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Profitability and disposal pattern of milk in underdeveloped hill production system of Meghalaya

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ABSTRACT

Though dairy is regarded as integral part of a farm in the country and contributes significantly to the rural economy, the situation in the North Eastern hills is considered to be different as the production system is underdeveloped. Hence, this article tried to assess the profitability and disposal pattern of milk in Meghalaya state in the North Eastern Hills of India. A sample of farmers (300) from two districts i.e., East Khasi Hills and Ri-Bhoi was drawn randomly. The study reveals that though the net return from local was negative, the cross bred animals are highly profitable. The farmers of the state either sell the milk to the consumers directly or to the co-operative societies. Hence, it is suggested that the rearing of CB animals should be encouraged in the hill region which is considered to be underdeveloped production system.

Key words: Disposal pattern, Hill, Milk, Profitability

Dairy is an integral part of farming systems in India. It supplements the farm income from crops as well as stabilises and sustains it through regular flow of income from milk sale. But in the North Eastern (NE) hill region of India, the dairy production system is different and underdeveloped. The livestock resources in terms of cattle population and dairy infrastructure in terms of number of dairy cooperatives societies, chilling centres or milk processing units are lacking behind other states of India where the production system is either developing or developed. In NE hill states, primarily farmers who are landless or marginal holders rear cattle at the outskirt of the villages. The local cows dominate over the crossbreds and reared mainly for meat purpose.

In contrast to the national scenario, livestock sector is not performing like the crop sector in the NE region. As in 2010–11, the share in value of output from livestock sector was only 14.8% in NE states in comparison to 24.2% in case of all India average and among the NE states, Nagaland (23.3%), Mizoram (22.1%) and Meghalaya (22.1%) were the states among the front runners. During the period of 2004–05 and 2010–11, the crop sector and livestock sector has grown at 3.9% and 4.0 per cent, respectively. The growth in livestock sector was maximum in Arunachal Pradesh (9.8%) whereas, Sikkim has registered negative growth (–0.2%) during the same period (Viswanathan 2015). The number of livestock owning households per 1000 households was 379 in NE states, which was significantly lower than the national average of 423 households and within NE states Sikkim (765), Asom (665) and Arunachal Pradesh (563) were the top three states (GoI, 2014). The population of crossbred animal is only 9.0 lakh which is 6.8% of the total cattle population in the NE states.

About 30% of landless and 48% of marginal households keep livestock in the North Eastern (NE) region (NSSO 2003) and most of the livestock rearers are living below the poverty line. Livestock sector can also generate alternate livelihood to the marginal section of the society. Moreover, in general perception, dairy is not profitable in the underdeveloped hill production system. Hence, the present study has been conducted to estimate the profit in milk production and to study the milk disposal pattern in Meghalaya state of NE region of India.

MATERIALS AND METHODS

Locale of the study: The study was conducted in East Khasi Hills (EKH) and Ri-Bhoi district of Meghalaya state, located in the NE hill region (25°02´N to 26°07´N latitude and 89°49´E to 92°50´E longitudes) of India at the altitude of 60 m to 1950 m above the sea level (msl). EKH district lies between 25°07´N to 25°41´N latitudes and 91°21´E to 92°09´E longitudes. The population of the district is 8.26 lakh and the literacy rate is at 84.15% (Census 2011). Ri-Bhoi district lies between 25°40´N to 25°21´N latitude and 90°55´ E to 91°55´ E longitude. The district is home for 2.59 lakh people and the literacy rate is at 75.67% (Census 2011).

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Livestock sector of Meghalaya: The livestock population of Meghalaya is 1.96 m which is 7.36% of the total livestock of NE region (Livestock Census 2012). Total bovine population of Meghalaya is 0.92 m which is 6.47% of the total bovine population of NE region. Meghalaya has second highest indigenous cows after Asom in NE region. Only 3% of the cattle population is crossbred (CB) in the state in comparison to NE average of 8%. Buffalo population in Meghalaya is minimal with only 2% of the NE buffalo population.West Garo Hills, South West Garo Hills and East Khasi Hills (EKH) are the 3 districts whereabout 59% of the total cattle of the state are found. The total milk production of Meghalaya is 82.16 thousand tonnes in 2013–14 which is 6.60% of the total milk production in NE states. Cow milk constitutes about 97.50% of the total milk produced in the state and within the total cow milk, milk from CB contributed 61.95%. The average productivity of CB cattle in milk in Meghalaya is 7.33 kg/day/animal but the local cows and buffalo are low yielder i.e., 0.34 and 0.96 kg/day/animal, respectively.

Like the all other NE states, absence of organized marketing channels in Meghalaya is one of the major constraints faced by dairy sector of the region. At present, there are only three dairy plants located at Mawiong, Jowai and Tura with a capacity 10,000, 2,000 and 2,000 litres, respectively. Three milk chilling centres are located at Resubelpara, Nongstoin and Latyrke. One creamery and ghee making centre has also been established at Ganol. Thus, the traditional market is the only option available in the region to market the indigenous as well as processed milk products.

Thirty six Dairy Co-operative Societies are functioning within the EKH and Ri-Bhoi District. One Integrated Dairy Development Project (IDDP) is at present functioning covering the two districts of EKH and Ri-Bhoi districts. Two such IDDP projects are under implementation at Jowai and Tura. Milk price is comparatively higher in Shillong as the cost of transportation and storage is costlier in the hills. The retail milk prices in Shillong market increased from Rs 28/l in 2000 to Rs 31/l in 2009 (Feroze *et al.* 2011). The retail milk price has been hiked to Rs 40/l since April 2014. The increase in price is due to increased cost of input as well as mismatch in demand and supply of milk in the state.

Sampling design and data: The study was conducted in two randomly selected districts, i.e. Ri-Bhoi and EKH of Meghalaya. From Ri-Bhoi all the three tehsils, i.e. Umsning, Umling and Jirang were selected and Mylliem, Mawryngkneng and Shella were selected randomly from EKH, for the study. Fifty dairy farmers were selected randomly from each of the selected tehsils, totalling to 150 dairy farmers in a district. Hence, a sample of 300 dairy farmers was selected from two districts of Meghalaya.

Primary data were collected on socio-economic variables and on dairy animals, investment on dairy, milk production, feed and fodder, veterinary expenses *etc.* through structured interview schedule using survey method, during 2013–14.

Estimation of cost of milk production: The general estimation procedure for cost of milk production is given below:

Gross costs = Total fixed cost + Total variable costs

Fixed costs = Depreciation on milch animals + Depreciation on cattle sheds and dairy equipment + Interest on fixed capital investment

Variable cost = Feed and fodder cost + Labour cost + Veterinary cost + Miscellaneous cost

Gross return = (Milk yield * Price) + Value of dung + Value of urine

Net cost = (Total cost – Value of dung – Value of urine)

Net return = Total return – Total cost

Allocation of joint costs: The joint costs include the cost of cattle sheds, cost of dairy equipment, interest on fixed capital, cost of labour and cost of land and allocated based on the Standard Animal Units (SAU) which were estimated based on the body weights of animals (60% weight) and labour utilization (40% weight) (see Annexure I).

Annexure 1

Standard Animals for Eastern and North Eastern region

Type of animal	Adult male	Adult female	Young stock male	Young stock female	Young stock male	Young stock female	Heifer
CB	1.48	1.71	0.41	0.72	0.71	1.08	1.24
Local	1.11	1.00	0.29	0.63	0.55	0.82	0.98

Fixed costs and variable costs: For a dairy enterprise, depreciation on fixed assets like animals, cattle sheds and stores and dairy equipment and interest on fixed capital investment are the fixed costs. Capital recovery cost has been calculated to work out the fixed costs.Variable costs included four items, i.e. feed and fodder cost, labour cost, veterinary cost and miscellaneous cost.

Returns structure

Income from dung: Monetary value of dung was estimated using weighted price of manure and dung-cakes is taken, weights being the utilisation proportion of dung into manure and dung cakes.

Returns from milk production: Milk yield was estimated on actual weighment of milk drawn in pail at the time of milking usually twice a day, i.e. during morning and evening. The money value of the milk consumed by calf was added as cost component and not treated as returns. For the dairy farm households selling milk to more than one agency, the price of milk was calculated on the basis of weighted price paid by the agencies, weighted by the quantity of milk sold to each agency.

RESULTS AND DISCUSSION

Socio-economic status of households: A family in the study area was composed of on an average five members. The average number of male per household was higher than female in a family in Ri-Bhoi whereas, the trend was reverse in EKH district (Table 1). Percentage of literate respondents

Table 1. Socio-economic information of sample households

Particulars		EKH	Ri-Bhoi
Average family size (number)		4.59	5.15
Adult	Male	1.48	1.57
	Female	1.54	1.47
Children	Male	0.88	1.03
	Female	0.69	1.09
Education of head of households (%)			
Illiterate		16.67	3.33
Primary		6.00	52.00
Middle		20.00	20.00
Secondary		13.33	17.33
Higher Secondary		22.00	3.33
Diploma/Certificate course		17.33	0.00
Graduate		2.67	2.67
Occupational pattern (% of HH)			
Principal occupation			
Dairy		46.67	33.33
Agriculture		42.67	56.67
Others		10.66	10.00
Subsidiary occupation			
Dairy		54.67	61.33
Agriculture		11.33	13.34
Others		34.00	25.33

was higher in Ri-Bhoi district (97%) in comparison to EKH district (83%). Majority of the head of the sample households in Ri-Bhoi district has attended primary education whereas, in EKH, majority of them have attended education either up to Higher Secondary or Middle level. Dairy was primary occupation for majority of the respondents in EKH district, followed by agriculture whereas, the trend was reverse in Ri-Bhoi district. The altitude of Ri-bhoi is lower than EKH district which makes crop sector more attractive to the farmers. Dairy was the subsidiary occupation for majority of the households in both the districts under study (Table 1).

Land inventory, cropping pattern, herd composition and asset ownership: The average size of operational holding was 1.67 ha and 1.84 ha in EKH and Ri-Bhoi districts, respectively. Primarily rainfed agriculture is practised in the study area. Only about 34 to 37% of the operational holdings were irrigated (Table 2). Rice as staple crop and ginger as cash crop were cultivated by majority of the farmers in both the districts. In *rabi* season, a number of vegetables (potato, tomato, leafy vegetables *etc.*) were grown in the study area. In Ri-Bhoi district, the farmers allocated some area to pineapple cultivation too. Other crops grown were broom grass, tezpatta, black pepper and arecanut.

Table 2. Average operational land holding and cropping pattern of sample households

Land inventory and cropping pattern	EKH	Ri-Bhoi
Average size of holding (ha)	1.67	1.84
Irrigated area (%)	37.34	34.16
Un-irrigated area (%)	62.46	65.84
Average Area under different crops (cropping pattern in %)		
Rabi		
Vegetables	55.87	44.38
Kharif		
Paddy/rice	34.06	38.56
Ginger	56.95	53.12
Summer		
Pineapple	-	15.21
Area under fodder crops	-	-

Table 3. Composition of milch animals owned by sample households

Category of animal	% households reporting ownership of animals			
	EKH		Ri-Bhoi	
	Local	CB	Local	CB
In milk and not pregnant	48.67	52.67	50.00	52.00
In milk and pregnant	0.00	14.67	0.00	14.67
Dry and pregnant	36.67	20.00	37.33	18.67
Dry and not pregnant	27.33	10.67	22.00	17.33
Dry and unfit for breeding	34.00	11.33	21.33	24.00
Not calved even once	7.33	0.67	10.00	2.00
Pregnant heifer	0.67	0.00	0.00	0.67
Calves less than 1 year				
Male	32.67	7.33	34.00	10.00
Female	40.67	44.00	29.33	51.33
Calves more than 1 year				
Male	17.33	1.33	15.33	0.67
Female	24.00	18.00	16.00	16.67
Adult male	48.67	4.00	49.33	9.33

The majority of the households reported that they have milch animals in milk in both the districts. In case of EKH district, the households reporting animals dry and unfit for breeding was higher in case of local cattle than the CB while, it was opposite in case of Ri-Bhoi district. The percentage of household having local dry animals was higher than the dry CB in both the districts (Table 3).The herd size of the respondent farmers was very small; only about 2 CBs and 1 local cow was in milk per household. The number of animals unfit for breeding was higher in case of local cattle than the CB (Table 4).

Majority of the milch animals were found in lactation order I and II in both the districts. The percentage of local milch animals in lactation order I was higher in Ri-Bhoi

Table 4. Average herd size for the selected households

(Number of animals in SAU)

Category of animal	EKH		Ri-Bhoi	
	Local	CB	Local	CB
In milk and not pregnant	1.45	2.11	0.95	2.02
In milk and pregnant	0.00	2.41	0.00	2.53
Dry and pregnant	1.50	1.00	1.06	0.99
Dry and not pregnant	2.02	0.75	1.36	1.48
Dry and unfit for breeding	2.24	0.58	1.43	0.84
Not calved even once	1.67	0.14	2.11	0.24
Pregnant heifer	1.96	0.00	0.00	1.24

Table 5. Composition of milch animals according to the stage of breeding (%)

Category of animal	EKH		Ri-Bhoi	
	Local	CB	Local	CB
Lactation order				
I	33.23	49.05	43.78	44.27
II	34.48	31.56	34.56	32.44
III	15.99	9.51	11.06	12.60
IV	10.66	6.08	9.68	6.87
Age at first calving (months)	30.68	36.51	35.35	35.35

than in EKH district and the trend was reverse in case of CB animals (Table 5). Animals in lactation order IV was higher in case of local animals than the CB in both the districts. The average age at first calving was about 3 years in both the districts for CB and local cattle which was higher than the normally reported in plain areas in the country but similar findings have been reported by ICAR for NE Hill region in their Annual Report 2010–11 (ICAR for NEH 2011). Exception was found that the age at first calving is lower in case of local cattle than CB which is due to the fact that local animals are left loose and in that natural breeding is common whereas, in case of CB artificial insemination is practiced where the farmers many a time fail to recognize the animal in heat and moreover, poor feeding adds to it.

Most of the respondent households also owned small equipment such as baskets, feeding trough, milk cans, milking buckets, ropes, water tanks etc. (Table 6). Though all the households had animal sheds but they did not have separate store for feed and fodder and separate mangers.

Table 6. Ownership of equipment for dairying by the sample households (% of HHs)

Item	EKH	Ri-Bhoi
Civil structure		
Animals shed	100.00	100.00
Store for storage of feed and fodder	00.00	02.00
Manger	00.00	02.00
Open space	00.00	00.00
Equipment and machinery		
Baskets	67.33	84.00
Feeding trough	57.33	53.33
Milk Cans	86.00	60.67
Milking buckets	99.33	28.00
Ropes	98.00	99.33
Water tank	80.67	60.67
Others	3.33	1.34

Feed consumption pattern: Stall feeding was practised primarily for CB animals. The dry fodder, green fodder and concentrate intake were significantly higher in CBs (Table 7). Green fodder was primarily fed to the CBs only in stall feeding mode and local cows were dependent on grazing. Mainly the road side, post harvesting field, canal land were used for grazing for which they did not pay any charges. The conditions of grazing land were reported to be good by more than 89% of the sample households in both the districts (Table 8). Grass and leaves were abundantly available in the forest and used as dry fodder too. In addition, little amount of salt as mineral was also added to the feed of the animals (Table 7).

Table 7. Feed consumption pattern for different categories of animals: Stall-fed quantity (kg/animal/day)

Particular	EKH		Ri-Bhoi		Meghalaya	
	Local	CB	Local	CB	Local	CB
Dry fodder hay	5.00	9.24	5.61	9.36	5.31	9.30
Green fodder grass and leaves	6.00	23.88	-	23.41	6.00	23.65
Concentrates purchased	2.06	3.38	2.36	3.26	2.21	3.32
Supplements salt	0.07	0.15	0.11	0.16	0.09	0.16

Table 8. Grazing detail of animals as percentage of household reported

Grazing of animals	EKH	Ri-Bhoi
Site of grazing		
Road side	54.67	26.00
Post harvesting field	46.00	50.67
Canal land	54.67	50.00
Government land	16.00	32.67
Pasture	0.00	0.00
Any other	0.00	0.67
Condition of grazing land		
Good	89.61	94.74
Fair	10.39	5.26
poor	0.00	0.00
Grazing charges paid (₹)	0.00	0.00

Economics of milk production: The net cost per day per animal is calculated to be ₹ 70.95 and ₹ 160.95 for local and CB, respectively in Meghalaya (Table 9). It is comparatively higher in EKH than Ri-Bhoi district for CB due to higher feed cost. The variable costs constituted the major share in total cost. The total variable cost was as high as 95% in case of local animals and 90% in case of CBs, remaining being the total fixed cost which comprises of Capital Recovery Cost (CRC) on animals, civil structure, equipment *etc.* No land rent was charged in the study area. In case of Nepali dairy farmers, they gave away the dung to the owner of the land.

Feed cost and the labour cost were the major cost components within the total variable costs. The average wage ranged from ₹ 161 to ₹ 176 in case of women labourers where as it was high as ₹ 268 to ₹ 342 in case of male labourers. The share of feed cost was 71% in case of local animals and 76% in case of CBs in Meghalaya. The local animals were mainly fed on grazing. The dry fodder and

Table 9. Cost and returns of milk production from local and CB animal (₹/animal/day)

Cost component	EKH		Ri-Bhoi		Meghalaya	
	Local	CB	Local	CB	Local	CB
Total fixed cost	4.09	18.28	4.54	18.16	4.31	18.22
Total feed cost	55.23	128.82	54.58	111.61	54.91	120.22
Labour cost	21.42	33.33	20.58	35.19	21.00	34.26
Total variable cost	77.97	164.39	77.14	150.17	77.55	157.28
Gross cost	82.05	182.67	81.67	168.32	81.86	175.50
Value of dung	10.98	14.64	10.84	14.45	10.91	14.55
Net cost	71.07	168.03	70.84	153.87	70.95	160.95
Sale price of milk (₹/l)	35.08	35.08	33.74	33.74	34.41	34.41
Milk (l/day) production	1.24	9.24	1.22	8.77	1.23	9.01
Gross return	43.85	324.17	41.05	295.75	42.45	309.96
Net return	-27.22	156.14	-29.79	141.88	-28.50	149.01
Cost per litre (₹/l)	60.06	17.32	57.95	16.19	59.01	16.76
Net return per litre (₹/l)	-24.99	17.76	-17.43	17.55	-21.21	17.65

concentrates were given to pregnant and sick animals which were a few only. The imputed charge of grazing is included in labour charge as it is not included in feed cost as grazing was free of cost in the study area.

The gross return per local animal per day was very low due to low productivity of the local animals which makes the enterprise non-profitable across the districts but it is to note that the tribal people of Meghalaya rear local cow primarily for beef purpose. The sales of large and small animals actually add to the annual income to the cattle keepers.

The price was of dung (dried) was about ₹ 5.00/kg in the study area as the demand for cow dung was high as manure. The net returns from milk production were positive for CB. The cost of milk production for CB was ₹ 16.76/l and the net return was ₹ 17.65/l. This higher net return was due to high price realization for milk in the study area and high productivity of CB animals.

Production and disposal pattern of milk: On an average, milk production was 14.86 l/household in EKH which was higher than the average milk production of 13.75 l/ household in Ri-Bhoi district of Meghalaya (Table 10). The percentage of milk disposal was significantly higher in EKH (85%) in comparison to Ri-Bhoi district (67%).As Shillong is located in EKH, the consumer demand for liquid milk is relatively higher in EKH district. It was found that in EKH all the households sold the milk whereas, in Ri-Bhoi district only 121 households sold milk to different agencies. More than half of the total production was sold to the consumer directly in both the districts (Table 10). The cooperative society was found to be the next important agency (43% in Ri-Bhoi and 39% in EKH district) through which milk was disposed in the study area. The prices received from the consumers (more than ₹ 34/l) were higher than the price received from the Cooperative Societies (maximum of ₹ 31.67/l) but, in both the cases theprices realized by the dairy farmers across the seasons were quite encouraging (*see* Annexure II).

Table 10. Production, sale and disposal pattern of milk

	EKH	Ri-Bhoi
Milk production (l/day)		
Average milk produced	14.86	13.75
Maximum milk produced	64.00	75.00
Minimum milk produced	1.00	0.50
Median of quantity produced	9.50	10.15
Average quantity of milk sold (l/day)	13.83	12.39
Household selling milk agency wise (%)		
Consumer	59.63	51.83
Vendor/middlemen	0.00	0.86
Sweet shop/creameries	0.00	2.22
Cooperative society	38.79	43.38
Private milk plant	0.00	0.00
Other	1.58	1.72

Annexure2

Average unit price received from various agencies (₹/l)

Agencies	EKH			Ri-Bhoi		
	Summer	Rainy	Winter	Summer	Rainy	Winter
Consumer	35.52	37.61	34.57	35.00	34.05	34.83
Vendor/ middlemen	-	-	-	-	35.00	-
Sweet shop/ creameries	-	-	-	-	30.00	35.00
Cooperative society	31.67	-	31.50	-	-	30.71
Private milk plant	-	-	-	-	-	-
Others	35.00	36.00	34.17	35.00	36.00	33.33

The study found that local cows were reared for meat purpose and the CBs for milk purpose in the study area.The share of variable cost in total cost of milk production was highest, and within the variable costs, costs incurred in feed and labour were the major cost components. The local cows were very low yielders and return from milk was not profitable but the return from milk in case of CBs was profitable due to higher milk yield. Most of the milk produced was either sold to the consumers directly or to the cooperative societies. The average price for milk received was satisfactory in Meghalaya. The study concludes that dairy has positive role in augmenting the farm income even in the underdeveloped hill production system if CBs are included in the farm unit. It is suggested

that to realize greater impact on rural economy of Meghalaya as well as in the NE region rearing of CBs should be encouraged as quality green grasses are abundantly available in the hills and the weather condition is conducive for rearing CB cattle.

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