

FINANCIAL VIABILITY OF INVESTMENTS IN MILK PLANTS

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ABSTRACT

Milk co-operatives have been a suitable instrument for planned development of dairying in the country encompassing dispersed rural population of milk producers. The ideal conditions for long term growth in milk procurement have been created like adopting modern technologies in animal breeding and feeding by number of dairy farmers. Existing level of efficiency was arrived at by working out economic parameters for four milk plants such as NPV, BCR, IRR, capital ratios and income ratios. To see the effect of costs on gross output and vice versa, regression analysis was done, sensitivity analysis was done at 5 stages. For all milk plants NPV for actual and projected period turned out to be positive. B/c ratio came out to be greater than unity means that project is having scope of improvement. For both federations (Milkfed Punjab, HDDF) the Ludhiana milk plant is holding the best position in all criteria NPV (3393.51), B/c (1.24), IRR (21.56) followed by Jalandhar NPV (1017.02), B/c (1.13), IRR (18.64) Rohtak NPV (404.83), B/c (1.08), IRR (19.68) and Jind NPV (236.25), B/c (1.01), IRR (17.45). The assessment of viabilities and investment productivities of study milk plant leads one to in escapable conclusion that there was a considerable scope of improvement in overall efficiencies of these plants. Another approach i.e. Marginal Redistributive Weights (MRW) concept was applied and analyzed by computing marginal costs for all milk plants. Jalandhar milk plant attained cost minimization point i.e. most efficient in production at minimum level. Ludhiana faces marginal costs to be quite higher which means that there is overuse of plant and machinery. In Rohtak and Jind milk plants marginal costs are below marginal revenue and hence we conclude average total costs would be reduced by increasing the production level. To supplement the benefit cost analysis and ratio analysis multiple regression analysis was used to study input output relationships in processing of milk at plant level gross output were used as dependent variable and all other cost components i.e. processing costs, raw material and procurement costs, marketing and overhead costs. Overall it can be concluded that processing costs emerged as the most common contributing factor towards revenue from gross output of all milk plants while administrative expenses exerted negative effect on the same. Another regression analysis was fitted taking total cost as dependent variable and total revenue as explanatory variable.

The regression coefficient of output in all milk plants was found to be less than unity highlighted that increase in cost was less than increase in output indicating scope of surplus capital for reinvestment in production process at an extended scale in all milk plants. Regression analysis evaluating the effect of physical output of major products on respective cost was done. It was concluded that 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 incorporated in order to minimize the per unit costs of these products. To reap full benefits of economics of scale, scope and integration there is requisite degree of co-ordination among units of production, procurement, processing and marketing.

Keywords: NPV, IRR, B/c ratio, MRW.

INTRODUCTION

India has witnessed white revolution, which portrayed manifold increase in milk yield during the post independence era. Milk production in country has enhanced from 17 million tonnes during 1951 to 92.2 million tonnes during 2003-2004 and India has become number one in milk production during 1998 after surpassing USA. 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.

It has been realized that dairy co-operative could be a suitable instrument for planned development of dairying in the country encompassing dispersed rural population of small milk producers with small scale production units. Today in India, there are 75,000 dairy co-operative societies spread all over the country with a membership of 10 million. 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. 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 comparative study has been undertaken to investigate financial performance of Punjab Milkfed and Haryana Dairy Co-operative Federation Ltd. With the following specific objectives:

1. To study the trends in investment, costs and returns from milk plants;
2. To work out the financial viability of milk plants;

3. To carry out the sensitivity analysis of the milk plants

REVIEW OF LITERATURE

Knudston and Kaller (1960) estimated the costs of processing of whole milk creameries in Minnesota for four model plants and found that with the increased scale of operation, there was reduction in the unit equipment costs due to more intensive use of labour. They also developed short run cost function by synthetic cost method for model plants.

Kunwar *et al* (1975) worked out the economies of milk processing per litre under public sector and co-operative sector units in Kanpur District of Uttar Pradesh. In this study it was revealed that the processing cost per litre of milk was about one and a half times higher in the case of public sector unit than co-operative sector unit. The processing cost per litre of milk for public sector was calculated at Rs. 0.36 and for co-operative sector at Rs. 0.24. The higher cost in the former unit was attributed to low quantity of milk handled and more emphasis on research and experiment than on profit.

Patel *et al* (1976) analyzed the worthwhile of Indo Swiss Project by using discounted benefits and costs. All the expenses were considered to establish, maintain and operate the project as the project costs and additional net income from the Brown Swiss crossbred cows over the local cows in the area as the project benefits. The study revealed that benefit cost ratios were 1.22 and 1.33 when discounted at 10 per cent discount rate upon assessing 30 and 55 years project lives respectively. The internal rates of return (IRR) were 13.78 per cent and 14.28 per cent for two respective project lives. These results fortified the government investments.

Ram and Kalla (1981) carried out an economic analysis of milk procurement by public sector plants in Haryana. It was observed that annual and monthly analysis of procurement for milk plant witnessed more relative instability in procurement in flush month. The lean months were relatively more stabilized in procurement at lower levels. The results indicated that milk procurement differs from lack of competitive price incentive offered to the milk producers of Haryana. The results of the value responsiveness confirmed that the procurement was highly responsive to increase in purchasing price of milk by the corporation. The increase in price paid to producer might have weaned the producers away from local milk vendors and sweet shops.

Shah (1982) conducted a study of cooperative dairy industry. The study aimed to identify the sources of growth in output, role of factors like capital and labour and economies of scale prevailing in dairy industry and dairy plants in cooperative dairy sector. The restricted Cobb Douglas production function was estimated. The results showed that capital productivity was negative which implied that the capital resources were over utilized.

Rao (1984) estimated the benefit cost ratio of multi-product dairy plant in South India for both the completed period from 1977-78 to 1982-83 and for the entire life of the project 20 years. The BCRs for completed 6 years were found to be 0.97 and 0.95 at 9 per cent and 15 per cent discount rates respectively where BCRs over its entire life period were found to be 1.14 and 1.09 at 9 per cent and 11 per cent discount rates respectively. The IRR for completed 6 years was found to be 7.26 per cent which indicated that it had not even recovered total cost.

Rani (1988) analyzed economic viability which revealed the intrinsically weak viability of investment committed to all plants of HDDCF, all the four criteria namely discounted net benefit cost ratio (DNB-C), NPV and annuity were used and study showed this fact, as for all the plants of two different federations, value of discounted gross benefit cost (DGB-C) ratios was less than unity (maximum 0.9423 for Jind Plant) accompanied by negative DNB-C, NPV and annuity. The interplant analysis of results showed that although all the plants were found non-viable yet, Jind Milk Plant was somewhat nearer to viability as compared to all the other plants. The aggregate results of federation as a whole also showed the tendency of non-viability. But on other hand better situation was discernible in the case of RCDF. The study revealed that three milk plants namely Jodhpur, Jaipur and Bikaner were found to be economically viable as value of DGB-C ratio was greater than unity accompanied by DNB-C, NPV and annuity.

Mukhopadhyay (1973) worked out the benefit cost ratio, NPW and IRR of two alternative irrigation projects namely deep and shallow tubewells in Nadia District of West Bengal. At 12 per cent discount rate, the BCR ratio and NPW of two alternative projects were estimated to be 2.75 and Rs. 1253.58 for deep and 1.87 and Rs. 1245.16 for shallow tubewells respectively. The values of IRR for these projects were 34 per cent and more than 50 per cent respectively. The study pointed out that on the basis of BCR, deep tubewell turned out to be the obvious choice of creating irrigation assets. NPW criteria also favoured the deep tubewell whereas the IRR criteria favoured shallow tubewell over the deep tubewell.

Sharma *et al* (1974) estimated the cost of procurement, reception and chilling of milk for a public sector milk plant situated in North-West region of India. The costs of milk procurement, reception and chilling for a litre of milk were found to be about Rs. 0.46, Rs. 0.08 and Rs. 0.03 respectively. It was concluded that the efforts to increase the milk procurement from a given milk shed area could help reducing the unit cost of milk procurement.

METHODOLOGY

Commensurate with the objectives of the research paper, 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 financial viability of the plants was measured by working out net present worth, internal rate of return and benefit-cost ratio.

RESULTS AND DISCUSSION

Trends in costs and returns

Financial viability of an economic activity deals with the related trends between investment, costs and returns. Therefore, before discussing the viability parameters such as net present worth, benefit-cost ratio, interned rate of turn, etc, it is relevant here to discuss the investment pattern and trends in costs and returns of the selected milk plants.

Trends in Revenue of milk plants

There are two type of revenue in milk plants. One, revenue from sale, of different products such milk, ghee, paneer, butter, curd, lassi, with powder, etc. and the other closing stock of these products. The trends for different costs and revenue components were worked out for three points of time i.e. 1992-93 to 1997-98, 1998-99 to 2008-09 and for the overall period of 1992-93 to 2008-09. The trends in revenue in different milk plants are shown in Table 1 Revenue from Sales The results presented in Table 1 show that revenue from sales increased from Rs. 2031.12 lacs in 1992-93 to Rs. 5451.32 lacs in 1997-98 witnessing a growth rate of 18.62 per cent, annually in Rohtak plant. It further increased to Rs. 11608.95 lacs in 2008-09 with a CGR of 14.66 per cent per annum. The growth rate of revenue from sales showed a decline from 18.62 per cent per annum during 1992-93 to 1997-98 to 14.66 per cent during 1998-99 to 2008-09. Overall growth rate of revenue from sales was found to be 17.70 per cent per annum, which was statistically significant. This showed that Rohtak milk plant experienced significant increase in the volume of sales.

The revenue of sales increase at CGR of 7.03 and 15.21 per cent during the first and second period respectively in the case of Jind milk plant. The revenue from sales increased from Rs. 1787.23 lacs in 1992-93 to Rs. 2487.41 lacs in 1997-98. The figure for 2008-09 came out to Rs. 5442.71 lacs. This showed there were lower sales during 1992-93 to 1997-98 as compared to 1998-99 to 2008-09. It was noticed that at the level sales increase at the rate of 11.12 per cent.

This was mainly due to the increased supply of milk to the plant. The revenue from sales increased from Rs. 1802.75 lacs in 1992-93 to Rs. 5914.10 lacs in 1997-98 depicting compound growth rate of 19.76 per cent per annum in Jalandhar plant. Though, the growth in revenue from sales in Jalandhar district was found to be significant (4.90 per cent) even during 1998-04, but was much lower than that during 1992-98. Overall growth rate in Jalandhar was estimated to be 17.00 per cent per annum.

The results presented in Table 1 show that the increase in revenue from sales during 1992-93 to 1997-98 came to be as high as 42.38 per cent compounded annually, but during 1998-99 to 2008-09 it came down to 5.31 per cent. Overall growth rate of revenue from sales in Ludhiana Milk Plant came to be 16.53 per cent of compounded annually. As in the first phase the actual capacity of milk plant and milk procurement was very low in comparison to other sample plants.

During the first phase the rate of increase in revenue from sales was highest in Ludhiana district followed by Jalandhar and Rohtak plants while there was stagnation in Jind milk plant during the 1st phase. During the 2nd phase, the increase in revenue from sales was found

to be the highest in Jind followed by Rohtak, Ludhiana and Jalandhar. Overall growth rate was highest in Rohtak followed by Ludhiana, Jalandhar and Jind.

Closing Stock

Closing stock is also a part of revenue, though not in terms of cash. It is the stock of different dairy products at the end of the year which may be sold in the next year.

The increase in closing stock during the 1st phase (1992-93 to 1997-98) was significant only in Rohtak (18.46 per cent) and Jalandhar (16.99 per cent) milk plants while there was stagnation in closing stock in Jind and Ludhiana milk plant during the same period.

Table 1. Revenue Growth Pattern in Sample Milk Plants, 1992-93 Till 2008-09

Particulars	Milk plant	1992-93	1997-98	CGR	2008-09	CGR	Overall CGR
Revenue from sale	Rohtak	2031.12	5451.32	18.62** (2.99)	11608.95	14.66** * (9.11)	17.70*** (12.51)
	Jind	1787.23	2487.41	7.03 (1.54)	5442.71	15.21** * (8.97)	11.12*** (8.83)
	Jalandhar	1802.75	5914.10	19.76** (2.69)	8695.66	4.95*** (5.91)	17.00*** (7.74)
	Ludhiana	2122.97	13708.02	42.38*** (9.94)	19310.23	5.31** (2.16)	15.53*** (6.080)
Closing stock	Rohtak	69.95	187.74	18.46** (2.86)	961.71	24.01** (2.18)	22.12*** (8.70)
	Jind	243.89	357.35	3.76 (1.44)	1385.95	20.76** * (4.28)	16.59*** (6.75)
	Jalandhar	483.64	1182.82	16.99*** (3.86)	1739.13	5.17*** (5.92)	13.82*** (9.49)
	Ludhiana	3148.77	3427.00	1.34 (0.44)	3510.95	0.60 (1.02)	1.04 (1.34)
Total Revenue	Rohtak	2101.07	5639.06	18.56** (2.44)	12570.66	15.17** * (8.97)	17.05*** (12.68)
	Jind	2031.12	2844.76	8.09** (2.24)	6828.66	16.15** * (15.50)	11.91*** (11.20)
	Jalandhar	2286.39	7096.92	19.26** (2.88)	10634.80	4.99*** (5.95)	16.40*** (8.05)
	Ludhiana	5271.74	17135.02	24.82*** (10.27)	22821.18	4.57*** (7.18)	12.58*** (7.55)

Note: Figure in parentheses are t-values of C.G.R
*** and **Significant at one and five per cent respectively.

During the 2nd phase (1998-99 to 2008-09), the increase in closing stock was significant in all the milk plants, except Ludhiana. It was highest in Rohtak followed by Jind and Jalandhar. Overall growth of closing stock during 1992-93 to 2008-09 was significant in all the milk plants under study, except in Ludhiana where the increase was non-significant. This may be due to the high level of sales in Ludhiana plant.

Total Revenue

The results given in Table 1 further revealed that total revenue increased significantly in phases as well as during the entire study period.

In Rohtak milk plant total revenue increasing from Rs. 2101.07 lacs in 1992-93 to Rs. 5639.06 lacs in 1997-98 with annual compound growth rate. The figure for 1998-04 turned out to be 18.56 per cent Rs. 570.66 lacs 2008-09 with an CAGR of 15.17 per cent. Overall increase in total revenue came to be 20.05 per cent compounded annually in Rohtak plant. Similarly in Jind milk plant, the total revenue increased from Rs. 2031.12 lacs in 1992-93 to Rs. 2844.76 lacs witnessing a growth rate of 8.09 per cent per annum. It incurred to Rs. 6828.66 lacs in 2008-09 at a capital growth rate of 16.15 per cent per annum. Overall, the level of total revenue increase at a given growth rate of 11.91 per cent compounded annually in Jind plant.

In Jalandhar milk plant, the total revenue rose from Rs. 2286.39 lacs in 1992-93 to Rs. 7096.90 lacs in 1997-98 depicted a significant growth of 19.26 per annum. The results further show that the growth rate came to be only 4.99 per cent per annum 1998-99 to 2008-09. Similarly, in the case of Ludhiana milk plant, total revenue increased from Rs. 5271.74 lacs in 1992-93 to Rs. 17135.02 lacs in 1997-98 with compound growth rate of 24.82 per cent. The revenue further increased to be Rs. 22921.18 lacs in 2008-09 significantly.

Rohtak, Jalandhar and Ludhiana milk plants witnessed a decline in total revenue during 1st phase. There was an increase in total revenue in Jind plant during the same phase. Overall, the growth rate of total revenue was the highest in Rohtak, followed by Jalandhar, Ludhiana and Jind milk plant.

Trends in Different Types of Costs

There are mainly four broad components of cost such as raw material and procurement expenses, processing expenses, marketing cost and administrative expenses. The trends in different components of cost as well as total cost are presented in Table 2. The results showed that total cost increased from Rs. 2057.60 lacs in 1992-93 to Rs. 5522.39 lacs in 1997-98 depicting a CGR of 18.43 per cent per annum in Rohtak plant. It further increased to Rs. 12397.77 lacs in 2008-09 at a compound growth rate of 14.94 per cent per annum. The total cost increased at a significant growth rate of 17.20 per cent compounded annually during 1992-93 to 2008-09 in Rohtak milk plant.

The perusal of Table 2 shows that the total cost increased from Rs. 2010.30 lacs to Rs. 2815.60 lacs during 1992-93 to 1997-98. The figure for 2008-09 estimated to be Rs. 6664.90 lacs. The CGR pertaining to the total costs during 1st phase and 2nd phase came to be 8.69 per cent and 15.46 per cent respectively. The total cost in Jalandhar milk plant rose from Rs. 2190.98 lacs to Rs. 6800.78 lacs during 1992-93 to 1997-98 with CGR of 19.04 per cent. It increased to Rs. 10282.21 lacs in 2008-09 at CGR of 12.33 per cent in 2008-09. Overall

CGR of total cost in Jalandhar milk plant came to be 16.76 per cent per annum. Similarly, in Ludhiana milk plant, total cost increased from Rs. 5065.68 lacs in 1992-93 to Rs. 16465.26 lacs in 1997-98 at a significant CGR of 24.96 per cent and further to Rs. 21409.67 lacs in 2008-09 with a significant CGR of 7.35 per cent. The overall growth rate of total cost in Ludhiana milk plant came to be 12.44 per cent compounded annually (Table 2).

The rate of increase of fixed cost declined during 2nd phase as compared to the 1st phase in all the milk plants under study, except in Jind milk plant. Total cost increased at the highest CGR in Rohtak followed by Jalandhar, Ludhiana and Jind. This may be due to slowing down the purchase of new inventory in Jalandhar, Ludhiana and Jind during the 2nd phase.

Table 2. Raw material and procurement expenditure growth pattern in different plants

Item	Milk plant	1992-93	1997-98	CGR	2008-09	CGR	Overall CGR
Raw material and procurement cost	Rohtak	1685.76	4524.41	18.68 (2.85)***	10329.02	14.38*** (9.61)	19.02*** (12.406)
	Jind	1368.50	1916.71	9.42** (2.34)	4540.24	12.36*** (5.85)	8.93*** (9.83)
	Jalandhar	1524.26	4731.28	19.36*** (2.84)	6756.42	10.09*** (9.38)	20.47*** (10.18)
	Ludhiana	3833.04	12458.73	24.38*** (9.21)	14888.57	17.50*** (11.73)	18.63*** (11.87)
Processing cost	Rohtak	66.14	177.52	19.62*** (2.91)	477.67	18.70* (1.96)	23.28*** (8.48)
	Jind	217.34	304.41	14.09** (2.41)	1063.26	27.16*** (4.86)	17.72*** (8.53)
	Jalandhar	457.28	1419.38	19.84*** (2.98)	2086.96	5.35*** (5.63)	16.54*** (8.18)
	Ludhiana	937.20	3046.23	23.16*** (8.41)	4291.16	5.31** (2.16)	12.09*** (6.98)
Marketing cost	Rohtak	64.03	171.85	17.04*** (4.68)	256.56	7.25 (1.57)	18.27*** (8.14)
	Jind	141.49	198.17	9.68** (2.3)	374.57	10.30*** (5.91)	8.71*** (8.58)
	Jalandhar	67.35	209.04	18.81** (2.59)	494.80	12.77*** (13.90)	21.37*** (11.30)
	Ludhiana	77.0	250.27	19.56*** (8.84)	804.56	13.35*** (3.87)	26.24*** (13.55)
Administrative expenses	Rohtak	241.67	648.61	16.21*** (2.84)	1339.45	15.09*** (8.41)	15.26*** (12.59)
	Jind	282.96	396.31	8.17** (2.41)	686.83	14.10*** (11.32)	11.43*** (11.56)
	Jalandhar	142.10	441.07	16.44*** (3.16)	944.03	12.34*** (10.18)	15.18*** (7.78)
	Ludhiana	218.45	710.03	22.81*** (12.66)	1425.38	7.63*** (3.18)	11.62*** (6.51)

Total cost	Rohtak	2057.60	5522.39	18.43*** (2.84)	12397.77	14.94*** (8.84)	17.20*** (12.58)
	Jind	2010.30	2815.60	8.69** (2.28)	6664.60	15.46*** (15.25)	11.79*** (11.44)
	Jalandhar	2190.98	6800.78	19.04*** (3.19)	10282.21	12.33*** (8.93)	16.76*** (8.21)
	Ludhiana	5065.68	16465.26	24.98*** (14.05)	21409.67	7.35*** (3.67)	12.44*** (7.33)

Note: ***, ** and * Significant at one five and ten per cent level respectively

Raw Material and Procurement Costs

This cost includes expenditure incurred on raw material, skimmed milk powder used in the processing of milk and manufacturing of milk products. The procurement expenses include salary, wages, TA, DA and other allowances paid to the procurement staff, chilling expenditures.

The perusal of Table 2 showed that the expenses on raw material and procurement increased at annual growth rate of 20.47 per cent per annum during 1992-93 to 2008-09 in Jalandhar milk plant. This was followed by in Rohtak 19.02 per cent and in Ludhiana milk plant 18.63 per cent while raw material and procurement cost increased at the lowest significant growth rate of in Jind milk plant 8.96 per cent. The rate of increase of raw material and procurement cost met with a decline from 18.68 per cent during 1992-93 to 1997-98 to 14.38 per cent during 1998-99 to 2008-09 in Rohtak milk plant. Similarly it decline from 19.36 per cent to 10.09 per cent in Jalandhar milk plant and from 24.38 per cent to 17.50 per cent during above send period respectively in Ludhiana milk plant. On the other hand, rate of increase of raw material and procurement cost was higher during 2nd phase (12.36 per cent) as compared to the 1st phase (9.42 per cent) in Jind milk plant. This may be due to larger increase in product mix requiring more of raw material and processing a Jind milk plant.

Processing Cost

Processing cost including all the expenses incurred on processing of milk right from the point of receipt of milk till it is converted into the final product. The items of processing cost include salary, wages and other benefits given to the workers and employees other than the procurement and factory staff, the expenditure incurred for electricity bills, electric goods consumed, salary and wages of electronic and other supporting staff, expenses on furnace, oil and cost for boiler, water charges, lubricant charges, other consumable expenditure incurred on the boiler section, salary and wages paid to the staff of boiler section, charges on water supplied by the tube well owned by the plant used in refrigeration, steam production and other operations, all the expenditure in tube well section mainly electricity bills, miscellaneous consumable material and wages of the tube well operator, general store items, branches, liveries, detergents, wastage consumable to handling of store items, all expenses incurred on chemicals, testing material, glassware, other miscellaneous store items used in the quality control laboratory, electricity and labour charges during quality control, and SNF losses during processing and manufacturing of milk and mil products, repair and maintenance of plant machinery and factory buildings selected to the factory, Industry,

control laboratory, boiler and tube well, interest and depreciation of plant and machinery and factory building selecting to the factory, quality control laboratory and boiler premises.

The perusal of Table 2 showed that the processing cost increased at CGR of 23.28 per cent in Rohtak milk plant, followed by in Jind 17.72 per cent, in Jalandhar 16.54 per cent and in Ludhiana milk plant 12.09 per cent. The rate of increase in processing cost was higher during second phase (1998-99 to 2008-09) (27.16 per cent) as compared to that during 1st phase 1992-93 to 1997-98 (14.09 per cent) in Jind milk plant. The results for the while the rate increase showed a decline during the 2nd period in all the remaining three milk plants. The rate of increase declined from 19.62 per cent to 18.70 per cent in Rohtak, 19.84 per cent to 5.35 per cent in Jalandhar and from 23.16 per cent to 5.31 per cent in Ludhaina milk plant.

Marketing Costs

Marketing costs include the expenses on sales and distribution, making material, advertising and Ag-marking. The overall rate increased during 1992-93 to 2008-09, in Ludhiana milk plant was 26.24 per cent followed by Jalandhar 21.37 per cent, Rohtak 18.27 per cent and Jind milk plant 8.71 per cent. The rate of increase in marketing cost was higher during 1998-99 to 2008-09 (10.30 per cent) as against 9.68 per cent during 1992-93 to 1997-98 in Jind milk plant. The results presented in Table 4.2.3 show that it came down from 17.04 per cent to 7.25 per cent in Rohtak, 18.81 per cent to 12.77 per cent in Jalandhar and 19.56 per cent to 13.35 per cent in Ludhiana milk plant.

Overhead Expenses

Overhead expenses include the salary, wages and other allowances of employees, and workers of accounts section, ministerial staff, supervisory staff, store and workshop staff, telephone, telegram and postage expenses, legal and bank charges, insurance premium, taxes, entertainment expenses, priority expenses of the head office, miscellaneous spare parts, medicines, salary apartment of managing director, interest and depreciation on office equipments, furniture and fixture, non factory buildings, etc.

The results presented in Table 2 showed that the rate of increase in overhead costs was the highest in Rohtak milk plant (20.26 per cent), followed by Jalandhar (16.18 per cent), Ludhiana (11.62 per cent) and Jind milk plant (11.43 per cent). The rate of increase in administrative cost was found to be higher during 2nd phase (14.10 per cent) as compared to that during 1st phase (8.17 per cent) in Jind milk plant. In other three milk plants, the rate of increase in overhead cost turned out to be lower during 2nd phase as compared to the 1st phase. The respective figures were 16.21 per cent to 15.09 per cent in Rohtak, 16.44 per cent to 12.34 per cent in Jalandhar and 22.81 per cent to 7.63 per cent in Ludhiana milk plant.

Overall, it can be said that both revenue and costs increased at significant growth rates during the period of study. Thus showed that revenue and cost are interrelated.

Project Evaluation

The financial viability of different milk plants under study was evaluated by working out the net present work, benefit-cost ratio and internal rate of return. The same are shown in Table 3.

The basic concept of financial appraisal of a project is to compare the costs and benefits stream using the discounted technique. Profit and loss statements of plants were used for getting desired information. The analysis was done for the period 1992-93 to 2008-09. A perusal of Table 3 showed that net present worth was positive for the milk plants. However, it was found to be the highest of the order of Rs. 3393.51 in Ludhiana milk plant followed by Rs. 1017.02 in Jalandhar milk plants and the time of Rs. 236.25 in Jind milk plant. According to the NPV criteria the milk plants under study turned out to be economically viable projects. The positive NPV implied that the discounted worth of benefits was greater than disconnected worth of cost steams.

Benefits-cost ratios were also found to be greater than unity in all the milk plants under study. It was the higher is, 1.0431 for Ludhiana milk plant, followed by 1.0306 for Jalandhar, 1.0134 for Rohtak and 1.0118 for Jind milk plant. Benefit cost ratio being greater than unity reaffirmed that the projects are viable and having scope for improvement.

Table 3. Values of project evaluation criteria

Milk plant	NPV (Rs.)	BC ratio	IRR (%)
Actual			
Rohtak	404.83	1.0813	19.68
Jind	236.25	1.0118	17.45
Jalandhar	1017.02	1.1306	18.64
Ludhiana	3393.51	1.2431	21.56
Projected values of evaluation criteria upto 2010			
Rohtak	562.25	1.09	21.13
Jind	397.36	1.02	20.67
Jalandhar	1157.06	1.17	21.94
Ludhiana	6622.93	1.28	23.12

Internal rate of return was also estimated for different milk plants under study, which was the highest i.e. 21.56 for Ludhiana milk plant, followed by 19.68 for Rohtak, 18.64 for Jalandhar and 17.45 for Jind milk plant. This showed the earning power of the projects over its project. This indicated that there was an increase in benefits according to the projected values for various parameters for 2006-10.

Therefore, it can be concluded that the milk plants under study have attained viability with proposed level of economic as well as social benefit structure of its then production of value added products is raised to projected levels. Additional efforts need to be made for cost minimization in different operations. For least cost of production, capacity utilization should be increased by procuring more milk or by diverting the milk to other product lines.

Sensitivity Analysis

Sensitivity Analysis was carried out to test the changes in income-generating capacity or investment productivity of milk plants under study with changes in costs and benefits that may be brought about with passage of time. Thus the sensitivity analysis of net present worth, benefits-cost ratio and internal rate of return to the escalated total plant costs and total plant benefits was carried out. The economic viability of milk plants under changed

circumstances was ascertained through changes in NPW, BCR and IRR, assuming changes in total costs and total benefits for 5 distinct situations as follows:

SA1: A 5 per cent increase in costs without corresponding increase in benefits;

SA2: A 5 per cent increase in benefits without corresponding increase in costs, and

SA3: A 5 per cent increase in both costs and benefits.

SA4: Rate of discount 10% in place of 12%

SA5: Rate of discount 15% in place of 12%

The changes in economic parameters are shown in Table 4.2.7. The analysis showed that if there is an increase of 5 per cent in the costs and the benefits remaining the same, then the milk plants under study will not be able to run on profitably. The NPV will turn out to be negative and B/C ratio less than unity indicating that investment will not fetch equal income, what to say of the higher income! The NPVs, being negative the IRR came to be less than 4.86, 3.98, 3.69 and 3.46 per cent the estimated value of IRRs for Rohtak, Jind, Jalandhar and Ludhiana milk plant respectively.

In SA2 where costs remained same and there is an increase of 5 per cent in the benefits the milk plants enjoy astonishingly higher level of NPVs as well as B/C ratios. In Ludhiana milk plant NPV came to be (Rs. 3563.19 lacs) followed by for Jalandhar (Rs. 1067.87 lacs), Rohtak (Rs. 425.08 lacs) and for Jind milk plants (Rs. 248.06 lacs). Similar was the case of B/C ratio. In SA2 B/C ratio was greater than unity and even greater than the existing B/C ratio for the respective plant. The IRR also came to be much higher than the existing IRR because of the much higher values of NPV in SA2 compared to the existing ones. The IRR came to be the highest in Ludhiana (44.18 per cent) followed by Jalandhar (41.94 per cent), Rohtak (39.15 per cent) and Jind milk plant (36.72 per cent).

In SA3 where 5 per cent increase was made in both costs and benefits, the NPVs were found to be slightly higher than the existing values. It was but natural that the B/C ratios remained the same as these were found in the existing scenario because of proportionately equal change in costs and returns stream. The IRR also came to be slightly higher than the existing one. In SA4, the rate of discount was taken 10 percent in place of 12 percent which resulted in an increase in NPV, BCR and IRR as compared to the values at 12 percent rate of discount in all the milk plants. On the other hand, the values of NPV, B/C ratio at IRR witnessed a decline at 15 percent rate of discount when compared with the values of 12 percent rate of discount and all the milk plants under study. This showed that lower the rate of discount better is the performance of the projects.

This shows that milk plants are sensitive to the increase or decrease in costs. This shows that the plant can improve their positions if both costs and benefits are increased in the equal proportions. However, increase only in benefits and not in the costs, would lead the milk plants to astonishing returns.

Table 4. Sensitivity analysis of sample milk plants

Milk plant	Sensitivity analysis	NPV	BC ratio	IRR (%)
Rohtak	SA-I	-1103.06	0.9652	4.86
	SA-II	1932.97	1.0641	39.15
	SA-III	425.08	1.0134	20.31
	SA-IV	455.68	1.0136	24.57
	SA-V	342.84	1.0133	16.84
Jind	SA-I	-764.32	0.9636	3.98
	SA-II	1248.62	1.0624	36.72
	SA-III	248.06	1.0118	18.44
	SA-IV	272.57	1.0121	21.62
	SA-V	193.18	1.0114	13.92
Jalandhar	SA-I	-646.37	0.9815	3.69
	SA-II	2731.26	1.0821	41.94
	SA-III	1067.87	1.0306	19.82
	SA-IV	1132.91	1.0308	22.94
	SA-V	872.76	1.0304	14.29
Ludhiana	SA-I	-539.71	0.9935	3.46
	SA-II	7496.40	1.0953	44.18
	SA-III	3563.19	1.0431	22.54
	SA-IV	3850.34	1.0434	26.13
	SA-V	2837.79	1.0427	18.51

Note: SA-I percentage increase in cost
 SA-II percentage increase in benefits
 SA-III percentage increase in both cost and benefit
 SA-IV reducing the rate of discounts
 SA-V enhancing the rate of discount

In SA3 where 5 per cent increase was made in both costs and benefits, the NPVs were found to be slightly higher than the existing values. It was but natural that the B/C ratios remained the same as these were found in the existing scenario because of proportionately equal change in costs and returns stream. The IRR also came to be slightly higher than the existing one. In SA4, the rate of discount was taken 10 percent in place of 12 percent which resulted in an increase in NPV, BCR and IRR as compared to the values at 12 percent rate of discount in all the milk plants. On the other hand, the values of NPV, B/C ratio at IRR witnessed a decline at 15 percent rate of discount when compared with the values of 12 percent rate of discount and all the milk plants under study. This showed that lower the rate of discount better is the performance of the projects.

This shows that milk plants are sensitive to the increase or decrease in costs. This shows that the plant can improve their positions if both costs and benefits are increased in the equal proportions. However, increase only in benefits and not in the costs, would lead the milk plants to astonishing returns

SUMMARY

The plant and machinery came to be the highest investment item in all the milk plants under study. Rohtak, Jalandhar and Ludhiana milk plants witnessed a decline in compound growth rates of total revenue from the 1st phase to the 2nd phase while there was an increase in the growth rate of total revenue in Jind plant during the same phases. Overall, the growth rate of total revenue was the highest in Rohtak, followed by Jalandhar, Ludhiana and Jind milk plant. Both revenue and costs increased at significant growth rates during the period of study. This showed that revenue and cost are interrelated.

According to the NPV criteria the milk plants under study turned out to be economically viable projects. The positive NPV implied that the discounted worth of benefits was greater than disconnected worth of cost steams. Benefit cost ratio being greater than unity reaffirmed that the projects are viable and having scope for improvement. Internal rate of return was the highest i.e. 21.56 for Ludhiana milk plant, followed by 19.68 for Rohtak, 18.64 for Jalandhar and 17.45 for Jind milk plant. This pointed towards the earning power of the projects over its project.

The sensitivity analysis showed that if there is an increase of 5% in the costs and the benefits remaining the same, then the milk plants under study will not be able to run on profitable basis. In SA2 where costs remained same and there is an increase of 5% in the benefits the milk plants enjoy astonishingly higher level of NPV as well as B/C ratios. In SA3 where 5% increase was made in both costs and benefits, the NPV was found to be slightly higher than the existing values. It was but natural that the B/C ratios remained the same as these were found in the existing scenario because of proportionately equal change in costs and returns stream. The IRR also came to be slightly higher than the existing one. This showed that milk plants are sensitive to the rise in costs and benefits. They can retain rather improve their positions if both costs and benefits are increased in the equal proportions. However, increase only in benefits and not in the costs, would lead the milk plants to astonishing highest of business.

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