VEGETATION CHANGES DUE TO CLOSURE AT JABA SHEEP FARM

Mohammad Noor*

Abstract

An area of two hectare was fenced in July, 1976 at Jaba, District Mansehra to find out the effect of protection on the vegetation. In October, 1980, changes in the vegetational charateristics inside and outside the closure were compared. Average airdry forage production increased nine times due to closure, this increase was both for grasses and forbs. The percent cover of grasses and forbs increased 2½ times inside as compared with that of outside the closure. The grazing capacity due to closure increased 7 times of the grazed area.

Introduction

Livestock exclusion is an important range improvement technique and is often used to improve forage of heavily grazed ranges. Vegetation changes in the enclosed and grazed areas have been compared by various researchers in different ecozones. Airdried forage production in the closure was significantly higher compared to adjacent grazed area (Khan, 1977 and Noor 1978). Richard and Cushing (1982), Thurow, *et. al.*, (1986), Tucker (1987) and Schulz and Leininger (1990) found that as a result of livestock exclusion, substantial increases in biomass and vegetation cover had occurred. This study was conducted to determine changes in vegetation due to closure of a site located in sub-tropical ecological zone.

Materials

Study Area

Jaba is situated in Mansehra district of Hazara Division in the subtropical humid ecological zone at an elevation of 1122 metres. Average annual rainfall is about 1500 mm, bulk of which is received during summer. Snowfall is common in winter. The mean maximum and minimum temperature varies from 14 to 35° C in summer and 1 to 25° C in winter, respectively. Average relative humidity is 48 and 33 percent in June to about 81 and 69 percent in August at 0800 and 1700 hours. The area is grazed by *Ramboillet* sheep and Red Sindhi cows including local cattle and sheep breeds.

Vegetation

The climax vegetation of this zone is chirpine forest. However, socio-economic pressures have resulted in conversion of chir forests into either agriculture fields or

*Author is Assitant Silviculturist, Pakistan Forest Institute, Peshawar.

productive rangelands in and round Jaba. The ground flora varies with degree of opening of crown canpy of chir forest, amount of needle cover on the ground, soil depth and the amount of light admitted to the ground surface (Khan, 1981). The following native species are found in the area (Khan, 1971).

Trees: *Pinus roxhurghii, Grewia oppositifolia, Quercus incana, Ficus* spp.

Shrubs: *Berberis lycium, Indigofera* spp. *Rosa* spp., *Zizyphus oxyphylla, Woodfordia fruticosa, Rubus* spp., *Dephne oleoides, Myrsine africana, Otostigia limbata.*

Grasses: *Themeda anethera, Heteropogon controtus, Chrysopogon aucheri, Bothriochloa intermedia, Apluda aristata, Cymbopogon martini, Aristida* spp., *Imerata cylindrica, Digiteria* spp., *Pennisetum orientale, Rottboellia exaltata*

Forbs: *Lespedeza* spp., *Lotus* spp., *Galium* spp., *Thymus serphyllum,/Eregeron* spp., *Taraxacum officinalis, Euphorbia* spp.

Methods

An enclosure of about 2 hectares was established on southern aspect of a hill having 50% slope at Jaba Sheep Farm in July 1976. In October 1980 changes brought about due to closure in the airdried forage production, total vegetation cover percent and percent cover of major forage species were recorded. The closure has a wide belt shape with width along the contours and length accross it. Four transects, two along the contours and two accross were laidout inside the closure. Each transect line was 60 meter long. An equal area approximately of the similar shape was selected outside the closure and 4 transects were laidout in the same manner as within the closure.

Systematic sampling with random start was used. Sampling points were 3 meter apart along 60 meter transect line. Twenty 1 m^2 quadrats (adjustable decimal collapsible quadrat) were placed with their left proximal corner on the fixed points and near side along the transects (Khan, 1974). In this manner, 80 quadrats were placed inside and 80 outside the closure. The total aerial cover and percent cover of the major forage species were estimated from each quadrat and averaged separately for inside and outside the closure. Forty alternate quadrats inside and 40 outside were used for determination of forage production. All the palatable grasses and forbs were clipped 3 cm above ground with hand shears in each quadrat. Only the current year's growth within the reach of livestock was clipped for shrubs. The clipped material was immediately weighed and its green weight recorded. The clipped material was then airdried until it gained a constant weight. The mean airdry weight in grams was coverted into Kilograms per hectare by multiplying with ten (Hussain, 1968).

Statistical analysis (t-test) was performed to determine significant differences in forage production and percent cover inside and outside the closure (Stell and Torrie, 1980). The grazing capacity for inside and outside the closure was calculated using a 50

percent use-factor and 9 Kg. airdry forage as daily requirement of one animal/unit (A.U.).

Results and Discussion

Forage Production

The average forage production was 3892 Kg/ha inside and 426 Kg/ha outside the closure, thus there was a nine times increase due to closure. The differences in the mean airdried forage yield of grasses, forbs and shrubs inside when compared with that of grazed site were highly significant ($P \leqslant 0.01$). The average airdried forage yield in kg/ha of grasses, forbs and shrubs is given in Table 1.

TABLE 1

MEAN AIRDRY FORAGE PRODUCTION (Kg/ha) OF GRASSES, FORBS AND SHRUBS INSIDE AND OUTSIDE THE CLOSURE

Life Form	Mean Airdry Forage Production Kg/ha	
	Inside the Closure	Outside the Closure
Grasses	3314 **	391
Forbs	201 **	29
Shrubs	377 **	6
Total	3892	426

** Highly significant.

The grazing capacity in the closure increased due to increase in forage prodution. The grazing capacity outside the closure was less than one AUM/ha and 7 AUM/ha (7 times increase) inside the closure due to protection from grazing for 4 years.

Percent aerial cover

Average percent cover of grasses, forbs and shrubs varied within and outside the closure and is given in Table 2.

The average aerial percent cover of grasses, forbs and shrubs was greater ($P \leqslant 0.01$) inside the closure as compared to that in area open to grazing. Total percent cover increased 2½ times inside the closure. The mean percent cover of major forage species is shown in Table 3.

TABLE 2

AVERAGE COVER PERCENT OF GRASSES, FORBS AND SHRUBS INSIDE AND OUTSIDE THE CLOSURE

Life Form	Percent Cover	
	Inside the Closure	Outside the Closure
Grasses	74.75 **	34.07
Forbs	10.14 **	1.46
Shrubs	15. 6 **	1.70
Total	100.49	37.13

TABLE 3

MEAN PERCENT COVER OF MAJOR FORAGE SPECIES INSIDE AND OUTSIDE THE CLOSURE

Species	Mean Percent Cover	
	Inside	Outside
Themeda anethera	35.26 **	15.22
Chrysopogon aucheri	24.18 *	10.21
Heteropogon contortus	11.51 **	4.84
Lespedeza spp.	6.08 **	0.61
Indigofera spp.	15. 6 **	1.7

** Highly significant ($P \leq 0.01$)

* Significant ($P \leq 0.05$)

The average percent cover of major forage species i.e., *Themeda anethera, Heteropogon contortus, Lespedeza* spp. and *Indigofera* spp. was greater ($P \leq 0.01$) inside as compared with that outside the closure. The average percent cover of *Chrysopogon aucheri* was significantly ($P \leq 0.05$) higher inside than outside the closure.

Prior research on the effect of livestock exclusion on the vegetation cover and above ground biomass support results of this study. Khan (1977), Noor (1978), Richard and Cushing (1982), Thurow et al.(1986), Tucker (1987), and Schulz and Leininger (1990) found higher airdried forage production and vegetation cover in the closure than in the adjacent grazed area.

Conclusion

Airdried forage production and cover percent were found to be significantly higher in the closure than in the adjacent grazed area. The over-grazed rangelands of Jaba are still producing a high quality forage and are capable of quick recovery if protected due to favourable ecological conditions. The airdried forage production and percent cover can be enhanced by proper protection for improving watershed value and increasing the production of livestock and livestock products from the subtropical humid zone.

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