ENHANCING RANGE PRODUCTIVITY THROUGH GRASS SEEDING IN SUBTROPICAL SEMI-ARID RANGELANDS NEAR PESHAWAR

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Abstract: *About 2 hectares in Jamrud target area near Peshawar were seeded with* Cenchrus ciliaris *in July, 1980. In September, 1981 the production data were recorded in the seeded and control areas. Due to grass seeding the average forage yield had increased from 45 kg/ha to 2324 kg/ha a tremendous increase, increasing the carrying capacity of this rangeland from about 23 to only 0.5 hectares/Animal Unit/year. This shows that at present level of livestock management the production of livestock and livestock products can be increased about 40 times by simply seeding these areas with* Cenchrus ciliaris.

Introduction: The rangelands in the subtropical semi-arid region of Pakistan are in a deplorable stage because of Centuries overuse by the livestock and cutting and even uprooting of shrubs. These rangelands are under severe erosion and are producing only a fraction of their potential. Grass seeding not only enhances range productivity but also checks erosion.

Cenchrus ciliaris has a very broad ecological aptitude. It is native and distributed throughout Africa, Arabia, India (Patil and Singh, 1963) and naturalised in northern Australia, U.S.A. and Mexico (Hull, 1972). It is adapted to tropical and subtropical summer rainfall area with a long dry season. It is an excellent grazing grass for hot and dry areas. It persists well under rather close grazing and becomes less palatable if allowed to mature it is cultivated for permanent pastures and is one of the most important hay grasses in India.

Seeding is generally regarded as the most effective means of improving semi-arid rangelands after native desirable forage species have been lost due to mis-management. Grasses seeding in 60 studies on depleted rangelands and on abandoned dry farmlands in the sagebrush region in southern Idaho produced from 800 to 1,800 lbs. herbage per acre as compared to 45 to 200 lbs. before reseeding (Hulls, 1974). Khan (1966) reported that airdry forage production in Thal ranges increased from 291 to 1750 lbs per acre per annum due to reseeding with *Cenchrus ciliaris* and *Lasuirus hirsutus*.

Study Area: It lies between 71°- 15′ to 71°- 25′ E Longitude and 34°- 0′ to 34°- 10′ N latitude. It is a small part of Peshawar valley in extreme western boundary. The area is bounded by Khyber range in the north-west, Peshawar-Jamrud road in the south and high level Warsak canal in the east and north east.

It is a dessicated piedmont plain gentle to moderate slope. The soil is gravelly and stony complex with yellow massive calcareous silt loam and brownish red calcareous silt loam having a weak structure.

The climate is hot subtropical semi-arid continental. The 12 years (1969-1980) average monthly minimum temperature, maximum temperature, rainfall and relative humidity recorded at Pakistan Forest Institute, Peshawar at a distance of about 4 kilometres from the study area are shown in figure 1.

The natural vegetation included *Zizyphus nummularia, Fagonia species, Alhagi camelorum, Peganum harmala, Aerua javanica, Rumex dentatus, Plantago ciliata, chenopodium murale, Astragalus* spp., *Malcomia africana, Cynodon dactylon, Bothriochloa pertusa, Cymbopogon* spp., *Stipa tortilis, Aristida adscencionis, Tetrapogon villosus, Enneapogon persicus* and *Hetropogon contortus.* The experimental area is planted with Eucalyptus camaldulensis at a spacing of 3m by 3m.

Methodology: An area of about 1.5 hectares was reseeded with *Cenchrus ciliaris* at a rate of 10 kg seed per hectare in July, 1980 after 2 ploughings with cultivator in prependicular directions. The sowing was done in lines spaced at 60 cm from each other and parallel to the line of eucalyptus plants. Thus four lines of grass alternated one line of tree saplings.

An area of 75 m x 42 m size in the central seeded portion was earmarked for sampling of forage production. This area contained 100 lines of *Cenchrus ciliaris* each 42 metres long. Ten lines out of these 100 lines were randomly selected. Four plots each one metre long were again randomly selected in each of the ten lines. In the control area, not seeded to *Cenchrus ciliaris* also an area of the same dimensions was taken for sampling to determine its forage yield. Forty one metre square plots were randomly selected for clipping in this area.

Cenchrus ciliaris in the seeded portion and natural palatable vegetation in the control area were clipped to 5 cm. above ground level with scissors. The clipped material was immediately weighed and its green weight recorded. The clipped material was then air dried till it gained a constant weight. The airdry weights were then recorded and converted to kg per hectare. The four quadrats in each line of seeded area and four quadrats in sequence in the control area were grouped to show the comparison between the forage yield of seeded and unseeded area.

Results: The air dry forage production in the area seeded to *Cenchrus ciliaris* is shown in Appendix I. It varied from 5550 kg/ha to 450 kg. per hectare with an average production of 2324 kg/ha. The coefficient of variation was 41%. The variation in the production of the grass yield was mainly due to variation in the grass cover.

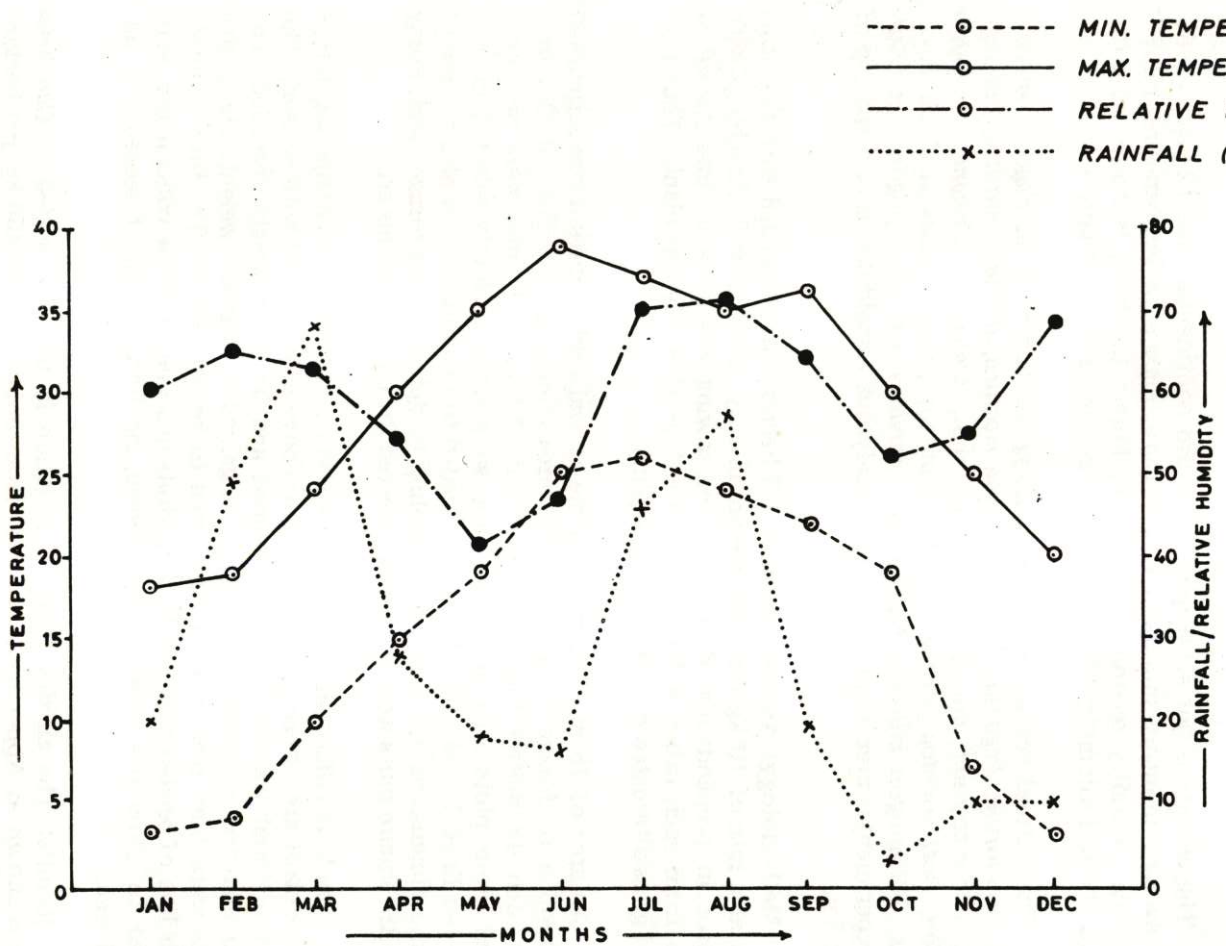

Fig. 1 AVERAGE METEREOLOGICAL DATA AT PESHAWAR FOR 1969-80

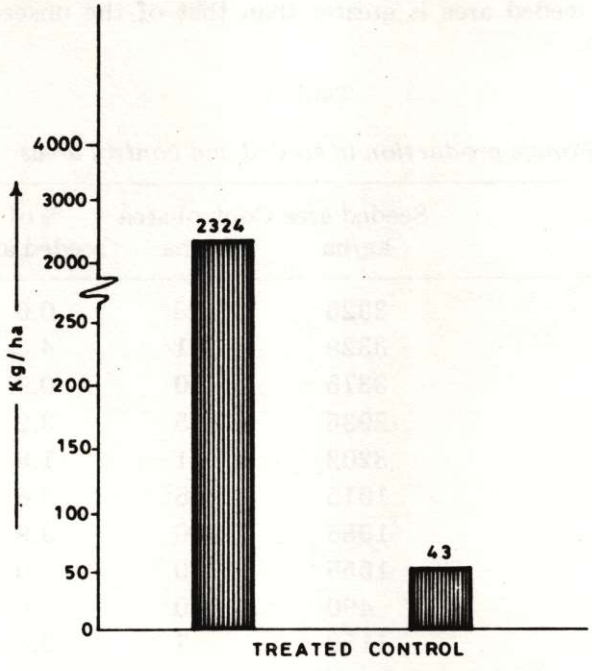

Fig. 2 AVERAGE FORAGE YIELD IN THE SEEDED AND CONTROL AREAS

The groupwise comparison of air dry forage yield in the seeded and control areas is given in Table 1. While the average production in these two areas is shown in Fig 2. The forage production in various grasses of seeded area varied from 3375 kg per hectare to 490 kg per hectare with an average production of 2324 kg air dry forage per hectare. Compared to this the various in the air dry forage yield in groups of unseeded was from 101 kg per hectare to 7 kg per hectare with an average yield of 43 kg per hectare. Even the highest yield of control groups is lower than the lowest yield of seeded groups. This shows that the yield of seeded area is greater than that of the unseeded area at any level of confidence.

Table 1

Forage production in seeded and control areas

Groups	Seeded area kg/ha	Control area kg/ha	% of seeded area
1.	3325	13	0.6
2.	3328	101	4.3
3.	3375	20	0.9
4.	2935	75	3.2
5.	3202	41	1.8
6.	1915	85	3.6
7.	1985	90	3.9
8.	1555	0	0
9.	490	0	0
10.	1158	7	0.3
Average:—	3224	43	1.8

Conclusions: The yield of overgrazed deteriorated rangelands in the subtropical semi-aird rangelands near Peshawar can be enhanced about 50 times. Based on the present efficiency of livestock this will result in increasing the livestock products 50 fold. The present grazing pressure on these rangelands is about 3 times their carrying capacity which tatamounts to feeding the animals about half of their production ration requirements. In other words most of the feed is presently taken by livestock from these rangelands goes to meet their maintenance requirement and the production of livestock and livestock products is being carried out at less than 25 per cent efficiency. With the increased availability of forage this efficiency can be improved to a level well beyond 50 per cent. The seeding of these rangelands can thus increase the production of livestock about 100 times of their present level and can help a lot in the economic development of these backward areas.

References

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Appendix I

Air dry forage production of seeded area (kg/ha)

Groups	Qudrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Average
1.	1880	3420	4850	3150	3325
2.	2010	4160	3420	3720	3328
3.	4510	3820	3170	2000	3375
4.	3700	3770	3720	510	2925
5.	5550	3100	2450	1710	3202
6.	3060	2340	1460	800	1915
7.	3000	3050	1250	640	1985
8.	1170	3250	700	1100	1555
9.	710	0	450	800	490
10.	1850	960	920	900	1158