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Socio-economic and Forest Resource Attributes Affecting Fodder Extraction and Consumption in Rural Kashmir

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ABSTRACT The study investigated the extraction and consumption situation of fodder and their socio-economic and forest resource correlates in district Ganderbal of Kashmir. Multi-stage random sampling technique was administered to select villages and households for field study employing interviews, observations and PRA tools. Results revealed that fodder requirement per household was 35.21 kg/day^{-1} with total requirement of 1464.46 tons annum^{-1}. Agricultural field was the major (52.09%) contributor of fodder extraction followed by forest (33.70%) and others (14.21%). Cattle alone consumed the maximum (58.25%) while the rest (41.75%) was consumed by others. People are underprivileged regarding socio-economic attributes while they are prosperous concerning forest resource characteristics. Correlation and multiple regression analysis established robust relationship between fodder consumption and socio-economic and forest resource attributes. Excessive fodder flow from forests is a threat to biodiversity conservation and ecological stability; hence, some alternative interventions must be implemented efficiently to keep pace with current development and future challenges.

INTRODUCTION

India is predominantly an agricultural country and has the largest livestock population in the world (Chandra et al. 2008). Livestock is an important component of rural economy and survival in the country (Chandramolly and Islam 2015). India is house to fifteen percent of the world's cattle population and sixteen percent of human population to be sustained and progressed on two percent of the total geographical areas (Bakshi and Wadhwa 2004). Due to the ever increasing population pressure of humans, arable land is mainly used for food and cash crops, thus there is little chance of having good quality arable land available for fodder production, until milk production is remunerative to the farmers as compared to the other crops. The quality and quantity of the livestock predominantly depends on the type of fodder, its quality and availability (Pandey and Mishra 2011; Islam et al. 2015). Livestock production is the backbone of Indian agriculture and also plays a key role in providing employment especially in the rural areas (Verma and Paul 2016). Thus, there is an intense demand of fodder in rural sectors playing an important role in socio-economic, cultural, farming and geo-environmental conditions of a region (Rawat and Vishvakarma 2016). This sector has been the primary source of energy for agriculture operation and major source of animal protein for the masses. Therefore, India has been the home of major draughts, milch and dual-purpose breeds of cattle. Indian dairy production system is complex and generally based on traditional and socio-economic considerations. The sustained livestock production needs adequate fodder provision, however, fodder scarcity is a major limiting factor for better productivity in India. In India, there is no practice of fodder production in rural areas and animals generally consume naturally grown grasses and shrubs which are of low quality in terms of protein and available energy. They are thus heavily dependent on seasonal variations and this results in fluctuating fodder supply round the year affecting the supply of milk.

Livestock component is closely linked with the forest ecosystem and common property resources to meet the fodder demand (Ahmad et al. 2016). About thirty-fifty percent of the total animal fodder is derived from forests and grasslands (Bajracharya 1999). Forests represent a key component of available national and regional biomass supply in rural India. Exploitation of

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forest biomass is a common way for fodder security among forest fringe dwellers (Khanduri et al. 2002). Although, India is the highest milk producer country but the per capita milk production is very low due to the huge deficit in the availability of fodder/feed. The animals depend predominantly on open grazing or stall feeding on the byproducts of agricultural produce like wheat straw, paddy straw, hay and green or dry grass collected from the forest. Open grazing in the forest is the conventional rearing practice for forest fringe communities and this has an adverse impact on the growing stock as well as the regeneration capacity of the forest. The large livestock population also results in huge collection of tree fodder, which affects the forest quality adversely. The annual requirement of dry and green fodder is estimated to be 569 MT and 1025 MT respectively against the availability of 385 MT and 356 MT (Roy and Singh 2008). This explains the pressure on India's forest from livestock sector and its contribution to the state of degradation of forests in the country.

Several states of India have been facing problems of inadequate fodder to sustain large livestock population (Ranjan 1995). However, in Jammu and Kashmir available natural fodder resources from forests, alpine pastures, orchards, aquatic vegetation and pastures on hilly slopes are in excess of 3.2 hundred thousand MT over fodder requirement, for sustaining the state livestock population; yet the productivity of ruminants in the state is below the national average (Akhter and Malaviya 2014). Livestock production is more efficient from cultivated fodder than from the degraded grazing lands but unfortunately the fodder cultivation remained static and only four percent arable land is under fodder production in J&K aggravating the intense dependence on forests (Ahmad et al. 2016). The socio-economic and forest resource attributes influence the extraction and consumption of fodder and diversified resource based feeding practices (Dhanai 2014). To keep pace with the current scenario and meet future aspirations some policy implications based on socio-economic and forest resource variables are imperative. With these backgrounds, the study was designed to analyze the household fodder extraction and consumption situation and their socio-economic and forest resource correlates in district Ganderbal of Kashmir.

MATERIAL AND METHODS

Locale of Study

The study was conducted in district Ganderbal of Kashmir valley located between 34.23°N longitude and 74.78°E latitude at an elevation of 1650 to 3000 meters above MSL. The total geographical area of the district is 39304 ha, of which 27.86 percent is forest, 14.65 percent is under non-agricultural use, 8.04 percent is barren and uncultivable land, 4.55 percent is permanent pastures and other grazing land, 2.48 percent is cultivable waste land and 42.42 percent is the net area sown (Anonymous 2011). The area experiences both temperate and sub-alpine conditions and is well known for excessive annual rainfall (700 mm) and temperature varying from 5^0 C to 20^0 C. The district has a total human population of 297446 (158,720 male and 138,726 female), the literacy rate of 59.98 percent, sex ratio of 874 female per 1000 males, family size of 6.62 and population density of 1148 per km^2. The district comprises of 84.19 percent of rural and 15.81 percent of urban population living in 136 villages and 44831 households (Census of India 2011).

Sampling Technique and Sample

Multi-stage random sampling technique was employed to select the sample villages and the households for the study (Ray and Mondol 2004). Fourteen sample villages viz., Babosipora, Bandi Bagh, Gund Rahman, Dev Pora, Darend, Daraduder, Tangchatir, Gund Ari, Drag Tanga, Narayan Bagh, Badam Pora, Ahan, Danger Pora and Bagh Mahanand were selected out of the 136 villages with around ten percent sampling intensity in the district. A sample of 114 households having ten percent of the total number of the households in the sample villages were drawn for the field survey. Household heads were treated as respondents.

Data Collection and Analysis

The data on extraction and consumption pattern of fodder and socio-economic and forest resource characteristics were collected by personal interviews through a well-structured pre-tested interview schedule, personal observations of the interviewer and PRA tools, that is, the key informant interview and focus group

discussion (Mukherjee 1993). The fodder requirement was based on the daily household extraction/ consumption, which was calculated on Adult Cattle Unit (ACU) bases. The Adult Cattle Unit refers to: 1 cow/ bullock = 1 ACU, 1 buffalo = 2 ACU, 1 goat/ sheep = 0.5 ACU, 1 calf = 0.75 ACU, 1 horse = 1 ACU (Khanna 1982).

The socio-economic and forest resource characteristics included were quantified using appropriate scales developed by the earlier workers (Venkataramaiah 1990; Singha et al. 2006) after certain necessary changes. These variables were; X_1= Age (chronological age in year); X_2= Education (0 = illiterate, 1 = below primary, 2 = primary, 3 = middle, 4 = high school, 5 = intermediate, 6 = graduate and above); X_3= Social participation (0 = no membership, 1 = membership of 1 organization, 2 = membership of more than 1 organization, 3 = office bearer of organization, 4 = public leader); X_4= Family composition (1 = nuclear, 2 = joint, 1 = upto 5 members, 2 = > 5 members); X_5= Size of land holding (0 = landless, 1 = up to 1.0 ha, 2 = 1.1 to 2.0 ha, 3 = 2.1 to 4.0 ha, 4 = > 4.0 ha); X_6= Livestock possession (0 = no livestock, 1= up to 5 livestock, 2 = 6 to 10 livestock, 3 = > 10 livestock); X_7= Housing status (0 = no house, 1 = hut, 2 = *katcha*, 3 = mixed, 4 = *pucca*, 1= 1room, 2 = 2 rooms, 3 = > 2 rooms); X_8= Main occupation (1= wage labour, 2 = caste occupation, 3 = cultivation, 4 = business, 5 = service, 6 = any other occupation); X_9= Annual income (1 = up to Rs. 30000/ annum, 2 = Rs. 30001 to 60000)/ annum, 3 = Rs. 60001 to 90000/ annum, 4 = > Rs. 90000/ annum); X_{10}= Wealth status (1 = smokeless *chulha* (crude oven), 1 = stove, 1 = sewing machine, 1 = watch, 1 = cycle, 1 = radio, 1 = wooden furniture, 1 = pressure cooker, 2 = improved storage bin, 2 = tape recorder, 3 = scooter/ motor cycle, 1 = any other); X_{11}= Proximity to the forests (km); Frequency of forest visits (3= very frequently, 2= frequently, 1= occasionally, 0= never); X_{13}= Extent of farm/ homestead forestry (ha); X_{14}= Access to forest plantations (3= very often, 2= often, 1= seldom and 0= never) and X_{15}= Urban closeness (km). Suitable statistical tools like mean, frequency, percentage, correlation and multiple regression were used for data analysis (Snedecor and Cochran 1967). The multiple regression statistic was used to determine the effect of socio-economic and forest resource characteristics on consumption of fodder as follows:

$$Y = a + b_1x_1 + b_2x_{2+\ldots\ldots\ldots} + b_nx_n + E_n$$

where, Y= fodder consumption, a = intercept, $x_1 - x_n$= values of independent variables, $b_1 - b_n$= regression coefficients, n = number of independent variables, En = Error term

RESULTS

Livestock Composition

Total livestock population in the sample households were 1086, of which poultry accounted maximum (54.88%) followed by sheep (18.05%), cow (10.96%), calf (8.20%), goat (3.96%), duck (1.47%), horse (1.01%), bullock (0.83%) and buffaloes (0.64%) (Table 1). The livestock sector, apart from contributing to food and nutritional security, has good potential for improving the socio-economic condition of the people. Local people rear the livestock for animal products such as milk, ghee, meat, dung, manure etc., ploughing, religious sacrifices, entertainment, propitiation of Gods and celebrations. The forests in vicinity of the villages offer plenty of grazing grounds with enough fodder availability for livestock rearing.

Fodder Extraction and Consumption

The average fodder requirement per household was estimated to be 12.85 tons/annum^{-1} with an annual requirement of 1464.46 tons in the sample households. The livestock owners secure their fodder requirement as paddy straw (28.02%), dried oat and maize (24.07%), tree foliages (8.94%), green grasses, aquatic vegetations, weeds and other agricultural residues etc., (14.21%) and forest herbage (24.76%) in the form of grazing. Of the total

Table 1: Livestock composition in the sample households (N=114)

Particular	*Livestock*									
	Bullock	*Cow*	*Buffaloes*	*Goat*	*Sheep*	*Calf*	*Horse*	*Poultry*	*Duck*	*Total*
Population	09	119	07	43	196	89	11	596	16	1086
Percentage	0.83	10.96	0.64	3.96	18.05	8.20	1.01	54.88	1.47	100

fodder consumption (1464.46 tons/annum), maximum consumption was by cattle (58.25%) followed by sheep and goat (35.74%), horse (3.29%) and buffaloes (2.72%) which included both stall feeding (green/dry) and grazing (Table 2). Low economic condition, unavailability of pastures or fodder production unit and ignorance towards green fodder production resulted in higher intensity of grazing in the forests. There is a scarcity of fodder in severe winter months as well as in hot summer as such, tree leaves are most suited fodder for the animals. Villagers use fodder for livestock by lopping trees and sometimes goats are used for onsite use of lopping of trees. The important species consumed by the villagers as fodder are *Populus* spp., *Ulmus wallichiana, Robinia pseudoacacia, Malus domestica, Salix* spp., *Morus alba, Morus serrata, Quercus* spp., *Celtris australis, Prunus armeniaca, Ailanthus excelsa, Catalpa bignonoides, Aesculus indica, Parrotia* spp. etc.

Socio-economic and Forest Resource Characteristics

The descriptive statistics for the socio-economic and forest resources parameters of the sample households (Table 3) indicated that there was a prevalence of middle aged (46.85) respondents having literacy upto secondary level (3.68), no membership or membership of only one organization (0.81) and belonged to large family size and nuclear (3.12) family type. The size of land holding amongst most of the respondents (1.08) were marginal, engaged mainly in cultivation or business (3.46), having 6 to 10 livestock (1.98), one *pucca* house (4.95), medium wealth status (23.10) and gross annual income up to Rs. 60000/annum (2.82). Majority of the respondents were having proximity of 5 to 10 km to the forests, who visited the forests frequently (1.77) and accessed the forest plantation most often (2.38). The extent of agroforestry/ homestead forestry among most of the respondents (87.72%) was up to 0.30 ha and the urban closeness varied from 5 to 10 km. The people are in impoverished position as regards to their socio-economic characteristics while they are in prosperous situation with respect to forest resource characteristics.

Correlation and Multiple Regression Analysis

Of the fifteen socio-economic and forest resource variables, thirteen attributes namely, education, social participation, family composition, size of land holding, livestock possession, housing status, main occupation, gross annual income, wealth status, proximity to forests, frequency of forest visits, extent of agroforestry/ homestead forestry plantation, access to the forest plantation had a positive and significant correlation with the fodder consumption (Table

Table 2: Fodder availability and consumption in the sample households (N=114)

Fodder	*Availability*			*Consumption*	
	Quantity (Tons annum^{-1})	*Percentage*	*Purpose*	*Quantity (Tons annum^{-1})*	*Percentage*
Paddy straw	410.40[a]	28.02	Cattle	853.01	58.25
Oat (Dried)	233.93[b]	15.97	Sheep + Goat	523.41	35.74
Maize (Dried)	118.56[c]	8.1			
Tree foliage	130.85	8.94			
Green grasses, aquatic vegetation, weeds, other agricultural residues etc.	208.05[d]	14.21	Horse	48.18	3.29
Forest herbage (Grazing)	362.67[e]	24.76	Buffalo	39.86	2.72
Others (Oilseed cakes, bran etc.)	064.98[*]	-	-	-	-
Total	1464.46	100%		1464.46[f]	100%

X ± S.E.= 12.85 ± 0.03 = 12.85 ± 0.03

S.E.= Standard Error

a @ 120 quintals ha^{-1}; b @ 90 quintals ha^{-1}; c @ 200 quintals ha^{-1} (Kamili et al. 2011); d @ 5.0 kg household^{-1} day^{-1}; e1464.46– 1101.79 (410.40 + 233.93+118.56+ 130.85 + 208.05) = 362.67;f @12 kg (1ACU) day^{-1} cow^{-1} or bullock^{-1}, @ 9 kg (0.75ACU) day^{-1} calf^{-1}, @ 12 kg (1ACU) day^{-1} horse^{-1}, @ 6 kg (0.5ACU) day^{-1} goat^{-1} or sheep^{-1}, @ 24 kg (2ACU) day^{-1} buffalo (Khanna 1982); ACU = Adult Cow Unit; [*]Supplementary feeds not included in total fodder availability.

Table 3:Descriptive statistics for socioeconomic and forest resources parameters of the sample households (N=114)

Characteristic	*Mean*	*Std. dev.*	*95% Confidence interval for mean*		*Minimum*	*Maximum*
			Lower bound	*Upper bound*		
Age (X_1)	46.85	11.52	44.71	48.99	22	69
Education (X_2)	3.68	1.47	3.4	3.95	0	6
Social Participation (X_3)	0.81	1.07	0.61	1.01	0	4
Family Composition (X_4)	3.12	0.77	2.98	3.26	2	4
Size of Land Holding (X_5)	1.08	0.42	1	1.16	0	3
Livestock Possession (X_6)	1.98	0.89	1.81	2.15	0	3
Housing Status (X_7)	4.95	0.79	4.8	5.09	3	6
Main Occupation (X_8)	3.46	1.29	3.22	3.7	1	6
Gross Annual Income (X_9)	2.82	0.79	2.67	2.96	1	4
Wealth Status (X_{10})	23.1	7.2	21.76	24.43	10	38
Proximity to Forests (X_{11})	9.3	5.39	8.3	10.3	2.5	18
Frequency of Forest Visits (X_{12})	1.77	1.06	1.58	1.97	0	3
Extent of Agroforestry/ Homestead Plantation (X_{13})	0.22	0.15	0.19	0.25	0	1
Access to the Forest Plantation (X_{14})	2.38	0.85	2.22	2.53	0	3
Urban Closeness (X_{15})	9.78	4	9.04	10.53	2	17.5

4). There was a negatively significant association between urban closeness and fodder consumption while the age had non-significant relationship. The value (0.835) of co-efficient of determination (R^2) indicated that 83.50 percent of the total variation in fodder consumption was being explained by these socio-economic and forest resource variables. Further, the analysis of 't' values of regression co-efficient showed that among the fifteen independent variables, family composition, size of land holding, housing status and extent of agroforestry/homestead plantation had a significant contribution in influencing the fodder consumption. The fitted multiple regression equation for fodder consumption should be written as:

$$Y = 11.925 - 0.002\,X_1 + 0.003\,X_2 - 0.001\,X_3 + 0.063\,X_4 + 0.196\,X_5 + 0.021\,X_6 + 0.059\,X_7 - 0.002$$

Table 4: Correlation and multiple regression analysis of socioeconomic and forest resource attributes with the fodder consumption (N=114)

Socio-economic and forest resource attribute (Code)	*Co-efficient of correlation (r)*	*Regression co-efficient (b)*	*Standard error of 'b'*	*'t' value*
Age (X_1)	0.163	-0.002	0.001	-1.658
Education (X_2)	0.392*	0.003	0.010	0.325
Social participation (X_3)	0.609*	-0.001	0.015	-0.084
Family composition (X_4)	0.604*	0.063	0.020	3.198*
Size of land holding (X_5)	0.668*	0.196	0.035	5.586*
Livestock possession (X_6)	0.654*	0.021	0.020	1.033
Housing status (X_7)	0.546*	0.059	0.018	3.328*
Main occupation (X_8)	0.420*	-0.002	0.010	-0.204
Gross annual income (X_9)	0.522*	0.035	0.018	1.904
Wealth status (X_{10})	0.357*	0.001	0.002	0.333
Proximity to forests (X_{11})	0.497*	0.002	0.003	0.660
Frequency of forest visits (X_{12})	0.537*	0.028	0.014	1.959
Extent of agroforestry/ homestead plantation (X_{13})	0.641*	0.400	0.096	4.167*
Access to the forest plantation (X_{14})	0.634*	0.029	0.019	1.478
Urban closeness (X_{15})	-0.544*	-0.008	0.003	-2.319

a = 11.925 F = 33.094 R^2 = 0.835 Multiple R = 0.914Adjusted R^2 = 0.810*

** = Significant at 5% level of probability*

$X_8 + 0.035\ X_9 + 0.001\ X_{10} + 0.002\ X_{11} + 0.028\ X_{12} + 0.400\ X_{13} + 0.029\ X_{14} - 0.008\ X_{15}$.

Where, Y_2 = Fodder consumption, $X_1 - X_{15}$ = Independent variables

DISCUSSION

Grazing/ browsing in nearby forests is a common practice among all the livestock owners as there is no managed pasture or fodder production unit in the surveyed area. The livestock owners graze their animals from dawn to dusk to provide sufficient feed to their livestock. As regards the stall feeding, the livestock farmers generally use paddy straw, fodder grasses (oat, maize), aquatic vegetation, weeds and other agricultural residues collected from agricultural fields and homesteads, lops and tops of trees and shrubs and by-products of cereals and pulses, bran, oil cakes etc. for their livestock. Such poor feeding reduces the quality and quantity of livestock products resulting in low economic return (Sati and Song 2012; Ajake and Enang 2012).

The preponderance of middle aged respondents could be attributed to the fact that the middle aged people are generally enthusiastic, innovative and hard working with more experience, vigour, zeal, aptitude and challenge (Sinha et al. 2010). The low literacy might be due to low socio-economic conditions, lack of educational facilities, higher involvement of boys and girls in livelihood earnings and ignorance towards education (Singh et al. 2011). The social participation shows the grousing magnitude of interest and willingness of the respondents to be associated with various formal and informal organizations (Pandey and Mishra 2011). Because of growing individualism people prefer to lead independent life with personal assets and proper accommodation in nuclear families. Consideration of child as an added asset to the family who can contribute by the way of labour and lack of knowledge of the benefits of small families might be the reasons for large sized families (Pal 2011). The prevalence of marginal farmers is due to the nuclear and neo-local structure of families in the community which urged early fragmentation of land from generation to generation and among married off-springs (Pal 2011). Holding a good number of livestock is due to the fact that livestock rearing supports agriculture and allied activities besides providing nutritional, social, economic, religious and recreational benefits to the people (Bijalwan et al. 2011). The satisfactory housing status is attributed to the fact that people traditionally expend a considerable sum in building good quality houses which acts as a sign of their socio-economic status (Bedia 2014). Agriculture and business being the back bone of the economy, most of the respondents either belong to farming families or are dependent on petty business for their livelihood. The families engaged in other occupations and activities were also doing agriculture or business as their subsidiary occupation (Pal 2011). The study confirmed the preponderance of families having low gross annual income (Rs. 31001 to 60000/ annum) which is due to the fact that the majority of the respondents were either farmers having small sized land holding or petty businessmen. Although different and varied types of domestic materials were possessed by the respondents, the overall picture was unsatisfactory, especially in the context of the improved, modern and prestigious material resources. The main reasons for such a scenario might be poverty, low literacy, lack of knowledge, lack of exposure, infrastructural insufficiency etc. (Gupta et al. 2009).

The heterogeneity on proximity to the forests has a clear-cut impact on the magnitude of extraction and consumption of fodder (Sapkota and Oden 2008). That's why the amount of fodder extraction and consumption varied greatly between proximate and distant households. The frequency of forest visits exerts a strong influence on appropriating fodder extraction and consumption from forests (Sapkota and Oden 2008). The frequency of forest visits is more among the households highly dependent on forests while it is limited among the households having low dependency on forests for fodder extraction. The inequalities among the households due to extent of agroforestry/ homestead forestry plantation differentiate apparently the scale of extraction and consumption of fodder (Singha et al. 2006). The higher the extent of agroforestry/ homestead forestry plantation, the lower will be dependency on forests for extraction of fodder and vice-versa. The availability of forest plantations viz., wasteland plantations, road side plantations, canal bank plantations, river side plantations, community forestry, village woodlots, pasture land etc. in the nearby villages and level of access by the households to the forest

plantations is a key factor influencing the extraction and consumption pattern of fodder (Singha et al. 2006). The rural-urban stratification has a strong association with the quantity of fodder extraction and consumption among the households (Chandra et al. 2008). Hence, the higher the urban closeness of the households the lesser will be the extraction and the consumption of fodder and vice-versa.

The positively significant correlation between education and consumption of fodder is well articulated by the facts that the education results in bringing desirable changes in human behavior and helps the individual to move in right direction (Egeru et al. 2010), the knowledge is built up through education, which makes the person aware of new innovations (Sood et al. 2008). The social participation paves the way for sharing their views and experiences with other members of the organization (Egeru et al. 2010), clarifying their doubts and getting opinion from different people and enriching their knowledge (Prakash and Sharma 2008). The positive and significant relationship of family composition with the consumption of the fodder could be attributed to the fact that the local people being an important member of their nuclear family might have taken up independent decision regarding any matter concerning to the livelihood generation for their family (Ajake and Enang 2012) and the larger sized families were having more labor force available for more extraction of fodder (Larinde and Olasupo 2011). The involvement of local people of different age groups in extraction of fodder was more or less similar indicating that the variation in age has no influence on the consumption of fodder at all.

The co-efficient of correlation (r) of all the six economic variables namely, size of land holding, livestock possession, housing status, main occupation, gross annual income, wealth status with the consumption of fodder was recorded to be positive and significant. The persons who have a big size of land holding will have good economic condition (Egeru et al. 2010) and more scope for availability of fodder by encompassing appropriate combinations of farm enterprises (Prakash and Sharma 2008). The main occupation exhibited direct bearing on the earning of money (Kumaresan and Devi 2009), facilitating the possession of fodder. The other economic attributes viz., housing status, livestock possession and wealth status are the major indicators of physical capital possessed (Singha et al. 2006) which is a core contributor, a major part and the representative of the fodder possessions (Pal 2011). The gross annual income is the prominent indicator of financial capital possessed by the local people (Sharma et al. 2012) and it occupies a central position governing the fodder resources possession (Sood et al. 2008). All the forest resource characteristics viz., proximity to forests, frequency of forest visits, extent of agroforestry/homestead forestry plantation and access to the forest plantations have a direct influence on the consumption pattern of fodder, thus, the higher the custody of these variables the higher will be consumption of fodder. Negatively significant association of urban closeness with the consumption of fodder could be articulated to the fact that the urban people have some other alternatives of these forest resources dwindling their dependency on these resources. The analysis of 't' values of regression co-efficient indicated that out of the fifteen independent variables, family composition, size of land holding, housing status and extent of agroforestry/ homestead plantation had the maximum contribution to the consumption of fodder and it turned out to be a potential predictor in explaining the variation in the consumption of the fodder. The families with higher custodian of these variables could arrange maximum amount of fodder whereas, families devoid of these variables were facing dearth of these forest resources. The findings are consistent with Singha et al. (2006) who reported that household fodder consumption is a function of myriad of existing socio-economic and forest resource dynamics in Assam, India.

CONCLUSION

The study led to conclude that the entire population traditionally depends mostly on forest biomass and agroforestry plantations for fodder security having no any alternate source to replace the requirements. The fodder flow from forests to the sample villages is excessive as compared to the national estimates, creating threats to the biodiversity conservation and ecological stability. The over-utilization of forest biomass by the local populace is leading to the depletion of forest resources and diminished biomass productivity, which in turn induces socio-economic and livelihood stress. Therefore,

some alternative interventions are required to be implemented efficiently to keep pace with the current development and future challenges. Despite inhabiting in resource rich areas, the socio-economic conditions of the people is away from the expected level and as such, there is still much scope to improve their quality of life. Nonetheless, the people are in prosperous position with regards to the forest resource characteristics, which needs to be exploited efficiently and livelihood diversification based on the existing forest resources needs to be implemented as an important strategy of socio-economic upliftment of the local people. Furthermore, the variables like education, social participation, family composition, size of land holding, main occupation, housing status, livestock possession, wealth status, gross annual income, proximity to forests, frequency of forest visits, extent of agroforestry/ homestead forestry plantation and access to the forest plantation should be given due importance during decision making, planning, implementation and execution of strategies envisaged to relieve the pressure of fodder on forest in the locality.

RECOMMENDATIONS

Livestock rearing has become a commercial activity in the region; therefore, quality fodder needs to be compensated by other sources to reduce the pressure on the forests. Timely harvesting and conservation of aquatic vegetation, treatments of tree browses for anti-metabolites, enrichment with non-protein nitrogen, supplementation with minerals/ vitamins of agricultural and horticultural waste products are some important measures which must be exploited for livestock feeding on scientific lines. This will ultimately reduce the pressure on the forest and may hence provide better quality of fodder for the livestock, which may boost further the dairy industry and ultimately better the quality of livestock.

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