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Is It Rational to Rear Crossbred Cow in the Hills of Meghalaya? Economics of Milk Production

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ABSTRACT

The present paper tries to find out whether the crossbred cow is economically viable in the hills of Meghalaya. Primary data were collected from 300 dairy farmers in 2013-14. The analysis revealed that share of feed cost was maximum in the total variable cost and it was followed by labour cost in case of local and CB cows in both the districts. The rearing of local cows for milk production is economically unviable whereas, the crossbred cows are economically viable at least in the short-run. Hence, it is recommended that government should encourage for rearing of CB in Meghalaya as it has the potential to augment income of rural households of the hill region.

1. Introduction

The livestock density in the North Eastern (NE) hill region of India is comparatively lesser than in the plain lands of India. Per 1000 households there are 379 households in NE states in comparison to 423 households in India that reported to own livestock (GoI 2014). Pigs are popular in comparison to other animals as pork is part of daily diet of the people and moreover due to its prolific birth rate makes it a profitable enterprise. Local cattle are reared for beef purpose (Feroze *et al.,* 2016) and used in land tilling. The cattle for milk purpose are reared by the nepali owners or sometime the local tribal people own the animals and they engage permanent nepali labourers for rearing those. The animals are reared at the outskirt of the villages in the hills so as to keep the villages clean. Population of crossbred cow is very less in the hills as they are costly and the demand for milk and milk products in the villages is very low; demand being confined to primarily surrounding the town areas only. At one hand, the local cattle are low yielders which make them non-remunerative vis-à-vis dairy; on the other hand, people were sceptical about performance of the exotic or crossbred (CB) animals in the hills. With constant government support through schemes like Integrated Dairy Development Project, the number of CBs has increased in Meghalaya. If rearing of CBs turn out to be remunerative then it can be an alternative source of income and employment for the region, as well as complement the farm yard manure requirement for the organic agriculture practiced in the hills. Hence, this study is an attempt to find out whether the CBs can be economically viable or not in Meghalaya, one of the hill states in the NE hill region.

2. Methodology

The study was conducted in two purposively selected districts *i.e.* East Khasi Hills (EKH) and Ri-Bhoi of Meghalaya, as they ranked 1st and 2nd in case of CB population in the state. From Ri-Bhoi, all the three blocks/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 dairy animals, investment on dairy, milk production, feed and fodder, veterinary expenses *etc.* through structured interview schedule using survey method, during 2013-14.

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2.1 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 standard animal units (SAU) were re-estimated based on the body weights of animals (60 per cent weight) and labour utilization (40 per cent weight). The estimated SAUs are presented in Table 1.

Capital Recovery Cost: The formula for estimation of capital recovery cost (CRC) is:

$$R = Z\left[\frac{(1+r)^n.r}{(1+r)^n - 1}\right]$$

Where,
R= Capital recovery cost, Z= Initial value[1] of the capital asset, r = Current interest rate, n = Useful life of the assets/animal

Returns from milk production

◦***Estimation of milk yield:*** Estimation of milk yield was done on actual weighment of milk drawn in pail at the time of milking usually twice a day, *i.e.* during morning and evening. The thumb rule is:

◦ Lactation yield = Peak yield * 200

3. Results and Discussion

The herd size was small in the study area (Table 2). The number of animal in milk was higher in case of CB cows than local cows. The herd size was bigger in EKH in case of local cows and it was opposite in case of CB cows. The investment made on civil structure was higher in EKH than Ri-Bhoi but it was reverse in case of investment on CB cows (Table 3).

4. Cost of milk production

The gross costs per day per local cow were ′87.03, ′72.28 and ′86.85 in summer, rainy and winter season, respectively in the EKH district whereas, it was lower in summer season (′68.65) than rainy (′90.08) and winter (′86.29) in Ri-Bhoi district (Table 4). The gross cost per day per CB cow was higher in rainy season *i.e.* ′192.66 than the summer (′170.05) and winter season (′185.31) in EKH district whereas, it was lower in Ri-Bhoi district (′158.44 in summer, ′171.54 in rainy and ′174.99 in winter) than the EKH district across the seasons (Table 5).

Table 1. Standard Animal Units 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

Table 2. Average herd size and households reporting ownership of cows (SAU/household)

Category of animal	EKH		Ri-Bhoi	
	Local	CB	Local	CB
In milk	1.45	2.26	0.95	2.28
Dry	1.92	0.78	1.28	1.10
Not calved even once	1.67	0.14	2.11	0.24
Pregnant heifer	1.96	0.00	0.00	1.24
Female calves				
Less than 1 year	0.59	0.69	0.28	0.73
More than 1 year	0.83	0.63	0.57	0.75

[1]Instead of initial value of capital assets, the current value of asset may be considered due to practical difficulties in getting the information on initial outlay

Table 3. Investment in dairy by the sample households(`per SAU)

Item	EKH	Ri-Bhoi
Civil structure	5553.76	3505.72
Dairy equipment and machinery	411.14	219.69
Milch animals		
Local	17881	17843
CB	45513	47279

Table 4. Season wise cost and returns of milk production from local cow (`/cow/day)

Cost component	EKH			Ri-Bhoi		
	Summer	Rainy	Winter	Summer	Rainy	Winter
Capital Recovery Cost						
CRC on animals	3.31	0.98	2.30	2.61	3.42	3.11
CRC on civil structures	1.15	1.81	1.15	0.95	1.08	1.12
CRC on equipment	0.36	0.78	0.42	0.51	0.34	0.42
Land rent	0.00	0.00	0.00	0.00	0.00	0.00
Total fixed cost	4.82	3.57	3.87	4.07	4.89	4.65
Green fodder	0.00	0.00	0.00	0.00	0.00	0.00
Dry fodder	28.56	0.00	7.02	0.00	15.17	15.76
Concentrate	38.56	29.71	49.54	47.28	43.75	38.29
Grazing	0.00	0.00	0.00	0.00	0.00	0.00
Others	0.80	0.70	0.80	1.10	1.10	1.30
Total feed cost	67.92	40.41	57.36	48.38	60.02	55.35
Labour cost	12.97	27.03	24.27	14.53	23.25	23.95
Hired	0.00	14.12	11.32	5.72	9.42	10.21
Family	12.97	12.91	12.95	8.81	13.83	13.74
Veterinary expenses	0.50	0.44	0.50	0.58	0.60	0.47
Miscellaneous expenses	0.82	0.83	0.85	1.09	1.32	1.87
Total variable cost	82.21	68.71	82.98	64.58	85.19	81.64
Gross cost	87.03	72.28	86.85	68.65	90.08	86.29
Value of dung	9.99	11.84	11.12	10.06	10.55	11.90
Value of urine (if any)	0.00	0.00	0.00	0.00	0.00	0.00
Net cost	77.04	60.44	75.73	58.59	79.53	74.39
Sale price of milk (`/L)	34.04	37.45	33.75	35.00	32.64	33.57
Milk production (L/ day)	1.20	1.53	0.99	1.04	1.31	1.31
Gross return	40.85	57.30	33.41	36.40	42.76	43.98
Net return	-36.19	-3.14	-42.32	-22.19	-36.77	-30.41
Cost per litre (`/L)	64.20	39.50	76.49	56.34	60.71	56.79
Net return per litre (`/L)	-30.16	-2.05	-42.75	-21.34	-7.72	-23.22

Note: CRC is capital recovery cost

The cost structure of milk production revealed that variable costs constitute the major share in total cost. The total variable cost was as high as 95%in case of local cows and more than 88% in case of CB cows across the seasons and districts; and remaining was the total fixed cost and within the fixed cost the CRC has the major share. The CRC was significantly higher in case of CB cows than the local cows due to considerable high value of CB cows. No land rent was charged in the study area. The total variable cost was lowest in summer season for CB cows in both the districts and for local cows in Ri-Bhoi district. Feed cost and the labour cost were the major cost components within the total variable cost. Similar findings were reported in earlier studies too (Bardhan and Sharma 2012; Baral and Bardhan 2016).

Table 5. Season wise cost and returns of milk production from CB animal (`/cow/day)

Cost component	EKH			Ri-Bhoi		
	Summer	**Rainy**	**Winter**	**Summer**	**Rainy**	**Winter**
Capital Recovery Cost						
CRC on animals	15.26	11.42	18.48	12.99	17.18	17.70
CRC on civil structures	1.97	1.33	0.72	0.77	0.51	0.63
CRC on equipment	0.61	1.33	0.72	0.77	0.51	0.63
Land rent	0.00	0.00	0.00	0.00	0.00	0.00
Total fixed cost	**17.84**	**15.84**	**21.16**	**15.17**	**19.30**	**20.00**
Green fodder	23.56	23.58	24.50	22.50	26.78	25.73
Dry fodder	32.24	52.20	30.57	18.03	24.51	32.55
Concentrate	70.37	61.27	63.77	73.53	56.45	49.96
Grazing	0.00	0.00	.0.00	0.00	0.00	0.00
Others	1.60	1.30	1.50	1.50	1.50	1.80
Total feed cost	**127.77**	**138.35**	**120.34**	**115.56**	**109.24**	**110.04**
Labour cost	**22.18**	**36.30**	**41.51**	**24.86**	**39.75**	**40.95**
Hired	0.00	14.12	19.36	9.79	16.11	17.46
Family	22.18	22.08	22.15	15.07	23.64	23.49
Veterinary expenses	0.85	0.75	0.85	0.99	1.03	0.81
Miscellaneous expenses	1.41	1.42	1.45	1.86	2.22	3.19
Total variable cost	**152.21**	**176.82**	**164.15**	**143.27**	**152.24**	**154.99**
Gross cost	**170.05**	**192.65**	**185.31**	**158.44**	**171.54**	**174.99**
Value of dung	13.32	15.78	14.82	13.41	14.07	15.87
Value of urine (if any)	000	0.00	0.00	0.00	0.00	0.00
Net cost	156.73	176.88	170.49	145.03	157.47	159.12
Sale price of milk (`/L)	34.04	37.45	33.75	35.00	32.64	33.57
Milk production (L/day)	9.16	9.18	9.39	8.44	8.64	9.23
Gross return	311.81	343.79	316.91	295.40	282.01	309.85
Net return	155.08	166.91	146.42	150.37	124.54	150.73
Cost per litre (`/L)	**17.11**	**19.27**	**15.59**	**17.82**	**14.41**	**16.33**
Net return per litre (`/L)	**16.93**	**18.18**	**18.16**	**17.18**	**18.22**	**17.24**

The share of feed cost ranged between 58-83% and 71-84% of the total variable cost across the seasons and districts for local and CB cows, respectively. The local cows were primarily fed on grazing and for CBs stall feeding was practised. The imputed charge of grazing was included in labour charge as grazing was not charged in the study area. Only the CB cows were fed green fodder through stall feeding mode, except in rainy season in EKH. Labour cost contributed 16-39% and 14-26% of the total variable cost in case of local and CB cows, respectively. The labour charge was higher in rainy and winter seasons in comparison to summer season because of the high demand of labour during *kharif* paddy and *rabi* vegetable season. Family labour constitutes a major chunk of total labour employed in a farm and specifically in small farms. Mainly male labourers were hired in daily wage basis. They were engaged in cleaning of animal shed, feeding the animals, milking, cutting and fetching grasses and leaves from forest *etc.* The child labourers were engaged as permanent labourer; they grazed the animals and cut the grasses and leaves for animals. In addition to salary, their food, clothing and medical expenses were met by the employers. Except a few cases in EKH, women were not engaged as permanent labourer.

5. Return structure

The highest productivity of milk was recorded to be 1.53L/ local cow in rainy season in EKH (Table 4). Whereas, milk productivity ranged from 8.44 L/animal/day to 9.39 L/animal/day in case of CBs in the study area. It was highest in winter season and lowest in summer season across the districts (Table 5).

The gross returns per local cow per day were very low due to low productivity of the local animals which makes the enterprise non-profitable across season and districts (Table 4). But it is notable that the tribal people of the state rear the local cow only for beef purpose. So, the sales of large and small animals actually generate annual income to the cattle keepers. So, looking into prism of milk production and linking it to the profitability aspect will be misleading. The gross returns per day per CB cow from milk were found to be higher in EKH (`312, `344 and `317) in comparison to Ri-Bhoi district (`295, `282 and `310) in summer, rainy and winter seasons, respectively (Table 5). The net returns 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.

Conclusion

The study revealed that significant proportion of the gross cost of maintenance was variable cost. Share of feed cost was maximum in the total variable cost and it was followed by labour cost in case of local and CB cows in both the districts. The net cost was highest in summer season in EKH whereas it was highest in rainy season in Ri-Bhoi district in case of local cows due to comparatively high feed and fodder cost. The very low level of productivity has led to very high cost of maintenance and per litre cost of milk production making dairy unprofitable in case of local cows in both the districts. The gross cost was higher in EKH hills than Ri-Bhoi district across the seasons in case of CB cows. Milk productivity was highest in winter season and lowest in summer season. Unlike, local cows the net returns per litre of milk turned out to be positive and it was highest in rainy season, followed by winter and summer season in both the district. The net return per litre of milk was higher in EKH district than Ri-Bhoi in winter season and it was reverse in other seasons. The rearing of local cows for milk production is economically unviable whereas, the crossbred cows are economically viable at least in the short-run. As the daily cost of maintenance does not increase proportionally with the productivity of CBs, only way to enhance economic viability of dairy farming is through yield improvement, by disseminating region specific scientific breeding, feeding, health care and management practices. It is recommended that government should encourage for rearing of CB in Meghalaya as it has the potential to augment income of rural households of the hill region.

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Annexure

Seasonal average prices of inputs and outputs (`)

Items	Summer		Rainy		Winter	
	EKH	Ri-Bhoi	EKH	Ri-Bhoi	EKH	Ri-Bhoi
Feed and fodder (per kg)						
Dry fodder: Hay	3.57	2.45	5.22	2.89	3.51	2.64
Green fodder	0.00	0.00	0.00	0.00	0.00	0.00
Concentrate: Prepared cattle feed (Purchased)	19.28	20.83	20.63	17.63	17.23	16.37
Labour wages (per person day)						
Men	296.40	267.76	342.00	249.60	328.60	288.63
Women	163.40	161.02	175.80	163.80	174.80	156.47
Child	120.00	98.38	156.67	140.00	120.00	106.67
Rental value of land	0.00	0.00	0.00	0.00	0.00	0.00
Salvage value of adult animals						
CB cow	20600	20857	21867	19969	20375	19886
Local cow	12231	13795	16243	12100	14538	13100
Dung	4.44	4.47	5.26	4.69	4.94	5.29
Dung used as manure (%)	100	100	100	100	100	100
Milk(`/L)	34.02	35.00	37.57	33.96	33.37	33.01

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