulated topography were mostly grazed by local and nomadic grazing animals. Dominating grasses includes *Cynodon dactylon*, *Hetropogon contortus*, *Cenchrus ciliaris*, *Desmostachya bipinnata* and *Digitaria sanguinalis*. Grazing animals include dominantly Sirohi breed goat and other includes Pygora goat, Sahiwal cow, Sindhi cow, buffalo and few camel and rabbits.

Technique Applied

Samples of different grasses were picked up from two sites i.e., forested area and rangeland by using line transect method (alternate sides) to check the density and vegetation cover at study site in three consecutive seasons (spring, summer and winter). Quadrates of 1 × 1 m² for grasses and 10 × 10 m² for trees was used over 100 m line with interval of 10 m between grasses and 30 m between trees. Frequency (%) showed the total vegetation cover with the help of formula used by Hussain (1989):

$$\text{Frequency (\%)} = \frac{\text{Number of quadrates having species}}{\text{Total quadrates}} \times 100$$

Relative frequency (%) was also estimated by formula (Kothari, 2009):

$$\text{Relative Frequency (\%)} = \frac{\text{Frequency of particular specie}}{\text{Frequencies of all species}} \times 100$$

Density (%) estimation showed that how much an area received number of individuals of species. Density (Hussain, 1989) and relative density (Shukla and Chandel, 2008) were calculated by formulas:

$$\text{Density (\%)} = \frac{\text{Number of quadrates having species}}{\text{sampling area}} \times 100$$

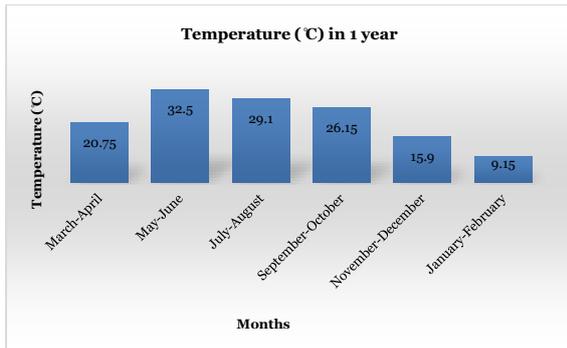


Fig. 1. Temperature (°C) variation in 1 year.

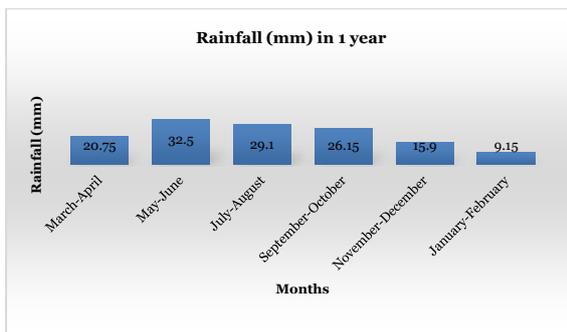


Fig. 2. Rainfall (mm) in 1 year.

$$\text{Relative Density (\%)} = \frac{\text{Density of particular specie}}{\text{Densities of all species}} \times 100$$

Socio-Economic perspectives of the Research Site

Questionnaire, group discussions, field investigations and survey (Kasemir *et al.*, 2003) were performed to know about the socio economic perspectives. Data was gathered from local and nomadic people to judge their point of views. A total of 150 questionnaires were distributed among different stakeholders (Agriculturists, foresters, private employees, government employees, range officers, etc).

Statistical Analysis

Friedman’s test was applied for ranked data. ANOVA and LSD (SPSS-17) was used for significant variations. Correlation was used to check the interactions between different variables.

Results and discussion

Vegetative Cover in Khairi murat Forest and Range area

In study area, a total of 11 grass species and 22 tree species encountered (Table 1, 2). Biodiversity is a key feature of accurately operation grazed ecosystem.

Leguminous and non-leguminous plants are the basic productions of grasslands (Sanderson *et al.*, 2002). Different sites have different vegetative cover due to variation in climatic conditions (Smitheman and Perry, 1990). History showed that angiosperms were observed in tertiary duration while before that duration there were no angiosperms noticed in Pothwar region (Ahmad *et al.*, 2009). Due to variation in micro and macro climate, a great number of plants and animals variations prevailed (Hussain, 2003).

Average Plant Density in Khairi murat Forest and Range area

In spring, average density on forested and range area was 227 and 105943 plants/ha respectively. In summer, average density on forested and range area was 229 and 110490 plants/ha respectively while in winter, average density on forested and range area was 232 and 85719 plants/ha respectively. Current study relates with study of Coppock (1994) who worked on synthesis of pastoral research, development and change and said that vegetative cover of mostly range area vary with variation in soil, climatic and edaphic factors. Similar conclusion was revealed by Ahmad *et al.* (2009). Average density of species (trees and grasses) in the relation with three consecutive seasons showed significant relation ($p > 0.05$) as LSD between species and seasons was 10.076 (in trees) and 3289.2 (in grasses) which was highly significant at $p=0.05$.

Table 1. Grasses encountered in study sites.

Sr. No.	Botanical Name	Local Names
1	<i>Saccharum ciliare</i>	Sar
2	<i>Digitaria bicornis</i>	Phairon
3	<i>Cynadon dactylon</i>	Khabbal
4	<i>Hetropogon contortus</i>	Suriali
5	<i>Panicum antidotale</i>	Bansi
6	<i>Desmostachya bipinnata</i>	Dab
7	<i>Cymbopogon jwarancusa</i>	Khawi
8	<i>Cenchrus ciliaris</i>	Dhaman
9	<i>Eleusine flagellifera</i>	Chimber
10	<i>Dactyloctenium aegyptium</i>	Madhana
11	<i>Saccharum spontaneum</i>	Khai

Table 2. Trees and Shrubs encountered in study sites.

Sr. No.	Botanical Name	Local Names	Sr. No.	Botanical Name	Local Names
1	<i>Olea ferruginea</i>	Kahu	12	<i>Periploca aphylla</i>	Bata
2	<i>Acacia modesta</i>	Phulai	13	<i>Grewia populifolia</i>	Gunger
3	<i>Eucalyptus camaldulensis</i>	Sufaida	14	<i>Dodonea viscosa</i>	Snatha
4	<i>Dalbergia sissoo</i>	Sheesham	15	<i>Albizia lebbek</i>	Saras
5	<i>Tamarix aphylla</i>	Farash	16	<i>Calligonum polygonoides</i>	Phog
6	<i>Prosopis cineraria</i>	Jand	17	<i>Leucaena leucocephala</i>	Ipil ipil
7	<i>Justicia adhatoda</i>	Bahekar	18	<i>Nerium indicum</i>	Kaner
8	<i>Calotropis procera</i>	Ak	19	<i>Caparis aphylla</i>	Karir
9	<i>Acacia nilotica</i>	Kiker	20	<i>Rhazya stricta</i>	Wena
10	<i>Pongamia glabra</i>	Sukhchain	21	<i>Suaeda fruticosa</i>	Lana
11	<i>Zizyphus nummularia</i>	Mala	22	<i>Prosopis juliflora</i>	Mesquite

Average Plant Frequency in Khairi murat Forest and Range area

It was resulted that 5 species in which 4 was grasses and 1 was tree dominated the whole area including forested and range site. Grasses which dominate include *Hetropogon contortus* (80%), *Panicum antidotale* (62%), *Cynodon dactylon* (34%) and *Cymbopogon jwarancusa* (25%) while tree dominated was *Olea ferruginea* (79%) in spring season. Same species dominate in other two consecutive seasons (summer and winter) with average frequency as 76% and 72% of *Hetropogon contortus*, 64% and 61% of *Panicum antidotale*, 36% and 31% of *Cynodon dactylon*, 27% and 23% of *Cymbopogon jwarancusa* and 80% of *Olea ferruginea* in summer and winter respectively. Some species dominate on each site may be due to suitability of soil moisture, temperature, controlled grazing, less natural disturbances (Ahmad *et al.*, 2007). Average frequency of species (trees and grasses) in the relation with three consecutive seasons showed significant relation ($p > 0.05$) as LSD between species and seasons was 2.531 (in *Olea ferruginea*) and 1.523 (*Hetropogon contortus*) which was highly significant at $p=0.05$.

Socio-economic effect of grazing on Forest and Range Area

According to survey via questionnaires, total population of area was 14321 from which 5214 were man, 6751 woman and 2356 children. Mostly people belong to Sheikh caste and almost 97% people were Muslim. Main sources of income (Fig. 3) was agriculture (57%), private employees (19%), government employees (10%) and shop keepers (14%).

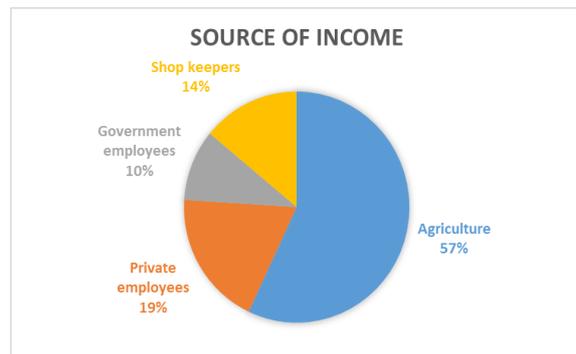


Fig. 3. Source of income (%) of local people.

Mostly people said that they live there from time of their ancestors. Few families migrated from other nearby areas mostly due to transfer of their government jobs. Land occupied by the natives was in different form (Fig. 4) as agricultural lands (54%), forest areas (5%), home territories (21%) and barren plots (20%).

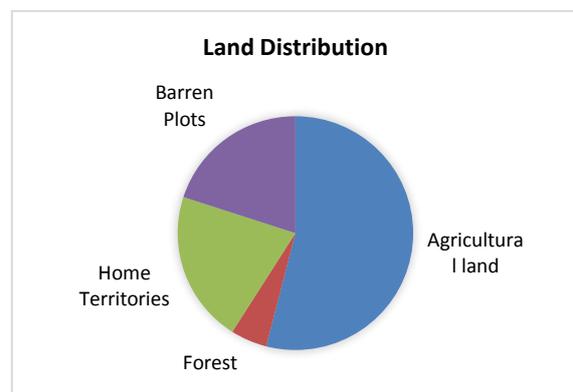


Fig. 4. Land distribution (%) among different stakeholders.

Mostly people were recorded illiterate, only 23% females and 17% males were educated (Fig. 5).

Grazing heads include 45% (5% Sirohi and 40% pygora) goats, 30% sheep, 14% (6% Sindhi and 8% Sahiwal) cow, 9% buffalo and 2% camel (Fig. 6).

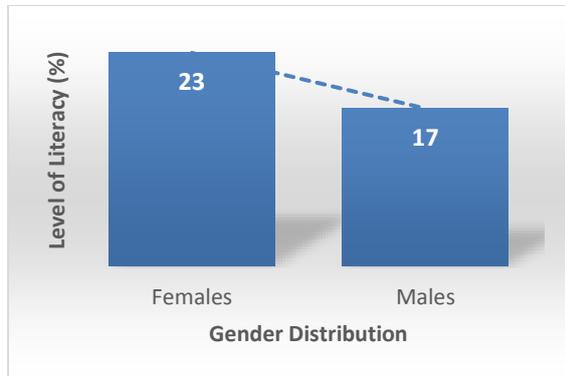


Fig. 5. Literacy rate (%) among male and female in study site.

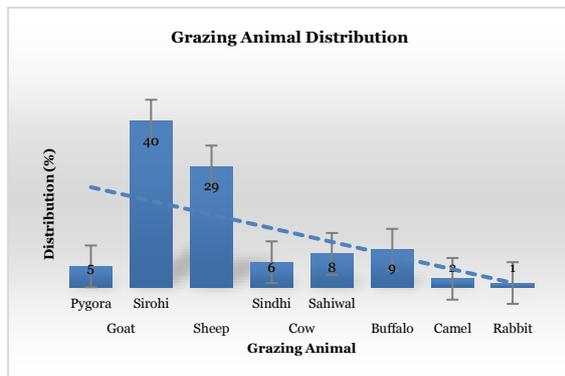


Fig. 6. Grazing animal distribution in study site.

Conclusion

According to data inquired, it is concluded that pressure on rangeland and forested land increased due to various socio-economic factors as land distribution, people dependency for living, people dependency in the sense of animal grazing and low rate of literacy. It is suggested that there should be some proper management teams to manage the land for controlled grazing. Provide alternate sources of income to local people to reduce their dependency on forested and range lands. Motivate people to get education so that they can know about the problems created by the mselves in climate change. Plant new trees and grasses on the areas being grazed and guide the local people about the grazing capacity. Start rehabilitation schemes with participation of local people to improve the vegetation cover and for more generation of biomass for climate betterment.

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