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Feeding management practices of goats followed by tribal farmers in Rajasthan

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Abstract
The aim of present study was to assess the feed intake and feeding management practices of tribal farmers in Rajasthan. A total of 120 tribal goat farmers were selected from 12 villages from 6 blocks in 3 tribal dominated districts viz., Banswara, Dungarpur and Udaipur. Ten farmers from each village were selected purposively based on the number of goats. The selected goat farmers were grouped into three categories based on flock size as small (<25 goats, N= 60), medium (26-50 goats, N = 36) and large (>50 goats, N = 24). The data on feed intake and feeding management practices were recorded on-field. A half of goat farmers (51.57 %) were adopting partial grazing followed by complete grazing (48.33%) and none of the selected farmers was practicing complete stall feeding. About two-thirds of farmer (75%) sent their goats for grazing for more than 5 hours daily and the remaining 25 per cent farmer sent their animals for grazing for less than 5 hours. The proportion of goat farmers who sent their animals for more than 5 hours was 76.67, 66.67 and 83.33 per cent among small, medium and large farmers respectively. Most of goat farmers (77.5%) were feeding colostrum after the birth of the kids whereas some of the farmers (22.5%) were not feeding colostrums at all to kids at all due to the myth of spread of diseases. About a half of the farmers (49.17 %) offered grasses, fodders (berseem, lucerne, bajra, jowar and oats) followed by 34.16 per cent goat farmers feeding tree leaves (ber, neem, babool, khejri) and 16.67 per cent farmers were feeding weeds and grass (stylo, cenchrus spp., crop weeds) and about the same number of farmers (16.66 %) in small, medium and large flock size practiced feeding weeds and grass (stylo, cenchrus spp., crop weeds). It was observed that overall average amount of green fodder offered to milking goats, dry goats, goatlings, kids and breeding buck was 1.33 ± 0.07, 0.85 ± 0.07, 0.45±0.03, 0.37±0.02 and 1.71±0.10 kg/day respectively. The average amount of green fodder offered daily was significantly (p<0.05) higher in case of small farmers as compared to medium and large goat farmers in case of milking as well as dry goats and significantly higher in case of breeding bucks in case of large farmers as compared to other categories of farmers. The overall available dry fodders fed to milking goats, dry goats, goatlings, kids and breeding buck was 0.95±0.67, 0.93±0.07, 0.87±0.06, 0.37±0.02 and 1.72±0.11 kg/day respectively. Being significantly (p<0.05) higher in small farmers followed by medium and large goat farmers. Overall average amount of concentrate mixture offered to milking/pregnant goats, dry goats, goatlings, kids and breeding buck was 210.09±14.26, 85.37±6.84, 86.76±5.83, 85.65±5.86 and 246.11±16.89 g/day respectively. Being significantly (p<0.05) higher in small farmers followed by medium and large farmers among milking goats and breeding bucks. A sizable majority of farmers (56 %) were offering fattening ration to their male kids for their higher body weight gain so that they attain early market weight and on an overall average 255.79±7923.12 g of concentrate mixture per buck/day was fed as fattening ration. The overall total DM intake through stall feeding in case of milking goats, dry, goatlings, kids and breeding bucks was 1.16, 0.90, 1.01, 0.52 and 1.38 kg respectively. The total DM intake in different categories of goats was similar among the three flock size categories. It was concluded that feeding management practices were mostly traditional without much regard to scientific recommendations. However, these management practices in general were better in case of small farmers as compared to medium and large farmers.

Keywords: Tribal, goat farming, feeding, feeding system

Introduction
Goats are the world's oldest and among the first ruminants to be domesticated by human beings in South-Western Asia (Iran and Iraq) between 10000 and 6000 years BC. Around 80 per cent of global goat population is in the developing countries. Among them, India ranks second in the world population of goat. With the present population of 135.2 million, goats account for more than 25 per cent of the total livestock in the country and contribute Rs 106335 million annually to the national economy (19th Livestock Census, 2012) [7]. They provide food and nutritional security to the millions of marginal and small farmers and agricultural labourers by providing animal protein through meat and milk. There are about 34 well defined and recognized breeds of goats in India (NBAGR, 2018) [8]. Goats are among the main meat-producing animals in India, whose meat (Chevon) is one of the choicest meat having huge domestic demand. Besides meat, goats, a multi-functional/purpose animal which

provide other products like milk, skin, fibre and manure. Goat contributed 5.05 million tonnes of milk (3.67% of total milk production of 137.685 million tons) and 0.97 million tonnes of meat (15.56% of total production) during the year 2013-2014 (BAHS, 2015) [1]. In India, Rajasthan is ranked first in goat population with a population of 21.66 millions, (37.53%) of total livestock population in the state. Sirohi goat is the most preferred goat breed over other breeds in Rajasthan (Marwari and Jhakhrana). Goats are the backbone of rural economy particularly, in the arid, semi-arid and mountainous regions of Rajasthan. Goat farming is a suitable option for revenue generation for the small scale farmers and tribal people as it require a very low investment and can efficiently survive and sustain sparse vegetation and extreme climatic conditions. Best known as the "poor man's cow" or "mini cow" these magnificent animals are the best alternative source of additional income and milk contributing immensely to the poor man's economy. In pastoral and agricultural subsistence societies in India, goats are kept as a source of an insurance against disaster. Goats are generally managed under extensive production system and semi intensive system, where only at night shelter is provided. A major part of their fodder requirement is met out through grazing at waste and other common community lands. India is a conventional home for about 645 tribal communities (population census, 2011) [2]. They are dispersed in almost all the states and union territories. The areas populated by tribals are mostly underdeveloped. They mostly reside in secluded villages or hamlets. The population of tribal in the country is 104 millions, which is 8.2 per cent of the total population of the country whereas; the Scheduled Tribe (ST) population of Rajasthan State is 7,097,706 constituting 8.4 percent of the total ST population of India (Census, 2011) [2]. The Scheduled Tribes of the State constitute 12.6 percent of the total population (68548437) of the state. According to the 19th Livestock census, 2012 [7] goats population in the districts of Banswara, Dungarpur and Udaipur which have been categorized as tribal districts in Rajasthan state (study area) is 38.52% of the total livestock population in Rajasthan. The information on following feeding management parameters was collected through a structured schedule pertaining to feeding practices. The data pertaining to feeding management practices is presented in table - 1. It was observed that about a half of goat farmers (51.57 %) were adopting partial grazing followed by complete grazing (48.33%) and none of the selected farmers was practicing complete stall feeding. The per cent of small, medium and large flock size farmer's following complete grazing was 40, 60 and 66.67 per cent, respectively the the remaining farmers were following partial grazing. These findings are in agreement with results of Rangnekar *et al.* (1992) [11], Patodiya (2003) [9], Rai and Singh (2004) [10] and Gurjar *et al.* (2008) [4]. On overall basis about two-thirds of goat farmer (75%) sent their goats for grazing for more than 5 hours daily. The proportion of goat farmers who sent their animals for grazing for less than 5 hours was 25%. The proportion of goat farmers who sent their animals for more than 5 hours was 76.67, 66.67 and 83.33 per cent among small, medium and large farmers respectively. Similar results were also observed by Kumar and Deoghare (2003) [6], Rai and Singh (2004) [10], Singh *et al*., (2005) [12] and Gurjar *et al.* (2008) [4]. Most of goat farmers (77.5%) were adopting colostrum feeding after the birth of the kids whereas 22.5 per cent farmers were not feeding colostrums to kids at all due to the myth of spread of diseases. Results were closely agreement with Gurjar *et al.* (2008) [4]. The proportion of small, medium and large categories of farmers who were preserving fodders and tree leave was 63.33, 66.67 and 83.33 %, while, 36.67, 33.33 and 16.67 per cent of farmers did not preserved any fodder and tree leave in small, medium and large farmers respectively. Similar results were also observed by Gurjar *et al.* (2008) [4]. About a half of the farmers (49.17 %) offered grasses, fodders (berseem, lucerne, bajra, jowar and oats) followed by 34.16 per cent goat farmers feeding tree leaves (ber, neem, babool, khejri) and 16.67 per cent farmers were feeding weeds and grass (stylo, cenchrus spp., crop weeds) and about the same number of farmers (16.66 %) in small, medium and large flock size practiced feeding weeds and grass (stylo, cenchrus spp., crop weeds). Among small and medium flock size farmers a majority of (58.3 and 50 %) and 25 per cent at large size farmers fed their goats with green fodders (berseem, lucerne, bajra, jowar and oats) and among large flock size farmers a majority of (58.33%), medium size farmers at (33.33%) and 25 per cent at small size farmers were offered tree leaves (ber, neem, babool, khejri.) for the feeding of goats. Similar results also observed by Gurjar (2006).On overall average 38.33% farmers fed their animal with legumes (gram, fenugreek, guar, black gram, green gram), 51.67% with cereals (barley, wheat, maize, bajra, jowar) and the remaining 10% with millets (ragi, kangni). Similar results were also observed by Gurjar *et al.* (2008) [4].

Table 1: Feeding management practices

S. No.	Variable	Small		Medium		Large		Overall	
1.	**Mode of feeding**	Freq	%	Freq	%	Freq	%	Freq	%
	Partial stall feeding with grazing	36.00	60.00	18	50.00	8	33.33	62	51.57
	Complete grazing	24.00	40.00	18	50.00	16	66.67	58	48.33
2.	**Duration of grazing in a day (hrs)**								
	Mean duration of grazing time	--	4	--	6	--	8	--	6
	Up to 5 hrs	14	23.33	12	33.33	4	16.67	30	25
	> 5 hrs	46	76.67	24	66.67	20	83.33	90	75
3.	**Colostrum feeding to new born kids**								
	Practiced	45	75	26	72.22	22	91.67	93	77.5
	Not practiced	15	25	10	27.78	2	8.33	27	22.5
4.	**Preservation of tree leaves/fodder (hay)**								
	Hay making practiced	38	63.33	24	66.67	15	83.33	77	64.17
	Hay making not practiced	22	36.67	12	33.33	9	16.67	43	35.83
5.	**Availability of feed resources**								
	Fodders (berseem, lucerne, bajra, jowar and oats)	35	58.33	18	50.00	6	25.00	59	49.17
	Grasses and weeds (stylo, cenchrus spp., crop weeds)	10	16.66	6	16.66	4	16.66	20	16.67
	Top feeds (ber, neem, babool, khejri)	15	25.00	12	33.33	14	58.33	41	34.16
6.	**Availability of concentrates**								
	Legumes (Fenugreek, Guar, black gram, gram, green gram)	24	40.00	12	33.33	10	41.67	46	38.33
	Cereals (barley, wheat, maize, bajra, jowar)	30	50.00	20	55.56	12	50.00	62	51.67
	Millets (ragi, kangni)	6	10.00	4	11.11	2	8.33	12	10.00

Fig 1: Weighing of green fodder

Fig 2: weighing of dry fodder

Table 2: Average amount of green fodder offered to different categories of goats (Kg/day)

Goat category	Flock size category			Overall	Recommended allowance (ICAR, 2015) [5]
	Small	Medium	Large		
Milking /pregnant goats	1.5^{b}±0.41	1.0^{a}±0.07	0.90^{a}±0.09	1.33 ± 0.07	2.5 (2-3)
Dry goats	1.0^{b}±0.41	0.86^{a}±0.07	0.70^{a}±0.09	0.85 ± 0.07	2
Goatlings	0.49^{b}±0.09	0.45^{ab}±0.02	0.40^{a}±0.04	0.45 ± 0.03	1
Kids	0.39±0.05	0.37±0.02	0.35±0.03	0.37 ± 0.02	0.5
Breeding bucks	1.08^{b}±0.41	1.75^{ab}±0.09	1.54^{a}±0.15	1.71 ± 0.10	2.5 (2-3)

Means bearing different superscripts in a row differ significantly

Table 3: Average amount of dry fodder offered to different categories of goats (Kg/day)

Goat category	Flock size category			Overall	Recommended allowance (ICAR, 2015) [5]
	Small	Medium	Large		
Milking/pregnant goats	1.11^{b} ± 0.07	0.89^{a} ± 0.08	0.83^{a} ± 0.08	0.95 ± 0.67	1
Dry goats	1.08^{b} ± 0.06	0.86^{a} ± 0.07	0.83^{a} ± 0.8	0.93 ± 0.07	1
Goatlings	0.91 ± 0.04	0.86 ± 0.06	0.83 ± 0.0	0.87 ± 0.06	0.75 (0.5-1.0)
Kids	0.38 ± 0.01	0.38 ±0.02	0.33 ±0.03	0.37 ± 0.02	0.5
Breeding bucks	1.88 ± 0.05	1.64 ± 0.12	1.62 ±0.15	1.72 ± 0.11	2.5 (2.0-3.0)

Means bearing different superscripts in a row differ significantly

1) Feeding of green fodders

The data pertaining to feeding of green fodders offered daily to all categories of goat is presented in table-2. It was observed that overall average amount of green fodder offered to milking goats, dry goats, goatlings, kids and breeding buck was 1.33 ± 0.07, 0.85 ± 0.07, 0.45±0.03, 0.37±0.02 and 1.71±0.10 kg/day respectively. Result revealed that green fodder offered was significantly (p<0.05) higher in case of small farmers as compared to medium and large goat farmers in milking and dry goats and significantly higher in case of breeding bucks in case of large farmers as compared to other categories of farmers. Higher amount of green fodder fed to milking and dry goats by small farmers may be due to largely stall feeding and partial grazing and lesser number of animals as the available green fodders is distributed to a smaller number of goats. The availability of green fodders in all categories of farmers and in case of all categories of goats was lower than those recommended by ICAR, (2015) [5]. Similar results were also observed by Gurjar *et al.* (2008) [4] in a study of goat farming conducted in villages around Udaipur district of Rajasthan.

2) Feeding of dry fodders

The data on average amount of dry fodders fed to different categories of goat farmers is presented in Table- 3. The overall available of dry fodders to milking goats, dry goats, goatlings, kids and breeding buck was 0.95±0.67, 0.93±0.07, 0.87±0.06, 0.37±0.02 and 1.72±0.11 kg/day respectively. Results revealed that average amount of dry fodder was significantly (p<0.05) higher in small group of goat farmers followed by medium and large goat farmers for milking and dry goats. Higher amount of dry fodder fed by small farmers may be due to the more number of small farmers practicing stall feeding to their goats and the available dry fodder were distributed among small size of animals. The availability of dry fodders in 3 categories of farmers was higher than the recommendations of ICAR, (2015) [5] in case of milking goat, dry goats and goatling, whereas, it was lower in case of kids and breeding bucks.

3) Feeding of concentrate ration

The data on average amount of concentrate mixture fed to different categories of goat farmers is presented in Table 4. It was found that overall average amount of concentrate mixture offered to milking/pregnant goats, dry goats, goatlings, kids and breeding buck was 210.09±14.26, 85.37±6.84, 86.76±5.83, 85.65±5.86 and 246.11±16.89 g/day respectively.

The feeding of concentrate mixture was significantly (p<0.05) higher in small group of goat farmers followed by medium and large goat farmers among milking goats and breeding bucks. Higher amount of concentrate fed by small farmers may be due to the more number of small farmers practicing stall feeding to their goats and the available concentrate were distributed in the small size flocks. The availability of concentrate in small, medium and large group of farmers was lower as compared to standard recommendations of ICAR, (2015) [5] in milking goat, dry goats, goatling, kids and bucks.

Table 4: Average amount of concentrate mixture offered to different categories of goats (g/ day)

Goat category	Flock size category			Overall	Recommended allowance (ICAR, 2015) [5]
	Small	Medium	Large		
Milking/pregnant goats	$227.50^{b} \pm 7.70$	$215.28^{ba} \pm 14.41$	$187.50^{a} \pm 20.68$	210.09 ± 14.26	250
Dry goats	90.83 ± 4.60	86.11 ± 5.76	79.17 ±10.17	85.37 ± 6.84	220
Goatlings	95.00 ± 3.44	86.11 ± 5.76	79.17 ± 8.29	86.76 ± 5.83	200
Kids	91.66 ± 3.54	86.11 ± 5.76	79.17± 8.29	85.65 ± 5.86	100
Breeding bucks	$267.50^{b} \pm 9.78$	$258.33^{b} \pm 16.37$	$212.50^{a} \pm 24.51$	246.11 ±16.89	400
Bucks (Fattening ration)	$304.16^{a} \pm 29.62$ (70%)	$244.44^{a} \pm 16.75$ (50%)	$218.75^{a} \pm 22.97$ (30%)	255.79 ± 3.12 (56%)	400

Means bearing different superscripts in a row differ significantly
Figure in parenthesis indicates per cent of respondents

Table 5: Total DM intake (kg) through stall feeding offered

Animal category	Small	Medium	Large	Overall
Milking /pregnant goats	1.38	1.09	1.02	1.16
Dry goats	1.01	0.90	0.80	0.90
Goatlings	1.07	1.00	0.95	1.01
Kids	0.56	0.55	0.49	0.52
Breeding bucks	1.80	1.54	1.40	1.38

4) Fattening ration

Majority of farmers (56 %) were offering fattening ration to their male kids for their higher body weight gain so that they attain early market weight and on an overall average 255.79±7923.12 g of concentrate mixture per buck/day was fed as fattening ration. In case of three categories of farmers feeding of fattening ration to their animals averaged 304.16±29.62g (70 % respondents), 244.44±16.75g (50% respondents) and 218.75±22.97 g/day (30% respondents) respectively. Across all categories of farmers 44 per cent farmers did not offer any fattening ration to their male goat. None of the farmers were found to purchase mineral mixture for goat feeding. However, mineral mixture was supplemented sometimes to milking goats if provided by some government agency at the rate of 6-10 g/day.

5) Dry matter intake

The overall total DM intake through stall feeding in case of milking goats, dry, goatlings, kids and breeding bucks was 1.16, 0.90, 1.01, 0.52 and1.38 kg respectively. The total DM intake in different categories of goats was similar among the three flock size categories (Table-5).

Conclusion

It was concluded that feeding management practices were mostly traditional without much regard to scientific recommendations. However, these management practices in general were better in case of small farmers as compared to medium and large farmers.

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