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Research Article

BUFFALO MILK PRODUCTION IN PUNJAB: AN ECONOMIC ANALYSIS

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Abstract: The present study has been conducted in three zones of Punjab, *viz*. zone I (Sub-mountainous zone), zone II (Central zone) and zone III (South-western zone) in order to examine the cost and return structure of buffalo milk production and suggesting measures to enhance the same. It was observed that herd size had a direct relationship with the milk production and yield. The milk yield per in-milk animal was found to be highest in zone II and it increased with increase in herd size. The total fixed and variable cost per day per milch animal was found to be highest in zone II and increased with the increase in herd size. The major share in the total cost of milk production was of variable costs (about 86 percent). The cost of milk production on per litre basis was highest in zone I (Rs 25.95/litre) and it decreased with increase in herd size. Further, dairy enterprise profit per day per milch animal on per litre basis was found to be the highest in zone II i.e. Rs 5.96/litre and it increased with increase in herd size. Further, during the period 2010 to 2012, cost of milk production has increased fast as compared to milk prices. Therefore, the profit per litre declined during this period.

Keywords: farm size category, fixed cost, variable cost, milk price, returns, dairy enterprise profit

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Introduction

Livestock sector is a vital sub sector of Punjab agriculture. This is evident from the large contribution of livestock sector to agriculture and allied GDP of the state, which increased from Rs 7,698 crore (29 %) during 2000-01 to Rs 37,415 crore (36.01 %) during 2016-17 [1]. The livestock sector provides a regular source of income and employment to the farmers. The employment in crop farming declined from 82 percent in 1981-82 to 56 percent in 2005-06 in the state agriculture. Against this, the employment in dairying enterprise increased from 18 percent to about 44 percent during the same period [2]. In the last four decades (1967-68 to 2016-17), milk production in Punjab grew at an annual rate of about 4 percent, and stands at 11.28 MT in 2016-17. Punjab stands first in terms of per capita milk availability (1075 gms per day) as well as in the milk yield of in-milk buffaloes (8.21 litres per day) [3]. As a result, today milk production/dairy farming has emerged as a major economic activity in the rural economy. In terms of quantity of milk production, Punjab has emerged as the 6th largest producer of milk in country (after U.P., Rajasthan, Madhya Pradesh, Gujarat and A.P.) despite of much smaller geographical area and livestock population. Buffaloes are contributing a major chunk of milk production in the state (8.06 MT *i.e.* 71.45 percent of total state milk production) with a population of 51.60 lakh. The Punjab livestock sector is also facing some issues. The green fodder deficiency in Punjab state was estimated to be 22.99 million tonnes which was 28.57 percent of the total green fodder requirement [4]. The need for data on cost of production of milk is being increasingly felt both for policy formulation and organizing extension activities. Adequate knowledge of the cost structure of milk production is also essential for working out a pricing policy and providing adequate/necessary economic incentives to milk producers. The price so determined should necessarily be within the reach of ordinary consumers, to reap the benefits of higher milk production and maintain the set of incentives to spur milk production. At present, the procurement price of milk is determined without considering the cost structure of milk production. Such an approach is not conducive for the growth of dairy sector. The realistic cost estimates of milk production should be reached after a comprehensive study of milk production system with adequate involvement/participation of dairy farmers. Therefore, this study has been undertaken with the following objectives.

1) To estimate the region wise and production group wise cost of buffalo milk production.
2) To estimate the net returns from buffalo milk production
3) To suggest measures to enhance profitability of buffalo milk production.

Methodology

The study was conducted in three zones of Punjab state viz. zone I (Sub-mountainous zone), zone II (Central zone) and zone III (South-western zone). The sample of the study was based on stratified random sampling technique with zones, districts, blocks, villages and farmers as the respective sampling units. Five districts were selected from the three zones and further, two blocks from each district were randomly selected, totaling 10 blocks in all, which are given below.

Zone	District	Block
I	Hoshiarpur	Garhshankar, Talwara
II	Ludhiana	Pakhowal
		Machhiwara
	Sangrur	Dhuri
		Sunam
	Gurdaspur	Fatehgarh churrian
		Kanuwan
III	Muktsar	Kot Bhai, Lambi

All the villages falling under each selected block were listed and two clusters of three villages each were selected at random from each block. Thus, twelve villages from each selected district were finalized. Overall, 60 villages were adopted from 5 selected districts for detailed analysis and study purpose. A complete list of all the farmers in each selected village was prepared along with the dairy units. The farmers were arranged in ascending order of dairy units. Four farm size categories were identified as under:

Farm size category	Dairy Units (No of milch animals)
Domestic	1-2
Small	3-7
Medium	8-15
Large	16 & above

The total number of farmers selected for the study was 185.The ultimate sample of the study came to be as under:

Zone	Farm size category				Total
	Domestic	Small	Medium	Large	
I	11	20	7	8	46
II	26	36	15	9	86
III	12	24	8	9	53
Overall	49	80	30	26	185

The primary data was collected from the selected farmers through personal interview method on a specially structured and pre-tested schedule. Each selected dairy farmer was visited at the monthly interval and data was collected for each animal and other dairy inputs. The information regarding various farm characteristics like farm inventory, detailed particulars of cost components viz. green fodder, dry fodder, concentrate feed, mineral mixture, labour charges, veterinary expenses and other miscellaneous expenditures (water, diesel, electricity etc), milk production, various sources of income *i.e.* sale of milk, sale of FYM, sale of animals etc was collected for the summer season (April-Sept) 2012.

Concepts used

Fixed costs

Fixed costs at the farmer's level are incurred on various fixed assets like buildings, equipment's, purchase of animals, depreciation on animals, buildings and equipment's, which do not vary with the level of milk production. As the investment on fixed items such as building, equipment's, animals etc provide returns over several years, only depreciation and interest on the amount incurred on these fixed items is included while calculating the components of fixed costs. Annual depreciation on animal shed was calculated at the rate of 5 percent of the present value of structure and on equipment was charged at the rate of 10 percent of purchase price. Regarding milch animals, no depreciation was charged up to three lactations, however, for fourth & fifth lactations, 10 percent and 6 & above lactations, 20 percent depreciation was charged. Straight line method of depreciation was used. Interest on fixed capital was worked out at the prevailing rate of 10.5 percent per annum.

Variable costs

The components of variable costs of dairy enterprise at farmer's level were feed, and fodder, labour, veterinary expenses and miscellaneous expenses on dairy farm.

Analysis of data

The tabular analysis was used for interpretation and comparison of the cost of milk production and returns from sale of milk for different categories of households. The analysis was carried out on per milch animal basis. Other statistical tools such as simple average, weighted average, percentage etc. were used wherever required.

Results and discussion

Milk yield and herd size relationship

Milk yield and herd size relationship is depicted in table 1. A perusal of the table shows that the average milk yield per in-milk animal was highest in zone II (8.41 litres/day) followed by zone III (7.25 litres/day) and zone I (6.59 litres/day) with an overall figure of 7.82 litres/day in Punjab. Category wise, there was a direct relationship between herd size and milk production. The higher milk yield of in-milk animals in large herds reveals that large herd dairy farmers manage their animals better than small herd size farmers. Moreover, large herd dairy farmers were rearing those animals which had better breed characteristics compared to animals of small herd farmers. It may be noted that large herd households usually rear animals for commercial use only and provide good quality feed/fodder and pay proper attention to their animals for producing large quantity of milk. Further, the milk yield per milch animal was the highest in zone II (5.85 litres/day) followed by zone III (5.48 litres/day) and zone I (4.74 litres/day) with an overall figure of 5.56 litres/day in Punjab. In category wise analysis, a direct relationship between milk yield and herd size was noticed in all three zones. Milk yield per in milk animal increase as the herd size increase. The milk yield of buffaloes increased with the increase in herd size [5]. It was 5.88 litres on small farms, 6.07 litres on medium farms and 6.20 litres on large dairy farms in Hisar district of Haryana state. Further, milk yield per animal of buffaloes increased with increase in herd size. It was 3.52 litres on small farms, 4.87 litres on medium farms and 6.10 litres on large dairy farms [6].

Fixed costs of buffalo milk production

The various components of fixed cost of buffalo milk production on per milch animal basis among different farm size categories in various zones of Punjab are presented in table 2. A perusal of the table reveals that the total fixed cost per day per milch animal was found to be highest in zone II *i.e.* Rs 20.21 followed by Rs 15.80 and Rs 15.03 in zone III and zone I respectively with an overall figure of Rs 18.32 in Punjab. Overall, out of total fixed investment of Rs 18.32 per day per milch animal, the maximum investment was on interest on animals *i.e.* Rs 9.45 followed by interest on buildings (Rs 2.78) and depreciation of animals (Rs 2.49). Category-wise, there was a direct relationship between the total fixed investments per milch animal and herd size. It was minimum on domestic farms *i.e.* Rs 17.35 and maximum on large dairy farms *i.e.* Rs 19.68 per day per milch animal.

Variable costs of buffalo milk production

The various components of variable cost of buffalo milk production on per milch animal basis among different farm size categories in various zones of Punjab are presented in table 3. A perusal of the table revealed that the total variable cost per day per milch animal was highest in zone II *i.e.* Rs 112.19 followed by Rs 112.15 and Rs 107.98 in zone III and zone I respectively with an overall figure of Rs 111.34 in Punjab. Overall, out of total variable costs of Rs 111.34 per day per milch animal, the maximum cost was incurred on green fodder *i.e.* Rs 40.81 (about 37 percent) followed by concentrates *i.e.* Rs 26.99 (24.24 percent) and labour charges with Rs 24.40 (about 22 percent). In a category-wise analysis, the total variable cost per milch animal increased with the increase in herd size which is due to the fact that large dairy farmers use higher quantities of concentrates at their farms as compared to domestic and small farms. In Hisar district, variable cost per day per animal (buffalo) was Rs 78.13 which constituted about 84 percent of the total costs [7].

Total cost of buffalo milk production

The total cost of buffalo milk production on per milch animal basis among different farm size categories in various zones of Punjab is presented in table 4. It is revealed from the table that the total cost per milch animal was found to be the highest in zone II with Rs 132.40 followed by zone III (Rs 127.95) and zone I (Rs 123.01) with an overall figure of Rs 129.66 in Punjab. In a category wise analysis, the total cost of milk production per day per milch animal increased with the increase in herd size. The major share in the total cost of milk production was of variable costs (86 percent). Further, cost of milk production on per litre basis was maximum in zone I *i.e.* Rs 25.95/litre which is mainly due to lower milk yield followed by zone III with Rs 23.35/litre and zone II with Rs 22.63/litre with an overall figure of Rs 23.32/litre in Punjab. In a category wise analysis, the cost of buffalo milk production on per litre basis decreased with increase in herd size indicating the prevalence of economies of scale on large farms. This might be due to the fact that large dairy farmers were rearing better milch animals and following better management practices as compared to domestic and small dairy farmers. Further, the relationship between cost/litre and milk yield of buffaloes on different sized dairy farms have is in figure 1. It was observed that the cost/litre decreased and milk yield increased as the size of dairy farm increased. These results are in line with other studies too. The cost of buffalo milk production on per litre basis was Rs 12.59/litre and decreased with increase in herd size [8].

Table-1 Milk yield and herd size relationship

Farm size category	Milk yield/in-milk animal (Litres /day)	Milk yield/ milch animal (Litres/day)
Zone I		
Domestic	4.79	4.11
Small	6.38	4.49
Medium	6.86	4.73
Large	8.62	5.81
Overall	6.59	4.74
Zone II		
Domestic	6.86	5.17
Small	7.95	5.41
Medium	9.30	6.53
Large	10.47	6.69
Overall	8.41	5.85
Zone III		
Domestic	5.42	4.77
Small	6.76	5.43
Medium	8.25	5.85
Large	10.01	6.25
Overall	7.25	5.48
Punjab		
Domestic	6.18	4.89
Small	7.45	5.25
Medium	8.6	6.04
Large	9.91	6.39
Overall	7.82	5.56

Table-2 Fixed costs of buffalo milk production, (Rs per day per milch animal)

Particulars/ Category	Animals		Buildings		Equipment		Land Rent	Total Fixed cost
	Deprecation	Interest	Deprecation	Interest	Deprecation	Interest	Interest	
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(i to vii)
Zone I								
Domestic	0.85	6.51	1.11	2.32	0.98	1.03	0.05	12.85
Small	1.37	6.35	1.57	3.3	0.71	0.74	0.02	14.06
Medium	1.99	9.63	1.31	2.75	0.44	0.46	0.04	16.62
Large	2.66	10.07	1.09	2.29	0.33	0.34	0.06	16.84
Overall	1.68	8.06	1.28	2.69	0.62	0.65	0.04	15.03
Zone II								
Domestic	3.85	7.36	1.72	3.61	1.47	1.54	0.05	19.6
Small	2.74	7.7	1.82	3.81	1.84	1.93	0.04	19.88
Medium	2.35	11.96	1.19	2.5	1.19	1.23	0.03	20.45
Large	3.25	12.7	1.37	2.88	0.62	0.65	0.02	21.49
Overall	3.01	9.53	1.55	3.26	1.38	1.44	0.04	20.21
Zone III								
Domestic	1.72	9.38	0.62	1.31	0.84	0.89	0.02	14.78
Small	1.11	11.03	0.4	0.84	0.67	0.71	0.02	14.78
Medium	1.37	11.05	0.97	2.04	0.71	0.74	0.02	16.9
Large	3.76	11.57	0.43	0.91	0.46	0.48	0.01	17.62
Overall	1.68	10.64	0.65	1.36	0.71	0.74	0.02	15.80
Punjab								
Domestic	2.85	7.61	1.38	2.90	1.25	1.31	0.04	17.35
Small	2.19	8.06	1.52	3.18	1.42	1.49	0.03	17.89
Medium	2.07	11.31	1.16	2.45	0.94	0.97	0.03	18.94
Large	3.17	11.83	1.16	2.43	0.52	0.54	0.03	19.68
Overall	2.49	9.45	1.33	2.78	1.10	1.15	0.03	18.32

Table-3 Variable costs of buffalo milk production, (Rs per day per milch animal)

Particulars/ category	Green fodder (i)	Dry fodder (ii)	Concentrates (iii)	Labour charges(iv)	Vety. Expenses (v)	Misc. expenses (vi)	Total variable cost(i to vi)
Zone I							
Domestic	27.57	18.88	18.15	30.11	0.62	0.78	96.11
Small	31.88	18.97	27.32	28.77	0.54	0.76	108.24
Medium	34.13	23.41	31.34	21.38	0.4	1.19	111.85
Large	36.31	24.34	33.32	21.36	0.32	1.02	116.67
Overall	32.35	21.28	27.38	25.55	0.48	0.94	107.98
Zone II							
Domestic	41.25	15.62	19.44	27.63	0.60	1.07	105.61
Small	44.11	15.23	25.63	26.55	0.36	1.35	113.23
Medium	44.37	16.76	29.88	21.49	0.35	1.17	114.02
Large	44.4	17.84	34.03	15.36	5.58	1.13	118.34
Overall	43.46	16.15	26.42	23.76	1.21	1.19	112.19
Zone III							
Domestic	34.79	15.81	26.81	32.40	0.01	0	109.82
Small	41.63	16.21	28.55	25.10	0	0.57	112.06
Medium	45.28	16.52	28.95	20.54	0.78	0.86	112.93
Large	44.28	18.45	29.98	21.37	0.69	0.95	115.72
Overall	41.20	16.47	28.36	25.24	0.34	0.55	112.15
Punjab							
Domestic	37.36	16.27	20.69	29.07	0.48	0.80	104.67
Small	41.44	16.09	26.47	26.69	0.33	1.10	112.11
Medium	42.61	17.98	29.96	21.26	0.45	1.11	113.36
Large	42.21	19.67	33.25	17.85	3.45	1.07	117.51
Overall	40.81	17.23	26.99	24.40	0.90	1.02	111.34

Table-4 Total cost of buffalo milk production, (Rs per day per milch animal)

Particulars/ Category	Fixed cost (i)	Variable cost (ii)	Total cost (i+ii)	Milk yield per animal (lt)	Cost of milk production (per lt)
Zone I					
Domestic	12.85	96.11	108.96	4.11	26.51
Small	14.06	108.24	122.30	4.49	27.24
Medium	16.62	111.85	128.47	4.73	27.16
Large	16.84	116.67	133.51	5.81	22.98
Overall	15.03	107.98	123.01	4.74	25.95
Zone II					
Domestic	19.6	105.61	125.21	5.17	24.22
Small	19.88	113.23	133.11	5.41	24.60
Medium	20.45	114.02	134.47	6.53	20.59
Large	21.49	118.34	139.83	6.69	20.90
Overall	20.21	112.19	132.40	5.85	22.63
Zone III					
Domestic	14.78	109.82	124.60	4.77	26.12
Small	14.78	112.06	126.84	5.43	23.36
Medium	16.90	112.93	129.83	5.85	22.19
Large	17.62	115.72	133.34	6.25	21.33
Overall	15.80	112.15	127.95	5.48	23.35
Punjab					
Domestic	17.35	104.67	122.02	4.89	24.95
Small	17.89	112.11	130.00	5.25	24.76
Medium	18.94	113.36	132.30	6.04	21.90
Large	19.68	117.51	137.19	6.39	21.47
Overall	18.32	111.34	129.66	5.56	23.32

Table-5 Dairy enterprise profit from buffaloes, (Rs per day per milch animal)

Particulars/ Category	Milk Yield (litres)	Price / litre	Returns from			Total Returns (i to iii)	Total Cost	Cost / litre	Dairy Enterp. Profit	Dairy Enterp. Profit / litre
			Milk Sale (i)	Manure (ii)	Young Ones (iii)					
Zone I										
Domestic	4.11	26.38	108.42	1.59	0.32	110.33	108.96	26.51	1.37	0.33
Small	4.49	27.43	123.16	1.87	0.00	125.03	122.30	27.24	2.73	0.61
Medium	4.73	28.79	136.18	1.42	0.02	137.62	128.47	27.16	9.15	1.93
Large	5.81	29.11	169.13	1.89	0.00	171.02	133.51	22.98	37.51	6.46
Overall	4.74	27.89	132.2	1.68	0.09	133.97	123.01	25.95	10.96	2.31
Zone II										
Domestic	5.17	26.01	134.47	2.07	0	136.54	125.21	24.22	11.33	2.19
Small	5.41	28.83	155.97	1.86	0.12	157.95	133.11	24.6	24.84	4.59
Medium	6.53	29.14	190.28	1.98	0	192.26	134.47	20.59	57.79	8.85
Large	6.69	29.33	196.22	2.21	0.27	198.7	139.83	20.9	58.87	8.80
Overall	5.85	28.24	165.2	2.00	0.08	167.28	132.4	22.63	34.88	5.96
Zone III										
Domestic	4.77	25.14	119.92	1.59	0.06	121.57	124.6	26.12	-3.03	-0.64
Small	5.43	27.5	149.33	1.52	0.00	150.85	126.84	23.36	24.01	4.42
Medium	5.85	27.89	163.16	1.66	0.00	164.82	129.83	22.19	34.99	5.98
Large	6.25	28.92	180.75	1.42	0.11	182.28	133.34	21.33	48.94	7.83
Overall	5.48	28.24	154.76	1.56	0.04	156.36	127.95	23.35	28.41	5.18
Punjab										
Domestic	4.89	25.91	126.7	1.88	0.07	128.65	122.02	24.95	6.63	1.36
Small	5.25	28.36	148.89	1.8	0.08	150.77	130	24.76	20.77	3.96
Medium	6.04	28.87	174.37	1.8	0.00	176.17	132.3	21.90	43.87	7.26
Large	6.39	29.24	186.84	2.01	0.17	189.02	137.19	21.47	51.83	8.11
Overall	5.56	27.96	155.46	1.85	0.07	157.38	129.66	23.32	27.72	4.99

Table-6 Change in items of variable cost and yield over time, (Rs./day/milch animal)

Inputs	Expenditure		Increase /Decrease (in %)
	(April -Sept.,2010)	(April -Sept.,2012)	(2010 to 2012)
Milk yield	7.70	7.82	1.56
Green Fodder	30.37	40.81	34.38
Dry Fodder	17.20	17.23	0.17
Concentrates	17.47	26.99	54.49
Labour	17.66	24.40	38.17
Cost of milk production	17.92	23.32	30.13
Milk prices	23.38	27.96	19.59
Per litre profit	5.82	4.99	-14.26

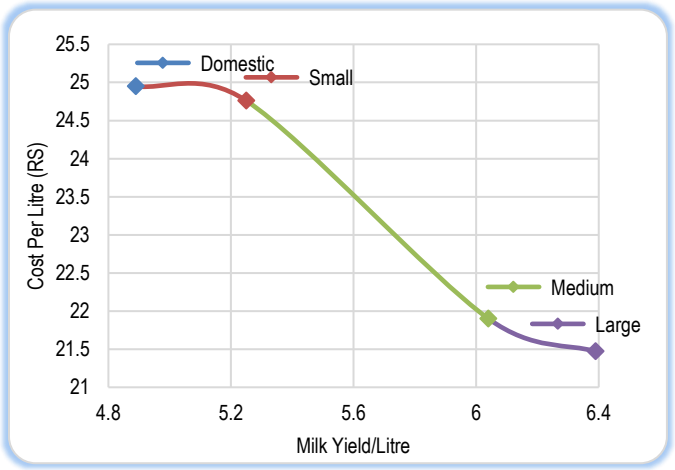

Fig-1 Relationship between cost/litre and milk yield of buffalo in different farm size categories in Punjab

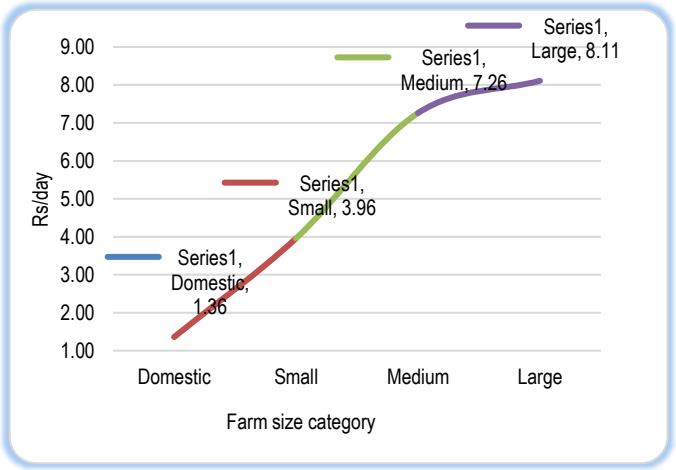

Fig-2 Dairy enterprise profit from buffaloes in Punjab (per milch animal)

Dairy enterprise profit from buffaloes

Returns and profits from buffaloes on per milch animal basis among different farm size categories in various zones of Punjab have been presented in table 5. A perusal of the table shows that the total returns per day per milch animal were the highest in zone II with Rs 167.28 followed by zone III (Rs 156.36) and zone I (Rs 133.97) with an overall figure of Rs 157.38 in Punjab. The higher returns in zone II were on the account of higher yield and higher price of milk in this zone. Out of total returns, the major share was from the sale of milk (about 99 percent). The share of milk in total dairy income was about 97 percent [9]. In a category wise analysis, total returns increased with the increase in herd size. Dairy enterprise profit from buffaloes per day per milch animal were highest in zone II *i.e.* Rs 34.88 followed by Rs 28.41 in zone III and Rs 10.96 in zone I with an overall figure of Rs 27.72 in Punjab. Similarly, dairy enterprise profit from buffaloes per day per milch animal on per litre basis was highest in zone II *i.e.* Rs 5.96/litre followed by Rs 5.18/litre and Rs 2.31/litre in zone III and zone I respectively with an overall figure of Rs 4.99 in Punjab. In a category wise analysis, dairy enterprise profit per day per milch animal on per litre basis increased with increase in herd size. These results are in conformity with other studies. The net profit per litre from buffaloes increased with increase in herd size. It is evident that dairy farming is not a profitable venture on domestic and small category dairy farms and to make it profitable one, the number of buffaloes should be 8 or more [10].

Change in cost of milk production, milk yield, milk prices and profit

During the period April-Sept, 2010 to April –Sept, 2012, milk yield increased only by 1.56 percent (Table 6). Need of the hour is to work on the genetic improvement of the animals to enhance the milk yield. Cost of green fodder per milch animal increased by 34.38 percent in the case of buffaloes. Highest increase was in concentrates *i.e.* 54.49 percent. Labour component has also increased drastically (38.17 percent) during the above period which is a matter of concern. In the coming years, dairy farming will not remain a viable enterprise due to whopping labour charges. For that suitable mechanisation at farm level and maximum possible utilisation of surplus family labour is very important to save the future of dairy farming in the state. During the above period, cost of milk production increased by 30.13 percent whereas milk prices increased by 19.59 percent which is lesser than the increase in cost of milk production. Therefore, the profit per litre declined by 14.26 percent during the above period.

Conclusion

The milk yield per in-milk animal was the highest in zone II (8.41 litres/day). There was a direct relationship between milk yield per milch animal and herd size which may be due to higher use of concentrates and better management practices on large commercialized dairy farms, thus indicating the prevalence of economies of scale on these farms. The total fixed cost per day per milch animal was found to be highest in zone II *i.e.* Rs 20.21. In a category-wise analysis, the total fixed investments increased with the increase in herd size indicating the heavy investments on large dairy farms. The total variable cost per day per milch animal was highest in zone II *i.e.* Rs 112.19. In a category-wise analysis, the total variable cost per milch animal increased with the increase in herd size which is due to the fact that large dairy farmers use higher quantities of concentrates at their farms as compared to domestic and small farms. The major share in the total cost of milk production was of variable costs (about 86 percent). The cost of milk production on per litre basis was maximum in zone I *i.e.* Rs 25.95/litre which is due to lower milk yield. In a category wise analysis, the cost of buffalo milk production on per litre basis decreased with increase in herd size indicating the prevalence of economies of scale on large farms. The total returns per day per milch animal were the highest in zone II amounting to Rs 167.28. Of total returns, the major share was from the sale of milk (about 99 percent). The dairy enterprise profit from buffaloes per day per milch animal on per litre basis was highest in zone II *i.e.* Rs 5.96/litre. In a category wise analysis, dairy enterprise profit per day per milch animal on per litre basis increased with increase in herd size. During the period April-Sept, 2010 to April –Sept, 2012, milk yield increased only by 1.56 percent and cost of green fodder per milch animal has increased by 34 percent in the case of buffaloes. Highest increase was in concentrates *i.e.* 54.49 percent. Labour component has increased drastically (38.17 percent) during the above period which is a matter of concern. During the above period, cost of milk production has increased by 30.13 percent whereas, milk prices increased 19.59 percent which is lesser than the increase in cost of milk production. Therefore, the profit per litre declined by 14.26 percent. For diversification of agriculture, dairy farming is the next best alternative available to the farmers. But in the previous two years, profitability of milk has not shown any sign of increase, rather it has declined by 14.26 percent in the case of buffaloes. Therefore, there is need of policy intervention in dairy sector for successful implementation of diversification programme. At present procurement price of milk is determined based on fat and SNF which is not realistic as fat and SNF content do not vary much, rather it is the major inputs like green fodder, dry fodder, concentrates, labour, veterinary expenses etc which constitute about 86 percent of total cost of milk production and vary significantly with time and season. So, the need of the hour is to consider prices of these inputs as one parameter along with existing parameters of demand supply scenario, import export policies *etc.* while determining the milk prices.

Suggestions to enhance profitability in dairy farming

The quality of animals and milk yield is low among the domestic and small dairy farms. Hence, there is need of intervention by government agencies to ensure that the quality of animals and milk yield of domestic and small farmers improve and they get remunerative price for milk produced by their animals. The dairy farmers should be encouraged to adopt new technologies such as silage making to get fodders at reasonable price round the year. New varieties of fodder which are more nutritious and high yielding need to be developed. To reduce the second largest component of cost of milk production *i.e.* labour cost, proper dairy farm management is required along with suitable mechanization and maximum utilization of surplus family labour. There is a need to restructure the whole dairy extension system in the state to provide the necessary knowledge and training to the farmers. With the commercialization and formalization/organization of dairy enterprise, it is transformed more and more to a business. More inputs are being purchased by farmers with passage of time. The success or failure in the business, therefore, depends largely upon farmers ability to learn from past about his own business or his contemporaries in similar profession. The records are necessary to examine the details of his business operations. Though, it is somewhat tedious to maintain and analyze the farm records, yet such records provide tremendous insights for making business improvement. Illiterate dairy farmers can take help of other family members who are educated or school going children for maintaining dairy records. Day to day activities *i.e.* physical quantities, costs and incomes should be recorded in record book. Without keeping record book, a farmer cannot have precise estimate of costs and returns. An analysis of record book also points out the loop holes where there is need of cutting the cost and where there is need of investing more so as to enhance overall profitability of dairy farming.

Application of research: The research is applicable for enhancing the dairy profitability from buffalo milk production in Punjab state.

Abbreviations: GDP-Gross Domestic Product, MT- Million Tonnes, A.P.- Andhra Pradesh, U.P. – Uttar Pradesh

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