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Production and quality assessment of pasture crop in red lateritic wasteland of central Chhattisgarh

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Introduction

The livestock constitutes a very important component in rural economy, as in agriculture. Our country largely depends on livestock for manure and power. The availability of fodder is short from the requirement and an estimate of several agencies, there is more than 300 per cent gap between availability and requirement (Anon, 1980). Most of the livestock depend either partially or completely on natural and developed pastoral system, but the existing practices of utilization of range lands, grasslands and forest areas natural resources and increasing land degradation. In the improved pastoral system in wastelands, the carrying capacity of grass-legumes pastoral field is consistently noticed to deteriorated over a period by invasion of local species. Here improved pastoral system was studied for its production and structure behavior and nutritive value after 10 years of establishment.

Materials and Methods

In well prepared field grass species *Chrysopogon fulvus* was planted by root slips at 50 cm distance while, legume species *Stylosanthes hamata* was sown by broad-casting of seeds @ 5 kg/ha in plot of 50x50m size. Yield of pasture crop was harvested during peak growth period *i.e.* October every year for grass, legume and forbs and estimated the dry matter production then local community around the farm was allowed to cut and carry the pasture yield. After ten years of establishment of pasture, the population structure of the crop field was recorded during peak growth period as the recommendation of Mishra (1961) for frequency, density and basal area, association index, dominance and diversity. Pasture crop were analyzed for NPK, crude protein, crude fiber, ash and calorific value as per standard methods.

Results and Discussion

Structure of pasture species: The structure of pasture crop after 10yrs of establishment showed that the total number of species available in pasture field was 15 with 6 grasses, 4 legumes and 5 forbs. The association index of 57.14 % between introduced species *Stylosanthes hamata* and *Chrysopogon fulvus*. The population strength of herbage species was 396.6 plants m^{-2} with abundance of 287.82 plants m^{-2} of which occupied the basal area of 4550.8cm^{-2} m^{-2} *i.e.* 45.5% area. Level of dominance was found very low (0.26) while diversity index was 0.85. Higher diversity is associated with less dominance with unstable production system (Naugraiya and Pathak, 1986; Naugraiya, 2008).

Among the total number of species encountered, grasses included *Cenchrus ciliaris*, *Cynodon dactylon, Chrysopogon fulvus, Eremopogon faveolatus, Heteropogon contortus* and *Pennisetum pedicellatum*. Out of these eight grass species only *C. fulvus, E. faveolatus, P. pedicellatum* and *H. contortus* were found to be dominated, where seven leguminous species *viz*; *Alysicarpus bupleurifolius, A. monilifer, Aschinomon indica and Stylosanthes hamata* lodged their presence of which the most dominating species –*A. indica* is reported very common in field (Table-1), while the forbs were *Celosia argentia, Chorchorus aletorius, Cyprus rotendus, Fembristylis tenera* and *Sida carpinifolia.* Over all on the basis of IVI dominating species distribution was found in order of *A. indica> P. pedicellatum > H. contortus > S.hamata > C. fulvus > E.faveolatus >A.bupleurifolius > C.argentia*. Naugraiya (1985) worked out the phyto-sociological status of five protected rangelands and found that local native species were always gradually occupied the dominating status over a period.

Production of pasture crop: Quantity of pasture dry matter was produced 86.5qha^{-1} with share of legumes 53.81 qha^{-1}, (30.57qha^{-1}) and forbs (2.11 qha^{-1}) at 10^{th} years of growth, (Table-2), while in 1^{st} yr thus the dry matter production of pasture was recorded 25.7qha^{-1} which were gradually increased to 44.4, 67.8 and 98.7 q ha^{-1} during 2^{nd}, 3^{rd} and 4^{th} year respectively afterward it get s decreasing in 5^{th} (79.3 qha^{-1}) and 6^{th} (57.4 q ha^{-1}) year of growth, the production of pasture again get started increasing steadily to 86.5 q ha^{-1} (Fig.-1). The contribution of grass, stylo, native legumes and forbs were varied in 1^{st} year where Stylo contributed 49.1% biomass which increased 60.7% in next year afterward it get declined gradually and at 10^{th} year it was remained 2.07%, while native legumes invaded in the field with 0.97% and occupied 60.25% share in total yield of pasture at 10^{th} year (Fig. 2), however forbs more or less maintained its yield share from 2.32

to 7.75% except in 7th year (10.29%). Thus without effective pasture management, the continued invasion of subtropical native herbage species was responsible for reducing the yield and quality of pasture (Naugraiya and Pathak, 2001).

Quality of pasture crop: The quality of pasture crop was estimated on the basis of availability of NPK, CP,CF, ash and energy where the total NPK was harvested 88.9, 65.9 and 76.3kg ha^{-1} in respectively, where share of NPK were found in order of legumes (71.7kgha^{-1}) > grasses (17.1 kgha^{-1}) > forbs (0.13kgha^{-1}) for nitrogen; legumes (34.3kg ha^{-1}) > grasses (29.2 kg ha^{-1}) > forbs (2.4 kg ha^{-1}) for phosphorus and legumes (49.6kg ha^{-1}) > grasses (25.3kgha^{-1}) > forbs (1.4kgha^{-1}) for potassium respectively (Table 2). Among major three herbage groups the ash was estimated maximum from grasses (100.1 kg ha^{-1}) followed by legumes (47.1 kg ha^{-1}) and minimum from forbs (3.2kg ha^{-1}) aggregating 102.4 kg ha^{-1}. Calorific value for pasture crop was estimated by using Bomb calorie meter and it was generated maximum by legumes (1909.5 lakh K Cal ha^{-1}) followed by grasses (1023.5 lakh KCal ha^{-1}) and forbs (69.6 lakh KCal ha^{-1}) thus aggregating (3002.7 lakh KCal ha^{-1}).

Rai *et al*.(1997) reported that the increasing the association between grass and legumes was found to be responsible for increasing nutritive value of any pasture crop due to higher share of legumes. In total pasture crop, the crude protein was 5.6 q ha^{-1}, with contribution of legume (4.48q ha^{-1}) grass (1.08q ha^{-1}) and forbs (0.02q ha^{-1}) respectively, similarly for crude fiber it was contributed 18.99q ha^{-1} by legumes followed by grasses (11.9q ha^{-1}) and forbs (0.67q ha^{-1}) aggregating 31.54qha^{-1}. The availability of resources influenced the invasion of local species which are extremely competitive and can easily take over the improve pasture species, if utilization system of pasture is not well managed and ultimately significant impact on forage production is reflected.

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Table 1: Structures of herbage species in 10 yrs old pasture crop

Herbage species	**Frequency (%)**	**Density (m^{-2})**	**Abundance (m^{-2})**	**Basal-cover ($cm^{-2}m^{-2}$)**
Grasses				
Cenchrus ciliaris	5	9.8	49.0	61.0
Chrysopogon fulvus	20	30.4	38.0	67.1
Cynodon dactylon	15	2.4	4.0	1.8
Eremopogon faveolatus	20	24.6	30.7	96.5
Heteropogon contortus	50	34.8	17.4	110.6
Pennisetum pedicellatum	40	28.2	17.6	472.4
Legumes				
Alysicarpus bupleurifolius	30	10.4	8.7	8.6
Alysicarpus monilifer	40	13.4	8.4	11.1
Aschinomon indica	95	199.8	52.6	3295.6
Stylosanthes hamata	35	17.6	12.6	290.3
Forbs				
Celosia argentia	30	9.6	6.9	84.8
Chorchorus aletorius	30	8.4	7.0	8.2
Cyprus rotendus	10	4.00	10.0	35.3
Fembristylis tenera	5	4.4	22.0	2.1
Sida Carpinifolia	10	1.2	3.0	5.3
	-	396.6	287.8	4550.8

Table 2: Harvesting of dry matter and nutrients from pasture after 10 yrs of establishment

Components	**Dry matter**	**CP**	**Fiber**	**N**	**P**	**K**	**Ash**	**Combustible Energy**
	(qha^{-1})	**(qha^{-1})**	**(qha^{-1})**	**($kgha^{-1}$)**	**($kgha^{-1}$)**	**($kgha^{-1}$)**	**($kgha^{-1}$)**	**(lakh KCal ha^{-1})**
Grasses	30.57	1.08	11.88	17.1	29.2	25.3	100.1	1023.5
Legumes	53.81	4.48	18.99	71.7	34.3	49.6	47.1	1909.5
Others	2.11	0.02	0.67	0.13	2.4	1.4	3.2	69.6
Total	86.47	5.57	31.54	88.9	65.9	76.3	102.4	3002.7

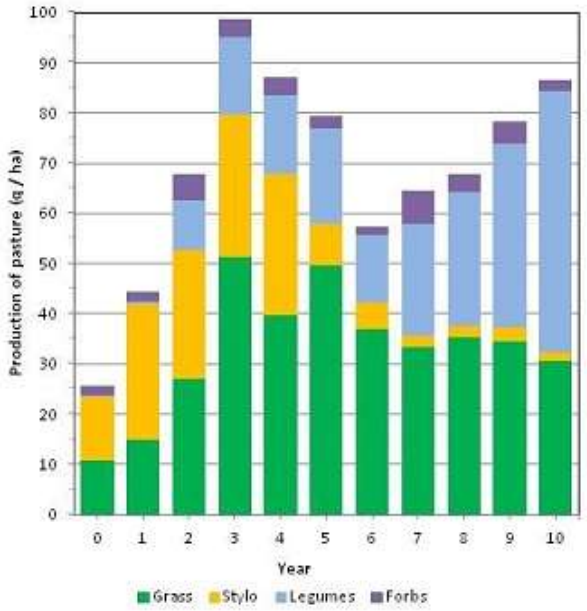

Figure -1: Production of permanent pasture during 10 years

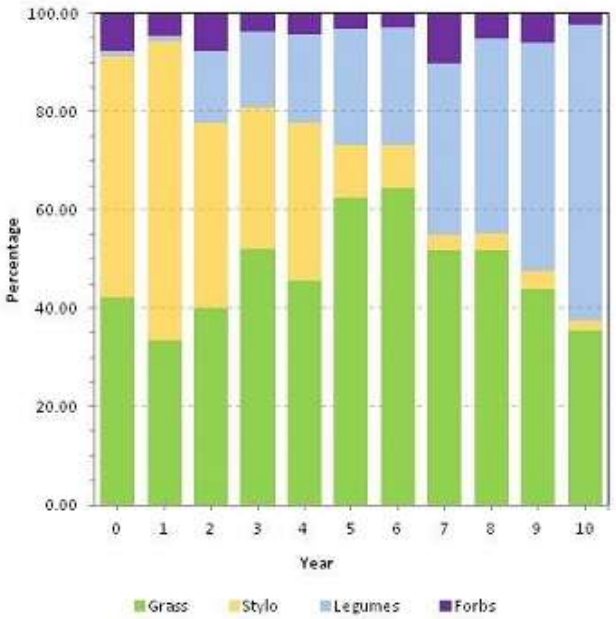

Figure- 2:Production contribution in pasture during 10 yrs

Conclusion

In red lateritic wastelands of central Chhattisgarh *Chrysopogon fulvus* + *Stylosanthes hamata* were grown to develop improved permanent pasture land. The cut and carry system was followed for consistently ten years with record of pasture yield in grass, Stylo, native legumes and forbs. The assessment of pasture crop was made with species composition, pasture yield and nutritive value. Over a period of ten years the status of pasture crop gets affected by invasion of local native species in terms of quantity and quality yield

References

Anon, 1980. *Hand Book of Agriculture*. ICAR, New Delhi.

Mishra, R. 1961. *Ecological Workbook*. IBH, New Delhi.

Naugraiya, M. N. 1985 *Population Ecology of Atylosia scarabaeoides Benth. in the rangelands of Jhansi (UP)*. Ph.D. thesis of Bundelkhand University, Jhansi. pp-410.

Naugraiya, M. N. and P. S. Pathak. 2001. Diversity of herbage species under silvipastoral system. *Indian Journal of Agroforestry*. 3(2): 154-158.

Naugraiya M.N. 2008 Impression of Bamboo Plantation *(Dendrocalamus strictus)* on structure and biomass production of under storey species in Silvipasture system. In: *Proc. National Conference on Bamboo: Management, Conservation & Value addition and Promotion* (12-14 March, 2008). Pub-TFRI, Jabalpur pp 69-78.

Naugraiya, M. N. and P. S. Pathak. 1986. An analysis of grassland vegetation on a Top sequence. *Indian J Range Mgmt.* 7(1): 27-32.

Rai, P., G. R. Rao, N. C. Verma and R. Singh. 1997. Forage production, quality and performance of growing lambs and kids on natural grassland and silvipasture under grazing condition. *Range Management and Agroforestry*. 18(1): 55-64.

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