

ASSESSING RANGE VEGETATION AND CARRYING CAPACITY IN RAKH GOHARWALA (THAL)

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Abstract

A survey of Rakh Goharwala (Thal) was conducted in September, 2000. *Eleusine flagellifera* was the key grass species. 26.37% and 16.88% ground was covered by grasses/herbs and shrubs, respectively while 56.75% was uncovered. Carrying capacity was found to be 1.003 AU/ha/Yr and shrubs were the major contributors of forage. The Rakh presented miserable condition of grasses and it is strongly recommended that rotational system to be followed which promotes forage vigour by avoiding repeated and continuous grazing of one block year after year.

Introduction

In Pakistan, 127.1 million livestock heads were supported by rangelands wholly or partially which contributed about 9.4% of the GDP (Anonymous 2001-02). Nutritional requirements of these animals are mainly met through fodder crops, grasses and shrubs. Akram (1990) reported that livestock were getting only 75 and 40 percent of the required amount of Total Digestible Nutrients and Digestible Crude Protein, respectively. Similarly Hanjra *et al.* (1995) found that animals in Pakistan are getting 38% of their nutritional requirements from rangelands. Improvement of the quality and quantity of feed could enhance livestock production up to 50% from existing genetic pool of animals (Hasnain, 1983).

Thal occupies 2.5 million hectares approximately. Out of the total area, about 32% is grazing land and consists of nine Rakhs under the control of Range Management Circle. Carrying capacity describes the number of grazing animals a management unit is able to support without depleting rangeland vegetation or soil resources. It reflects the minimum level of sustainable production over the long-term. Determining carrying capacity is a fundamental component of rangeland evaluation, because it is an important management tool that supply information about forage supply and consumption. Furthermore, evaluating carrying capacity is important for rangeland inventory and monitoring programs and it also helps to ensure sustainable use of natural resources.

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It forms the basis of the stocking rate decisions that are particularly important for public land management agencies seeking an objective platform for arbitrating grazing use. Information regarding the carrying capacity of a management unit is also useful for interpreting potential economic returns on range developments, such as developing watering points to improve livestock distribution or enhancing wildlife habitat.

Species composition and vegetation cover are good indicators of a range condition. There is ample scope for increasing forage production through managing the rangeland areas scientifically. The assessment of present potential of range resources is very important in order to plan for its development. Keeping in view, Rakh Goharwala (Thal) was surveyed in September, 2000 for the following objectives:

- To determine the species composition
- To determine the vegetation cover
- To assess the grazing potential/carrying capacity
- To assess the current range-use

Materials and Methods

The whole area of Rakh Goharwala (24242 acres) was divided into four groups depending upon type and condition of vegetation and from each group one pasture was randomly selected for sampling. Following parameters were studied to assess the range condition:

- Species composition
- Percent cover
- Carrying capacity
- Range-use

1. Species composition

For species composition, method used by Chaudhry *et al.* (2000) was adopted. A 100ft measuring tap was stretched along the diagonal of the pasture in one of the two randomly selected directions. The plant species lying vertically under the footmark were noted on data sheet. Ten equidistant transacts were taken in a systematic sampling from each compartment along the diagonal line. Species percentages were determined by simple mathematical calculations.

2. Percent cover

After collecting data for species composition, 1m² quadrat was put along each transect at 30, 60 and 90ft. Covered area in percent by grasses/herbs was estimated by visual observation. Similarly, at each transect, a plot of (100 x 100ft) was taken to count the number of trees/shrubs present. The covered area of each tree/shrub was determined by measuring distances between two points on ground lying vertical to crown ends of each plant species. Two measurements at right angle were taken and mean values were calculated for the determination of crown diameter. Crown cover was calculated by the formula $\pi D^2/4$.

3. Carrying capacity

a. Forage production for grasses/herbs

Forage in each quadrat was cut 2.5 cm (stubble height) above the ground level with the help of sickle. The forage was weighed at the spot with the help of a spring balance. Cut samples were packed in paper bags and were air dried to determine average dry weight (grams) per quadrat. The figure thus, obtained multiplied by 10 gave average weight (Kg/ha) of dry grasses/herbs.

b. Forage production from browse species

There are various methods, which could be applied to measure biomass but the most accurate, although quite laborious, is the harvest plot technique (Bobek and Bergstrom, 1978). For the estimation of forage production, a plot of 200m² was used. The selection of plots was at random. A circular plot was made with the help of a measuring tape having radius of 7.98m. All the browse plants falling within the plot were carefully pruned with the help of pruning scissors. Only those parts of the plants were pruned which fell in the reach of goat/cattle (5 ft. above ground level). The forage was carefully weighed (grams) and then air-dried. The calculations were made on dry matter production per hectare. Local grazers revealed that shrub re-sprouted after browsing in 2-weeks of rest period. Per hectare shrub biomass was therefore multiplied by 20 (for 10months) leaving 2 months dormant period of December and January. Total air-dry biomass was determined by adding the figure for grasses/herbs and shrubs/trees. The carrying capacity was calculated as following:

1. Average air-dried forage (kg) per ha = A
2. Available air dried forage (kg) per ha = A/2 -----(x)
3. Annual dry forage requirement of
an animal unit (AU) = 9 x 365 = 3285Kg----- (y)

$$\text{Carrying capacity} = x/y = \frac{\text{Available air dried forage(kg)}}{\text{Requirement of one air dried forage by Aum(kg)}}$$

$$\text{Carrying capacity in ha/Aums} = \frac{\text{Requirement of one Aum(kg)}}{\text{Available air dried forage(kg)}}$$

c. Range use

On the basis of carrying capacity, the condition of the range was assessed as poorly stocked, fully stocked or over stocked.

Results and Discussion

Thal is an alluvial formation with sandy loam to clayey soil in valley flats which are interspersed with loose sand dunes. The region is characterized reside by an extreme continental desert climate, i.e. high temperature meager monsoon rainfall and severe windstorms in summer, low temperature in winter.

For management purposes, Rakh Goharwala is divided into 51 pastures. These pastures vary in size from 100 to 640 acres. Open grazing system is being followed. Grazing permits are issued by the Divisional Forest Officer, Bhakker (Table-1).

Table 1. Rates of grazing permits

Animal species	Rate of grazing permit per year (Rs)
Sheep	2
Goat	8
Cow	8
Buffalo	15
Camel	25
Donkey	15

Different pastures of the Rakh were Reseeded with *Cenchrus ciliaris* (Dhaman) during Punjab Forest Development Project that ended in December, 2001 and since then no reseeding was practiced in the area.

1. Species composition

Species composition of Rakh Goharwala is shown in table-2. (*Eleusine flagellifera*) Chhimber was the main grass species of the area.

Table 2. Species composition of Rakh Goharwala (Thal)

Botanical Name	Local Name	Percent
<i>Aristida</i>	Lumb	0.20
<i>Aristida caerulascens</i>	Lumbi	3.40
<i>Boerhavia diffusa</i>	Itsit	1.40
<i>Cenchrus ciliaris</i>	Dhaman	0.94
<i>Cymbopogon jawarancusa</i>	Khavi	5.70
<i>Cyprus eleusinoides</i>	Deela	0.80
<i>Eleusine flagellifera</i>	Chhimber	53.12
<i>Lactuca scariola</i>	Bhattal	0.09
<i>Leptadenia spartium</i>	Khip	0.25
<i>Sueda fruticosa</i>	Lana	28.50
<i>Tribolus terrestris</i>	Bhakra	3.90
Unidentified		1.70
Total		100.00

2. Vegetation Cover

As shown in Table-3, grasses/herbs had maximum ground cover (26.37%) followed by *Sueda fruticosa* (12.75%) and *Acacia jacquemontii* (4.07%) whereas, 56.75% of the area was bare. There were 97.9, 53.8, 5.7 and 0.3 plants of Lana, Kandi, Mallah and Karir per hectare Table 4. In shrubs Lana also gave the maximum biomass (301Kg/ha) followed by Kandi (14.2 Kg/ha).

Table 3. Ground cover of Rakh Goharwala (Thal)

Type of vegetation	Botanical Name	Cover (%)
Green grasses/forbes		26.37
Lana	<i>Sueda fruticosa</i>	12.75
Kandi	<i>Acacia jacquemontii</i>	4.07
Mallah	<i>Zizyphus numularia</i>	0.05
Karir	<i>Capparis aphylla</i>	0.01
Bare ground		56.75
Total		100.00

Table 4. Average number of shrubs and dry biomass per hectare at Rakh Goharwala (Thal)

Species	Average No. of plants per ha	Dry biomass Kg/ha
<i>Sueda fruticosa</i>	97.95	301
<i>Acacia jacquemontii</i>	53.82	14.2
<i>Zizyphus numularia</i>	5.70	0.34
<i>Capparis aphylla</i>	0.32	0.1

3. Carrying capacity

Carrying capacity determined was 0.04, 0.96 and 1.00 AU/ha/yr based on biomass from grasses/herbs, shrubs and both, respectively (Table-5). It is evident from the data that shrubs contributed the major source of biomass for grazing animals. Due to uncontrolled grazing and lack of rest period during growing season, the area was heavily overgrazed. Among shrubs, *Sueda fruticosa* and *Acacia jacquemontii* were the major contributors of biomass for animal browsing. Although, the two species are less palatable and can withstand over grazing pressure. Also they survive well under arid conditions.

Table 5. Carrying capacity of Rakh Goharwala (Thal)

Source of biomass	Carrying capacity	
	AU/ha/Yr	Ha/AU/Yr
Grasses/herbs alone	0.042	23.54
Shrubs	0.961	1.04
Grasses/shrubs combined	1.003	0.99

4. Range-use

Detail of estimated number of animals to be grazed during the current financial year was obtained from the Range Forest Officer Bhakkar. Data were based on the number of permits issued up to the time of survey. The findings revealed that the area was adequate rather surplus for sustaining given number of animals especially browsing animals.

Table 6. Estimated No. of grazing animals for one year

Species	No.	Animal Units
Sheep	5000	1000
Goat	3000	900
Cattle	1000	1000
Buffalo	10	15
Camel	50	85
Donkey	10	6
Total		3006

5. Conclusions and recommendations

Goharwala is under heavy grazing pressure as far as Grasses/herbs are concerned. The animals have to sustain on shrubs, which although are adequate to meet nutritional requirements of animals but are less palatable. This demand for reseeding flats, intensive management of the area and strict application of rotational system of grazing.

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