



Consumption pattern of livestock products and their nutritional contribution in northern hill states of India

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ABSTRACT

Livestock products are not only rich in calories but have a high nutritional value too. The northern hill states of Himachal Pradesh (HP), Uttarakhand (UK), and erstwhile Jammu and Kashmir (now a UT) face unique challenges which may have a direct bearing on food security. The present study used NSSO reports pertaining to the year 2011–12 to analyse the consumption pattern of livestock and nutritional contribution in northern hill states. Apart from high CAGR in real MPCE (2.6–4.8%) on livestock products, their share in total food expenditure has also risen and it has overtaken the expenditure on cereals in the states considered. Liquid milk was the major livestock product consumed and its level of consumption was much higher than national average. Highest consumption of milk in HP in India calls for ramping up the cattle productivity. Consumption of chevon/mutton in JK and HP was unparalleled. There is huge demand for the market curd in urban areas of the hill states. Livestock products contributed a major chunk of proteins (18–28%) and fats (33–37%) in the northern hill states. Consumption of eggs, fish, and meat in Uttarakhand and Himachal Pradesh was very less.

Keywords: Consumption, Food security, Livestock products, Northern hill states

Traditionally, the main source of nutrients in India have been food grains, but there has been a gradual shift in favour of high value commodities like milk, meat and eggs, fruits, and vegetables (Mittal 2008, Gandhi and Zhou 2010). The nutritional value of livestock products is higher in comparison to plant source foods (Murphy and Allen 2003). The proteins from animal-source foods stand out in terms of quality and density in comparison to plant proteins (Devi *et al.* 2018, Kashyap *et al.* 2018). Consumption of animal-source foods leads to reduced stunting and wasting in children (Aguayo *et al.* 2016, Nguyen Bao *et al.* 2018).

The hilly region of Northern India includes the states of Himachal Pradesh (HP), Uttarakhand (UK), and erstwhile Jammu and Kashmir (JK). Hilly regions face unique challenges which have a direct bearing on different dimensions of food and nutritional security. These challenges include, deterioration of local food systems; changing diets; climate change; lingering poverty; increased outmigration; abandonment of cultivable land; constraints to internal food movement etc. (Rasul *et al.* 2019). All three states figured on top-ten list for per capita consumption of most of livestock products (Gandhi and Zhou 2010). This suggests that livestock have a major role to play in food

and nutritional security of these hill states. Most of studies concerning consumption pattern and food security in India have either restricted themselves to national level or have not paid attention to any of the northern hill states. Further, though NSSO reports of various quinquennial rounds indicate nutritional contribution of different food groups, but all milk products mentioned in the questionnaire are not categorised in the 'Milk and Milk Products' sub-group e.g. ghee and butter are categorised under 'Oils and Fats' sub-group while ice-cream is grouped in 'Misc. food, etc.' sub-group. This grouping might be done keeping in mind the nutritional structure of these products but substantially understates the nutritional contribution of 'Milk and Milk Products' sub-group. The above arguments call for a disaggregate study on consumption pattern of livestock products and their nutritional contribution in the states mentioned which is lacking in literature.

MATERIALS AND METHODS

The study was based on NSSO (National Sample Survey Organisation) reports on household consumption and nutrient intake pertaining to 68th round conducted in year 2011–12. The NSSO reports of 61st round conducted in year 2004–05 were used only for comparison purposes. As both the rounds were quinquennial in nature, the sample size was very large and covered almost the entire geographical area of the country, making the sample a representative one.

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Table 1. Average MPCE on livestock products in Northern Hill states in 2011–12 (at 2011–12 prices)

State	Sector	MPCE on livestock products (₹)			% Share of (1) products in MPCE on food	MPCE on cereals (₹)	Real MPCE on livestock products in 2004–05* # (₹)	% CAGR of real# MPCE on livestock products from 2004–05 to 2011–12
		Milk and milk products	Egg, fish and meat	Total (1)				
HP	Rural	230.71	50.49	281.20	29.22	154.94	219.09	2.82
	Urban	284.22	66.34	350.56	25.36	188.28	274.21	3.45
UK	Rural	188.66	34.57	223.23	26.08	151.34	158.33	4.71
	Urban	245.24	59.79	305.03	28.14	191.96	208.94	4.84
JK	Rural	189.17	109.58	298.75	31.02	185.28	214.96	2.61
	Urban	242.71	128.63	371.34	31.24	211.98	285.66	2.69
India	Rural	114.90	68.46	183.36	24.24	152.91	119.84	4.38
	Urban	184.31	95.99	280.30	25.01	173.82	230.63	1.35

*Authors own calculation using price relevant price deflators; #For comparison purposes MPCE_{URP} figures of both rounds were used, elsewhere MPCE_{MMRP} figures have been used. *Source:* Compiled from NSSO (2014a) and NSSO (2006).

Parameters and statistical analysis: From the reports, the data on 3 Northern hill states, i.e. HP, UK, and JK were compiled on two aspects of livestock products consumption, viz. average Monthly Per Capita Expenditure (MPCE) as well as average Monthly Per Capita Quantity (MPCQ) consumed. The number of households surveyed in 68th round was 2040, 1782, and 3387 in the states of HP, UK, and JK, respectively. Livestock products belong to two major sub-groups, i.e. Milk and Milk Products (MMP) sub-group and Eggs, Fish, and Meat (EFM) sub-group. Major livestock products analysed in MMP sub-group were liquid milk, curd, and ghee; remaining milk products were grouped into ‘others (comprise of butter, ice-cream, baby food, condensed/powder milk, and other milk products.)’. Similarly, main livestock products covered in EFM sub-group were Eggs, Fish/prawn, Chevon/mutton, Beef/carabeef, and Others (Meats). The nutrients provided by the livestock products were computed by using their nutrient equivalents provided in NSSO (2014b).

Further, to compare the average MPCE on livestock products of 61st and 68th rounds, MPCE_{URP} figures were used, elsewhere MPCE_{MMRP} were used. For calculating the annual growth rate (AGR) in MPCE on livestock products, the following formula was used:

$$\text{AGR (\%)} = \left[\left(\frac{\text{Estimate of current year}}{\text{Estimate of base year}} \right)^{1/n} - 1 \right] \times 100$$

where, n, 7 years; Current year, 68th round, i.e. 2011–12; Base year, 61st round, i.e. 2004–05.

RESULTS AND DISCUSSION

Expenditure incurred on livestock products: The average monthly per capita expenditure (MPCE) on livestock products, its share in average MPCE on food, its comparison with average MPCE on cereals and its increase (in real terms) over the period from 2004–05 to 2011–12 for the Northern hill states is given in Table 1. It was observed that average MPCE on livestock products was dominated by

average MPCE on MMP in all the states considered. Clearly, average MPCE on livestock products in all the selected states was much above than national average due to much higher expenditure on MMP. But, the average MPCE on EFM products in HP (₹ 50.49 and ₹ 66.34 in rural and urban sectors, respectively) and UK (₹ 34.57 and ₹ 59.79 in rural and urban sectors, respectively) was lesser than their corresponding national figures due to dominance of vegetarian households in both these states. At all-India level, 55% of households consumed EFM products in both sectors. As opposed to national average, just 47% and 37% households in UK consumed EFM products in rural and urban sector, respectively while this figure was just 33% in both sectors of HP. Rural-urban inequality in expenditure on livestock products was visible in all the selected states with urban sector exceeding (in terms of average MPCE on livestock products) the rural sector by 24.67%, 24.30%, and 36.64% in HP, UK, and JK, respectively. But, this rural-urban difference was much lower than that observed at national level which was to the tune of 52.87%. Not only the northern hill region households spent higher on livestock products, the proportion of MPCE on livestock products in MPCE on food was also higher than observed at national-level.

To further illustrate the importance of livestock products in northern hill states, a comparison of expenditure on livestock products and cereals was carried out as cereals dominate the Indian diets and were a major source of nutrients. It was noticed that average MPCE on MMP was greater than expenditure on cereals in both sectors of all the northern hill states. Among the major food groups too, MPCE on MMP was highest in both sectors of all the selected states with the exception of urban sector in HP in where MPCE on MMP was just behind ‘beverages etc.’ sub-group. Not only the nominal expenditure on livestock products increased, the real MPCE on livestock products also showed a great increase over the period from 2004–05 to 2011–12 in both sectors of all the states considered with increase being highest for UK (CAGR of 4.71% and 4.84%

Table 2. Composition of average MPCE on livestock products in northern hill states in 2011–12[#]

Livestock product	HP		UK		JK		India	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
<i>MMP sub-group</i>								
Liquid milk	212.75 (75.66)	222.18 (63.38)	179.39	203.62 (66.76)	174.46 (58.39)	207.27 (55.82)	106.25 (57.95)	158.43 (56.52)
Curd	0.78 (0.28)	8.95 (2.55)	1.68 (0.75)	9.02 (2.96)	1.8 (0.60)	9.45 (2.54)	0.88 (0.48)	2.64 (0.94)
Ghee	13.55 (4.82)	45.81 (13.07)	6.13 (2.75)	22.64 (7.42)	8.49 (2.84)	14.31 (3.85)	5.71 (3.11)	16.32 (5.82)
Others (milk products)	3.63 (1.29)	7.27 (2.07)	1.47 (0.66)	9.95 (3.26)	4.42 (1.48)	11.68 (3.15)	2.07 (1.13)	6.91 (2.47)
<i>EFM sub-group</i>								
Eggs	5.07 (1.80)	9.26 (2.64)	7.09 (3.18)	9.08 (2.98)	12.25 (4.10)	11.6 (3.12)	6.94 (3.78)	11.12 (3.97)
Fish, prawn	0.73 (0.26)	3.31 (0.94)	4.81 (2.15)	7.34 (2.41)	1.74 (0.58)	3.84 (1.03)	22.77 (12.42)	26.73 (9.54)
Goat meat/mutton	28.78 (10.23)	34.42 (9.82)	6.84 (3.06)	16.58 (5.44)	34.13 (11.42)	61.12 (16.46)	12.11 (6.60)	21.78 (7.77)
Beef/ Carabeef meat	0.05 (0.02)	0.17 (0.05)	4.72 (2.11)	8.94 (2.93)	30.26 (10.13)	11.3 (3.04)	4.4 (2.40)	6.55 (2.34)
Chicken	15.57 (5.54)	19.19 (5.47)	11.09 (4.97)	15.44 (5.06)	30.61 (10.25)	40 (10.77)	20.63 (11.25)	28.65 (10.22)
Others (meats)	0.29 (0.10)	0 (0.00)	0.03 (0.01)	2.4 (0.79)	0.6 (0.20)	0.78 (0.21)	1.6 (0.87)	1.16 (0.41)
Total	281.2 (100)	350.56 (100)	223.25 (100)	305.01 (100)	298.76 (100)	371.35 (100)	183.36 (100)	280.29 (100)

Figures in parenthesis indicate percentage to the total of the column. [#]Based on MPCE_{MMPRP}. Source: Compiled from NSSO (2014b).

in rural and urban sectors, respectively). Impact of urbanization was also visible in rising MPCE on livestock products in the selected states as urban areas showed a higher increase compared to rural areas. It was contrary to the trend observed at national level where rural sector had accelerated expenditure on livestock products.

Composition of expenditure on livestock products: The composition of MPCE on livestock products is presented in Table 2. As expected, the expenditure on liquid milk formed the bulk of total expenditure on livestock products. The expenditure on liquid milk was highest in HP (₹ 212.75 and ₹ 222.18 in rural and urban sectors, respectively) among the northern hill states. Though the expenditure on liquid milk was comparable for UK and JK, their share of expenditure on liquid milk in total expenditure on livestock products differed greatly as JK households spent much more on EFM in both the sectors (rural– ₹ 109.58; urban– ₹ 128.63). The expenditure on liquid milk in northern hill states was way ahead of national average (₹ 106.25 and ₹ 158.43 in rural and urban sectors, respectively). The expenditure on curd (absolute as well as share) was higher for urban areas as compared to rural areas which reflected that urban households in northern hill region were purchasing curd from the market while the rural households were consuming less of market purchased curd. Again, the expenditure on curd in both sectors of all northern hill states was higher than the corresponding national average except

in rural sector of HP. The average MPCE on ghee was highest in both rural (₹ 13.55) and urban (₹ 45.81) sectors of HP among the northern hill states. Particularly, the urban sector of HP spent much more on ghee than their counterparts in UK (2 times) and JK (more than 3 times). Yet again, the expenditure on ghee in both sectors of all northern hill states exceeded the corresponding figures for national level except in urban sector of JK. The expenditure on ‘Others (milk products)’, similar to curd, showed a huge rural-urban disparity in all states considered. Most of the products under this sub-group are not traditional in nature and a higher expenditure on them suggested westernization of diets as propounded by Pinghali (2006).

JK showed highest expenditures on all the EFM livestock products except the expenditure on fish/prawn where UK had higher expenditure in both sectors. The main reason for this phenomenon is that more than 60% of households in JK consume non-vegetarian products which can be attributed to different socio-economic and demographic characters of the state. The expenditure on Chevon (goat meat) /mutton is of special interest in HP and JK; the MPCE on chevon/mutton in both sectors of HP and JK was 2 times and just less than 3 times the national averages, respectively. It is also pertinent to mention here that to meet the consumption requirements of chevon/mutton, the traders in these states resort to large scale sourcing of goat/sheep from other nearby states (Kumar 2007, GoJK 2017). The

Table 3. Average MPCQ on livestock products in northern hill states in 2011–12

Livestock product	HP		UK		JK		India	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Liquid milk (l)	9.42	8.33	7.73	6.72	8.08	8.58	4.33	5.42
Curd (g)	21.00	217.00	32.00	186.00	71.00	344.00	24.00	62.00
Ghee (g)	40.00	144.00	20.00	68.00	32.00	48.00	17.00	50.00
Eggs (no.)	1.21	2.38	1.85	2.38	3.08	3.12	1.94	3.18
Fish, prawn (g)	5.00	31.00	53.00	76.00	12.00	27.00	266.00	252.00
Chevon/mutton (g)	143.00	169.00	31.00	78.00	153.00	247.00	49.00	79.00
Beef/Carabeef (g)	0	1.00	53.00	97.00	249.00	91.00	42.00	64.00
Chicken (g)	111.00	145.00	78.00	102.00	290.00	387.00	178.00	239.00

Source: Compiled from NSSO (2014b).

consumption of beef/carabeef (buffalo meat) was distinctly higher in JK and had no parallels with other selected states as well as national average for the same. This might be due to demographic characters of the state wherein Kashmir division had 96.40% muslim population where consuming beef/carabeef is not a taboo. Another interesting feature of consumption expenditure on beef/carabeef in JK is that it was higher in rural sector as compared to urban which might be due to its affordability as well as social status attached to it. In case of chicken consumption, yet again, both sectors of JK had higher MPCE (of ₹ 30.61 in rural and ₹ 40 in urban sector) as compared to the UK and HP. Both HP and UK had lesser MPCE on chicken than national average too.

Consumption of major livestock products: The northern hill states may not figure in top producing states but have huge demand (reflected by consumption) of liquid milk. All the states had higher consumption of liquid milk than national average. In fact, as per statistics available in NSSO (2014b), all three northern hill states were among the states with highest average monthly per capita quantity of consumption (MPCQ). The rank of HP, UK, and JK in consumption of liquid milk was third, sixth and fifth, respectively in rural sector while in urban sector corresponding rank was sixth, seventh and fourth, respectively. In HP and UK, it can be observed that their rural sector was consuming more liquid milk (9.42 litres and 8.33 litres, respectively) as opposed to what was depicted by their corresponding urban expenditure figures (7.73 litres and 6.72 litres, respectively) which may be due to rural-urban price differences as prices of primary commodities like milk are generally lower in rural areas owing to their proximity to production centers. This causes the rural households to consume more while spending lesser. The high liquid milk consumption in HP raises issues on supply side as productivity of cross-bred cattle (the major contributor of milk in the state) was lowest in HP among all the states in India (GoI 2019). The high consumption and lower productivity indicated need for strengthening the efficient input provisioning and increasing the resource-use efficiency so that demand and supply could match in the state itself. The curd consumption (similar to the corresponding expenditure) was significantly higher in urban sector in all the states considered. Further, the national

average for curd consumption in urban sector was way lesser than these states. In fact, a general comparison of curd consumption in urban sector across all states and UTs, given in statistics available in NSSO (2014b), revealed that JK, HP, and UK ranked first (344 g), second (217 g), and third (186 g) for the same. In ghee consumption, the pattern was similar to the corresponding expenditure. HP not only had the highest MPCQ of ghee in the northern hill region, it ranked fourth (40 g) and third (144 g) in rural and urban sector, respectively across all the states in India. The patterns exhibited in MPCQ of eggs were similar to those observed for their corresponding expenditures in all the states considered. Fish/prawn consumption in northern hill region was very less compared to average observed at national level. A comparison of chevon/mutton, beef/carabeef, and chicken consumption and their corresponding expenditures in rural sector of JK revealed that though the expenditures on all three meats were nearly similar (₹ 34.13, ₹ 30.26, and ₹ 30.61, respectively) their respective quantity consumed differed with chicken being highest (290 g) and chevon/mutton (153 g) lowest which meant that chevon/mutton was costlier than other meats and therefore, the households had to buy other affordable meats, i.e. chicken and beef/carabeef to meet their meat consumption needs. But surprisingly, the beef/carabeef consumption in urban sector of JK was extremely low (91 g) which was even lesser than urban sector of UK (which is a Hindu majority state and had a lower consumption of other meats as well). This validates that beef/carabeef was considered inferior to other meats in urban sector of JK.

Nutritional status and trends in northern hill states: Before discussing the nutritional status and trends in the northern hill states, a brief discussion about daily recommended dietary allowance (RDA) of major macronutrients, viz. energy, protein, and fat is required. Many institutions and dieticians have suggested these RDAs according to their respective research. In this study, RDAs for different nutrients suggested by GoI (2014) have been taken into consideration which are different for rural and urban sectors. In rural sector, RDAs for energy (calorie), protein, and fat have been taken as 2155 kcal/capita/day, 48 g/capita/day, and 28 g/capita/day, respectively, while in urban sector, the corresponding figures are 2090 kcal/capita/

Table 4. Status and trends in nutrient intake in northern hill states

State	Year	Calorie (in kcal/capita/day)		Protein (in g/capita/day)		Fat (in g/capita/day)	
		Rural	Urban	Rural	Urban	Rural	Urban
HP	2011–12	2502	2512	71.4	70.7	59.3	66.3
	2004–05	2326	2389	68.4	67.5	52.6	60.0
UK	2011–12	2436	2379	68.2	66.2	52.8	57.7
	2004–05	2160	2205	61.6	62.8	41.3	48.0
JK	2011–12	2357	2353	63.3	62.9	54.9	61.6
	2004–05	2366	2304	63.6	61.2	49.6	56.9
India	2011–12	2233	2206	60.7	60.3	46.1	58.0
	2004–05	2047	2020	57.0	57.0	35.5	47.5

HP, Himachal Pradesh; UK, Uttarakhand; JK, Jammu and Kashmir. *Source:* Compiled from NSSO (2014c).

day, 50 g/capita/day, and 26 g/capita/day.

The nutritional status and trends in northern hill states are given in Table 4. The northern hill states had higher average intake of all the nutrients mentioned above than recommended RDAs. The excess of nutrients particularly intake of fats was humongous to tune of more than 2 times in urban areas which may be leading to deleterious effects on health of people in all the states considered. The higher amounts of fats consumed may be linked to number of obese men and women in India which has increased to 9.8 million and 20 million, respectively in year 2014 from mere 0.4 million and 0.8 million in 1975 (NCD-RisC 2016). HP had maximum average intake of all the nutrients in both the sectors. Further, all the northern hill states had higher average intake of all the nutrients than all-India average intake of all the nutrients. Also, Table 4 suggested that there was perceptible increase in intake of all the nutrients in urban sector of all the northern hill states as well as at national level over the period from 2004–05 to 2011–12. If increase in nutrient intake among the states were compared, it can be perceived that for both rural and urban sectors, UK had comparatively more rise in intake of all the nutrients considered. Among the nutrients, the maximum increase in

intake of fat was observed across all the selected states.

Nutritional contribution of livestock products: Nutritional contribution of livestock products in three northern hill states is given in Table 5. Due to higher consumption of livestock products in the states considered, the nutrients contributed by these products were mostly higher than national average. Among the livestock products, the chief contribution for all nutrients was made by liquid milk because of its ubiquitous consumption. The livestock products accounted for nearly 11–13% and 12–14% of calories in rural and urban sectors, respectively in the states considered. The caloric contribution, in absolute as well as proportional terms, was higher for the northern hill states than the national average in both sectors. As EFM products are protein-rich, their proportional contribution in protein intake from livestock products was higher than the corresponding caloric intake and fat intake. EFM products contributed nearly 41% of the animal-source protein intake at all-India level. Due to dominance of non-vegetarian livestock products in its consumption habits, animal source proteins accounted for more than quarter of total protein intake in JK which was highest among the selected states. In fact, proteins from livestock products accounted for more

Table 5. Nutritional contribution of livestock products in northern hill states

Nutrient	HP		UK		JK		India	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Calories (kcal)... (1)	342.98	351.95	279.51	277.19	320.97	355.44	177.39	235.39
% contribution of MMP (1)	95.94	94.04	94.96	92.16	88.52	89.08	85.22	85.59
% contribution of EFM (1)	4.06	5.96	5.04	7.84	11.48	10.92	14.78	14.41
% contribution of (1) in total calorie intake	12.86	13.38	10.97	11.73	12.93	14.41	7.94	10.67
Proteins (g)... (2)	15.04	14.68	12.42	12.72	17.34	18.85	9.91	12.67
% contribution of MMP in (2)	84.46	77.90	83.62	74.30	63.22	63.98	59.22	59.11
% contribution of EFM in (2)	15.54	22.10	16.38	25.70	36.78	36.02	40.78	40.89
% contribution of (2) in total protein intake	19.92	19.84	17.49	19.16	25.46	28.13	16.32	21.02
Fats (g)... (3)	24.02	25.93	19.46	19.62	21.59	24.13	11.61	15.94
% contribution of MMP in (3)	97.82	96.57	96.78	95.36	94.03	94.58	92.77	92.32
% contribution of EFM in (3)	2.18	3.43	3.22	4.64	5.97	5.42	7.23	7.68
% contribution of (3) in total fats intake	36.39	37.26	33.72	33.26	36.23	36.34	25.18	27.48

*Authors' own estimates using conversion Tables given in NSSO (2014c).

than one-third of RDA for protein in JK while it was nearly 30% and 25% of RDA for protein in states of HP and UK, respectively. Among the nutrients, contribution of fats from livestock products was higher than protein and caloric intake. Livestock products comprised of more than one-third of total fat intake in the northern hill states while at national level the fats contribution of livestock products was more than quarter of the total fats intake.

The study concluded that there was unparalleled consumption of chevon/mutton in JK and HP. There was huge demand for the market curd in urban areas of the hill states. Highest consumption of milk in HP calls for ramping up the cattle productivity. Livestock products contributed a major chunk of proteins (18–28%) and fats (33–37%) in the northern hill states. Consumption of eggs, fish, and meat in UK and HP is very less and therefore, should be promoted. Fat consumption in the selected states has reached disastrous levels and therefore, nutritional education campaigns should be organized to reverse this trend.

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