ECONOMIC EFFICIENCY OF MILK PLANTS IN PUNJAB AND HARYANA

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INTRODUCTION

India has witnessed white revolution, which portrayed manifold increase in milk yield during the post independence era. The fact, that dairying could play a major constructive role in promotingrural welfare and reducing poverty, is increasingly being recognized. Milk production alone involvesmore than 70 million producers, each raising one or two buffaloes. Milk production in country has enhanced from 17 million tonnes during 1951 to 92.2 million tonnes during 2005-2006 and India hasbecome number one in milk production during 1998 after surpassing USA. The target for 10th five- year plan, though yet not finalized would be of order of 100 million tonnes. The value of milk and milk products during 1998-99 was reported to be 8,22,640 million, which accounted for 21% of agricultural output during that year putting dairy enterprise as the highest contributor to agricultural sector. Milk production has become major farm enterprise contributing about 7% to GDP of India. According to an estimate, the milk production of our country would be 115 million tonnes during 2009-10 considering a growth rate of 4% in milk production (Gandhi and Sharma, 2001).

The ideal conditions for long-term growth in milk procurement have been created like adopting modern technologies in animal breeding and feeding by significant number of farmers. Competition has also necessitated improvement in the quality of products, reduction in cost, innovation in product development and enhancement of productivity leading to achieving corporate excellence. The new environment demands creative management redesigning and remodeling of traditional system and practices to suit new circumstances. Modern milk processing and marketing facilities have been created all over the country.

For running a business economically, the fixed as well as variable costs must be realized so that the organisation runs at profit. To use optimally the fixed and variable capital invested in milk procurement, the total milk procurement should be commensurate with the installed capacity of the plant. This implies that more milk should be procured from a given milk shed of co-operative union. This is possible only through increasing the profits of milk producers without any indirect increase in consumer prices. Milk processing represents an important link between consumers and producers. The nature and magnitude of processing costs are thus liable to affect economic viability of milk plant considerably.

So keeping in view its practical utility, the present study has been undertaken

i) to evaluate the economic efficiency of milk plants under Punjab Milkfed and Haryana Dairy Co-operative Federation Ltd.
ii) To study the effect of different costs on gross product mix and vice-versa.

METHODOLOGY

Haryana and Punjab states were purposively selected for present investigation. The decision to select Haryana and Punjab states was prompted by national importance of dairying enterprise in the states and resultant familiarity of researcher. The states of Haryana and Punjab have been identified as two milk intensive states (Khumkhare and Gandadharan 1980). Four milk plants two under MILKFED Punjab and two under HDDCF were selected on the basis of capacity utilization i.e. highest and lowest criteria. Ludhiana attained the highest criteria while Jalandhar attained the lowest criteria in Punjab whereas in Haryana, Rohtak attained the highest criteria while Jind attained lowest criteria. The data for the period from 1992 to 2006 were taken. The data were collected from Accounts Section, Production Section, Engineering Section, Marketing and Sales Section, Procurement Section. The economic efficiency of the plants was measured by using various ratios viz. capital ratio, income ratios and cost ratios. The effect of various costs on gross product mix and vice-versa was worked out by carrying out the regression analysis.

CONCEPTS USED IN THE STUDY
RATIO ANALYSIS (EFFICIENCY MEASURES)

Ratio methods are simply per unit returns or costs to factor inputs involved in the business. These measures help work the rate at which a resource is converted into output, whether or not the resource is being utilized optimally. These ratios are affected by a combination of resources and in use of production and marketing practices.

Ratio Methods

(i) Capital Ratios

a) Net capital ratio = $\frac{\text{Total assets}}{\text{Total liabilities}}$

b) Current ratio = $\frac{\text{Current assts}}{\text{Current liabilities}}$

These ratios actually measure the degree of financial safety by comparing the business over time. The net capital ratio determines the solvency of business in long run and current ratio is used to determine the solvency over shorter period.

(ii) Income ratios

Rate of capital turnover is gross returns from co-operative on farm as percentage of total capital investment.

$$\text{Rate of turnover} = \frac{\text{Gross income}}{\text{Total assets}} \times 100$$

This method is useful in measuring the efficiency of capital investment. A high turnover rate usually means efficient use of capital.

Commensurate with objective of study, techniques of project appraisal, ration analysis and regression analysis were employed.

Cost ratios

$$\text{Gross ratio} = \frac{\text{Total expenses}}{\text{Gross income}}$$

$$\text{Fixed ratio} = \frac{\text{Fixed expenses}}{\text{Gross income}}$$

$$\text{Operating ratio} = \frac{\text{Operating expenses}}{\text{Gross income}}$$

The cost ratios provide a measure for determining whether costs are high or low and indicate the proportion of the gross income consumed by these expenses.

RESULTS AND DISCUSSION

Exiting Levels of efficiency in Milk Plants

The efficiency of milk products can be measured in many terms such as capacity utilization, input output relationship, assets liabilities relationship, income-assets relationship, etc. The comparison of capacity utilization input output in selected milk plants is given in Table 1.

Capacity Utilization

Capacity utilization is an important indicator of efficient running of milk plant. Situated as they are in comparative sector, their operation is of total significance to national economy. These sectors derive their significance from two fundamental considerations, namely, creation of sound infrastructure and situation of balanced regional developments. The utilization of installed capacityin these enterprises is per haps the largest single indicator of their operating efficiency.

It is obvious from Table 1 that the actual capacity of different milk plants under study was different. It was 100 litres per day for Rohtak and Jind while the same was 300 litres per day for Jalandhar and 400 litres per day for Ludhiana milk plant. But the milk handled per day did not tally with the actual capacity of milk handling. The milk handled in Rohtak milk plant was 64728 litres per annum which turned to be 177.34 litres per day against actual capacity of 100 litres per day. Thus, Rohtak milk plant was running over-utilized, is, it was doing business beyond its capacity. Under utilization of capacity led to high cost of production because of primarily inefficient utilization of fixed resources.

In Jind milk plant, total milk handled was 36226 litres per annum or 99.25 litres per day. This showed that Jind milk plant was running with almost 100% of utilization. But in case of milk plants in Punjab, these were under utilized.

Table1.Milk handled, milk procured and capacity utilization in milk plants

Milk plant	Milk Handled (lac Litres/Annum)	Milk Procured (lac Litres/Annum)	Average milk handled (lac Litres/day)	Actual capacity (lac Litres/day)	Capacity utilization (%)
Rohtak	64728	52800	177.34	100	177.34
Jind	36226	28000	99.25	100	99.25
Jalandhar	71370	45832	195.54	300	65.18

Ludhiana	121796	96328	333.69	400	83.42

Jalandhar milk plant, 71370 litres of milk was handled per annum which became 195.54 litres per day. This was only 65.18% of the actual capacity. Such a low utilization is to be noted seriously.This may be either due to low availability of milk in the region or due to some technical fault in the plant.
In Ludhiana milk plant, as much as 121796 litres of milk was handled per annum turning out to be 333.69 litres per day. In this way 83.42% of the actual capacity could be utilized in Ludhiana milk plant. Though, Ludhiana milk plant was also under-utilized but in comparison to Jalandhar milk plant, its position was satisfactory.
Therefore, as for as capacity utilization is concerned, Rohtak and Jind Milk plants however performing the best while Ludhiana milk plant's performance was satisfactory. The performance of Jalandhar milk plant may be said poor.

Efficiency Ratios

The balance sheets of dairy plants were used for the analysis of financial strength of milk plants. The different commonly used ratios were employed to analyses the balance sheets. The ratios are shown in Table 2.
Net capital ratio indicates long run liquidity position of business. Ludhiana milk plant was holding better position than all other plants. This showed that sale of all assets of business would produce efficient cash to cover all the liabilities in Ludhiana milk plant as the ratio was greater than unity. Ludhiana milk plant was followed by Rohtak (1.0073), Jalandhar (1.0042) and Jind (1.0016).
To examine the short term financial strength of milk plants, current ratios were worked out. The analysis showed that all the milk plants were having current ratios greater than unity, except in Rohtak milk plant where it was just near to unity i.e. 0.9929. Therefore, it can be said that all themilk plants under study were technically solvent as in general current assets of business showed be more than the current liabilities. The best solvency was found in Ludhiana milk plant (1.3463), followed by Jalandhar (1.1854), Jind (1.0425) and Rohtak (0.9929). This showed that current assets management was satisfactory in these milk plants. It needs improvement to raise the ratio to the levelof 2.
Rate of turnover conveys that how much poor's income is generated with one unit of total assets. Rate of ratio was the highest in Rohtak milk plant i.e. 4.54, followed by 3.26 in Ludhiana; 2.76 in Jind and 2.12 in Jalandhar milk plant. This showed that one rupee invested in assets fetched Rs. 4.54,3.26, 2.76 and 2.13 for Rohtak, Ludhiana, Jind and Jalandhar milk plant respectively. Thus Rohtak milk plant can be said to be more solvent than other milk plants. Gross ratio provided a measure for determining whether costs were higher or lower than income and indicated what proportion of gross income was consumed by these expenses. Thus lower gross ratio is better than the higher ones. So, Ludhiana milk plant performed the best in this regard as its gross ratio was the lowest to the time of 0.9341, followed by 0.9657 in Jalandhar, 0.9754 in Jind and 0.9861 in Rohtak milk plant. In other words we may say that as much as 98.61, 97.57, 96.57 and 93.41 per cent of gross income was consumed by by the costs in Rohtak, Jind, Jalandhar and Ludhiana milk plant respectively. The trends in fixed ratios and operating ratios were somewhat differences than gross ratio. Though gross ratio in the sum total of fixed ratio and operating ratio.

Table 2: Efficiency ratios in different milk plants

Ratios	Rohtak	Jind	Jalandhar	Ludhiana
Net capital ratio	1.0073	1.0016	1.0042	1.0356
Current ratio	0.9929	1.0425	1.1854	1.3463
Rate of turnover	4.54	2.76	2.13	3.26
Gross ratio	0.9861	0.9754	0.9657	0.9341
Fixed ratio	0.0207	0.0562	0.0481	0.0376
Operating ratio	0.9654	0.9192	0.9176	0.8965

The analysis revealed that fixed expenses were lowest in Rohtak milk plant (0.207) followed by Ludhiana (0.0376), Jalandhar (0.0481) and Jind (0.0562), while it was but matured that operating ratio deposited an inverse trend. It was lowest to the 0.8965 for Ludhiana, followed by 0.9176 for Jalandhar, 0.9192 for Jind and 0.9654 for Rohtak milk plant.

Thus, overall it can be concluded that all the milk plants under study were running efficiently. There were, by and large, some weaknesses in performance of milk plants such as under utilization of installed capacity particularly in Jalandhar milk plant, narrow gap between assets and liabilities in Jind milk plant. These weaknesses need to be checked in order to improve the operating efficiencyof milk plant.

Costs affecting output in milk plants

In order to examine the effect of different types of costs on gross product mix, regression analysis was done for each milk plant. Rohtak Milk Plant. It is clear from Table 3 that in Rohtak milk plant, R^2 came to be as high as 0.8758 which indicated that 87.58 per cent of the variation is gross mix product mix was explained by different types of costs included in the equation. These costs included marketing cost, raw material and procurement costs, processing cost and Overhead cost.

Table3.Costs effecting output in Rohtak milk plant

Y = Gross Product Mix
R_2 = 0.8758 F – Ratio = 12.34

Variable	Regression Coefficient	t-value
Constant	8.27	0.123
Marketing Costs	1.35***	2.733
Overhead Cost	-0.49***	2.730
Processing Cost	2.47**	2.616
Raw Material & Procurement Cost	3.74**	2.836

The regression coefficient all types of costs came to be significant which showed that the role of different types of costs was significant towards gross sales of milk and milk products in Rohtak milk plant. The regression coefficient of marketing cost was found to be 1.35 which showed that an increase of one unit in marketing cost would lead to an increase of 1.35 units in the gross sales.

Similarly the regression coefficient of processing cost (2.47) conveyed that there would be an increase of 2.47 units in gross sales if an increase of one unit was made in the processing cost. Moreover, an increase of 3.74 units in gross was suggested with an increase of one unit in raw material and procurement cost. But on the other hand, the regression coefficient of Overhead cost was found to be negatively significant, which highlighted that administrative cost had an adverse bearing on gross sales as it was incurred in excess than what was required. Therefore, in Rohtak milkplant, gross mix product i.e. gross sales of all the products is largely dependent upon marketing, processing and raw material and procurement costs which had to be enhanced while the cost on overhead set up needs to be rationalized.

Jind milk plant

In the first run equation, all the four types of costs were regressed. The R^2 came to be as high as 0.8278 but no coefficient turned to be significant. Then the variable with the least t-value i.e. overhead costs was excluded from the equation and R^2 again came to be 0.8278 which showed thatin Jind milk plant costs incurred on administrative lead had nothing to do with the gross mix. But in the 2nd run equation, again none of the remaining three variables came to be significant. Once more the variable with the least t-value i.e. raw material and procurement costs was excluded from the equation and the regression equation was return with two costs in the equation. The R^2 come to be .7979 and the coefficient of marketing cost turned to be significant. This showed that in Hind milk plant marketing cost was the only variable which influenced the gross sale positively. The contribution of only marketing cost towards explaining variation of gross product mix was found to be 0.7736, thus leaving behind as 0.0343 for processing costs

Table 4: **Costs effecting output in Jind milk plant**

1st Run Equation

R^2 = 0.8278 F-ratio = 8.41

Variable	**Regression Coefficient**	**t-value**
Constant	203.46	0.623
Marketing Costs	1.31	1.540
Overhead Cost	-0.78	0.047
Processing Cost	-1.38	1.312
Raw Material & Procurement Cost	0.65	0.994

2nd Run Equation

R^2 = 0.8278 F-ratio = 9.61

Variable	**Regression Coefficient**	**t-value**
Constant	201.74	0.857
Marketing Costs	1.32	1.623
Processing Cost	-1.34	1.396
Raw Material & Procurement Cost	0.67	1.014

3rd Run Equation

R^2 = 0.7979 F-ratio = 17.77

Variable	Regression Coefficient	t-value
Constant	209.29	1.096
Marketing Costs (0.7736)	1.36**	2.334
Processing Cost (0.0343)	-1.41	1.459

Final Run Equation

R^2 = 0.7979 F-ratio = 17.77

Variable	Regression Coefficient	t-value
Constant	211.37	1.117
Marketing Costs	1.38**	2.356

The regression coefficient of marketing costs revealed that an increase of one unit in the marketing cost would lead to an increase of 1.38 units in the gross sales of the milk plant. Therefore, in Jind milk plant, marketing cost needs to be enhanced and all other types of costs to be re-planned in orderto enhance the return from product mix.

Jalandhar milk plant

In the first run equation, the magnitude of R^2 came to be 0.8956 but no variable was found to be significant. Then the variable with the lowest t-value was excluded which was marketing cost and the R^2 came down negligibly from 0.8956 to 0.8903 and the two out of 3 variables turned to be significant. This showed the raw material and procurement costs, processing costs and overhead costs together explained 89.03% of the variation in the revenue from gross product mixes inJalandhar milk plant. The regression coefficient of overhead costs came to be non-significant but negative which needs to be utilized in a rational manner. The R^2 after excluding overhead costs fromthe equation was found to be 87.18 per cent.

Table5. Costs effecting output in Jalandhar milk plant

1st Run Equation

R^2 = 0.8956 F-ratio = 15.01

Variable	Regression Coefficient	t-value
Constant	-128.49	3.152
Marketing Costs	-1.16	0.891
Overhead Cost	-1.27	1.432
Processing Cost	3.06	1.547
Raw Material & Procurement Cost	0.21	1.651

2nd Run Equation

R^2 = 0.8903 F-ratio = 24.35

Variable	Regression Coefficient	t-value
Constant	-114.18	3.080
Overhead Cost	-1.29	1.578
Processing Cost	3.34**	2.140
Raw Material & Procurement Cost	0.23**	2.367

Final Run Equation

$R^2 = 0.8718$ F-ratio = 37.40

Variable	Regression Coefficient	t-value
Constant	-109.67	2.944
Processing Cost	3.38**	2.216
Raw Material & Procurement Cost	0.24**	2.372

The significant regression coefficient of processing costs showed that an increase of one unit is processing costs would contribute 3.38 units towards gross sales of the plant while with an increase of one unit in raw material and procurement costs there would be an increase of 0.24 units in revenue from gross product mix in Jalandhar milk plant. Therefore, processing of different milk products emerged as the highest contributor of revenue followed by the raw material and procurement. Both these inputs are interrelated because processing can only be done if raw material and procured products are there in adequate qualities. Thus, emphasis should be given on these two items in order to increase the volume of gross product mix in Jalandhar milk plant.

Ludhiana Milk Plant

All the four types of costs were also regressed in case of Ludhiana milk plant where R^2 came to be as high as 0.8242 but no explanatory variable except processing cost was significant. Then the marketing cost was excluded from the equation due to it lowest t-value and the regression analysis was again tried. The R^2 with the 3 types of costs was found to be 0.8189, which showed that marketing cost could contribute only 0.53% towards gross sales while the contribution of raw material and procurement worked out to be 1.74%. Thus the remaining two costs i.e. processingcosts and overhead costs could explain 80.15% of the variation in revenue from gross product mix inLudhiana milk plant.

Table6.Costs effecting output in Ludhiana milk plant

1st Run Equation

$R^2 = 0.8242$ F-ratio = 8.20

Variable	Regression Coefficient	t-value
Constant	-1835.80	3.232
Marketing Costs	0.98^{NS}	0.793
Overhead Cost	-0.69^{NS}	1.661
Processing Cost	4.32**	2.754
Raw Material & Procurement Cost	0.78^{NS}	0.870

2nd Run Equation

$R^2 = 0.8189$ F-ratio = 15.07

Variable	Regression Coefficient	t-value
Constant	-1856.01	3.334
Overhead Cost	-0.81**	2.169
Processing Cost	4.14	3.441
Raw Material & Procurement Cost	0.82^{NS}	0.670

Final Run Equation

$R^2 = 0.8015$ F-ratio = 22.21

Variable	Regression Coefficient	t-value
Constant	-1861.54	3.341

Processing Cost	-0.83**	2.227
Raw Material & Procurement Cost	4.21***	4.056

The regression coefficient of processing cost came to be 4.21, significant at one per cent level indicating that an increase of one unit in processing cost would lead to an increase of 4.21 units in gross product mix. On the other hand, the regression coefficient of overhead cost was –0.83,significant at five per cent level. This showed that the impact of overhead costs on revenue was negative due to this being used in excess, which ought to be utilized in a rational manner in order to augment the income of the Ludhiana milk plant.

Overall, it can be said that processing emerged as the most common contributing factor towards revenue for gross product mix of all the milk plants under study, while overhead expenses exerted negative effect on the same.

Cost Function Analysis

In order to see the effect of revenue on cost, another regression analysis was done taking total cost as the dependent variable and the total revenue as the explanatory variable in the log-linear form.

The regression analysis presented in Table 4 showed that revenue resulted in a significant increase in total cost in all the milk plant under study. The R^2 came to be 0.9971, 0.9973, 0.9924 and 0.9901 in Rohtak, Jind, Jalandhar and Ludhiana milk plant respectively. This indicated that output was powerfully responsible for the variations in total costs.

Table 7.Effect of revenue on cost in milk plants : Log-Linear Function

Dependent variable: Total cost				
Milk Plant	**Variable**	Regression coefficient	**t-value**	**R^2**
Rohtak	Constant	0.4925	3.573	0.9971
	Revenue	0.9422***	59.036	
Jind	Constant	0.3514	2.723	0.9973
	Revenue	0.9571***	60.484	
Jalandhar	Constant	0.6158	3.089	0.9924
	Revenue	0.9286***	39.515	
Ludhiana	Constant	1.1272	4.908	0.9901
	Revenue	0.8739***	34.690	

The log-linear regression coefficient of revenue in all the milk plants under study was found to be less than unity. This highlighted that increase in cost was less than the proportionate increase in revenue indicating toward scope of surplus capital for reinvestment in reproduction process at an extended scale in all milk plants. One can say that an increase of one percent in the revenue would lead to an increase of 0.9422, 0.9571, 0.9286 and 0.8739 percent in total cost in Rohtak, Jind, Jalandhar and Ludhiana milk plants respectively. This showed that Ludhiana milk plant is running most efficiently followed by Jalandhar, Rohtak and Jind.

This analysis highlighted that the milk plants under study are doing a business on proportionate cost reduction pattern, which is a healthy sign for the future expansion of the projects.

COST / OUTPUT FUNCTIONAL ANALYSIS

Another regression analysis evaluating the effect of physical output of major products on their respective per unit costs was also done. The major products such as milk, ghee, butter and cheese were taken for the analysis. The dependent variable was cost per unit of different products. The results are presented in Table 5.

In Rohtak milk plants, the output of milk and butter were found to be significantly affecting per unit cost. The regression coefficient of milk production showed that an increase of 100 litres in the milk production would lead to a decline of Rs. 94.16 in cost per 100 litre of milk production. Similarly, an increase of 1 kg in butter production, there would be a decline of Rs. 9.18 in the cost of production of 1kg of butter.

In Jind milk plant, butter and cheese came to be the cost effecting products. There would be a decrease of Rs. 11.87 and Rs. 16.55 in the cost of production of 1 kg of butter of cheese respectively with an increase of 1 kg in the production of these products.

In Jalandhar milk and cheese were found to be cost-effective products. In regression coefficients of these products indicated that an increase of 100 litres in production of milk would lead to a decline of Rs. 87.45 in the cost of production of 100 litres of milk. Similarly, a decline of Rs. 13.89 in the cost of production of 1 kg of cheese would be there if 1 kg more of cheese be produced.

I COST OUTPUT FUNCTIONAL ANALYSIS: LINEAR FORM

Dependent variable: Cost per unit of product (Rs.)				
Variable	**Rohtak**	**Jind**	**Jalandhar**	**Ludhiana**
Milk (100 litres)	-94.16**	-18.34^{NS}	-87.45**	-107.09***
	(2.403)	(1.032)	(2.516)	(3.524)
Ghee (Quintals)	-123.28^{NS}	-78.54^{NS}	-59.04^{NS}	-489.58**
	(1.057)	(0.984)	(1.232)	(2.493)
Butter (kg)	-9.18**	-11.87***	-6.51^{NS}	-7.83^{NS}
	(2.384)	(4.129)	(1.142)	(1.220)
Cheese (kg)	-4.41^{NS}	-16.55**	-13.89**	-17.52**
	(1.005)	(2.496)	(4.078)	(2.307)

Figures in parenthesis are calculated t-value of respective regression coefficients

Ludhiana, milk plant, milk, ghee and cheese came to be the significant cost effecting products. An increase of 100 litres in the production of milk would lead to an decline of Rs. 107.09 in the cost of production of 100 litres of milk while there would be a decline of Rs. 489.58 in the cost of production of 1 quintal of ghee if 1 quintal more production of ghee be made in the plant. And additional production of 1 kg of cheese would lead to a decline of Rs. 17.52 in the cost of productionof 1kg of cheese.

Therefore, it can be concluded that the production of milk and butter in Rohtak, butter and cheese in Jind, milk and cheese in Jalandhar and milk ghee and cheese in Ludhiana milk plant may be enhanced in order to minimize the per unit cost of these products.

SUMMARY

The capacity utilization of different milk plants under study came to be 177.34 percent in Rohtak, 99.25 percent in Jind, 83.42 percent in Ludhiana and 65.18 percent in Jalandhar milk plant. Therefore, as for as capacity utilization is concerned, Rohtak and Jind Milk plants however performing the best while Ludhiana milk plant's performance was satisfactory. The performance of Jalandhar milk plant may be said poor.

It can be said that all the milk plants under study were technically solvent as in general current assets of business should be more than the current liabilities. The best solvency was found in Ludhianamilk plant (1.3463), followed by Jalandhar (1.1854), Jind (1.0425) and Rohtak (0.9929). Current assets management was satisfactory in these milk plants. One rupee invested in assets fetched Rs. 4.54, 3.26, 2.76 and 2.13 for Rohtak, Ludhiana, Jind and Jalandhar milk plant respectively. Thus Rohtak milk plant can be said to be more solvent than other milk plants.

Thus lower gross ratio is better than the higher ones. So, Ludhiana milk plant performed the best in this regard as its gross ratio was the lowest to the tune of 0.9341, followed by 0.9657 in Jalandhar, 0.9754 in Jind and 0.9861 in Rohtak milk plant. In other words we may say that as much as 98.61, 97.57, 96.57 and 93.41 per cent of gross income was consumed by the costs in Rohtak, Jind, Jalandhar and Ludhiana milk plant respectively. The trends in fixed ratios and operating ratios were somewhat differences than gross ratio. Though gross ratio is the sum total of fixed ratio andoperating ratio.

The analysis revealed that fixed expenses were lowest in Rohtak milk plant (0.207) followed by Ludhiana (0.0376), Jalandhar (0.0481) and Jind (0.0562), while it was but natural that operating ratio depicted an inverse trend. It was lowest to the 0.8965 for Ludhiana, followed by 0.9176 for Jalandhar, 0.9192 for Jind and 0.9654 for Rohtak milk plant.

Processing cost emerged as the most common contributing factor towards revenue from grossproduct mix of all the milk plants under study, while overhead expenses exerted negative effect on the same. The study highlighted that the milk plants under study are doing a business on marginal cost reduction pattern, which is a healthy sign for the future expansion of the projects.

Production of milk and butter in Rohtak, butter and cheese in Jind, milk and cheese in Jalandhar and milk ghee and cheese in Ludhiana milk plant may be enhanced in order to minimize the per unit cost of these products.

Thus, overall it can be concluded that all the milk plants under study were running efficiently. There were, by and large, some weaknesses in performance of milk plants such as under utilization of installed capacity particularly in Jalandhar milk plant, narrow gap between assets and liabilities in Jind milk plant. These weaknesses need to be checked in order to improve the operating efficiencyof milk plant.

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