Scientific Production Technology of Range Grasses and Legumes for Western India

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INTRODUCTION:

Livestock contributes approximately 9% to national GDP and 25% to agricultural GDP. India contributes about 18 % world's livestock population while it has only 0.5 % grazing area. The pasture lands covers about 4.0 % of geographical area (12 m ha) of the country with high grazing intensity (12.6 ACU/ha). Area under cultivated fodder is about 8.3 m ha (4.4 %) and there is hardly any scope for extension. The major part of fodder comes from crop residue but agricultural harvests are irregular due to periodic drought, erratic rainfall in arid and semi-arid regions which result in big gap between demand and supply of feed and fodder.

Western India covers about 4.36 lakh km^2 which represents one-fourth of total arid and semi-arid regions of the country and these regions extend over 61 and 13 % in Rajasthan, 20 and 9 % in Gujarat, 9 and 6 % in Haryana and Punjab respectively, of total area of the state. Out of total area of Rajasthan and Gujarat 40 % and 30 % area are available as grazing lands and 5.4 % and 3.5 % under permanent pasture, respectively. The prominent range species being *Cenchrus ciliaris*, *C. setigerus*, *Lasiurus sindicus*, *Dichanthium annulatum*, *Chrysopogon fulvus*, *Heteropogon contortus*, *Panicum antidotale*, *Clitorea ternatea*, *Stylosanthes hamata*, *S. scabra*, *S. seabrana*, *Atylosia scarabaeoides*, etc.

The over grazing has resulted in grassland deterioration and desertification. Therefore, improvement and systematic utilization of pasture lands could facilitate sustainability of livestock production in western region.

Integration of range grasses and legumes provides nutritive, palatable fodder with high digestibility dry matter and protein.

The mixed pasture also improves the soil physical conditions, check soil erosion, suppress the weeds and withstand the vagaries of weather. The legumes can adds up to 40 kg N/ha and increase three times of crude protein of forage.

The package of practices of range grasses and legumes under arid and semi-arid regions is described here:

LAND PREPARATION AND BUSH CLEANING: Weeds and undesirable bushes may be removed manually /mechanically followed by spray of selective herbicide on the cut stamps to stop coppicing. The leaf fodder yielding bushes may, however, be retained in appropriate proportion, for example, 14 % density of *Zizyphus nummularia* was found optimum for high forage production in desert.

ESTABLISHMENT TECHNIQUES: Both broadcast and line sowing are equally effective for grasses and legumes. Planting of nursery raised seedlings and rooted slips gives higher establishment and forage production but it involves higher cost than spot sowing of seed. However, this method is recommended in case where limited quantity of seed is available. For large areas, spot sowing of seed is preferable in terms of lower cost and time saving. Integration of legumes with grasses sown in strips/ line sowing gives higher establishment.

TIME OF SOWING AND SEED RATE: Middle of July is the most suitable time but it is greatly depends on onset of monsoon and inteisty of rainfall. The optimum seed rate is 4-6 kg/ha for *C. ciliaris, L. sindicus, S. nervosum and D. annulatum* & 8-10 kg/ha for *C. setigerus* and range legumes.

SPACING AND DEPTH OF SOWING: A spacing of 50x30 cm is most appropriate for grasses and legumes. The optimum depth of sowing is 0.4-0.8 cm for grasses and 0.8-1.2 cm for legumes. Pelleting of seed with clay+farm yard manure gives higher establishment under arid conditions.

FERTILIZER APPLICATION: The economic dose of nitrogen is 40-60 kg/ha and phosphorus is 20-40 kg/ha depending on rainfall distribution. The dose of nitrogen should be applied in three equal splits. Full dose of phosphorus and one-third dose of nitrogen should be applied at the time establishment. In old pastures, first dose of nitrogen should be applied at 30 days after first effective rainfall followed by 25 days interval.

GRAZING AND CUTTING MANAGEMENT: In pasture grazing system, a periodic rest is essential for recoup and rejuvenation. The deferred rotational grazing system is found superior in terms of providing more number of animal days and average body weight gain over continuous grazing system. Cutting at 50 % flowering stage at 10-15 cm height is proper for high quantum and quality forage production under cut and carry system. Cutting of different grasses at 50-60 days interval was found optimum for high forage and crude protein production.

CONTROLLED BURNING: Judicious burning of range/ pasture is also important management tool for enhancing fodder production by about 15-20 %. Burning during wetter period with long intervals of about three years is recommended.

OTHER OPERATIONS: Measures related to soil and water conservation in dry areas is crucial. Construction of bunds along the contour lines, water storage/discharge structures viz, check dam, anicuts, embankments are required. The spreading of dry grasses or shrubby growth on bare field and along the contours or terraces has the potential to check soil and water loss.

Anjan grass (*Cenchrus ciliaris*): It is drought tolerant perennial grass occurring naturally in areas with average annual rainfall of 100-750 mm. Light to medium texture soil is most suitable. The crude protein value ranges from 6-9 % with digestibility from 50-60%. Green and dry fodder yield varies from 15-18 and 4-6 t/ha, respectively.
Promising genotypes:- Bundel anjan-1, Bundel anjan-3 Marwar anjan, IGFRI-S-3133, C-357 & C-358.

Cenchrus ciliaris

Cenchrus setigerus

Mode Dhaman grass (*Cenchrus setigerus*): The grass is well adapted in semi-arid climate. Prefers light-textured sandy soils but also does well over a wider range of soils. The green and dry fodder yield varies from 20-22 and 7-9 t/ha, respectively, crude protein of 6-9per cent. Promising genotypes:- CAZRI-76

Sewan grass (*Lasiurus scindicus*): It is most prevalent grass of arid regions with thin stems and bushy thickets in sandy deserts where it is used for pasture and hay. Production potential is of 6.5 t/ha fresh fodder and 2.5 t/ha dry matter. It contains about 6 % crude protein with digestibility of 50-55 per cent. Promising genotypes are: CAZRI-317, CAZRI-319 and CAZRI-30-5.

Lasiurus scindicus

Dichenthium annualatum

Marvel grass (*Dichanthium annulatum*): It is used for grazing and also cut-and-carry for silage and hay. Preferable adoption areas being sub-humid with rainfall range of 700-1,400 mm on light to heavy black soils. It also withstands alkaline and saline conditions. The green and dry fodder yield ranges from 18-20 and 8-9 t/ha. The digestibility ranges from 28-47% with average crude protein of 5 per cent. Promising accessions:- Marvel-7, Marvel-8, Marvel-93, GMG-1, GMG-2, IGFRI-S-495-1 and IGFRI-S-495-5.

Titaly matar (*Clitoria ternatea*): This range legume is suitable for semi-arid conditions and due to large seeded its establishment is very easy. It has an excellent nutritive value with 18 % protein with 80 % digestibility. The dry matter production is ranging from 3-6 t/ha. It is grown successfully with *C. ciliaris and C. setigerus.* Promising genotype are:- CAZRI-466, CAZRI-752, CAZRI-1433 and IGFRI-23-1, IGFRI-12-1, IGFRI-40-1, ILCT-249.

Stylosanthes hamata

Clitoria ternatea

Caribbean stylo (*Stylosanthes hamata*): This range legume is used as component of pastures, hay and leaf-meal production. It is also grown on degraded soils and well drained sandy soils of low fertility in tropics. The dry matter can be obtained up to 3.0 t/ha. It contains very high crude protein (17-24%) and digestibility.

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