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**Nilam V Chaudhary**

Ph.D. Scholar, Department of Livestock Production Management, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Navsari, Gujarat, India

**Anand P Chaudhary**

Department of Livestock Production Management, College of Veterinary Science and Animal Husbandry, Kamdhenu University, SK Nagar, Gujarat, India

**Jay P Gupta**

Department of Animal Genetics and Breeding, College of Veterinary Science and Animal Husbandry, Kamdhenu University, SK Nagar, Gujarat, India

**KP Thakar**

Department of Agricultural Economics, C. P. College of Agriculture, SDAU, SK Nagar, Gujarat, India

**AK Srivastava**

Department of Livestock Production Management, College of Veterinary Science and Animal Husbandry, Kamdhenu University, SK Nagar, Gujarat, India

**Corresponding Author:**

**Nilam V Chaudhary**

Ph.D. Scholar, Department of Livestock Production Management, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Navsari, Gujarat, India

## An economic analysis of milk production of crossbred cow in Banaskantha district of Gujarat

**Nilam V Chaudhary, Anand P Chaudhary, Jay P Gupta, KP Thakar and AK Srivastava**

### Abstract

Dairy sector is one of the fastest expanding occupation and demand for milk is growing day by day not only in cities, but also in small towns and rural areas. The data for this investigation was collected from 120 dairy farmers of Banaskantha district of Gujarat and these dairy farmers were classified based on land holdings as marginal, small, medium and large categories of dairy farmers, which were 28.33, 25.84, 27.50 and 18.33 per cent respectively. The average cost of milk production by CBC was Rs. 76397.93 per animal per year. It includes fixed cost and variable cost, which was Rs. 7240.81 and 69157.13 per animal per year, respectively. The overall cost of per liter milk production has been found Rs. 25.54. Overall net income was Rs. 11049.25 per animal per year and Rs. 30.27 per animal per day. On the basis of observations, it is concluded that net income from crossbred cows was highest for large farmers followed by medium, marginal and small category of dairy farmers.

**Keywords:** Crossbred cow, fixed cost, variable cost, net income, categories of farmers

### 1. Introduction

Dairy farming is a major economic activity in the country's rural areas, contributing significantly to the economic growth. It offers income to agriculture-dependent households as well as numerous landless households. The total livestock population is 536.76 million in the country, showing an increase of 4.8% over Livestock Census-2012. The total number of cattle in the country is 193.46 million in 2019 showing an increase of 1.3% over previous census. The exotic or crossbred cattle population in the country is 51.36 million. In case of Gujarat total livestock population was reported 2,68,70,500 during 20<sup>th</sup> Livestock Census whereas, cattle population is 96,10,870. In Banaskantha district, crossbred cattle population was 912180 [1].

As Banaskantha is the country's leader in milk production and processing, having the largest milk processing plant operated by the cooperative sector is a lifeline for the farmers in the operational region. Dairy development activities are increasing day by day with mechanization and the introduction of new technology, where significant milk production can be increased and this could be possible if we have to introduce new inventions and farmers must adopt those inventions to produce milk more economically.

Considering the current scenario of the milk industry, input costs are rising while net returns are falling, resulting in development breakthroughs in this sector. Therefore, the present study was designed to learn about the economics of dairy farming, as commercial dairy farming is becoming more popular.

### 2. Material and Methods

The study was conducted in Banaskantha district of Gujarat. A multistage sampling technique was used to select the respondents from the Banaskantha district of north Gujarat and information were collected in the predefined questionnaire from the farmers through direct interview. The district having 14 talukas and study was conducted in two taluka were selected purposively *viz:* Vadgam and Palanpur, because commercial dairy farming activities are increasing day by day in these talukas since last few years and this occupation of rural households is becoming a source of livelihoods. A total of six villages from each taluka and ten respondents were selected from each village randomly, which becomes about 120 respondents from two talukas of Banaskantha district. Respondents/dairy farmers were classified into four different categories *viz:* marginal (0 to 1 ha.), small (1.01 to 2 ha.), medium

(2.01 to 4 ha.) and large (above 4 ha.) on the basis of land holding of the farmers.

## 2.1 Cost of milk production

The cost of milk production includes the total fixed cost and total variable cost. The details of these are given here as below:

### 2.1.1 Fixed cost

The expenditure borne by dairy farmers on the housing, equipments and animals were included to calculate the fixed cost, where interest and depreciation on fixed capital was calculated on annual basis.

#### 2.1.1.1 Interest

The annual interest on dairy animal, housing and equipments maintain by different categories of dairy farmers of Banaskantha district of Gujarat was calculated as per prevailing interest rate at time of investigation i.e. at 6.0 per cent per annum.

Depreciation is the cost of an asset as a result of its use resulted into decline its value due to wear and tear, accidental damage and time obsolescence. It is worked out separately for animal shed, machinery and equipments like: tractor, milking machine, chaff cutter, milking cane etc. and other items required on the dairy farms viz: buckets, chain, ropes etc. keeping in view the present value and useful economic life. The depreciation on these was calculated by straight line method [2].

#### 2.1.1.2 Depreciation on buildings

The depreciation on buildings like: animal shed, store room, milking parlour, storage for feed and fodders, shed for chaff cutter etc was included to calculate the depreciation with the help of following formula:

$$\text{Depreciation on buildings} = \frac{\text{Cost of Building} - \text{Residual value}}{\text{Life span (25 years)}} \quad (1)$$

**2.1.1.3 Depreciation on machine or equipment:** The farmers usually having tractor, milking machine, chaff cutter etc on the farm and depreciation on this machine/equipment was calculated by using the following formula:

$$\text{Depreciation on equipment} = \frac{\text{Purchase price of equipment} - \text{Residual value}}{\text{Productive life}} \quad (2)$$

### 2.1.2 Variable cost

The variable cost includes the expenses incurred on feed and fodder, labour, veterinary and health care services, water and electricity charges and miscellaneous cost.

**2.1.2.1 Feed and fodder cost:** The expenditure on green fodder, dry fodder, concentrate and mineral mixture etc was worked out by multiplying quantities of feeds and fodders consumed by animals with their respective prevailing prices in the study area. Green fodder and dry fodder price in the study area was Rs. 2 to 4 per kg and Rs. 8 or 9 per kg, respectively. In case of concentrate, farmers procure from the Banaskantha District Cooperative Milk Producers Union Ltd @ Rs. 1000 to 1200 per 50 kg, while some of the farmers prepare at home by purchasing different ingredients from the

market includes cotton seed cake, maize cake, maize barn, jowar barn, urad barn, toor dal chunni, bajara and isabgol husk (lali) price in study area Rs 36.25, 22.50, 26.00, 19.00, 24.00, 24.00, 17.50 and 34.00 per kg, respectively.

**2.1.2.2 Labour cost:** It included family as well as paid labour (hired labour). The hired labour was calculated considering type of work allotted and wages paid to them. In present investigation, it was observed that dairy farmers paid Rs. 6000 to 8000 per month per labour.

**2.1.2.3 Treatment cost:** It included the cost incurred on medicines and charges of veterinary doctor. But generally treatment was given by the doctors of Banaskantha District Cooperative Milk Producers' Union Ltd and their charge were Rs. 100 per visit, while sometimes they asked the services of private doctors and actual payments given to him was includes in the expenses of treatment of animals.

**2.1.2.4 Breeding cost:** It included the cost incurred on natural service, Artificial Insemination (A.I.) charges by AI workers. An artificial insemination charge was around Rs. 120 to 150 per insemination in study area.

**2.1.2.5 Water and electricity charges:** The charges for water and electricity were calculated based on the actual expenses on it. As dairy farmers paid for 7.5 HP motor Rs 5000 per annum as fixed charges, while some farmers paid bill on month basis of Rs. 1000 to 2000 per month. These dairy farmers used the water and electricity for domestic purpose, drinking of animal etc. So, water and electricity charges were calculated based on actual cost of water used for drinking of animals and cleaning of shed, equipments etc.

**2.1.2.6 Miscellaneous cost:** The miscellaneous expenses born by farmers include the cost of repairs of machinery, shed / buildings like roof, flooring; white wash of shed, transportation of milk and stationary.

**2.1.3 Cost of rearing dairy animals:** It included the sum of total fixed cost and total variable cost of rearing the different categories animal was divided by number of different categories animal.

$$\text{Total cost of rearing (per animal per year)} = \frac{\text{Total fixed cost} + \text{Total variable cost}}{\text{No. of animal}} \quad (3)$$

## 2.2 Income from dairy farming

The income from dairy farming was calculated by inclusive the value of sale of milk, sale of manure, sale of gunny bag and sale of surplus animals.

### 2.2.1 Sale of milk

The main source of income to dairy farmers was from the sale of milk to the District Cooperative Milk Producers' Union Ltd. These farmers use about 3.0 to 5.0 liter of milk for home consumption and 0.5 to 1.0 liter of milk given to the labour on farm also included in the actual milk production of the farm and cost was calculated by multiplying milk yield of animal with the prevailing prices of milk in the study area.

Income from sale of milk = Quantity of milk produce on the farm x Milk price (per liter) (4)

### 2.2.2 Sale of manure

The income from manure was calculated based on the manure produce on the farm and farmers got the income from its sale to other farmers. Usually, they sold the manure @ Rs. 1500 per trailer and actually income received by the farmers from the sale of manure was included in this study.

Income from manure = Quantity of manure produce on the farm x Sale price of manure (5)

### 2.2.3 Sale of surplus animals

The income from sale of surplus animals was studied based on the actual income received from the sale of animal/s during year.

Income from sale of surplus animals = No. of animals sold x Sale price of animals (6)

### 2.2.4 Sale of gunny bags

The income from sale of gunny bags was calculated based on the number of empty bags and price of a gunny bag, which was consider Rs. 65 for jute bag.

Income from sale of empty gunny bags = No of jute or gunny bags x Sale price of jute or gunny bags (7)

### 2.2.5 Total income from dairy farming

The total income from the sale of milk and other dairy farm produce or waste was calculated by adding these values as per following formula:

Total income from dairy farm = A + B + C + D

Where,

A=Total income from sale of milk

B=Total income from sale of manure

C=Total income from sale of gunny bags

D=Total income from sale of surplus animals. (8)

### 2.2.6 Net income from dairy farm

It was calculated from the following formula:

Net income from dairy farm = Total income from dairy farm - Total expenditure on the farm for respective class

$$\text{Net income per milch animal per day} = \frac{(\text{Total income from dairy farm} - \text{Total expenditure on the farm for respective class})}{\text{No. of milch animals}} \quad (9)$$

## 2.3 Statistical analysis

To achieve the objectives of the study, the data collected from 120 dairy farms was processed, summarized, scrutinized, tabulated and analyzed with the help of software i.e., Statistical Package for Social Sciences (SPSS).

## 3. Results and Discussion

Information about the number of milch and dry cows reared

by different categories of farmers was collected and presented in Table 1. The number of milch cows kept by different categories of dairy farmers shows that they were 8.35, 8.74, 9.34 and 9.55 per cent of marginal, small, medium, and large farmers, respectively. Similarly, dry cows across different categories were 4.22, 1.86, 2.39 and 4.19 per cent on marginal, small, medium and large-sized farms respectively.

### 3.1 Fixed cost

The expenditure borne by dairy farmers on the animals, housing and equipment is included as a fixed cost. The details of these costs are discussed here as below, and the results are depicted in Table 2.

Interest rate on milch and dry crossbred cow was calculated Rs. 3333 and 3350 per animal per year respectively, irrespective of class of households. However, Lalrinsangpuii *et al.* (2016) [3] suggested that overall interest on fixed assets for crossbred cow kept on small, medium and large farms as Rs. 3.49, 3.69 and 3.71 per animal per day, respectively. Whereas Kaur and Singh (2018) [4] reported value of interest on animal as Rs. 7.61, 8.06, 11.31 and 11.83 per day per animal respectively for domestic, small, medium and large farms.

Interest rate on dairy farm building for milch, dry crossbred cow was calculated Rs.1215, and 1260 animal per year respectively for all categories of dairy farmers. Anbukani (2018) [5] estimated interest on investment for crossbred cow herd kept on small, medium and large farms was Rs. 5.88, 4.41 and 4.01 per animal per day, respectively.

Interest rate on dairy farm equipment for milch and dry CBC was calculated Rs. 839 and 809 per animal per year respectively for all categories of dairy farmers. Kaur and Singh (2018) [4] suggested interest on equipment was Rs. 1.31, 1.49, 0.97 and 0.54 per day per animal respectively for domestic, small, medium and large farmers, whereas, Ghule *et al.* (2012) [6] reported interest on fixed assets for CBC on small, medium and large farms as Rs. 10.00, 9.48 and 9.15 per animal per day, respectively.

The reduction in value of any items is an indirect cost, bear by owner of the enterprises. The depreciation on dairy farm buildings for milch, dry and CBC was calculated and it was found Rs.729, and 756 per animal per year respectively. Kaur and Singh (2018) [4] reported that depreciation on farm buildings was Rs. 1.38, 1.52, 1.16 and 1.16 per day per animal respectively for domestic, small, medium and large farms. The depreciation on dairy farm equipments for milch and dry CBC was calculated Rs. 1119, and 1079 per animal per year respectively by all categories of households.

### 3.2 Variable cost

The expenses incurred by farmers on rearing their animals, like feeding, breeding, labour, electricity charges, treatment, etc., are included as variable costs or operational costs of the farm. The details of these costs are discussed as below, and the results are depicted in Table 3.

The feeding cost of a milch cow was calculated at Rs. 79204 per animal per year by all categories of dairy farmers. The respective value for dry cow was observed at Rs. 21284 per animal per year.

**Table 1:** Distribution of crossbred cows among different categories of farmers of Banaskantha district

Taluka	Category of dairy farmers	Number of dairy animals			
		Milch Cow	Dry Cow	Other <sup>#</sup>	Overall
Palanpur	Marginal (N=24)	173 (12.00)	90 (6.24)	258 (17.92)	521 (36.16)
	Small (N=19)	140 (9.71)	38 (2.63)	240 (16.66)	418 (29.00)
	Medium (N=11)	57 (3.95)	24 (1.66)	123 (8.55)	204 (14.16)
	Large (N=06)	95 (6.59)	49 (3.40)	154 (10.69)	298 (20.68)
Vadgam	Marginal (N=10)	64 (4.58)	30 (2.14)	136 (9.49)	230 (16.48)
	Small (N=12)	108 (7.73)	15 (1.07)	134 (9.60)	257 (18.40)
	Medium (N=22)	208 (14.89)	44 (3.15)	234 (16.81)	486 (34.82)
	Large (N=16)	176 (12.60)	70 (5.01)	177 (12.69)	423 (30.30)
Overall	Marginal (N=34)	237 (8.35)	120 (4.22)	394 (13.90)	751 (26.47)
	Small (N=31)	248 (8.74)	53 (1.86)	374 (13.19)	675 (23.79)
	Medium (N=33)	265 (9.34)	68 (2.39)	357 (12.59)	690 (24.32)
	Large (N=22)	271 (9.55)	119 (4.19)	331 (11.68)	721 (25.42)
Total (N=120)		1021 (35.99)	360 (12.69)	1456 (51.32)	2837 (100.00)

(Note: Figures in the parenthesis indicates the percentage of animals of different class of respective talukas; N= Number of respondents in of different class of respective talukas;

<sup>#</sup> Other category includes heifer, milch and dry buffalo, bull and calf)

**Table 2:** Fixed cost of rearing the milch and dry CBC kept on different categories of farms (Rs./animal/year)

Taluka	Category of dairy farmers	Interest over Investment on Animals		Interest on dairy farm buildings		Interest on dairy farm equipments		Depreciation on dairy farm buildings		Depreciation on dairy farm equipments	
		Milch Cow	Dry Cow	Milch Cow	Dry Cow	Milch Cow	Dry Cow	Milch Cow	Dry Cow	Milch Cow	Dry Cow
		Palanpur	Marginal	3317	3323	1202	1227	345	443	721	736
Small	3330		3403	1383	1460	327	488	830	876	437	651
Medium	3353		3398	1515	1317	1734	1440	909	790	2312	1919
Large	3540		3422	673	584	686	435	404	350	915	580
Vadgam	Marginal	3469	3420	1121	1225	607	266	673	735	810	354
	Small	3306	3340	1304	1505	735	463	782	903	980	617
	Medium	3208	3198	1322	1433	982	916	793	860	1309	1222
	Large	3349	3357	1142	1503	1506	1740	685	902	2007	2320
Overall	Marginal	3358	3348	1180	1226	416	399	708	736	555	532
	Small	3319	3385	1349	1473	505	481	809	884	673	641
	Medium	3239	3268	1364	1392	1143	1101	818	835	1525	1468
	Large	3416	3384	978	1125	1218	1203	587	675	1624	1604
Total		3333	3350	1215	1260	839	809	729	756	1119	1079

It shows that the feeding cost of milch cow was higher than dry crossbred cow. However, Singh *et al.* (2017) <sup>[7]</sup> suggested the feeding cost of cow kept on the small, medium and large dairy farms was Rs. 55.57, 72.36 and 28.84 per animal per day, respectively.

The labour cost of milch and dry CBC was calculated Rs. 3022 and 2987 per animal per year respectively by all categories of dairy farmers. Lal and Chandel (2016) <sup>[8]</sup> reported labour cost for CBC on small, medium and large farms was Rs. 40.36, 35.23 and 24.53 per animal per day, respectively.

The treatment cost of milch and dry was calculated Rs. 677 and 634 per animal per year, respectively. The observations of Ghule *et al.* (2012) <sup>[6]</sup> suggested that veterinary cost for CBC on small, medium and large farms was Rs. 3.40, 3.13 and 2.37 per animal per day, respectively. The value for treatment of buffaloes and CBC reported by Meena *et al.* (2019) <sup>[9]</sup> was Rs. 2.85 and 3.35 per animal per day, respectively. Hence, it can be concluded that expenses on treatment by different categories of farmers of Banaskantha district were almost more or less similar to these reports of different workers.

**Table 3:** Variable cost of rearing the milch and dry CBC kept on different categories of farms (Rs./animal/year)

Taluka	Category of dairy farmers	Feeding cost		Labour cost		Treatment cost		Breeding cost		Water and electricity cost		Miscellaneous cost	
		Milch Cow	Dry Cow	Milch Cow	Dry Cow	Milch Cow	Dry Cow	Milch Cow	Dry Cow	Milch Cow	Dry Cow	Milch Cow	Dry Cow
		Palanpur	Marginal	69475	21372	1814	2175	957	837	669	623	150	150
Small	112734		24084	2464	1961	1170	906	649	661	156	160	685	649
Medium	71414		20335	1948	2784	1369	1225	824	582	308	290	839	742
Large	50824		18642	2689	2972	335	272	888	791	303	246	399	92
Vadgam	Marginal	91740	21120	3509	2598	495	398	515	469	93	106	510	508
	Small	77711	21227	2312	2179	423	652	545	601	166	204	438	594
	Medium	84971	22798	4335	4575	487	476	611	634	133	163	517	634
	Large	69478	20956	3887	4009	414	472	495	556	161	155	505	595

Overall	Marginal	75488	21309	2271	2280	832	727	627	584	135	139	693	646
	Small	97482	23275	2398	2023	845	834	604	644	161	172	577	634
	Medium	82055	21929	3821	3943	677	741	657	615	171	208	586	672
	Large	62939	20003	3467	3582	386	390	633	653	210	192	468	388
Total		79204	21284	3022	2987	677	634	631	622	170	175	577	564

**Table 4:** Total cost of rearing the milch CBC kept on different categories of farms

Taluka	Category of dairy farmers	Total cost of rearing milch CBC (Rs./animal/year)			Rearing cost (Rs./animal/day)
		Fixed cost	Variable cost	Total cost	
Palanpur	Marginal	6045.97	73825.87	79871.83	218.83
	Small	6306.94	117858.66	124165.60	340.18
	Medium	9822.93	76701.98	86524.91	237.05
	Large	6216.58	55438.08	61654.66	168.92
Vadgam	Marginal	6680.11	96862.39	103542.50	283.68
	Small	7107.98	81594.92	88702.90	243.02
	Medium	7613.75	91054.80	98668.54	270.32
	Large	8690.28	74938.60	83628.88	229.12
Overall	Marginal	6217.21	80046.70	86263.91	236.34
	Small	6655.77	102066.39	108722.16	297.87
	Medium	8088.93	87967.60	96056.53	263.17
	Large	7823.11	68102.63	75925.75	208.02
Total		7235.79	84280.86	91516.65	250.73

The annual per animal breeding cost of milch and dry CBC was observed Rs. 631 and 622, respectively for all categories of dairy farms. The overall annual cost of water and electricity for milch and dry CBC was beyond Rs. 170 and 175 per animal, respectively. Miscellaneous expenses include the cost of repairing fixed assets, buckets, ropes, insurance premiums, and other incidental charges for the management of all dairy animals. Miscellaneous cost for milch and dry CBC was calculated at Rs. 570 and 572 per animal per year, respectively, for all categories of dairy farmers.

### 3.3 Rearing cost

The rearing cost of milch and dry cow includes total fixed cost and total variable cost. The details of rearing cost are discussed here as below and results are depicted in Table 4 and Table 5.

#### 3.3.1 Rearing cost of milch cow

The total rearing cost of milch CBC kept on dairy farms by different categories of dairy farmers in Banaskantha district of Gujarat is presented in Table 4. It was revealed from the table that overall total cost of rearing the milch CBC highest for small farmers (Rs. 297.87), followed by medium (Rs. 263.17), marginal (Rs. 236.34) and large (Rs. 208.02) category of dairy farmers. It shows that large farmers bear less expenses for rearing the milch CBC as compared to other category of dairy farmers; it might be due to proper utilization of resources as compare to other category of farmers. These findings are in agreement with the reports of earlier workers viz: Lal and Chandel (2016)<sup>[8]</sup> and Horo and Chandel (2019)<sup>[10]</sup>, while findings of Singh *et al.* (2017)<sup>[7]</sup> and Anbukkani (2018)<sup>[5]</sup> are in contrary.

**Table 5:** Total cost of rearing dry CBC kept on different categories of dairy farms

Taluka	Category of dairy farmers	Total cost of rearing dry CBC (Rs./animal/year)			Rearing cost (Rs./animal/day)
		Fixed cost	Variable cost	Total cost	
Palanpur	Marginal	6320.57	25847.80	32168.37	88.13
	Small	6878.21	28420.89	35299.11	96.71
	Medium	8864.13	25958.29	34822.42	95.40
	Large	5372.18	23015.82	28388.00	77.78
Vadgam	Marginal	6000.40	25198.33	31198.73	85.48
	Small	6828.13	25457.60	32285.73	88.45
	Medium	7628.34	29280.82	36909.16	101.12
	Large	9821.86	26742.80	36564.66	100.18
Overall	Marginal	6240.53	25685.43	31925.96	87.47
	Small	6864.02	27582.19	34446.21	94.37
	Medium	8064.50	28108.18	36172.68	99.10
	Large	7989.65	25208.15	33197.80	90.95
Total		7255.03	26264.54	33519.57	91.83

**Table 6:** Total cost of milk production by CBC kept on different categories of dairy farms

Taluka	Category of dairy farmers	Average daily milk yield (liter/animal)	Total cost per liter milk production			
			Fixed cost (Rs./animal/Year)	Variable cost (Rs./animal/Year)	Total cost (Rs./animal/Year)	Total cost (Rs./liter)
Palanpur	Marginal	6.48	6139.94	57407.52	63547.45	26.86
	Small	9.20	6428.89	98765.21	105194.10	31.34
	Medium	8.52	9538.84	61666.81	71205.65	22.90
	Large	7.08	5929.25	44405.51	50334.76	19.47
Vadgam	Marginal	8.89	6463.18	73990.88	80454.06	24.78
	Small	8.86	7073.85	74748.90	81822.76	25.30
	Medium	9.66	7616.29	80268.87	87885.16	24.92
	Large	7.74	9012.27	61224.35	70236.62	24.85
Overall	Marginal	7.12	6225.05	61774.00	67999.05	26.17
	Small	9.06	6692.44	88951.23	95643.67	28.92
	Medium	9.38	8083.94	75744.05	83828.00	24.47
	Large	7.50	7873.93	55014.32	62888.25	22.97
Total		8.20	7240.81	69157.13	76397.93	25.54

### 3.3.2 Rearing cost of dry cow

The total rearing cost of dry CBC kept by different categories of dairy farmers in Banaskantha district of Gujarat is presented in Table 5. It was revealed from the table that overall total cost of rearing the dry CBC was highest for medium farmers (Rs. 99.10), followed by small (Rs. 94.37), large (Rs. 90.95) and marginal (Rs. 87.47) category of dairy farmers. It shows that marginal farmers bear less expenses for rearing the dry CBC as compared to other category of dairy farmers.

### 3.4 Cost of cow milk production

The total cost of milk production by CBC managed by different categories of dairy farmers in Banaskantha district of Gujarat was depicted in Table 6. It was revealed from the data that overall cost of milk production by CBC was Rs. 76397.93 per animal per year. It includes fixed cost and variable cost, which was Rs. 7240.81 and 69157.13 per animal per year, respectively.

**Table 7:** Total income from CBC kept on dairy farms

Taluka	Category of dairy farmers	Total income from the rearing of milch cow (Rs./animal/year)				
		Sale of milk	Sale of manure	Sale of surplus animals	Sale of gunny beg	Overall income
Palanpur	Marginal	64392.66	1585.71	3042.59	1049.08	70070.05
	Small	92082.53	2135.33	2634.83	2479.39	99332.08
	Medium	84166.30	1642.09	2222.22	1184.42	89215.02
	Large	69831.60	796.10	6750.00	628.52	78006.22
Vadgam	Marginal	88252.34	2571.35	1218.09	1635.72	93677.50
	Small	88238.01	2725.74	1951.22	1668.22	94583.19
	Medium	94240.97	2784.47	2785.71	1752.22	101563.38
	Large	76939.33	2489.06	1394.31	1137.98	81960.68
Overall	Marginal	70675.04	1845.24	2562.18	1203.55	76286.01
	Small	90511.51	2376.60	2355.48	2147.91	97391.50
	Medium	91790.38	2506.59	2648.65	1614.11	98559.73
	Large	74314.94	1863.97	3371.79	949.87	80500.57
Total		81118.01	2125.81	2766.62	1436.74	87447.18

The overall cost of per liter milk production has been found Rs. 25.54. However, it was highest for small farmers (Rs. 28.92), followed by marginal (Rs. 26.17), medium (Rs. 24.47) and large (Rs. 22.97) category of dairy farmers. It shows that large farmers produce the milk with minimum expenditure as compare to other categories of dairy farmers. These findings are well supported by earlier workers like: Lal and Chandel (2016) <sup>[8]</sup>, Horo and Chandel (2019) <sup>[10]</sup> and Meena *et al.* (2019) <sup>[9]</sup>.

### 3.5 Total income

The total income from the rearing of milch crossbred cows kept on dairy farms by different categories of dairy farmers in Banaskantha district of Gujarat is presented in Table 7. It shows that overall income from milch crossbred cows of dairy farmers was Rs. 87447.18 per animal per year. However, it was highest for medium farmers (Rs. 98559.73), followed by

small (Rs. 97391.50), large (Rs. 80500.57) and marginal (Rs. 76286.01) category of dairy farmers. Income from sale of milk to dairy farmers was Rs. 81118.01 per animal per year. However, it was highest for medium farmers (Rs. 91790.38), followed by small (Rs. 90511.51), large (Rs. 74314.94) and marginal (Rs. 70675.04) category of dairy farmers.

The present findings are in harmony with that of Lal and Chandel (2016) <sup>[8]</sup>, Lalrinsangpuii *et al.* (2016) <sup>[3]</sup> and Horo and Chandel (2019) <sup>[10]</sup>. The income from sale of manure to all categories of dairy farmers was Rs. 2125.81 per animal per year. However, it was highest for medium farmers (Rs. 2506.59), followed by small (Rs. 2376.60), large (Rs. 1863.97) and marginal (Rs. 1845.24) category of dairy farmers. The findings were in accordance with the reports of earlier workers *viz*: Lal and Chandel (2016) <sup>[8]</sup> and Lalrinsangpuii *et al.* (2016) <sup>[3]</sup>, but these observations are not in agreement of report of Ghule *et al.* (2012) <sup>[6]</sup>.

**Table 8:** Net income from CBC kept on dairy farm by different categories of dairy farmers

Taluka	Category of dairy farmers	Net income			
		Total Income (Rs./animal/year)	Total Cost (Rs./animal/year)	Net income (Rs./animal/year)	Net income (Rs./animal/day)
Palanpur	Marginal	70070.05	63547.45	6522.59	17.87
	Small	99332.08	105194.10	-5862.02	-16.06
	Medium	89215.02	71205.65	18009.37	49.34
	Large	78006.22	50334.76	27671.47	75.81
Vadgam	Marginal	93677.50	80454.06	13223.44	36.23
	Small	94583.19	81822.76	12760.43	34.96
	Medium	101563.38	87885.16	13678.22	37.47
	Large	81960.68	70236.62	11724.06	32.12
Overall	Marginal	76286.01	67999.05	8286.96	22.70
	Small	97391.50	95643.67	1747.84	4.79
	Medium	98559.73	83828.00	14731.73	40.36
	Large	80500.57	62888.25	17612.32	48.25
Total		87447.18	76397.93	11049.25	30.27

The income from sale of surplus animals to all categories of dairy farmers was Rs. 2766.62 per animal per year. However, it was highest for large farmers (Rs. 3371.79), followed by medium (Rs. 2648.65), marginal (Rs. 2562.18) and small (Rs. 2355.48) category of dairy farmers. The present results were in contrast with the findings of Kaur and Singh (2018) [4].

The income from sale of gunny bags to all categories of dairy farmers was Rs. 1436.74 per animal per year. However, it was highest for small farmers (Rs. 2147.91), followed by medium (Rs. 1614.11), marginal (Rs. 1203.55) and large (Rs. 949.87) category of dairy farmers.

### 3.6 Net income

The net income from milch CBC is depicted in Table 8 and details of these are discussed here as below:

It shows that overall income from CBC to all categories of dairy farmers was Rs. 87447.18 per animal per year and overall cost was Rs. 76397.93 per animal per year. Therefore, net income was Rs. 11049.25 per animal per year and Rs. 30.27 per animal per day. However, it was highest for large farmers (Rs. 48.25) followed by medium (Rs. 40.36), marginal (Rs. 22.70) and small (Rs. 4.79) category of dairy farmers.

The present findings are in harmony with that of Ghule *et al.* (2012) [6], Lal and Chandel (2016) [8], Anbukani (2018) [5], Lalrinsangpuii *et al.* (2016) [3] and Meena *et al.* (2019) [9].

### 4. Conclusions

From the results of the investigation, it can be concluded that the rearing cost of milch cow was higher than dry cows, where the variable cost was 92.09% in the case of milch cow and 78.36% in the case of dry cow. Net income from crossbred cow farm was highest for large farmers and lowest for small category of farmers. Net income of marginal and small farmers can be improved by reducing total cost and introducing high yielding animals, this can be achieved by adopting better feeding and management practices by the dairy farmers of the region.

### 5. References

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