Indian Journal of Animal Sciences **83** (10): 1078–1083, October 2013/Article

Analysis of fodder status in Karnataka

NAGARATNA BIRADAR[1] and VINOD KUMAR[2]

Indian Grassland and Fodder Research Institute, Southern Regional Research Station, Dharwad, Karnataka 580 005 India

Received: 15 February 2013; Accepted: 14 May 2013

ABSTRACT

Animal husbandry is an integral component of Indian agriculture supporting livelihood of more than two-thirds of the rural population. Reduction in agricultural production during drought affects livestock and the livelihood of farmers. Karnataka is second state next only to Rajasthan in terms of total geographic area which is drought prone. Fodder mitigating plan in place for Karnataka is must to sustain livestock. An assessment was made based on the availability and requirement of fodder as dry matter (DM) in each district. Secondary data of crop production, land utilization and livestock census data were used along with the primary data collected through pre-tested interview schedule. Out of 29 districts of Karnataka, 6 districts belonged to adequate DM available category with the mean availability of 87.51%. Five districts belonged to moderately adequate and 10 districts belonged to deficient DM available categories. However, 1 in every 4 districts belonged to severely DM deficient category. The mean DM availability for the state was 56.46%. Total contribution of crop residues to DM in the state was 72.59% with coarse straw contribution being one third of it. Gross cropped area contributed more among the sources of green fodder and contribution of concentrates to the total DM availability in the state was 3.81%. This information generated may facilitate policy makers to develop plan with appropriate interventions to improve feed and fodder scenario in the state.

Key words: Concentrates, Coarse and fine straws, Crop residue, Districts of Karnataka, DM availability

Fodder and feed resources in the country in general and Karnataka (11º 30'–18º 25' N and 74º 10'–78º 35' E) in particular are gradually decreasing owing to many factors. Shrinking of common and pasture lands, and increased cultivation of hybrids and commercial crops by the cultivators are the important reasons. On the contrary, demand for forages is increasing due to rearing of high yielding livestock by the farm households. Fodder availability needs to be ensured if livestock is to be sustained at farm level. Systematic planning of fodder and feed resources thus needs to be attended to in today's scenario so that not only livestock but also the livelihood of large majority of small and marginal livestock holders is sustained.

One of the factors that threatens sustainability of livestock at household level is the natural calamities. Drought is considered as one of the biggest menace to livestock sustainability among all weather related crisis. Failure of crops and the non availability of fodder in drought, force many farmers to resort to distress livestock selling which results in economic crisis. Advance planning to ensure adequate stock of fodder and feed in the region is the only option to resolve this crisis.

Present address: [1, 2]Principal Scientist, Agricultural Extension (nagaratna123@gmail.com, vinoddhone@gmail.com).

Karnataka needs to follow the systematic fodder planning as it is the second most drought affected state, next only to Rajasthan in the country. Out of its total 29 districts, 20 are drought prone. Planning exercise demands factual information. The present paper brings out the availability of fodder as dry matter to the livestock, keeping district as the smallest unit. Some past efforts were reported by Raju *et al.* (2002), Anandan *et al.* (2003) and Anandan *et al.* (2005), but were based on crop production data of 1996–97. The present paper accounted the crop production data from 2005–06 to 2010–11 and categorized the districts based on the availability of dry matter vis-à-vis livestock population. It also reflects on the management of fodder deficiency at rural household level to sustain their livestock.

MATERIALS AND METHODS

Secondary and primary sources were consulted for gathering data for the study. District wise and year wise crop production and land utilization data were obtained from Directorate of Economics and Statistics, Bengaluru. The methodology followed was as suggested by Anandan and Sampath (2012) with slight modification. Present study used 6 years (2005–06, 2006–07, 2007–08, 2008–09, 2009–10, 2010–11) crop production data of 24 crops instead of one

year to minimize the variations and instead of uniform harvest indices for total pulses (1.7) it made use of more specific harvest indices for some of the pulse crops. They are *tur* (1.8), gram (1.3) and soybean (1.6). Estimated livestock population for 2011 was arrived at by using the compounded annual livestock growth rates based on livestock census of 2003 and 2007. Cattle, buffaloe, goat and sheep were considered and converted into adult livestock units (Planning Commission 2001). The total annual feed requirements in terms of DM for each district was estimated from the total ALUs (estimated for 2011) for one year taking 7 kg DM requirement per ALU per day (Anandan and Sampath 2012). The difference between DM availability and requirement was converted into percentage of DM availability for every district of Karnataka based on which districts were classified into four groups as adequate (above 80% DM availability), moderately adequate (60–79% DM availability), deficient (40–59% DM availability) and severely deficient (< 40% DM availability) districts. DM availability from each source-crop residues, greens and concentrates was converted into percentage to assess their contribution to the total DM availability in each district.

Randomly 1 district from 3 groups (combined adequate and moderate categories) was selected for primary data collection–Bijapur from adequate and moderate, Chitradurga from deficient and Dakshin Kannada from severely deficient dry matter availability groups. Three blocks (taluks/tehsils) representing distinct cropping systems to reflect the different farming systems prevalent in the area were selected from each district. Three villages from each block and 6 households from each village were sampled. Households owning livestock but belonging to landless and landholding categories were interviewed to capture different socio-economic configurations present in the study area. Data were collected through personal interview technique using pretested and standardized interview schedule. In the study 3 districts, 9 blocks, 27 villages and 162 households were covered to collect primary data. Collected data was analysed to know the fodder management through purchases at household level in each of these districts.

RESULTS AND DISCUSSIONS

Classification of districts in Karnataka based on extent of estimated DM availability to the livestock: Out of 29 districts of Karnataka, 6 districts belonged to adequately DM available category. Five districts belonged to moderately adequate and 10 districts belonged to deficient DM available categories. One in every four districts belonged to severely deficient DM category with the DM availability of less that 40% (Table 1). The mean DM availability for the state was 56.46% indicating the deficiency to the extent of 43.54%. Singh *et al.* (1997) reported that in the country there was a substantial gap of demand and supply of dry matter, of about 31%.

Table 1. Classification of districts as per estimated DM availability

Categories	Criteria	No of districts	Percentage of districts
Adequate	>80% DM availability	6	20.69
Moderately adequate	60–79% DM availability	5	17.24
Deficient	40–59% DM availability	10	34.49
Severely deficient	< 40% DM availability	8	27.58
Total		29	100.00
Mean		56.46	
SD		21.20	

Distribution of districts based on the estimated availability of DM: Davangere (93.96%), Bijapur (91.21%), Koppal (90.32%), Bellary (86.61%), Kodagu (82.72%) and Gadag (80.25%) districts (Fig. 1) belonged to adequate DM available category and the percentage of DM available in each district is given in the bracket. The mean percentage of DM availability for this category was 87.51%. The highest DM available district, hence, in the state was Davangere. Sorghum, maize and paddy were predominantly grown in these districts except in Kodagu where plantation crops dominate. However in Kodagu the total livestock population was less, thus indicating higher DM availability. Large area of Davangere district was covered by paddy and maize. Farmers however did not prefer to feed the livestock with paddy straw and maize stover (Biradar 2004). Farmers claimed that feeding of maize stover affected the health of animal which was agreed by 53.33% of scientists (Biradar *et al.* 2007). Sorghum is found in more than 25% of the cropped area in Bijapur district and was most preferred coarse straw by the farmers (Biradar 2004). The potential dry matter availability in Bijapur and Bellary was not the primary constraints in these districts (Anandan *et al.* 2003). In this category, majority of districts belonged to northern dry zone of the state which is noteworthy.

Five districts belonged to moderately adequate DM available category with the mean DM availability of 73.29% (Fig. 1). Bagalkote district top this group with percentage dryped matter availability of 78.30%, followed by Raichur (75.65%), Dharwad (75.54%), Haveri (73.31%) and Bengaluru rural (63.64%). Bagalkote and Raichur have more area under irrigation due to Upper Krishna and Tungabhdra irrigation projects as a result higher cropping intensity prevails in these districts. Sugarcane is grown widely especially in Bagalkote district and sugarcane tops are fed to livestock for limited extent for few weeks only, which could be the reason for belonging to moderately adequate DM available districts. In the later part the paper discusses contribution of sugarcane tops to total DM availability.

The third group, deficient DM available category had the highest number (10) of districts. Among them, 5 districts

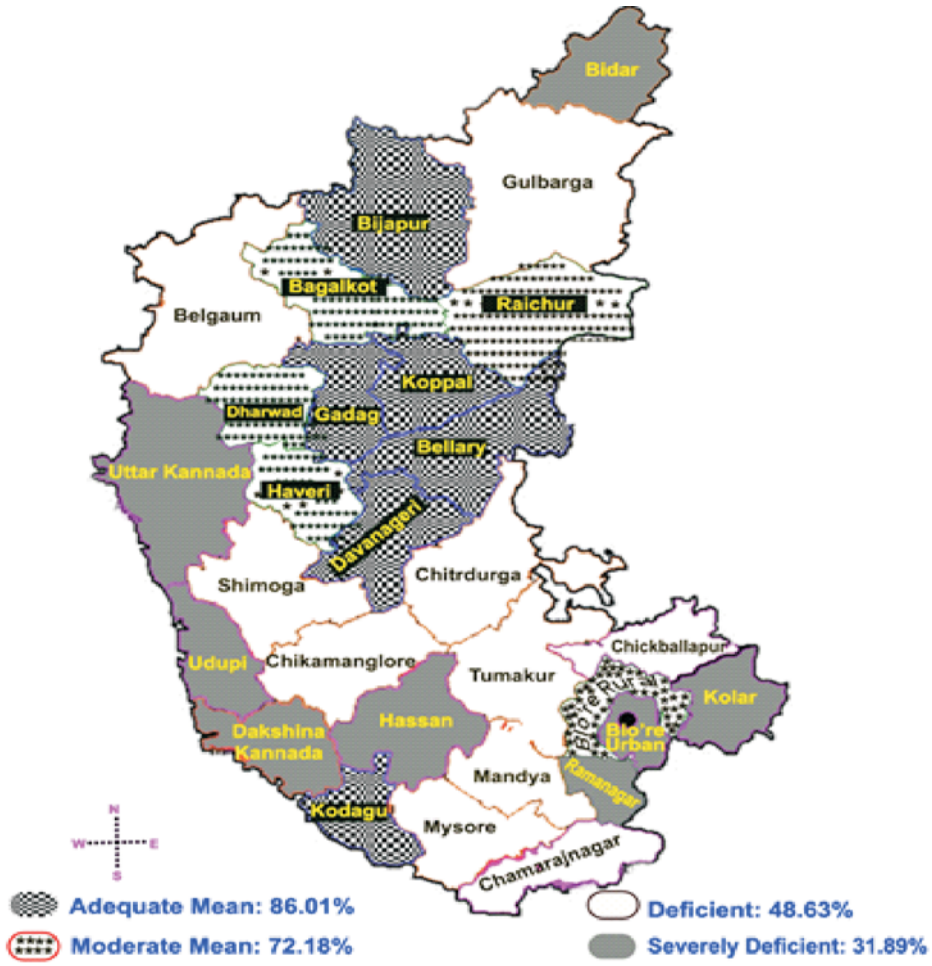

Fig. 1. Districts based on estimated DM availability.

had DM availability little above 50% (but less than 59%). Mysore (59%), Chamrajnagar (57.01%), Chitradurga (53.42%), Mandya (53.41%) and Belgaum (52.02%) belonged to this group. Gulbarga (49.38%), Shimoga (47.93%), Chickballapur (44.62%), Tumkur (42.80%) and Chikmagalur (41.44%) had less than 50% DM availability. Mean DM availability for this category was 50.17%.

Bidar (39.25%), Kolar (37.81%), Uttara Kannada (36.12%), Hassan (34.92%), Bengaluru (31.30%), Ramnagar (30.75%), Udupi (30.57%) and Dakshina Kannada (26.14%) were the districts having percentage dry matter availability of less than 40% and thus belonged to severely deficient category with the category mean of 33.36% DM availability. Majority districts in this category belong to high rainfall/ malnad region and still they have severe fodder shortage, the result that needs to be noted by the policy makers. Anandan *et al.* (2005) also reported that the potential dry matter availability for the malnad region was hardly sufficient to meet the dry matter requirement. Dakshina Kannada district thus had the lowest DM availability in the state. Deficient and severely deficient districts were the most vulnerable districts and need immediate attention to improve the situation irrespective of the annual rainfall changes and/ or drought like situation.

Contribution of different sources to the total DM availability: Percentage contribution of coarse straw (thick-stemmed residues from coarse grain crops) was more in adequate (41.83%) and moderately adequate (42.73%) DM available districts, while contribution of fine straw (straw from slender stemmed grain crops) dominated in deficient (31.09%) and severely deficient (45.35%) districts. Leguminous straws contributed less than 8%, ranging from 7.36% in deficient to 5.82% in moderately adequate districts (Table 2). The total contribution of crop residues in the state was 72.59% with coarse straw contribution being one third, followed by fine straw (27.48%), leguminous straw (6.89%) and sugarcane tops (4.97%). The mixed crop–livestock systems of India are underpinned by the crop residues which contribute on an average 40–60% of the total dry matter intake per livestock unit. There is however considerable

Table 2. Percentage contribution of different sources towards total estimated DM availability in different categories of districts

Source	Adequate >80% DM	Moderately adequate 60–79% DM availability	Deficient DM availability	Severely deficient < 40% DM availability	State 40–59%
Crop residues					
Coarse straw	41.83	42.73	24.77	10.48	33.25
Fine straw	23.45	24.28	31.09	45.35	27.48
Leguminous straw	6.53	5.82	7.36	6.12	6.89
Sugarcane tops	2.06	5.08	4.91	2.18	4.97
Total crop residues	73.88	77.91	68.12	64.13	72.59
Greens					
Gross cropped area	16.83	14.8	14.53	14.6	15.04
Fallows	0.84	1.26	1.38	1.95	1.29
Forests	2.63	1.13	4.34	9.36	3.36
Pasture	1.26	0.83	7.29	5.03	3.39
Others*	0.39	0.26	0.68	1.63	0.51
Total greens	21.94	18.28	28.23	32.57	23.6
Concentrates					
Grains	1.7	1.9	1.42	1.2	1.54
Brans and chuni	1.39	0.88	1.2	1.41	1.26
Oil cakes	1.09	1.04	1.04	0.69	1
Total concentrate	4.19	3.82	3.65	3.3	3.81
DM availability	87.51	73.29	50.17	33.36	56.46
kg/ALU/day	6.13	5.13	3.62	2.47	4.08

* Culturable waste and miscellaneous. Trend showing the contribution of different DM sources in districts of Karnataka.

regional variation in the dominant type of crop residue: rice and wheat straws in irrigated regions compared to coarse cereal straws and hay from leguminous crops in the drier, semi-arid regions (Rao and Hall 2003).

Gross cropped area contributed more among sources of green fodder in all the four categories. Contribution of forests was comparatively better in severely deficient (9.36%) and deficient (4.34%) districts (Table 2). Greens contributed nearly one fourth (23.6%) to the total DM availability of the state. Free dry season access to all unfenced land, be it natural pastures, fallows or cropped land after harvest prevailed in most parts of Karnataka. Most of the districts in deficient and severely deficient category are irrigated lowlands and have large area under common grazing and forests. The weeds and native grasses growing on bunds and in forest and common lands thus might have contributed for the finding. Kapur (2010) reported that the contribution of commons to DM availability was in the range of 16% in Amritiya to 235% in Cheetrawas villages of Rajasthan; 17% in Rojani to 100% in Karwakhedi villages of Madhya Padesh supported by Foundation for Ecological Sustainability; 19% in Gudha Gokalpura and 24% Jodha ka Kheda in BAIF supported villages of Rajasthan.

Contribution of concentrates to the total DM availability in the state was 3.81% (Table 2). However, it should be noted that the contribution of all other sources except greens is influenced primarily by crops grown in each district as well as the prevailed cropping intensity. Besides these production aspects, variety of social and economic factors like land, crop and animal ownership patterns, cultural practices, the use of modern crop varieties and the opportunities for market and non market exchanges also influenced.

As the contribution of crop residues decreased from Davangere to Uttara Kannada, the contribution of greens increased (Fig. 2). However contribution of concentrates remained almost same across the districts. In Uttar Kannada district, DM from crop residue was the lowest but from greens, highest in the state, but the difference was not corresponding to each other. Crop residue explains 79% variation and greens explain 77% variation on DM availability across different districts. Variation explained by the concentrate was meagre.

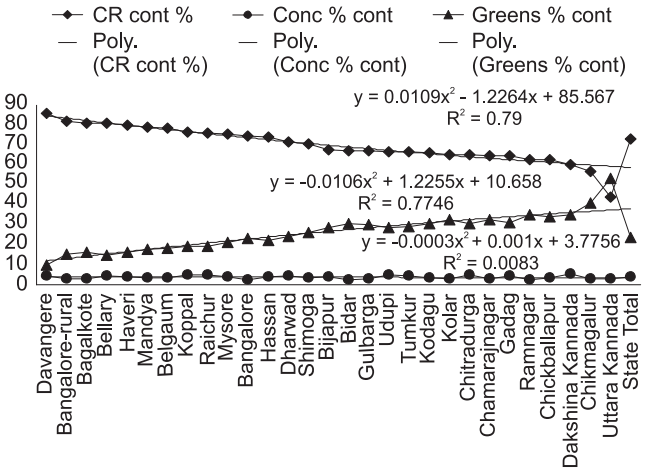

Fig. 2. Trend showing the contribution of different DM sources across districts of Karnataka.

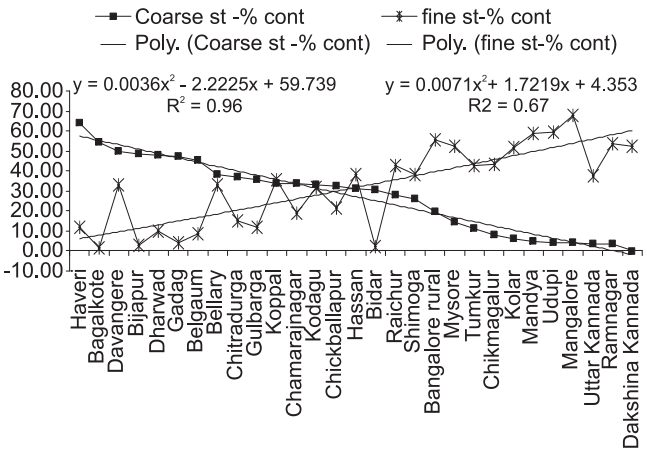

Fig. 3. Trend showing the contribution of different crop residue sources across districts of Karnataka.

Trend showing the contribution of different sources of crop residue across different district is presented in Fig 3. Contribution of coarse straw decreased from Haveri to Dakshina Kannada district and the reverse trend was observed for fine straw. This means as the availability of coarse straw decreases the availability of fine straw increases. This could be attributed to the prevailing agroclimatic factors and the corresponding cropping pattern followed. Coarse straw explains the variation of 96% and fine straw explains 67% variation in their availability as DM across the districts in Karnataka. Haveri district had highest and Dakshina Kannada had the least DM availability from coarse straw in the state. Mangalore had highest and Bidar had the least DM availability from fine straw in the state. In Koppal, Kodagu and Hassan districts, availability of straw from coarse and fine cereal was almost equal (Fig. 3).

Trend showing the contribution of different sources to the availability of greens across districts is presented in Fig 4. Availability of greens from gross cropped area was maximum in Gadag and gradually its availability decreases across different districts, the minimum being was in Shimoga. Greens from gross cropped area explain 90% variation across its contribution to greens total DM availability in different districts of the state. Contribution of greens from forest indicated increasing trend between Gadag and Shimoga. Contribution of forest to total greens DM availability was less than 1% in Bijapur, Koppal, Raichur, Bengaluru rural and Mandya. Ramnagar, Chikmagalur, Kodagu, Dakshinakannada, Chamrajnagar, Udupi, Dakshina Kannada and Shimoga were the districts indicating peaks in DM availability from forests due to their strategic location as a part of Western Ghats. However forests explain only 15% of variation in total DM availability in greens across different districts.

Legume straw plays an important role in improving the quality of crop residue fed to the livestock and its availability as percentage DM across district is presented in Fig 5. The highest availability of legume straw as percentage DM to the total crop residue was in Bidar (20.75%) followed by Gulbarga (17.90%), Chitradurga (13.06%), Bijapur (12.76%), Gadag (12.62%), Dharwad (12.20%) and Tumkur 912.08%). In remaining districts its availability was less than 10% to the total crop residue availability, the least was in Shimoga (0.95%0. In the state its contribution to the total DM availability from crop residue was 6.89%.

Average quantity of fodder andfeed types purchased by the farmers of different DM available districts: In confirmation with the secondary data, analysis of primary data revealed that livestock farmers of severely deficient DM available category district i.e., Dakshina Kannada relied much on purchase of different fodder and feed types as compared to other two groups (Table 3). Maximum quantities of green (6,913 kg) and dry fodder (3,865 kg) were purchased by them as compared to adequate (1, 825 kg dry, 462 kg green) and deficient (1,492 kg dry, 831 kg green) dry matter available districts whereas purchase of concentrate feed was the least (116 kg). Rice/wheat bran was purchased more (407kg) as compared to legume bran/husk (310 kg) and oil cake (286 kg) by the farmers of severely deficient DM available district. Oil cakes and concentrate feeds are however fed to productive animals in all the surveyed districts.

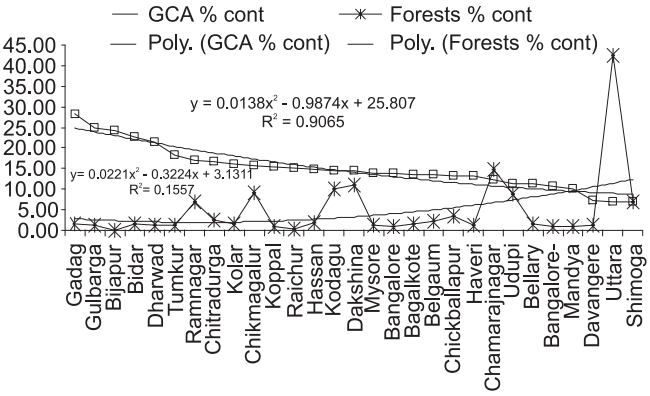

Fig. 4. Trend showing the contribution of different sources to the availability of greens across districts.

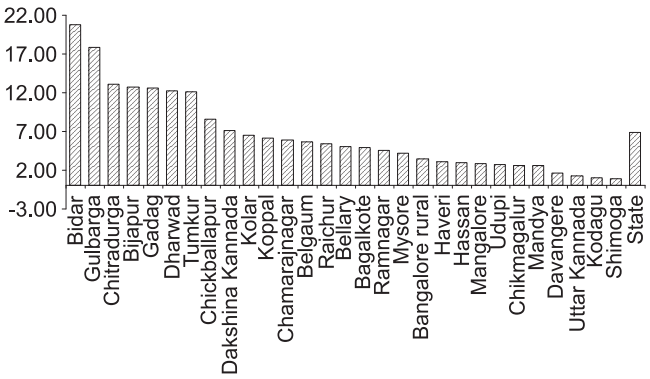

Fig. 5. Percentage DM availability from legume straw to the total crop residue in different districts.

The startling revelation of this systematic analysis was that one in every four districts of the state belonged to severely deficient DM category. Most of these districts are part of high rainfall/Malnad region. Forests, pasture and fallows are in plenty and increasing biomass availability by introducing high yielding range grasses (e.g. *Bracharia ruziziense*s, *Panicum maximum* grazing type) and legumes (*Stylosanthes guianensis*, *Centrocema pubescence*) in this region is the best option looking into the little scope to increase the availability from crop residue as large area in this region is under plantation crops. Draft report of Karnataka livestock development policy 2010 also mentions on this line of improving fodder production through utilizing wastelands, *kavals* and *goumalas*. Fine straw contribution is dominant in deficient and severely deficient districts. Efforts to increase the biomass availability of millets, paddy and

Table 3. Average quantity of fodder and feed types purchased by the farmers of different DM available districts

Particulars	Average quantity purchased (kg/year)		
	Bijapur (adequate)	Chitradurga (deficient)	Dakshina Kannada (severely deficient)
Rice/wheat bran	133	198	407
Legume bran/husk	130	82	310
Oil cake	150	149	286
B/UB concentrate feeds	498	264	116
Green fodder	462	831	6, 913
Dry fodder	1, 825	1, 492	3, 865
Others	262	192	90

wheat are thus required. For instance, paddy grown in SRI (System of rice intensification) method yields more straw than the conventional method. Such practices need to be introduced along with other practices like educating farmers not to burn the paddy straw and maize stover. As none of the districts have excess DM availability, irrespective of the weather related situation the state should have preparedness to supply fodder whenever situation arises. Steps to establish fodder banks at district and block levels should be taken immediately, which is also a part of Karnataka livestock development policy 2010 (draft), without further delay as it helps to stop present practice of last minute cry for fodder. Increasing the legume straw availability too is one of the important factors to enhance the quality of crop residue. Besides the already existing program of increasing area under pulse crops in the state, efforts to breed dual purpose pulse varieties would also help.

REFERENCES

Anandan S, Raju S S, Angadi U B and Ramachandra K S. 2005. Status of livestock and feed resources of Malnad region in Karnataka. *Animal Nutrition and Feed Technology* **5**: 99–105

Anandan S, Raju S S and Ramachandra K S. 2003. Status of livestock and feed resources in Northern Karnataka region. *Indian Journal of Dairy Sciences* **56**: 230–34

Anandan S and Sampath K T. 2012. The Indian feed inventory, retrieved from www.fao.org/docrep/016/13043e/i3043e04.pdf on 14.12.201

Biradar Nagaratna, Ramesh C R and Pathak P S. 2007. Traditional livestock feeding practices in Northern Karnataka. *Indian Journal of Traditional Knowledge* **6**: 459–62

Biradar Nagaratna. 2004. Analysis of straw and stover of different crops as a livestock feed by the farmers. *Annals of Agriculture Research New Series* **25**: 377–80

Kapur D. 2010. Dependence of Livestock Rearers on Common Lands: A Scoping Study. *South Asia Pro Poor Livestock Policy Program FAO-NDDB*. Pp. 23

Planning commission. 2001. Draft report of working group for X plan for AHCD, Government of India

Raju S S, Anandan S, Angadi U B, Ananthram K, Prasad C S and Ramachandra K S. 2002. Assessment of animal feed resource availability in Southern Karnataka region. *Indian Journal of Animal Sciences* **72**: 1137–40

Rao P P and Hall A J. 2003. Importance of crop residues in crop–livestock systems in India and farmers' perceptions of fodder quality in coarse cereals. *Field Crops Research* **84**: 189–98.

Singh K, Habib G, Siddiqui M M and Ibrahim M N M. 1997. Dynamics of feed resources in mixed farming systems of south Asia. *Crop Residues in Sustainable Mixed Crop/Livestock Farming Systems*. Pp 113–130. (Ed.) Renard C. CAB International, New York.