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**AN EVALUATION OF
THE DAIRY DEVELOPMENT CORPORATION:
COLLECTION, PRODUCTION
AND
FINANCIAL PERFORMANCE**

Mahendra Raj Sapko

**HMG-USAID-GTZ-WINROCK PROJECT
STRENGTHENING INSTITUTIONAL CAPACITY IN THE
FOOD AND AGRICULTURAL SECTOR IN NEPAL**

Foreword

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One of the most important components of this project is advanced training, at the Masters and Ph.D. levels, of young professional staff of agricultural agencies of the MOA and related institutions. Winrock Fellows have been selected for advanced training in Asia, Australia, and the U.S.A. Most of them have written a thesis based on their research of a particular problem area in Nepal's agricultural and rural development. In addition, this project sponsors problem-oriented research activities which are carried out by the staff of agricultural agencies of the MOA and related institutions with the cooperation of Winrock staff.

The purpose of this Research Paper Series is to make the results of these research activities available to a larger audience, and to acquaint younger staff and students with advanced methods of research and statistical analysis. It is also hoped that publication of the Series will stimulate discussion among policy-makers and thereby assist in the formulation of policies which are suitable to the development of Nepal's agriculture.

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ABBREVIATIONS

ADB	:	Asian Development Bank, Manila
ADB/N	:	Agricultural Development Bank, Nepal
BMSS	:	Biratnagar Milk Supply Scheme
BO	:	Butter Oil
CPSS	:	Cheese Production and Supply Scheme
DDC	:	Dairy Development Corporation
FAO	:	Food and Agriculture Organization
HMG	:	His Majesty's Government, Nepal
HMSS	:	Hetauda Milk Supply Scheme
kg	:	Kilogram
KMSS	:	Kathmandu Milk Supply Scheme
mt	:	Metric Ton
NA	:	Not Available
PMSS	:	Pokhara Milk Supply Scheme
Rs.	:	Nepalese Rupees
SMP	:	Skim Milk Powder
UN	:	United Nations
WFP	:	World Food Programme
WMP	:	Whole Milk Powder

AN EVALUATION OF
THE DAIRY DEVELOPMENT CORPORATION:
COLLECTION, PRODUCTION AND FINANCIAL PERFORMANCE

Mahendra Raj Sapkota*

PREFACE

Considering the expansion of the Dairy Development Corporation (DDC) over the past 14 years in terms of physical infrastructure, manpower development and addition of employees, it has become necessary to evaluate its performance. The Corporation has recorded continuous losses (except for the year 1974/75) during the ten years from 1973/74 to 1982/83. This study was designed and conducted to evaluate the factors contributing to these losses.

This type of evaluation of the DDC has not been carried out before. This study should help in understanding collection, production and financial performance which is essential to help the management of the DDC to bring about necessary reforms. Besides its usefulness to the DDC management, it is hoped that this study will be useful to the government, and to other concerned individuals, agencies, and organizations.

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INTRODUCTION

Ninety-four percent of Nepal's population depends on agriculture and this sector produces two-thirds of the Gross Domestic Product (GDP). Agriculture supplies raw materials for export promotion and import substitution industries. Unfortunately agricultural productivity has failed to rise, slowing economic growth. Unless productivity is increased, incomes cannot be raised. Low investment and low output and income are results of low productivity in agriculture.

Livestock contributes 15 percent of GDP and 25 percent of agricultural production. Animals provide power for cultivation and transport, dung to replace soil nutrients, milk, and meat. The livestock population in 1979/80 was 2.6 million buffalo, 6 million cattle, 3.6 million goats, 0.55 million sheep, 0.36 million pigs, and 6.2 million poultry. The average family in the Hills has 3.7 cattle and 1.9 buffalo, and in the Tarai 2.5 cattle and 0.85 buffalo (ADB 1982).

Among livestock products, milk is most important. Total production in 1980/81 was 6,10,000 metric tons, of which about three-fourths was buffalo milk and the rest cow milk. Annual per capita milk consumption is 33 litres. Most of the surplus is made into ghee, and some is exported to India.

The Dairy Development Corporation (DDC) was established as a Government-owned Corporation in 1969 to develop the dairy industry. The DDC provides an assured market to rural milk producers through milk collection centres and supplies pasteurised milk and dairy products to urban consumers. The DDC operates four milk processing plants: the Kathmandu, Biratnagar, Hetauda, and Pokhara Milk Supply Schemes (KMSS, BMSS, HMSS, and PMSS). The DDC also has 16 cheese and butter factories in the mountains which operate under the Cheese Production and Supply Scheme (CPSS).

This study evaluates the collection, production, and financial performance of the DDC from 1973/74 to 1982/83. The DDC has recorded continuous losses (except for 1974/75) during this period. This study attempts to:

- assess growth rates of collection and production;
- evaluate the productivity of workers and equipment;
- determine the factors responsible for variability in the DDC's financial performance.

THE CORPORATION

Establishment and Objectives

Organized dairy development in Nepal began with the establishment of the Dairy Development Section under the Department of Agriculture in 1953/54. A dairy plant was erected with New Zealand assistance in 1956/57 at Lainchaur. This plant could process 500 litres of milk per hour. The Dairy Development Commission was formed in 1955 to guide the Dairy Development Unit, which became the Dairy Development Board in 1962. The capacity of the Lainchaur Dairy Plant, called the Central Dairy, was increased from 500 to 1000 litres per hour in 1960/61 as a result of increased demand for processed milk. To meet demand, the Dairy Development Board was transformed into the Dairy Development Corporation. At its establishment the DDC had one milk plant at Lainchaur called the Kathmandu Milk Supply Scheme and four yak cheese production plants in the mountains under the Cheese Production and Supply Scheme.

At establishment the DDC had fixed capital of Rs.1.65 million. Rapid expansion of DDC's infrastructural and processing capacity led to installing new machinery and equipment. Grant aid and long-term loans from bilateral and multilateral agencies were the main sources of investment. Major donors are the UN WFP, New Zealand, and the Netherlands. The DDC has long-term loans from Denmark, ADB, and World Bank. The DDC took loans to expand chilling and processing facilities by importing machinery and equipment.

The main objectives of the Corporation are to:

- provide a secure market and fair price for milk;
- supply pasteurised milk and dairy products in urban areas;
- organize and extend milk collection to meet demand;
- organize and expand sales of milk and milk products in urban areas;
- organize and promote milk producers' associations.

Kathmandu: Although the capacity of the Lainchaur plant was raised to 1200 litres per hour in 1974 it had to run round the clock at times to meet increasing milk demand. To provide better service, a new plant with a capacity of 5000 litres per hour was installed at Balaju Industrial District. This plant, with equipment and advisory services provided by New Zealand, began operations in 1977 (Table 1).

Biratnagar: A milk plant was established at Biratnagar in 1974 with grant assistance from the Netherlands with an initial pasteurising capacity of 2000 litres per day. In 1983 with Dutch assistance a chilling system was installed and storage capacity was increased. This addition allows the plant to run at 10,000 litres per day.

Hetauda: This plant was established in 1975 in the Hetauda Industrial District with equipment purchased and installed under a Danish loan. It has a rated capacity of pasteurising 3000 litres of milk per hour or 18,000 litres per day. It has facilities to store only 12,000 litres, so its effective capacity is 12,000 litres. The ADB provided loans to the DDC to operate collection and chilling centres.

Pokhara: This milk plant was established under a Danish loan in the Pokhara Industrial District in 1980. Its rated capacity is 2000 litres per hour and effective capacity is 9000 litres per day.

Cheese Production and Supply Scheme: Cheese production started with FAO technical assistance in the 1950s. Cheese is produced from surplus yak milk in remote alpine belts and from buffalo milk in mid-mountain regions. Milk fat remaining after retaining the required percentage for cheese is used to produce butter. There are now 16 cheese factories--ten produce cheese and butter from yak milk and six use buffalo milk. The Pauwa, Nagarkot, and Trisuli buffalo cheese factories were established with Swiss grant assistance and Danish and World Bank loan assistance, respectively. The capacities of the cheese plants at Pauwa, Nagarkot, and Trisuli are 70 kg, 100 kg, and 100 kg of cheese per day respectively.

Table 1. Capacity, Collection, and Production

Scheme	Capacity		Collection	Total Production	Utilization of Capacity (%)	
	Rated	Effective (average per day in litres)			Rated	Effective
KMSS	30,000	30,000	12,800	42,000	140	140
BMSS	12,000	10,000	2,000	3,900	33	39
HMSS	18,000	12,000	7,800	8,500	47	71
PMSS	12,000	9,000	2,800	3,500	29	39

Source: Technical Division, DDC.

Milk Collection System and Pricing Policy

The DDC has established a network of 214 collection centres in the rural areas of different parts of Nepal. Distance from farms to collection centres is usually not more than three km and each centre covers three to five villages. Farmers carry their morning and evening milk (the latter only in KMSS milkshed areas) to the nearest collection point where milk is measured or weighed and recorded and samples are taken for quality control. Evening milk is stored in the collection centre and transported the next morning together with the morning collection to the nearest chilling centre. In the KMSS and PMSS milk is mainly transported by porters because of the difficult terrain and lack of roads. In the BMSS and HMSS vehicles pick up milk from collection centres and transport it to chilling centres.

In the chilling centre milk received from each collection centre is measured and recorded and quality control tests are performed. In the chilling centre milk is cooled and stored in a chilling tank prior to dispatch to the processing plant once every day or alternative day by an insulated road milk tanker. There are a few collection centres from which milk is directly brought to the milk plants.

In the BMSS and HMSS the DDC has encouraged farmers to form milk producers' associations. The goal is to link producers with the DDC by providing them well-managed technical inputs and financial help. This association was started in December 1981 in the BMSS. The positive result there gave impetus to the HMSS to follow.

Until March 1982, farmers in the KMSS were paid according to milk fat content. To encourage farmers to supply standard milk the DDC started paying for SNF in April 1982. Farmers supplying milk with 5 percent fat and 8 percent SNF receive Rs.4.15 per litre. Farmers are paid twice a month.

In the BMSS and HMSS, farmers receive Rs.0.65 per fat unit while Rs.0.325 is paid per unit of SNF if it is over 8 percent. A deduction is made of Rs.0.16 per SNF unit if it is below 8 percent to discourage farmers from adding water. The DDC pays 2 percent commission on the value of total fat received to the milk producers' associations, and 7.7 percent of the total fat purchased for milk collecting and testing. In the PMSS, farmers are paid Rs.0.75 per fat unit.

The farmers under the CPSS usually come directly to the factories with their milk. They are paid Rs.0.55 and Rs.0.48 per unit fat for yak and buffalo milk respectively. Producer prices are different in different areas. While fixing the purchase price the DDC takes into consideration the market price of food commodities, transportation costs, and the price of milk products where there is no other market for selling milk. Purchase price will be kept high where food commodities are expensive or where there is a high price for other milk products. If there is high transportation cost the price will be a little lower.

Distribution System and Prices of Milk and Milk Products

The DDC has established ten milk sales shops and 235 selling booths to supply milk and milk products to urban consumers. Booths operate for a few hours in the morning and evening whereas the shops operate throughout the day. About 90 percent of milk is sold in half-litre returnable glass bottles and the rest in half-litre plastic pouches.

Since June 1984 pasteurised milk is sold for Rs. 4.50 per litre or Rs.2.25 per bottle or pouch in all milk schemes. The price of cheese and butter is Rs.60 per kg. The DDC adjusts selling prices according to the increase in its buying price of milk from the farmers, but sometimes the DDC has to increase its purchase price without any change in selling price. The price rise to farmers is usually based on price increases of food commodities and also upon the Corporation's financial position. The latest price revision of pasteurised milk and other milk products was made according to the increase in purchase of raw milk from the farmers.

WFP Commodity Aid

The WFP-assisted project began in 1974 from the BMSS followed by the KMSS and HMSS in 1976 and 1977. These projects tried to bridge the gap between raw milk supplies and consumer demand in Biratnagar, Kathmandu and Hetauda. All these WFP projects were combined into the National Dairy Development Project in July 1982. Between 1974 and 1982 the WFP supplied 3500 metric tons of dried SMP and 345 metric tons of BO which was reconstituted and mixed with local milk to reduce the gap between local supplies and consumer demand. In 1982 the WFP agreed to supply 1900 metric tons of SMP and 151 metric tons of BO from 1982 to 1985.

WFP-provided SMP and BO are to be used with local raw milk for recombination into liquid milk at the plants in Kathmandu, Biratnagar, and Hetauda. Milk thus produced is to be sold at reasonable prices. The DDC must take measures to increase local milk collection.

Funds generated from sales of the WFP component in recombined milk were calculated on the basis of the following formula: one kg of SMP and BO are valued respectively at 4.5 and 9 times the price of one litre of local milk. This formula was used until 1982 when the purchase price of raw milk was increased, and now one kg of SMP and BO are valued at 4.2 and 10.5 times the price of one litre of local milk.

Manpower

The DDC has increased its manpower in collection, production, and sales. There are now 986 employees of which 591 hold technical posts and the remaining 395 work in administration. Almost half the manpower are at the KMSS.

MILK COLLECTION PERFORMANCE

Collection Targets and Achievement: Collection targets are fixed in five-year development plans and annual programs. Previous year achievement is the main basis for fixing annual targets. Progress reviews are held to assess performance and discuss problems. The DDC achieved 79 percent of its target from 1977/78 to 1982/83. The KMSS and PMSS achieved 95 and 85 percent respectively, whereas BMSS and HMSS achieved only 58 percent. Declining BMSS and HMSS milk collection forced the DDC to change the collection pattern in these areas. The DDC encouraged farmers to form producers' associations like the Indian "Operation Flood" village dairy societies. The positive effect of this can be seen from the doubling of BMSS and HMSS milk collection.

(In 1964/65 Prime Minister Shastri of India decided to introduce rural milk cooperatives nationally, and the National Dairy Development Board (NDDB) and Indian Dairy Corporation were established. With WFP and FAO assistance the NDDB organized milk marketing in Bombay, Delhi, Calcutta, and Madras, with interlinked development of milksheds for rural milk production, procurement and processing. This was called "Operation Flood.")

Collection depends on conditions affecting livestock and natural calamities like floods. The KMSS in 1979/80 (and BMSS in 1983/84) was affected by farmers striking for higher milk prices. Once the price was raised, achievement was higher than the 1980/81 target. Achievement fell in 1981/82 as a result of floods and landslides, forcing the DDC to close KMSS collection centres for several days. BMSS and HMSS progress was hampered because the milk price was not favorable and collection areas could not be expanded. Once farmers were paid well through a new collection pattern under the milk producers' association, collection increased.

To increase collection the DDC should keep its milk price equal to the market price, which it cannot always do easily. Being a Government corporation it has to follow official procedures, and meanwhile the free market price may rise, resulting in a low DDC collection level.

Growth of Milk Collection: Average annual growth rates of collection have varied. For the KMSS, 73/74-82/83, annual growth was 12 percent; BMSS, 74/75-82/83, 36 percent; HMSS, 75/76-82/83, 17 percent; PMSS, 80/81-82/83, 59 percent; the DDC, 73/74-77/78, 36 percent; 78/79-82/83, 10 percent; 73/74-82/83, 19 percent. Causes of lower DDC growth from 78/79-82/83 were low prices, closing KMSS collection centres due to floods, and inability to expand BMSS and HMSS collection areas. The DDC increased its collection centres by 86 percent from 1977/78 to 1982/83 but milk collection per centre decreased by 25 percent (Table 2).

Causes of Declining Milk Collection: Rapid population growth in DDC milkshed areas is the main cause of decreased collection. In traditional farming systems, many cattle or buffalo were considered essential for sustained crop farming and were expected to supply manure for compost. The increasing human population has caused a general deterioration of pasture and fodder areas. Declining soil fertility resulting from continuous cropping and excessive population pressure have caused marginal lands to be cultivated. This results in deforestation, soil erosion, and decreased pasture area. Thus, an increasing number of livestock is competing for less pasture. This forces livestock owners to feed animals submarginal diets resulting in low productivity. As there has been no study of total milk production in DDC milkshed areas, it is difficult to quantify this decline.

The main problem facing livestock is malnutrition. Nutrition is barely enough to keep animals at current low productivity levels. This is a waste of scarce fodder as most feed is used to keep animals alive and little is available for productive purposes. Malnutrition makes animals susceptible to disease. Until the fodder situation is improved, livestock productivity will further decline with serious impact on agricultural production which depends on livestock. Livestock breeding, care, and management are also poor. Inbreeding, disease, and lack of information about improved livestock also hinder livestock development. No attempt has been made to commercialize livestock farming.

Traditional milk vendors and private dairies obtaining milk from the same areas as the DDC pose difficulties for milk collection. While the DDC supplies standard quality fresh pasteurised milk regularly at a fixed price, milk supplied by private vendors is unhygienic and usually water adulterated though it sells for a higher price. Adulteration is so widespread that if one asks any vendor to supply pure whole milk, the reply is that to obtain pure milk one should be born a calf. Private dairies produce only yoghurt, ice cream, cheese, and butter which have high profit margins. Both private vendors and dairies pay more to producers for raw milk than the DDC. Even though private vendors and dairies provide higher prices for milk, the DDC should not let private vendors do everything. First, as proper implementation of milk price and quality regulations is lacking, no private vendors supply hygienic milk at a reasonable price to consumers. Second, private dairies are not producing pasteurised milk. Third, they have been collecting only a limited quantity of milk. If the private dairies were attracted to unexploited areas, farmers would benefit and this would help reduce rural income disparities.

Although measures have been taken to prevent adulteration, they have not been effective. The government has fixed the minimum legal standard of marketed buffalo milk at 5 percent butterfat and 8 percent SNF, but it is difficult to find any vendor who follows this standard.

Declining productivity in the milkshed areas and the free market quality and price of milk and milk products have made it difficult for the DDC to run its collection program even if it pays more to farmers, because it cannot compete with private vendors and dairies in providing higher prices

to farmers, and it cannot provide free market quality milk and milk products. The DDC could sell milk at the free market price if it had autonomy to fix the milk selling price. Because HMG controls the price, the DDC cannot easily increase the milk price. When the selling price is low, it must keep the buying price low.

 Table 2. Average Milk Collection per Collection Centre

Scheme/Particulars	77/78	78/79	79/80	80/81	81/82	82/83
KMSS						
Total Collection (000 l)	3155	3227	3273	4271	3954	4485
Collection Centres(no)	58	69	69	81	85	81
Average Coll/day/centre	149	132	130	144	127	152
Percent Increase (Av.coll)	-	-11	-2	11	-12	20
EMSS						
Total Collection	933	691	795	560	455	900
Collection Centres	13	13	17	20	25	20
Average Collection	197	146	128	77	50	123
Percent Increase	-	-26	-12	-40	-35	146
HMSS						
Total Collection	1464	1338	967	981	837	1400
Collection Centres	20	22	23	32	33	38
Average Collection	201	163	115	84	69	101
Percent Increase	-	-19	-29	-27	-18	46
PMSS						
Total Collection	-	-	-	381	645	957
Collection Centres	-	-	-	12	20	30
Average Collection	-	-	-	87	88	87
Percent Increase	-	-	-	-	1	-1
DDC						
Total Collection	5552	5356	5041	6193	5891	7745
Collection Centres	91	104	109	145	163	169
Average Collection	167	141	127	117	99	126
Percent Increase	-	-16	-10	-8	-15	27

Source: Technical Division, DDC.

PRODUCTION PERFORMANCE

Production Targets, Achievements, and Growth: Based on projections of future demand for pasteurised milk, production targets are fixed by the DDC in Five Year Development Plans and annual programs. Cheese and butter targets are fixed by estimating the milk available in milkshed areas of cheese and butter production centres. Except in 1980/81, milk production was above 85 percent of target, while cheese achievement was nearly 76 percent and butter was above 95 percent. Milk production was dominated by the KMSS. This method of judging performance is not satisfactory because targets are fixed arbitrarily. However, fixing targets encourages management to increase production.

Growth rates for the individual schemes are: KMSS, 21 percent (73/74-82/83); BMSS, 17 percent (74/75-82/83); HMSS, 18 percent (75/76-82/83); PMSS, 55 percent (80/81-82/83). Average annual growth of milk production was 25 percent while butter and cheese were 11 and 9 percent respectively. From 73/74 to 77/78 milk production increased 38 percent per year whereas the increase after that was only 10 percent and the DDC had to increase use of SMP and BO.

Butter and cheese production has declined lately even though it increased substantially from 73/74 to 77/78. This decline had four causes. First, there was a reduction in Yaks and Chauries in the high hills as animals were sold to Tibet for high prices. Second, there is declining interest in raising Yaks and Chauries because of expanding tourism and decreased pasture areas. Third, ghee traders pay more for local ghee and butter than the DDC pays for milk. Fourth, there are increased employment opportunities for farmers in road construction, particularly on the Lamosangu-Jiri Road.

Skim Milk Powder and Butter Oil in Milk Production: SMP is used to produce milk by reconstituting it with local milk or by recombining it with BO. SMP is also used to add SNF to local milk if it is below the legal SNF standard. BO is used to produce only recombined milk. SMP and BO are used to make up local milk collection deficit. Both commodity aid from the WFP and commercially purchased SMP and BO were used. Whole milk powder was also used for reconstitution and recombination. The share of local milk has never exceeded 60 percent and its overall share was only 46 per-

cent. During the period under review, local collection increased five times, total production seven, and reconstituted and recombined milk by nearly eleven times.

Capital and Labor Productivity

Although DDC production mostly depends on external factors such as conditions affecting livestock, availability of imported raw materials, and buying and selling prices of milk, it is useful to assess capital and labor productivity.

Regression Analysis of Productivity of Capital and Labor

Methodology. A multiple log-linear regression is used to explain variation in total production resulting from variation in machinery, capital, salary and labor. The following regression model is used:

$$\ln(TP) = B_0 + B_1 \ln(MAC) + B_2 \ln(CAP) + B_3 \ln(SAL) + B_4 \ln(LAB) + u$$

where TP = total production; B₀ = constant term;

B₀, ..., B₄ = regression coefficients; u = error term.

Regression equations are solved by ordinary least squares (OLS). R² values and 't' statistics are used to determine the goodness of fit of regression equations and the significance of regression coefficients.

Results. The coefficient of determination (R²) of this regression equation is high (0.986) which indicates that variation in total production has been explained by the variation in explanatory variables. Regression results are:

Independent Variables Coefficients, 't' statistics

Intercept	2.204 (1.92)*	
Machinery (Rs.'000)	-0.847 (-3.27)***	R ² = 0.986
Capital (Rs.'000)	1.495 (2.47)**	
Salary (Rs.'000)	0.617 (1.34)*	F = 90.37***
Labor (number)	-0.892 (-2.009)**	
*Significant at 10% level;	**significant at 5%;	
***significant at 1%.		

The fit of the overall regression equation is good. The independent variables explain 99 percent of the variation of the dependent variable. The F-statistic is signifi-

cant at the one percent level. All variables have expected signs. As the model is log-linear, the coefficients are elasticities of the variables with respect to output.

The coefficient of machinery is -0.847 which means a 10 percent increase in machinery will cause production to decline by 8.47 percent. It suggests that machinery are not used optimally and there is no need to add more. The coefficient of capital is 1.495 indicating that a 10 percent increase in capital will increase production by 14.95 percent. The coefficient of salary, 0.617 , implies that 10 percent increase in salary would increase output by 6.17 percent. The coefficient of labor is -0.892 , so increasing labor by 10 percent will decrease output by 8.92 percent. The negative labor productivity suggests that the number of laborers is increasing without a precise plan to use them.

As only ten observations were available for this analysis, results may not be conclusive and coefficients should be interpreted cautiously.

FINANCIAL ANALYSIS

Financial Ratios: (See Table 3.) The debt-equity ratio is a measure of the relative claims of creditors and owners against a firm's assets. A high debt-equity ratio is unfavorable because this introduces inflexibility in operations as a result of increasing interference from creditors. For the DDC this ratio should be interpreted cautiously as most loans are soft loan from donor countries. The DDC borrowed Rs.45,000 in 1973/74 from the ADB/N which resulted in a low debt equity ratio. However, the ratio rose to 0.71 in 1974/75 when the DDC borrowed Rs.7.137 million from the Danish Government and Rs.1 million from the ADB/N.

The debt-equity ratio declined to 0.36 in 1977/78 as a result of an increase in government equity. In 1978/79, the ratio went up to 0.84 in the next years primarily because of more than doubling of long-term loans. Loans increased as a result of the borrowing from the Danish Government to invest in the PMSS. The ratio declined to 0.63 in 1980/81 and rose to 0.90 in 1982/83. This was a result of loans from the ADB Manila to set up milk chilling and collection centres under the Livestock Development Project.

The debt to total capital ratio also has a pattern of rise and fall although it is lower than the debt-equity ratio primarily due to large amounts of grant aid in DDC capital. Debt to total capital ratio was highest at 0.39 in 1979/80. In other years, the ratio was less than 0.35 indicating that long-term debt was less than 35 percent of total capital. This ratio is well within the rule of thumb that long-term debt should not exceed 67 percent of capital.

Liquidity Ratios: (See Table 4.) The Current Ratio increased from 6.05 in 1973/74 to 12.06 in 1977/78, and declined to 6.48 in 1982/83. It is advisable that a company have a current ratio of at least 2:1. The DDC has a favorable current ratio indicating short-term solvency, as its ratio has not gone below 6.05 and has been as high as 12.06.

As the current ratio does not measure the quality of assets, the quick ratio is considered a better measure of a corporation's liquidity. The DDC's quick ratios are lower than the current ratios because of high inventory and debtors. In 1973/74, the quick ratio was 2.10, which rose to 2.26. The cash level dropped in 1975/76 and the quick ratio decreased to 0.70. This decrease resulted from a sharp cut in HMG equity. In the following year, HMG equity rose to Rs.4 million and the quick ratio climbed to 2.53. This rose further in 1977/78 and 1978/79, then declined to 1.34 in 1979/80 from a decline in government equity and WFP assistance. During the next year, the quick ratio improved to 3.35 because of increasing WFP assistance despite a decrease in government equity. In 1981/82 it again decreased to 2.63 although there was an increment in government equity. In 1982/83 it was 3.02 as a result of a sharp increase in WFP assistance which significantly improved the cash position.

A quick ratio of 1:1 is generally considered to reflect a satisfactory current financial condition. Based on this, the liquidity position of the DDC can be considered favorable except in 1975/76. The cash position and the quick ratio depend on HMG equity and WFP assistance.

The DDC's working capital has generally increased indicating a favorable liquidity position. Working capital declined in the same years (1975/76 and 1979/80) as the current and quick ratios declined. These years coincide with the decline in the cash position of the DDC as a result of cuts in government equity which reduced working capital.

Table 3. Financial Ratios (Rs.'0000)

	73/4	74/5	75/6	76/7	77/8	78/9	79/0	30/1	81/2	82/3
CAPITAL										
Equity	835	1143	1233	1623	2328	2603	2813	3013	3313	3313
Borrowing	5	814	851	783	827	116	2370	1902	3010	2880
Reserve	13	-	-	-	-	-	-	-	-	-
Grant Aid	314	428	701	806	1011	1256	956	3037	3685	5386
Total	1164	2384	2785	3220	4166	4975	6139	7952	10008	11678
Debt-Equity										
Ratio	.005	0.71	0.69	0.48	0.36	0.43	0.84	0.63	0.91	0.90
Debt-Capital										
Ratio	.004	0.34	0.31	0.24	0.20	0.22	0.39	0.24	0.30	0.26

Table 4. Liquidity Ratios (Rs. '0000)

	73/4	74/5	75/6	76/7	77/8	78/9	79/0	80/1	81/2	82/3
ASSETS										
Cash	173	260	900	299	548	667	328	715	1570	2177
Debtors	237	365	332	271	399	937	650	489	1582	553
Inventory	90	328	418	541	813	408	829	877	753	1944
Total	500	953	840	1110	1760	2012	1806	2080	3905	4674
LIABILITIES										
Creditors	53	83	92	72	97	111	140	99	427	338
Bills	-	-	-	-	-	25	40	38	39	213
Depositors	5	6	6	7	9	17	20	22	57	81
Welf. Fund	25	26	31	39	40	37	45	54	75	89
Total	83	115	129	118	146	190	245	213	597	721
Cur. Ratio	6.1	8.3	6.5	9.4	12.1	10.6	7.4	9.8	6.5	6.5
Quick Ratio	2.1	2.3	0.7	2.5	3.8	3.5	1.3	3.4	2.6	3.0
Wrkg Cptl	417	838	711	992	1614	1822	1561	1867	3308	3953

Activity and Profitability Ratios: (See Table 5.) The inventory turnover ratio indicates the efficiency of inventory management. Inventory turnover indicates how rapidly inventory is turning into receivables through sales. Low inventory turnover suggests that inventory levels exceed production requirements while high implies a low level of inventory which may result in frequent shortages. Inventory turnover has not followed any particular pattern. Although sales have continuously improved except for 1979/80, the DDC's inventory turnover has fluctuated from 9.46 to 3.81. This was due to a fluctuation in inventory levels resulting from irregular supplies of raw materials like SMP and BO.

Table 5. Activity Ratios and Profit Margins

	73/4	74/5	75/6	76/7	77/8	78/9	79/0	80/1	81/2	82/3
Sales	740	1278	1954	2577	3097	3857	3453	4377	6185	7508
Inventory	90	328	418	541	813	408	829	877	753	1944
Net Assets	635	1432	1831	2004	2155	2345	3733	5005	5244	6096
Gross Prft	153	337	303	299	330	324	40	485	859	-
Net Profit	-25	33	-8	-17	-6	-172	-234	-349	-332	-639
Inv. Turn.	8.2	3.9	4.7	4.8	3.8	9.5	4.2	5.0	8.2	3.9
F.Ass.Turn.	1.2	0.9	1.1	1.3	1.4	1.7	0.9	0.9	1.2	1.2
G Prft Mar	0.2	0.3	0.2	0.1	0.1	0.1	0.0	0.1	0.2	-
N Prft Mar	-0.03	.03	-0.00	-0.01	-0.00	-0.05	-0.07	-0.1	-0.05	-0.09

Inventory includes milk, cheese, butter, SMP, BO. Assets include machinery, equipment, land, buildings and vehicles.

The fixed assets turnover ratio is sales divided by the depreciation value of fixed assets. This has not followed a uniform pattern. In three out of ten years fixed assets turnover was less than unity indicating that a rupee investment in fixed assets generated sales of less than one rupee. In the remaining seven years, the ratio varied from 1.07 to 1.65. Generally low fixed assets turnover in recent years indicates inefficient management. The level of capacity utilization of the DDC plants supports this observation. In 1983/84, the effective capacity utilization of four milk plants was 95 percent. Except for the KMSS, capacity utilization was low in the other milk plants, three buffalo cheese factories, and the ice cream freezing plant.

The gross profit margin reflects the efficiency with which each unit of product is produced. This indicates the average spread between the costs of goods sold and sales revenue. For the DDC, the gross profit margin in the initial year was 0.21 and increased to 0.26 the next year. Thus, the DDC had a gross profit of Rs.0.25 per Rs.1.00 of sales. In the next five years this margin declined and reached Rs.0.012 in 1979/80, then improved to 0.15 in 1981/82. A low gross profit margin ratio may reflect higher costs of production or low selling prices. The DDC had no gross profit in 1982/83 because the selling price of pasteurised milk was low while its production cost was high.

The net profit margin is the overall measure of the

firm's ability to turn each rupee of sales into net profit. This ratio also indicates the firm's capacity to withstand adverse economic conditions. A firm with a high ratio would be in an advantageous position to adjust to falling sales prices, rising costs of production, or declining demand for the product. The DDC has suffered net losses in nine out of ten years, and these losses have increased over the years. The net profit margin is thus negative in all but one year.

LOSSES

Although the volume of production and sales have increased continuously since 1979/80, the DDC has suffered increasing losses. An attempt has been made to analyze the causes affecting the profitability of the DDC.

The DDC lost Rs.2,45,000 in 1973/74. It made a net profit of Rs.3,26,000 in 1974/75 which covered all previous losses and gave a net cumulative profit of Rs.3,000. For the next three years losses were Rs.3,19,000. The next year losses jumped to Rs.1.7 million, over five times higher than the total losses of the previous three years. Losses increased rapidly except in 1981/82 when they declined to Rs. 3.3 million from Rs.3.5 million. In 1982/83 the DDC suffered losses of Rs.6.4 million. The DDC has incurred a total loss of Rs.17.5 million during the study period.

Factors Responsible for Losses

Government Control of Prices: Judicious fixation of milk procurement and sales prices is of utmost importance to the DDC's viability. The sales price should be fixed on the basis of cost of procurement, collection, transportation, processing, sales, and overhead. Any revision in procurement price, salaries, inflation and other costs must be properly reflected in the sales price. HMG has pressed the DDC to sell milk in Kathmandu at a reduced rate whereas it allowed DDC to increase the KMSS producer price for raw milk. This is the main cause of losses in recent years.

In the last six years the price of milk paid to farmers increased by 86 percent while the sales price increased by only 46 percent. When the purchase price was increased from Rs.2.75 to Rs.3.63 per litre in April 1982, the DDC sought HMG approval for a corresponding increase in the sales price. However, HMG was silent and the DDC was compelled to

sell milk at a lower rate which seriously affected the DDC's financial position. In 1982/83 the KMSS incurred a loss of Rs.5.36 million as the DDC was compelled to sell pasteurised milk at Rs.3.50 per litre whereas its production cost was Rs.3.86. The KMSS recovered about Rs.0.02 per litre of milk by selling milk products like yoghurt and ice cream. Thus, it suffered a net loss of Rs.0.34 per litre.

Milk Loss During Collection: As payment to farmers is made according to the quantity and quality of milk they supply, any milk loss directly causes financial losses. There may be losses from spillage and transfer of milk from one container to another. The DDC had allowed loss of 5 percent of total fat collected by the KMSS from collection centres to the factory and a new norm of 4.5 percent has been fixed. This allowance was too high. Actual collection losses are also high. KMSS losses were Rs.0.13 per litre of milk from the collection point to the factory. In 1983/84 the KMSS collected 4.488 million litres of milk and at Rs. 0.13 per litre total losses were Rs.5,83,440. According to the new norm, if collection losses are 4.5 percent the KMSS will lose Rs.0.14 per litre of milk with the double axis price. In 1982/83 and 1983/84 collection losses were Rs.0.13 per litre as the loss was 4.17 percent out of the allowed 5 percent. Losses could be reduced to 4 percent but they remain high because 4.5 percent is allowed. Losses above 4.5 percent are to be compensated by the concerned staff. This system seems unwise because it is difficult for an employee to compensate a loss of even 1.5 percent. In practice, employees compensate by underweighing milk, by degrading milk quality or by adding water. All of these practices are detrimental to producers' confidence and employees' morale. Instead of penalizing employees, the DDC could motivate them to not lose milk by rewarding those who have lower losses. There would then be competition among workers to decrease losses, and rewards would improve producers' confidence and employee morale.

For other milk plants collection losses of 2 percent are tolerable.

Expansion of the Collection Area: The DDC nearly doubled its milk collection centres between 1977/78 and 1982/83. This adds to the cost of collection as facilities must be provided to collect and transport milk. Although the quantity of milk has increased, collection per centre has de-

clined. The DDC operated 91 milk collection centres and collected an average of 167 litres of milk from each in 1977/78 but it collected only 126 litres each from 169 collection centres in 1982/83. Many centres were added but the result was low collection and higher costs.

Gap between Flush and Lean Season Collection: Milk production in Nepal has high seasonal fluctuation because of variation in green fodder grass availability. Buffalo after six months of lactation yield less milk and as they are fed only dry fodder then, milk production decreases as the dry season begins. The main buffalo lactating season is July to September, and July to December is the flush season for milk production. More than two-thirds of the milk is collected in the flush season. Milk collection costs increase significantly in the lean season. Collection and transportation facilities are established according to flush season collection. Once set up facilities are operated in the lean season regardless of the quantity of collection, leading to high collection costs. In 1982/83 KMSS collection cost was Rs.0.73 per litre in the flush season while it rose to Rs.1.09 in the lean season; for the BMSS costs were Rs.0.90 and Rs.1.37; for the HMSS, Rs.0.44 and Rs.0.79; and for the PMSS, Rs.0.47 and Rs.1.31.

Handling Loss During Processing: The DDC has incurred substantial handling losses as a result of lack of vigilance and inefficient operation. Handling losses have been reduced over the last five years. In the KMSS they have decreased from 9.18 percent in 1978/79 to 0.53 percent in 1982/83. This could be attributed to vigilance and improvement of operations at the dairy plant. One of the major sources of handling losses is receipt of coagulated milk and spillage during operations. The KMSS has demonstrated that management desire and vigilance in day-to-day operation can minimize handling losses. BMSS handling losses went from 2.15 percent in 1978/79 to 3.79 percent in 1982/83. These losses are high and can be reduced to less than 1 percent.

The HMSS had less than one percent handling loss in 1978/79, which increased over three percent in the next two years, then decreased to 0.73 percent in 1982/83. This is a satisfactory level of losses. The PMSS suffered a loss of 1.49 percent in 1980/81 then went up to 2.47 percent the next year but decreased to 0.95 percent in 1982/83. Except the BMSS all supply schemes have reduced handling losses.

High Production Costs for Cheese and Butter: In 1982/83 the Thodung, Chordum and Kyama factories produced cheese and butter for less than Rs.38 per kg. In other units cost varied from Rs.40 in Kalinchok to Rs.53.54 in Chankhu, Rs.69.78 in Taksindu, Rs.72.81 in Gatlang and Rs.110.70 in Gunsibhadaure. Trisuli Plant incurred an expenditure of Rs.1,50,000 without producing any cheese or butter.

Unlike milk supply schemes, in cheese factories increased production does not add much cost except the cost of milk and cheese and butter transportation cost. If a factory produces 9000 kg (cheese plus butter) it can remain profitable, and the cost of production is about Rs.37 per kg. All other costs including 8 percent sales commission, losses in storage and transportation of 13 percent, central office expenses of 13 percent and depreciation of 6 percent add Rs.15 per kg to the cost. The sales price of cheese and butter was Rs.54 per kg, so there is a net profit of Rs.2 per kg. However, unproductive units like Trisuli, expensive units like Gunsibhadaure, Gatlang, Taksindu, Chankhu and Lengtang, and losing units like Daurali, Nagarkot, Fauwa and like pull down the profits made by others.

In 1982/83, even though milk collection increased from 889,000 to 969,000 litres, cheese production came down to 71 mt from 86 mt. Although butter production increased from 37 mt to 40 mt, marketing butter has been less easy than marketing cheese, and a stock of butter is piled up in the KMSS. When this butter becomes rancid it must be converted into ghee. This leads to more losses because ghee sells for Rs.45 per kg and butter for Rs.54. In 1980/81, cheese losses were 27 percent, which decreased to 11.7 percent in 1981/82 and to 2.2 percent in 1982/83. Butter losses were 16.6 percent in 1982/83.

Capital Accumulation and Utilization: The DDC's capital has increased over ten times in ten years. Three milk plants are running below potential capacity. The cheese factories at Fauwa and Nagarkot are running below capacity. What is happening in the Trisuli Plant has already been mentioned. Similar is the case of ice cream plant at Lainchaur. Many machines have long been idle. Under utilization of plant capacity and machinery has accounted for high overhead costs and depreciation per unit of product.

Addition of Manpower: Except for the cheese factories

almost all DDC units are overstaffed, especially the KMSS. Overstaffing has bred indiscipline, laziness and indifference. Non-technical staff have increased faster than technical staff. Many technical officers are in the centre or the KMSS, rather than where their services are required.

RECOMMENDATIONS

The DDC milk sales price in Kathmandu has become a sensitive issue and caused financial losses. Raw milk is bought from farmers at a remunerative price at collecting centres. Additional expenses are incurred between collection and delivery to consumers. To improve the DDC's financial position and eliminate losses, HMG should grant autonomy to the DDC to revise the sales price of milk so it can cover costs of collection, processing, and distribution. The consumer milk price should be increased along with increases in the producer price. Nevertheless, the consumer price should be fixed as low as possible. If HMG is committed to pay higher prices to rural producers and sell milk at a reduced rate to urban consumers, budgetary provisions or a subsidy should be provided to the DDC. The DDC's working capital is also dependent on HMG equity. However, there has been a decline in HMG's contribution recently which has adversely affected working capital. HMG should make annual budgetary provisions to provide equity to the DDC.

DDC milk collection has not increased commensurate with milk demand. Consequently, the DDC must depend more and more on imported SMP and BO to produce pasteurised milk. As milk and cheese plants are operating below capacity for want of milk the DDC should try to increase collection. A study should be done to find out how much milk is produced in the command areas of existing collection centres. The DDC should expand milk collection areas after assessing the potential of marketable surplus milk and the feasibility of collecting this milk. Addition of collection centres has been costly in the past as milk collection per centre has declined. Milk collection activities should be conducted through milk producers associations in all schemes as this has increased collection in the BMSS and HMSS.

Milk collection depends on production, which has declined due to malnutrition, inbreeding, diseases and lack of funds to purchase buffalo. On the other hand, the rising population and increased purchasing power particularly in

urban areas will continue to increase demand for milk and milk products. There should be greater efforts to increase milk production to meet increasing demand. Effective programs should be implemented by the DDC, Department of Livestock Development and Animal Health and the ADB/N. These programs should support farmers by providing improved buffalo, upgrading local breeds, improving feed and fodder availability, improving veterinary services, training farmers, providing loans to purchase buffalo and providing remunerative prices for produce.

An issue related to milk collection is the prevalence of free market price and quality of milk and milk products sold by private vendors and dairies. Private dairies are only producing products which have a good profit margin but not pasteurised milk even though there is a good market. If the DDC has to compete with private vendors and dairies, adulteration in milk must be discouraged. Arrangements should be made to spot check quality of milk sold by private vendors and offenders should be penalized. This system should be implemented thoroughly and impartially. Private dairies should be asked to produce a certain percent of pasteurised milk out of their total handling.

KMSS collection losses and BMSS handling losses during processing have been major factors responsible for DDC losses. Close supervision of collection and processing are needed to reduce these losses.

As it will take time for the DDC to substantially increase its milk collection even with increasing effort, the DDC will have to depend on SMP and BO for several years to come. In the absence of long-term arrangements with donor countries and agencies for the supply of these raw materials the DDC has faced shortages of these materials in the past. As pasteurised milk is regarded as an essential commodity in urban areas particularly for children, old people, and patients, an uninterrupted supply of these raw materials is essential. The DDC and the concerned Ministries should work out a long-term plan and seek firm commitments for assistance from donors so that a regular supply of SMP and BO is maintained until the DDC can meet its raw milk requirements through local milk collection.

The decline in the production of yak cheese--the only one of its kind in the world--is a matter of regret. In

1981/82 yak cheese production was 71 mt, and this declined to 61 mt in 1982/83. The main reason for this decline is low milk production and collection in the areas of cheese factories resulting from the unavailability of pasture area, lack of extension programs for breeding care and management, veterinary service and disease control, and low price of milk provided by the DDC compared to the price paid by ghee traders. Declining cheese production has also increased cost per kg. There should be greater efforts to increase milk production near the cheese factories. Joint programs should be implemented by the DDC and the Department of Livestock Development and Animal Health to increase buffalo milk production. The DDC should supervise the yak cheese factories regularly with the help of a skilled dairy technologist to keep cheese quality high and curtail losses.

The DDC should be careful about adding capital and manpower. The result of adding more of both of these factors of production has been costly. The DDC should run existing plants efficiently and utilize idle equipment. Addition of capital and manpower should be done only with a well-defined purpose related closely with production.

Increasing costs of production are a matter of great concern for the DDC management. Collection, processing, distribution and other costs are also increasing. A thorough study on cost reduction should be conducted.

The DDC should attempt to increase sales of milk products such as yoghurt, ice cream, and butter which have high profit margins. As pasteurised milk is an essential commodity, its sales price must be kept at a minimum level to make it available to all types of people. Thus, the DDC will not be able to make profits by selling only pasteurised milk. If sales of milk products could be increased, it will improve the DDC's financial position. Moreover, the DDC could then bear some shocks of price differences if they arise through unavoidable circumstances. The DDC has not attempted to diversify its products. There are many skilled dairy technologists whom the DDC can rely on to introduce a variety of products that can be produced from milk.

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