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Restoration of arid grasslands: Issues and strategies

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Introduction:

Economy of the Thar Desert of India, lying between 24°-29°N latitude and 70°-76°E longitude, is closely linked with the raising of livestock which mainly depends upon the native rangelands for their sustenance. Pearl millet, moth bean, cluster bean, range grasses and legumes, trees and shrubs are the major components of arid ecosystem. Perennial grasses, *viz*., buffel grass, bird wood grass, sewan and gramna are the dominating pasture species of the region. Due to frequent droughts and overgrazing, the productivity of the natural grasslands of the region has been steadily decreasing leading to reduced carrying capacity between 0.2-0.5 ACU per ha, which needs to be enhanced through improved technological interventions.

Materials and Methods

The arid grasslands dominated by *Lasiurus-Cenchrus* grass cover are influenced by various biotic and abiotic stresses which has caused fast erosion of genetic diversity. Rajasthan Thar desert is known as the primary centre of genetic diversity, comprising of many primitive and wild forms. About 106 species of grasses are found in western Rajasthan. Sewan grasslands spread in Jaisalmer, Barmer, Bikaner and Jodhpur districts of Rajasthan once remained as the major source of fodder supply are in highly deteriorating condition. Two types of diversity, *viz*., morphological and genetic have been evidenced. The former is governed by variation in habitat and later is based on fixed genetic variable forms. At the ICAR-CAZRI, Jodhpur, a sizable genetic stock is being maintained derived from different habitats and had been studied for various morphological and genetic aspects of variation. Wide range of genetic variation was observed in the characteristics contributing to forage yield, forage quality and underground biomass for the pasture grasses of arid zone.

Results and Discussion

Prominent range grasses: Arid rangelands are changing in composition mainly due to pattern and amount of precipitation received and grazing pressure. Prominent perennial grass species are:
Sewan (*Lasiurus sindicus* Henr.) is one of the dominant species of *Dichanthium-Cenchrus–Lasiurus* type grass cover. In India sewan rangeland are spread in western Rajasthan, and has been the integral component of the traditional rainfed farming systems. The grass is extremely drought resistant and thrives even in very low rainfall regions receiving 100 mm to 300 mm annually. Buffel grass (*Cenchrus ciliaris* L.) has wider adaptability for a range of soil and climatic conditions and can be cultivated in the areas receiving rainfall from 150 - 1250 mm. It is very palatable at early stage of growth, and remains fairly palatable at maturity. Similarly, bird wood grass (*C. setigerus* Vahl) tolerates heat and drought and grows in areas of annual rainfall as low as 200 mm, making it excellent for improvement of low rainfall grazing lands. Karad (*Dichanthium annulatum* (Forsk) Stapf) is another important grass of Rajasthan, thriving in rainfall regions of $\geq$ 350 mm. It grows to a height of 75 cm and regarded as an excellent fodder plant and pasture of high quality, vigour and productivity. Blue Panic (*Panicum antidotale* Retz.), often found on sand dunes is an excellent sand binder and drought resistant grass adapted to a variety of soils and climatic conditions. Murat (*P. turgidum* Forsk.) grows on sand dunes and sandy plains in open rangelands and cultivated fields of Thar desert of Rajasthan and Gujarat. These grasses are highly nutritive, crude protein content varies from 5-12% of dry matter and have good yield potential. *L. sindicus* may yield up to 50-75 q/ha dry matter under optimum growing conditions, while it is between 30-45 q/ha for the other grasses.

Adaptation to climatic variability: Climate change is increasingly recognized as one of the greatest challenges to mankind and other life on the earth. Identification of plant species that are naturally well adapted to survive under conditions of intense water limitation and warmer conditions are of interest (Tubiello *et al*., 2007). *L. sindicus* has adaptive characteristics to survive under extreme desert conditions that include ability to draw water from greater soil volume owing to extensive root system, higher water and heat use efficiency, C_4 photosynthetic pathway and ability to withstand high wind velocity. It contributes maximum root matter to the soil for longer sustainability. Further, 65% of its roots penetrates deeper than 1.5 m indicates the ability to draw moisture from deeper strata of the soil helping the species

to survive under prolonged moisture deficit conditions. In *C. ciliaris*, 50% of the roots penetrate to a depth of 1-1.5 m. This shows that *C. ciliaris* has more water requirement than *L. sindicus*. Water use of *L. sindicus* varied from 144 to 271 mm and water use efficiency varied from 13.2 to 20.8 kg dry matter/ha/mm (Singh and Rao, 1996).

Key issues for expanding the pasture area: Desertification is a global phenomenon of land degradation, which reduces the normal potential of the ecosystems and has a direct impact on the diversity of rangelands. Continuous droughts coupled with heavy grazing pressure result in diversity loss of perennial grasses as these species are always exposed to adverse climate and biotic factors. Following are the key issues for restoration of pastureland in arid areas.

- Low productivity of grazing lands,
- Lack of high yielding varieties,
- Non-availability of quality seeds,
- Increased grazing pressure,
- Conservation of genetic resources, and
- Training and education.

Strategies for grassland conservation

Soil conservation measures: In human-used lands, degradation is clearly correlated with species loss, but it is not clear that degradation is driven by species loss. Instead, soil degradation simultaneously reduces rain use efficiency and species richness. The loss of keystone species is a final indicator that irreversible land degradation has occurred. Strategies for sustainable dry land management should therefore, primarily address the maintenance or restoration of soils, rather than focus on species conservation *per se*.

Protection: Overgrazing is one of the main causes of deterioration in grasses diversity in arid tracts of India. Fencing of angle iron posts with barbed wire is the most effective and economical in long run. Ditch and core wall fencing through participatory approach may be constructed.

Controlled grazing: Controlled grazing as per the carrying capacity has been the proper way to utilize native rangelands. Overgrazing invites annuals and guide biodiversity loss of palatable perennial pasture species.

***In-situ* conservation**: Extensive areas in Jaisalmer, Bikaner and Barmer district are covered with high yielding nutritious grasses like *L. sindicus*. But these pastures are deteriorating due to over grazing. In order to upgrade these pastures, these areas may be brought under the purview of the State Forest Act or the State Soil Conservation Act and dividing the area in to suitable blocks for practising rotational grazing can regulate the grazing. To save the germplasm for future uses it must be conserved in both *in-situ* as well as *ex-situ*.

Restoration of wastelands: Vast tracts of wasteland of the country may be brought under rehabilitation. Reduced grazing pressure would lead to diversity richness of pasture grasses. Natural succession of the desired species is very slow process, reseeding the natural grasslands with appropriate grass species suiting the agro-climatic sub-regions, is the only possible means for obtaining higher productivity. Reseeding involves thorough soil working, grubbing of unwanted bushes, sowing of appropriate grass species and after care of the sward. CPRs available with *Panchayats* should be developed through improved pasture/silvi-pasture systems on cooperative basis.

Conclusion

Range grasses hold a key position in development of productive and nutritive pastures in the arid zone of Rajasthan. They have high water and energy use efficiencies irrespective of the low moisture conditions ensuring stabilized herbage production to support livestock. Carrying capacity of grazing lands can be improved by available technologies if applied and adapted in long term basis. Control grazing is desirable to sustain the productivity as well as to mitigate environmental hazards. There is also need of reseeding and protection of degraded *L. sindicus* dominated grassland. Further, overall higher efficiency of sprawling *L. sindicus* grazing land in Jaisalmer district again signifies its vital role in extreme part of the hot arid region for livestock productivity. Therefore, *in situ* conservation should be encouraged by protecting and preserving existing natural grasslands. People/community participation is important to conserve the precious resource base of this desert grass. Rangelands and grasslands had been the soft targets of non-agricultural developmental activities and to protect the precious grassland diversity, utmost attention of the decision makers and policy planners is required before taking these lands under developmental works.

References

Singh, K.C. and A. S. Rao. 1996. A short note on water use and production potential of *Lasiurus sindicus* Henr. in the *Thar* desert of Rajasthan, India. *Journal of Arid Environments* 33: 261-262.

Tubiello, F. N., J. F. Soussana and S. M. Howden. 2007. Crop and pasture response to climate change. *Proc. Nat. Acad. Sci.* USA, 104:19686–19690.