Economic analysis of dairy cattle farms under town milk supply scheme in Jorhat district of Assam

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Abstract: Dairy development has assumed significant importance in the rural economy of India due to its immense potential for supplementing income and employment generation for the rural people. Recently, under the Town Milk Supply Scheme, Government of Assam has attempted to increase the milk production under organized sector. Present study is an attempt to study the economics of organized dairy cattle farms in Jorhat district of Assam started under the scheme. The study was done by selecting 100 commercial dairy farmers under organized dairy sector in Jorhat district of Assam. In the study area 81 dairy farmer found to be small category, 10 dairy farmers were identified to be in medium category and nine dairy farmers were in large category of dairy farmer. The total milk production in 100 sample dairy farms was reported as 3445 litres per day with average milk production of 8.79 litres per day per milch animal. The total milk production per day per farm in small dairy farms was observed as 21.57 litres, in medium dairy farms as 58.7 litres and in large as 123.44 litres. Overall the average milk production per farm in 100 sample households was estimated to be 34.45 litres per farm per day. With more than 94 percent of the investments the dairy cattle's especially the cross breed and Indian breed accounted for the maximum share of the investments. A return of Rs. 812.68 per farm per day in small

category of dairy farms, Rs. 2210.85 per farm per day in medium category of dairy farms, Rs. 4497.81 per farm per day in large category of dairy farms was observed. The income from sale of milk constituted the maximum proportion of the income (more than 98 percent) in all the categories of the dairy farm. The returns from sale of manure/cow dung and male calves also contributed to the total income but in minimal way. It was observed that the profit per farm per day increased from Rs. 248.53 from small farms to Rs. 690.86 in medium farms to Rs. 773.9 in large dairy farms. Feed cost influence was positive and significant. Hence, increase in the use of feed would increase the revenue from dairy farms by 1.66 percent.

Keywords: Cost and Returns, Dairy farmers, Organized Dairy Sector, Resource Use Efficiency

Introduction

Dairying in India, over the years, apart from insuring nation's nutrition, has been recognized as an instrument for social and economic development. Dairy has an important role in improving the overall economic conditions of rural India (Dhanabalan, 2009). There are proven evidences that dairy farming has emerged as a major allied enterprise for supplementing the income of farmers (Singh and Joshi, 2008; Ramakrishnappa, 2006). There are also evidences that dairy sector contributes significantly in generating employment opportunities and supplementing the income of small and marginal farmers by providing them food security (Kakaty and Gogoi, 2001). Thus, dairy development has assumed significant importance in the rural economy of India due to its immense potential for supplementing income and employment generation for the rural people. As a result, the milk production in India, which was around 17-22 million tonnes in the 1960s, has increased to 165.4 million tonnes in 2016-17 (Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture, GoI). India's milk production is estimated to have increased by 6.6 per cent from 165.4 million tonnes during 2016-17 to 176.35 million tonnes during 2017-18 (GoI, 2018). In fact India ranks first in the world in milk production. As per the vision 2022 document the projected milk production by 2021-22 is 254.5 million tonnes. Similarly, per capita availability of milk has increased from 178 grams per day in 1991-92 to 307 grams in 2013-14 to 355 grams in

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the year 2016-17. Similarly, the income of dairy farmers increased by 23.77 percent in 2014-17 compared to 2011-14 (The Hindu, 28th December, 2017; Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture, GoI, 2017).

With 2.4 per cent of the country's total geographical area and 2.6 per cent population of the Country, the State of Assam is situated in the North-Eastern region of India. The State has total cropped area of 40.83 lakh hectares (2014-15) with net sown area of 28.27 lakh hectares. Though agriculture is considered as the mainstay of the economy of Assam and agriculture and allied activities in Assam do continue to be the dominant sources of livelihood for majority of its people, it is also a fact that agriculture in the State is characterized by low level of productivity due to recurring natural calamities, low level of mechanization, inadequate availability of quality inputs, poor soil health, low level of assured irrigation and inadequate marketing infrastructure. In fact about 83 per cent of the total land holdings are small and marginal and is a major concern for formulation of any agricultural development strategy. This necessitates the importance of allied sectors like dairy in States economy (Kakaty and Das, 2017).

Interestingly, in the state of Assam, organized development of dairy processing infrastructure was initiated even before the launch of OF (Operation Flood) Phase-I. The first processing plant in the state was established at Jorhat in 1966 with daily milk processing capacity of 5,000 litres (Sirohi et al. 2009). However, in spite of that, the present estimated production of milk in the district is about 70000 litres per day as against the total demand of 160000 litres per day and this gap is bridged by importing milk from Dimapur and other places (Progress report of dairy development in Jorhat and Golaghat District, Town Milk Supply Scheme, Jorhat, 2013). Recently, under the Town Milk Supply Scheme, Government of Assam has attempted to increase the milk production under organized sector in the district. Present study is an attempt to study the economics of organized dairy cattle farms in Jorhat district of Assam started under the Town Milk Supply Scheme, Government of Assam. The findings of this study shall help in the formulation of a comprehensive dairy development plan which may lead to bridge the existing demand-supply gap of milk in the district.

Materials and methods

Jorhat district in State of Assam was purposively selected as in spite of the first processing plant of the State being established in 1966 (Sirohi et al. 2009), there is still huge demand supply gap in the district (Progress report of dairy development in Jorhat and Golaghat District, Town Milk Supply Scheme, Jorhat, 2013). Total geographical area of Jorhat district is 2,859.35 sq km. equivalent to 3.63 percent of the state. The district consists of 3 civil subdivisions, 8 development blocks and 111 Gaon panchayats with 866 revenue villages. Jorhat district consists of one municipality and 6 towns. The study was done by selecting

100 commercial dairy farmers under organized dairy sector in Jorhat district of Assam. The organized sector sample farmers were drawn from randomly selected DUSS namely Surabhi DUSS, Chitrallekha DUSS, Sonali DUSS, Titabor, Swarnadhenu DUSS, Amrit DUSS, Paschim Titabor DUSS, Panchamukhi DUSS, Dahikhur Bhuyanchuk DUSS, Lakhimi DUSS, Lachit DUSS, Phesual DUSS. The random selection was done by preparing the list of dairy farms and dairy farmers operational under Town Milk Supply Scheme, Jorhat. The list was taken from the Office of the Assistant Dairy Development Officer, Town Milk Supply Scheme, Rowriah, Jorhat.

To achieve the specific objectives of this study, necessary data were collected from dairy farmers through personal interviews by using schedules. The schedules were constructed after following an extensive review of literature, discussion with experts and pilot survey. Information was sought on the milk production practices adopted by the milk farmers in the study area and the average price farmers received for the milk. The time series data for different periods were collected from the State level reports published by Directorate of Economics and Statistics, Government of Assam. "Basic Statistics of NER" published by North Eastern Council, Shillong was considered. Secondary data was also collected from various websites and report of various committees, etc.

Both tabular and functional analyses with econometrical tools were utilized for the analysis of the data and logical interpretation of the different aspects and results of the study. The Cumulative Square Root frequency procedure of stratum construction (Dalenius and Hodges, 1959) was carried out for the division of dairy farmers into L strata. To understand the changes in milk production, growth rate and stability examination was done by working out compound annual growth rate, standard deviation and coefficient of variation. To understand the economics of milk production, the cost of milk production and capital investment was estimated. The interest on the fixed capital was worked out based on prevailing rate of interest i.e. 7 percent per annum (RBI, 2016, 17). Depreciation on fixed asset was calculated separately for milch animals, cattle shed (the cowsheds found in the study area were semi pucca- buildings in nature), machinery and equipments (Ghule et al. 2012) as given below:

Crossbred cows- 8 per cent (productive life 12.5 years),

Local cows- 10 percent (productive life 10 years)

Depreciation rates for semi- pucca building was worked out as 5 percent, for Bicycle was 8.33 percent, for Chaff-cutter as 10 percent and for Milk cans and patty items as 20 percent.

The resource-use efficiency of the inputs used by the dairy farms was estimated using Cobb-Douglas (CD), formula given by

Charles Cobb and Paul Douglas in 1928 production function, as given below.

$$Y = a X_1^{b_1} X_2^{b_2} X_3^{b_3}$$

Where, Y is the revenue from farm (income from selling of milk and male calf and cow dung in rupees per day); X₁, X₂ and X₃ denotes feed cost, miscellaneous expenditure and labour cost in rupees per day.

The estimated coefficients of significant independent variables were used to compute the marginal value products (MVP).

$$\text{where, } MVP_i = \hat{a}_i \frac{\bar{Y}}{\bar{X}_i}$$

Here, MVP_i = Marginal value product of the ith input, $\bar{Y}$ =

Geometric mean of the value of output, $\bar{X}_i$ = Geometric mean of the ith input, $\hat{a}_i$ = Estimated co-efficient (or) elasticity of the ith input.

The economic efficiency of resource use was estimated as

$$r = \frac{MVP}{MFC}$$

where, MFC_i = Marginal Factor Cost (i.e. cost of one unit of a particular resource)

Decision rule: If $r = 1$, resource is efficiently utilized; $r > 1$, resource is underutilized and $r < 1$, resource is over utilized

Economic optimum was taken place where MVP = MFC. If r is not equal to 1, it is suggested that resource are not efficiently utilized. Adjustments could be therefore, be made in the quantity of input used and costs in the production process to restore $r = 1$.

Results and discussion

Distribution of sample dairy farms

Table 1 presents the distribution of sample dairy farms. As mentioned earlier, data were collected from 100 sample dairy farms from organized dairy sector. Based on Cumulative Square Root frequency of stratification (Jaiswal and Singh, 2015; Singh, Chauhan and Yogi, 2014; Ghule, Verma, Cahuhan and Sawale, 2012 and Khoveio, Jain and Das, 2016), the sample dairy farms were grouped into three categories viz. small (up to 5 milch animals), medium (6-10 milch animals) and large (11 milch animals and above). In organized dairy sector 81 dairy farmer found to be small category, 10 dairy farmers were identified to be in medium category and nine dairy farmers were in large category of dairy farmer. Here it is to be mentioned that the dairy farmers in organized dairy sector have taken dairy farming under the initiative of TMSS (Town Milk Supply Scheme) very recently with one or two dairy cows.

Distribution of cattle in sample dairy farms

Table 2 presents the distribution of cattle in sample dairy farms in organized dairy sector as 213 milch cows, 17 dry cows, 13 heifer

Table 1 Distribution of sample dairy farms

Sl. No	Category of dairy farmers	Sample size (in numbers)		
		Organised dairy sector	Unorganised dairy sector	Total
1	Small (up to 5 milch animals)	81	8	89
2	Medium (6-10 milch animals)	10	42	52
3	Large (11 milch animals and above)	9	50	59
4	All	100	100	200

Sub: Authors Calculations Based on Field Survey

Table 2 Distribution of cattle in dairy farms

Sl. No.	Cattle	Categories of Dairy Farms			
		Small	Medium	Large	Total
1	Milch Cow	213	63	116	392
2	Dry Cow	17	04	31	52
3	Heifer	13	07	11	31
4	Calf	33	09	24	66
	All	276	83	182	541

Sub: Authors Calculations Based on Field Survey

and 33 calves by small category of dairy farms. Medium category of dairy farms reported 63 milch cows, 4 dry cows, 7 heifer and 9 calves. Large category of dairy farms reported 116 milch cows, 31 dry cows, 11 heifer and 24 calves. The entire 100 sample dairy farms 392 milch cows, 52 dry cows, 31 heifer and 66 calves were noted. A total of 541 cattle were observed in 100 sample dairy farms with 276 in small

Distribution of cattle breeds in sample dairy farms

Table 3 presents the distribution of cattle breeds in sample dairy farms in organized dairy sector. Three categories of cattle breeds were observed in sample dairy farms. These are local (non-descript), Indian breed and Crossbreed. In small category of dairy farms two cows of local breed (two milch cows), 11 cows of Indian breed (11 milch cows) and 217 cows of cross breed (200 in milch and 17 in dry) were reported. In medium category of dairy farms four cows of local breed, three cows of Indian breed and 60 cows of cross breed (56 in milch and four in dry) were reported. In large category of dairy farms 5 cows of Indian breed (5 milch cows) and 142 cows of cross breed (111 in milch and 31 in dry) were reported. Overall in 100 sample dairy farms 6 local, 19 Indian breed and 419 crossbreed (367 in milch and 52 in dry) were reported.

Milk production by sample dairy farms

Table 4 presents the milk production information by sample dairy farms of the organized dairy sector. The total milk production in

81 samples of small dairy farms was reported as 1747 litres per day with average milk production of 8.20 litres per day per milch animal. The total milk production in 10 samples of medium dairy farms was reported as 587 litres per day with average milk production of 9.32 litres per day per milch animal. The total milk production in nine samples of large dairy farms was reported as 111 litres per day with average milk production of 9.58 litres per day per milch animal. The total milk production in 100 sample dairy farms was reported as 3445 litres per day with average milk production of 8.79 litres per day per milch animal. The total milk production per day per farm in small dairy farms was observed as 21.57 litres, in medium dairy farms as 58.7 litres and in large as 123.44 litres. Overall the average milk production per farm in 100 sample households was estimated to be 34.45 litres per farm per day. The total milk production from crossbreed per day per farm in small dairy farms was observed as 1609 litres, in medium dairy farms as 543 litres and in large as 1051 litres. Overall the total milk production from cross breed per day per farm in 100 sample households was estimated to be 3203 litres per day. The average milk yield from crossbreed per day per milch animal in small dairy farms was observed as 8.05 litres, in medium dairy farms as 9.70 litres and in large as 9.47 litres. Overall the average milk production from cross breed per day per milch in 100 sample households was estimated to be 8.73 litres per milch animals. The total milk production from Indian breed per day per farm in small dairy farms was observed as 134 litres, in medium dairy farms as 36 litres and in large as 60 litres. Overall the total milk production from Indian breed per day per farm in 100 sample households

Table 3 Distribution of cattle breeds

Sl. No.	Breeds	Category of Sample Dairy Farms							
		Small		Medium		Large		Total	
		Milch	Dry	Milch	Dry	Milch	Dry	Milch	Dry
1	Local (Non-Descript)	02	0	04	0	0	0	06	0
2	Indian Breed	11	0	03	0	05	0	19	0
3	Crossbreed	200	17	56	04	111	31	367	52
	Total	213	17	63	04	116	31	392	52

Sub: Authors Calculations Based on Field Survey

Table 4 Milk production in dairy farms

Sl. No.	Dairy Farms	Number of Dairy Farms	Total Milk Production /Day				Total Milk Production per Day per Farm	Average Milk Yield/Day /Milch Animal			
			CB	IB	ND	Total		CB	IB	ND	Total
1	Small	81	1609	134	4	1747	21.57	8.05	12.18	2.00	8.20
2	Medium	10	543	36	8	587	58.7	9.70	12.00	2.00	9.32
3	Large	9	1051	60	0	111	123.44	9.47	12.00	0.00	9.58
4	Total	100	3203	230	12	3445	34.45	8.73	12.11	2.00	8.79

Note: C.B= Cross Breed; IB= Indian Breed; ND= Non Descript

For calculation of average milk production/day/milch animal, only milch animals under lactation were considered and the dry animals were not considered

was estimated to be 230 litres per day which is very less compared to production from cross breed. The average milk yield from Indian breed per day per milch animal in small dairy farms was observed as 12.18 litres, in medium and large dairy farms as 12.00 litres. Overall the average milk production from Indian breed per day per milch in 100 sample households was estimated to be 12.11 litres per milch animals. The total milk production from non descript per day per farm in small dairy farms was observed as 4 litres and in medium dairy farms as 8 litres. Overall the total milk production from non descript per day per farm in 100 sample households was estimated to be 12 litres per day. The average milk yield from non descript per day per milch animal in both small and medium dairy farms was observed as 2 litres. Overall the average milk production from non descript per day per milch in 100 sample households was also estimated to be 2 litres per milch animals.

Investment pattern on dairy farms

Table 5 presents the investment pattern on commercial dairy farms in organized dairy sector. The investments were presented in terms of rupees per farm per day for small, medium and large categories of dairy farms. With more than 94 percent of the investments the dairy cattle's especially the cross breed and Indian breed accounted for the maximum share of the investments. Earlier studies on economics of milk production (Pant and Karanjkar, 1965; Chattraji and Singh, 1989; Chand et al. 2002;

Singh 2008 and Ghule et al. 2012) also indicated that the share of investment on animal always remains the highest followed by buildings and equipment. Taking productive life of cattles into consideration, the investment per farm in cross and Indian breed was estimated to be Rs. 660.23 per farm per day in small dairy farms, Rs. 1623.48 in medium dairy farms per day and Rs. 4247.34 per day in large category of dairy farms. Investment in local breed was observed to be only Rs. 1.12 per farm per day and Rs. 9.10 per farm per day in medium category of dairy farms. In terms of percentage of total investment, it was observed that investment in cross breed and Indian breed was 93.97 percent of total investment in small dairy farms, 95.08 percent of total investment in medium dairy farms and 96.71 percent in large dairy farms. This is seriously higher from the findings of Ghule et al. (2012) where they reported the share of dairy animals in total investment as 51.28 percent on small farms, 55.19 percent on medium farms and 70.12 percent in case of large farms. Overall it was observed that 95.09 percent of total investment was in cross breed and Indian breed in the sample of 100 dairy farms in organized dairy sector. The investment in local breed was 0.16 percent of total investment in small dairy farms and 0.53 percent of total investment in medium dairy farms. Overall it was observed that 0.16 percent of total investment was in local breed in the sample of 100 dairy farms in organized dairy sector.

Taking building (cattle shed and stores) into consideration, the investment per farm in was estimated to be Rs. 13.83 per farm per

Table 5 Investment pattern

Sl No	Items	Category of Dairy Farms			
		Small	Medium	Large	Pooled
A)	Animals				
	i) Cross Breed and Indian Breed	660.23 (93.97)	1623.48 (95.08)	4247.34 (96.71)	1079.40 (95.09)
	ii) Local Breed	1.12 (0.16)	9.10 (0.53)	0.00 (0.00)	1.81 (0.16)
	Total (i & ii)	661.35 (94.13)	1632.58 (95.62)	4247.34 (96.71)	1081.21 (95.25)
B)	Building (Cattle Shed and Stores)	13.83 (1.97)	20.27 (1.19)	33.00 (0.75)	16.20 (1.43)
C)	Machinery, Equipments and Others				
	(i) Bicycle	3.79 (0.54)	3.84 (0.22)	3.20 (0.07)	3.74 (0.33)
	(ii) Chaff-cutter	0.00 (0.00)	16.44 (0.96)	41.10 (0.94)	5.34 (0.47)
	(iii) Milk Cans and Patty Items	23.60 (3.36)	34.33 (2.01)	67.11 (1.53)	28.59 (2.52)
	Total (i to iii)	27.39	54.60 (3.20)	111.40 (2.54)	37.67 (3.32)
	Total Investment or	702.57	1707.45	4391.74	1135.08
	Fixed Capital or Non-	(100.00)	(100.00)	(100.00)	(100.00)
	Recurring Expenditures (A+B+C)				

Note: Figures in parentheses are the percentage to total investment.

Sub: Authors Calculations Based on Field Survey

day in small dairy farms, Rs. 20.27 in medium dairy farms per day and Rs. 33.00 per day in large category of dairy farms. Overall investments in buildings were estimated as Rs. 16.20 per farm per day. In terms of percentage of total investment, it was observed that investment in buildings was 1.97 percent of total investment in small dairy farms, 1.19 percent of total investment in medium dairy farms and 0.75 percent in large dairy farms. Overall it was observed that 1.43 percent of total investment was in buildings in the sample of 100 dairy farms in organized dairy sector. About 3.32 percent of the total investment accounted for machinery, equipment and other similar items. In small dairy farms this investment accounted for 3.90 percent, in medium this investment accounted for 3.20 percent and in large dairy farms accounted for 2.54 percent of total investment. Thus, in contrast to the observations of Pant and Karanjkar, 1965; Chattraji and Singh, 1989; Chand et al. 2002; Singh 2008 and Ghule et al. 2012, the share of investment on equipment was found to be higher than that of buildings. The total investment in small dairy farms was calculated as Rs. 702.57, in medium dairy farms as Rs. 1707.45

and in large dairy farms as Rs. 4391.74.

Economics of milk production

Table 6 presents the cost incurred by different categories of commercial dairy farms in milk production in organised dairy sector. The various cost components were categorized into two categories- operational fixed cost or overhead cost per day and working capital or recurring expenditure. The operational fixed cost or overhead cost per day per farm of Rs. 60.17 in small category of dairy farms, Rs. 259.03 in medium category of dairy farms and Rs. 665.41 in large category of dairy farms. Overall for the entire sample Rs. 173.25 found to be spent as operational fixed cost or overhead cost per day per farm. The depreciation on cross breed & Indian breed accounted for the majority of the share of operational fixed cost or overhead cost per day per farm with Rs. 52.82 in small, Rs. 129.88 in medium, Rs. 339.79 in large category of dairy farms. Since the maximum investment was for the cross breed and Indian breed, thus, obviously, the

Table 6 Cost incurred by dairy farms

(Rupees per Farm per Day)

Sl. No	Cost Components	Herd Size category			
		Small	Medium	Large	Pooled
A	Operational Fixed Cost or Overhead Cost per Day				
a)	Depreciation on Cross Breed & Indian Breed	52.82	129.88	339.79	86.35
b)	Depreciation on Local Breed	0.11	0.91	0.00	0.18
c)	Depreciation on Building (Cattle Shed and Stores)	0.69	1.01	1.65	0.81
d)	Depreciation on Machinery, Equipments and Others				
	Bicycle	0.32	0.32	0.27	0.31
	Chaff-Cutter	0.00	1.64	4.11	0.53
	Milk Cans and Patty Items	4.72	6.87	13.42	5.72
	Total Depreciation on Equipment	5.03	8.83	17.80	6.56
e)	Interest on Fixed Capital (Subsidised)	1.51	118.40	306.18	79.34
	Total Operational Fixed Cost Per Day	60.17	259.03	665.41	173.25
B	Working Capital or Recurring Expenditure				
a)	Expenditure on Feed				
	Feeding During Lactation Period (Green Fodder, Dry Fodder and Concentrates)	436.71	1038.90	2166.84	652.64
	Feeding During Dry Period (Green Fodder, Dry Fodder and Concentrates)	19.30	38.48	334.43	46.77
	Feed of Heifers (Green Fodder, Dry Fodder and Concentrates)	14.54	63.44	110.76	28.09
	Feed of Calf's (Green Fodder, Dry Fodder and Concentrates)	14.26	31.50	93.33	23.10
	Total Expenditure on Feed	484.81	1172.32	2705.37	750.61
b)	Expenditure on Veterinary Services	18.39	44.80	109.14	29.20
c)	Expenditure on Labour	0.00	16.67	177.78	17.67
d)	Miscellaneous Expenses	11.16	27.17	66.21	17.71
	Total Recurring Expenditure	514.35	1260.96	3058.50	815.19
C	Operational Cost Per Day				
a)	Total Operational fixed cost per Day	60.17	259.03	665.41	173.25
b)	Total Recurring Expenditure per Day	514.35	1260.96	3058.50	815.19
	Total Operational Cost Per Day	574.52	1519.99	3723.91	988.44

Note: Subsidy of Rs. 58480.00 per farm under Scheme for two animals

depreciation on cross breed and Indian breed was having maximum share of the operational fixed cost per day in all the category of dairy farms.

As far as working capital or recurring expenditure is concerned, it was observed that Rs. 514.35 was spent by small dairy farms per day, Rs. 1260.96 by medium dairy farms per day, Rs. 3058.50 by large dairy farms per day. The pooled recurring expenditure was estimated as Rs. 815.19 per farm day. The expenditure on

feed accounted for the majority of the share of recurring expenditure per day per farm with Rs. 484.81 in small, Rs. 1172.32 in medium, Rs. 2705.37 in large category of dairy farms. Since, the small farms mostly run by the family members, whoever is available at that time, thus, no expenditure on labours in small farms was found. Taking both the categories of costs together, the total operational cost per day per farm was found as Rs. 574.52 in small category of dairy farms, Rs. 1519.99 in medium category of dairy farms, Rs. 3723.91 in large categories of dairy

Table 7 Return per farm per day

Sl. No.	Return Components	Herd Size category			
		Small	Medium	Large	Pooled
a)	Sale of Milk	812.68 (98.74)	2185.60 (98.86)	4441.11 (98.74)	1276.53 (98.76)
b)	Sale of Manure/Cow dung	6.72 (0.82)	16.37 (0.74)	39.89 (0.89)	10.67 (0.83)
c)	Sale of Male Calves	3.65 (0.44)	8.88 (0.40)	16.80 (0.37)	5.36 (0.41)
	Total	823.05 (100.00)	2210.85 (100.00)	4497.81 (100.00)	1292.56 (100.00)

Note: Figures in parentheses are the percentage of gross cost.

Source: Authors Calculations Based on Field Survey

Table 8 Cost and return analysis

Sl. No.	Cost and Return Components	Herd Size category			
		Small	Medium	Large	Pooled
a)	Number of Farms	81	10	9	100
b)	Total Operational Cost/Farm/Day	574.52	1519.99	3723.91	988.44
c)	Total Return/Farm/Day	823.05	2210.85	4497.81	1292.56
d)	Profit/Farm/Day	248.53	690.86	773.9	304.12
e)	Profit/Farm/Year	90713.45	252163.9	282473.5	111003.8

Source: Authors Calculations Based on Field Survey

Table 9 Resource use efficiency analysis

Variables	Categories of Dairy Farms							
	Small		Medium		Large		Pooled	
	Coefficients	t Stat	Coefficients	t Stat	Coefficients	t Stat	Coefficients	t Stat
Intercept	-1.813	-2.784	-9.006	-3.203	-4.242	-1.001	-1.801	-1.733
Feed Cost	1.592	10.010**	3.100	5.224**	1.656	1.919*	1.650	11.294**
Miscellaneous Expenditure	-0.558	-3.564**	-1.271	-2.540**	-0.288	-0.461	-0.599	-4.224**
Labour	-	-	-0.178	-0.515	0.125	0.764	-0.047	-0.270
Sample size	81		10		9		100	
Sum of Elasticities	1.034		1.650		1.493		1.004	
R ²	0.80		0.87		0.77		0.93	
F	156.123**		13.175**		5.474*		444.336**	
Standard Error	0.192		0.128		0.078		0.182	
Cobb-Douglas Production Function	P(F,M)=0.163F ^{1.592} M ^{-1.592} P(F,M)=0.0001F ^{3.100} M ^{-1.271} bP(F,M)=0.014F ^{1.656b} P(F,M,L)=0.165F ^{1.650} M ^{-0.559}							

** Significant at 0.05 level of significance

* Significant at 0.10 level of significance

Categories of Dairy Farms

GM: Geometric Mean; RC: Regression Coefficients; MVP=Marginal Value Product

Resource use efficiency of dairy farms in organized dairy sector

The estimated resource-use efficiency of dairy farms in organized dairy sector is furnished in Table 9. In small dairy farms the R^2 value was 0.80 which indicates that 80 per cent of the variations in income from dairy farms were influenced by the explanatory variables included in the model. It is evident from Table 9 that feed cost influence was positive and significant and miscellaneous expenditure was negative and significant. Hence, increase in the use of feed would increase the revenue from dairy farms by 1.59 percent and increase in miscellaneous expenditure decreases the farm revenue by 0.56 percent.

As all the dairy farms reported to use one family labour with opportunity cost of Rs. 298.00 (minimum wage), due to lack of variation was not considered as a variable. The MVP of feed was calculated as 2.703 and MVP of miscellaneous expenditure was calculated as (-) 39.59 (Table 10). In medium dairy farms the R^2 value was 0.87 which indicates that 87 per cent of the variations in income from dairy farms were influenced by the explanatory variables included in the model. It is evident from Table 9 that feed cost influence was positive and significant and miscellaneous expenditure was negative and significant. Hence, increase in the use of feed would increase the revenue from dairy farms by 3.1 percent and increase in miscellaneous expenditure decreases the farm revenue by 1.27 percent. The influence of labour was not found to be significant. The MVP of feed was calculated as 9.852 and MVP of miscellaneous expenditure was calculated as (-) 206.682 (Table 10). In large dairy farms the R^2 value was 0.77 which indicates that 77 per cent of the variations in income from dairy farms were influenced by the explanatory variables included in the model. It is evident from Table 9 that feed cost influence was positive and significant. Hence, increase in the use of feed would increase the revenue from dairy farms by 1.66 percent. The influence of miscellaneous expenditure and labour was not found to be significant. The MVP of feed was calculated as -0.007.

Conclusions

In the study area 81 dairy farmer found to be small category, ten dairy farmers were identified to be in medium category and nine dairy farmers were in large category of dairy farms. The total milk production in 100 sample dairy farms was reported as 3445 litres per day with average milk production of 8.79 litres per day per milch animal. The total milk production per day per farm in small dairy farms was observed as 21.57 litres, in medium dairy farms as 58.7 litres and in large as 123.44 litres. Overall the average milk production per farm in 100 sample households was estimated to be 34.45 litres per farm per day. With more than 94 percent of the investments the dairy cattle's especially the cross breed and Indian breed accounted for the maximum share of the investments. A return of Rs. 812.68 per farm per day in small category of dairy farms, Rs. 2210.85 per farm per day in medium category of dairy farms, Rs. 4497.81 per farm per day in large category of dairy farms was observed. The income from sale of milk constituted

the maximum proportion of the income (more than 98 percent) in all the categories of the dairy farm. The returns from sale of manure/cow dung and male calves also contributed to the total income but in minimal way. It was observed that the profit per farm per day increased from Rs. 248.53 from small farms to Rs. 690.86 in medium farms to Rs. 773.9 in large dairy farms. Feed cost influence was positive and significant. Hence, increase in the use of feed would increase the revenue from dairy farms by 1.66 percent. The influence of miscellaneous expenditure and labour was not found to be significant.

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