

26. PROFILE ON PASTEURIZED MILK, BUTTER AND CHEESE

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I. SUMMARY

This profile envisages the establishment of a plant for the production of 66,000 liters of pasteurized milk, 4,714 kg of butter and 1,800 kg of cheese per annum.

The present demand for proposed product is estimated at 600 hecto-liter, 4 tonnes and 1.5 tonnes for milk, butter and cheese, respectively and it is projected to reach 1,247 hecto liter, 8.3 tonnes and 3.1 tonnes for milk, butter and cheese, respectively by the year 2019.

The plant will create employment opportunities for 17 persons.

The total investment requirement is estimated at Birr 2.26 million, out of which Birr 1.2 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 14% and a net present value (NPV) of Birr 428,999, discounted at 10.5%.

II. PRODUCT DESCRIPTION AND APPLICATION

Cow milk is white liquid containing water, fats, protein, sugar and ash. Chemical analysis of cow milk revealed that about 86-88% of it by weight is water. Cow milk processing results in a number of dairy products such as processed milk, yorgot, cheese and butter. All these products can be consumed by human beings as part of diet on the daily feeding menu.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply And Present Demand

The products considered as a main outputs of milk collection and processing are pasteurized milk, butter and cheese. The domestic production of Dairy products during the period 1993-2002 is shown in Table 3.1.

Table 3.1
DOMESTIC PRODUCTION OF DIARY PRODUCTS
(1993-2002)

Year	Pasteurized Milk (H.L)	Butter (Tonnes)	Cheese (Tonnes)
1993	24180	38	N.A
1994	31042	75	3
1995	42775	81	6
1996	45299	45	5
1997	42062	74	12
1998	42447	78	15
1999	37637	64	13
2000	38291	60	11
2001	73807	922	187
2002	89382	384	166

Source: CSA, *Survey of the Manufacturing and Electricity Industries, Annual Issues*.

The consumption of industrially processed dairy products is mostly limited to urban areas. The largest market for these products is still Addis Ababa, though flourishing regional capitals and growing urban centers will increasingly create demand for such items of food. It is also noteworthy that, as one can easily infer from Table3.1, production of processed dairy products has exhibited significant leap since 2001. The most plausible cause for this is proliferation of private processing plants in peri-urban areas near Addis Ababa.

Although both economic and non-economic factors are important in explaining the demand for industrially processed dairy products, economic factors such as income and price are the major determinants of demand. About 50% of households in Ethiopia are believed to be living below the poverty line, and it would not be unreasonable to assume that they will not consume any sort of dairy products, let alone those that are industrially processed. Catering establishments which consume these products are also mostly concentrated in big urban centers.

When assessing demand for industrially processed dairy products, one has also to take into account the socio-economic conditions of the region, which is one of the remotest, least developed and least urbanized regions in Ethiopia.

Having considered all the above, with an assumption of one liter per capita urban consumption of milk, the present demand is estimated at 600 hectoliter of pasteurized milk 4 tonnes of butter and 1.5 tonnes of cheese per annum.

2. Projected Demand

The future demand for industrially processed dairy products depends, as stated earlier, on income, food habit of the population and expansion of catering establishments in urban areas. It is assumed that a 5% annual growth rate will take care of these factors, and the demand projection is executed in this manner is shown in Table 3.2.

Table 3.2
PROJECTED DEMAND FOR INDUSTRIALLY PROCESSED
DIARY PRODUCTS

Year	Projected Demand		
	Pasteurized Milk (H.L)	Butter (Tonnes)	Cheese (Tonnes)
2004	600	4	1.5
2005	630	4.2	1.6
2006	661	4.4	1.65
2007	695	4.6	1.7
2008	730	4.8	1.8
2009	765	5.1	1.9
2010	804	5.4	2
2011	844	5.6	2.1
2012	886	5.9	2.2
2013	930	6.2	2.3
2014	977	6.5	2.4
2015	1026	6.8	2.5
2016	1077	7.2	2.7
2017	1131	7.5	2.8
2018	1188	8	3.0
2019	1247	8.3	3.1

3. Pricing and distribution

The current factory- gate price of pasteurized milk in Addis Ababa is Birr 4 Birr /liter. The price of butter varies between Birr 3 and 3.5/100g. The price of cheese is about Birr 7.5/100g.

Distribution of the products could be undertaken through small retail outlets as well as large wholesalers and catering establishments.

B. PLANT CAPACITY AND PRODUCTION PROGRAMME

1. Plant Capacity

The milk processing plant to be established will have a capacity of 117,850 liters of raw milk per annum and producing 66,000 liters of pasteurized milk, 4, 714 kg of butter and 1,800 kg of cheese at full operation capacity.

2. Production Programme

The envisaged plant is expected to operate in double shifts of 8 hours each a day for a total of 300 days a year. It will commence operation at 80% of its rated capacity in the first year, 90% in the second and 100% in the third year. As the processing of raw milk facilitates alternative products like butter and cheese as well as other milk products, the production programme along with the product mix is shown in Table 3.3.

Table 3.3
PRODUCTION PROGRAMME

Year	Year 1	Year 2	Year 3 and onwards
Capacity	80%	90%	100%
Pasteurized milk, lt	52,800	59,400	66,000
Butter, kg	3,771	4,243	4,714
Cheese, kg	1,440	1,620	1,800

IV. RAW MATERIALS AND INPUTS

A. RAW AND AUXILARY MATERIALS

The basic raw material for milk, butter and cheese production is raw milk. Other materials such as milk coagulating enzymes and salts are also required in relatively small quantity. In addition to raw materials, auxiliary materials like containers and glycine papers are required. Except glycine paper and coagulating enzymes, the other major raw materials can be obtained from the local market. The list and costs of the above mentioned materials are indicated in Table 4.1.

Table 4.1**RAW AND AUXILIARY MATERIALS REQUIREMENT AND COST**

Sr. No.	Description	Qty	Cost, Birr		
			FC	LC	Total
1.	Raw milk, lt	120,000	-	180,000	180,000
2.	Plastic bags (200cc), pcs	330,004	-	99,001	99,001
3.	Glycine paper (40 g), tonne	24 kg	2,880	-	2,880
4.	Coagulating enzymes, kg	755	11,325	-	11,325
	Grand Total	-	14,205	339,001	353,206

B. UTILITIES

The major utilities required by the envisaged project are electric power, water & fuel oil. The annual requirement of utilities and the corresponding cost is indicated in Table 4.2.

Table 4.2**ANNUAL REQUIREMENT OF UTILITIES AND COST (BIRR)**

Sr. No.	Utilities	Qty.	Cost
1.	Electric power, kWh	7,775	3,678
2.	Water, m ³	1,344	2,688
3.	Fuel oil, lt	9,598	22,075
	Grand Total	-	28,441

V. TECHNOLOGY AND ENGINEERING**A. TECHNOLOGY****1. Process Description**

Processing of raw milk mainly involves heat treatment operation usually known as pasteurization and sterilization. These processes are discussed in detail as follows.

A weighed amount of raw milk is pumped to a clarifier by means of the milk pump, where it is removed of microscopic impurities. Clarified milk is next sent to the cooler where it is cooled to about 2-5°C, then pumped to the storage tank.

The milk is, then, preheated and pasteurized to a temperature of about 80°C by heat exchange. Further, by the effect of ultra-high temperature sterilizer, the fatty ingredients are homogenized in the homogenizer and recycled to the ultra-high temperature sterilizer where it is pasteurized instantly in about 2 seconds at high temperature of 135°C.

Finally, cooling is achieved by means of chilled water to lower the temperature to 3°C, after which the milk is stored in the surge tank for filling into suitable containers for various uses. After such a process, a specified quantity of the milk is sold as a pasteurized product while the remaining portion is further processed in the plant for the production of other milk products such as butter and cheese. The details of the production processes are stated as follows.

a) Butter Production

Whole milk is partially or totally separated to produce standardized whole milk with 3.25% milk fat, low fat milks, 1-2% milk fat, and skim milk. After separation, cream is held in stainless steel tanks and refrigerated at (4-7°C).

The separated cream is pasteurized in order to destroy bacteria. Following pasteurization, rapid cooling is conducted to facilitate the formation of butter by a churning process. By continuous churning, the entering will be pasteurized and tempered cream is agitated vigorously by beater bars. This action causes stripping of the fat globule membrane and aggregation of the fat into chunks. Finally, a continuous ribbon of yellow butter streams from the end of the continuous churn. Butter as a product drops into a hopper, where it is transferred to packing machinery.

b) Cottage Cheese Production

Cheese is made from pasteurized skim milk, and in form of discrete particles classified as small or large curd. A curd forms when the increasing lactic acid of milk

during fermentation attains the isoelectric point of casein at pH 4.6. This soft curd additionally contains lactose, salt and water. Latter, the curd matrix is cut and cooked to about 126°F (52°C). Separation of whey from the curd is rapid, and is followed by two or three water washings at warm to chill temperatures. Washing removes whey from residues and acts as a cooking medium. After drainage of the last wash water, the chilled curd is blended with a viscous, salted cream dressing to give 4.2% fat and 1% salt, and is packaged.

2. Source of Technology

The address of a possible supplier of the technology and equipment is as given below.

Pharmalab Engineering (1) PVT. LTD.
 Star Metal Compound, L.B.S Marg. Vikhroli
 Bombay - 83 (India)
 Tel. 5782559 (Hunting)
 Telex 11-71934 - PL IN
 Fax: 91-22-5785329

B. ENGINEERING

1. Machinery and Equipment

The list of required machinery and equipment is indicated in Table 5.1. The total cost of machinery and equipment is estimated at Birr 2,220,750.

Table 5.1
REQUIRED MACHINERY AND EQUIPMENT

Sr. No.	Item	Qty
1	Weighing tank	1
2	Receiving tank	1
3	Milk clarifier	1
4	Milk pump	1
5	Plate cooler	1
6	Storage tank	1
7	Milk pump	1
8	Pasteurizer	1
9	Surge tank	1
10	Filling and packing machine	1
11	Boiler	1
12	Chiller	1
13	Churning equipment	1
14	Hopper	1
15	Power facilities	1
16	Sterilizer	1

2. Land, Building and Civil Work

Total land area required is about 1,000 square meters. The cost of land at a lease rate of 2 Birr per square meter and for a period of 70 years holding is estimated at Birr 140,000. The total land lease cost is assumed to be paid in advance. The built-up area is estimated to be 300 m² and the cost of buildings and construction at a unit cost of Birr 1,400 per m² is estimated at Birr 420,000.

3. Proposed Location

As indicated in the market study, the major consumers of milk and milk products are the urban population of Assosa, Chagni and other towns of the region. Thus, the plant is proposed to be established in the town of Assosa.

VI. MANPOWER AND TRAINING REQUIREMENT

A. MANPOWER REQUIREMENT

Total number of manpower required is 17 persons. Details of the manpower requirement and the corresponding annual labour cost including fringe benefits are shown in Table 6.1.

Table 6.1
MANPOWER REQUIREMENT AND ANNUAL LABOUR COST

Sr. No.	Description	No. of Persons	Salary, Birr	
			Monthly	Annually
1	Manager	1	1,500	18,000
2	Administration and Finance Head	1	1,200	14,400
3	Secretary	1	600	7,200
4	Storekeeper	1	600	7,200
5	Salesperson/Purchaser	1	600	7,200
6	Cleaner and Messenger	1	250	3,000
7	Gaurds	2	250	3,000
8	Production Head	1	1,200	14,400
9	Engineer	1	1,200	14,400
10	Operators	4	300	14,400
11	Assistant Operators	2	250	6,000
12	Technicians	1	400	4,800
	Total	17	14,020	114,000
	Benefit (20% of Basic Salary)		2,804	22,800
	Grand Total	17	16,824	136,800

B. TRAINING REQUIREMENT

Six operators and two technicians should be given a short-term on-site training during, commissioning by machinery & equipment supplier and the training cost is estimated at Birr 30,000.

VII. FINANCIAL ANALYSIS

The financial analysis of pasturized milk, butter and cheese project is based on the data provided in the previous chapters and the following assumptions:-

Construction period	2 years
Source of finance	30% equity
	70% loan
Tax holidays	3 years
Bank interest	10.5%
Discounted cash flow	10.5%
Repair and maintenance	5 % of Plant machinery and equipment
Accounts receivable	30 days
Raw material (local)	
• Raw milk	1 days
• Others	60 days
Raw material (import)	90 days
Work in progress	2 days
Finished products	1 days
Cash at hand	5 days
Accounts payable	30 days

A. TOTAL INITIAL INVESTMENT COST

The total initial investment cost of the project including working capital is estimated at Birr 2.26 million, out of which about 52% will be required in foreign currency. Details are indicated in Table 7.1.

Table 7.1
INITIAL INVESTMENT COST ('000 BIRR)

Sr. No.	Cost Items	Foreign Currency	Local Currency	Total
1	Land	-	140.00	140.00
2	Building and Civil Work	-	420.00	420.00
3	Plant Machinery and Equipment	1,050.00	150.00	1,200.00
4	Office Furniture and Equipment	-	25.00	25.00
6	Pre-production Expenditure*	-	362.77	362.77
	Total Investment Cost	1,050.00	1,097.70	2,147.77
7	Working Capital	35.55	80.74	116.29
	Grand Total	1,085.55	1,178.1	2,264.06

B. PRODUCTION COST

The annual production cost at full operation capacity of the plant is estimated at Birr 792,270 (see Table 7.2). The material and utility cost accounts for 48 per cent while repair and maintenance take 6.8 per cent of the production cost.

* *Pre-production expenditure include interest during construction (Birr 287,774.5), training (Birr30,000) and cost of registration, licensing and formation of the company including legal fees, commissioning expenses, etc.*

Table 7.2
ANNUAL PRODUCTION COST
(‘000 BIRR)

Items	Year			
	3	4	7	10
Raw Material and Inputs	282.56	317.89	353.21	353.21
Labour Direct	54.72	61.56	68.40	68.40
Utilities	22.75	25.60	28.44	28.44
Maintenance and repair	43.36	48.78	54.20	54.20
Labour overheads	18.24	20.52	22.80	22.80
Administration Cost	36.48	41.04	45.60	45.60
Total operating costs	458.12	515.39	572.64	572.64
Depreciation	100.50	100.50	100.50	85.50
Cost of Finance	166.39	156.70	119.12	68.41
Total Production Cost	725.54	772.59	762.27	726.56

C. FINANCIAL EVALUATION

1. Profitability

According to the projected income statement, the project will start generating profit in the first year of operation. Important ratios such as the percentage of net profit to total sales, net profit to equity (return on equity) and net profit plus interest to total investment (return on total investment) will show an increasing trend throughout the production life of the project.

The income statement and other profitability indicators show that the project is viable.

2. Break-even Analysis

The break-even point of the project is estimated by using income statement projection.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales-Variable Cost}} = 24 \%$$

3. Pay-Back Period

The investment cost and income statement projection are used to project the pay-back period, the project will fully recover the initial investment and working capital within 7 years time.

4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 14% and the net present value at 10.5% discount rate is Birr 428,999.

D. ECONOMIC BENEFITS

The project can create employment opportunities for 17 persons. In addition to supply of the domestic needs, the project will generate Birr 9.07 million in terms of tax revenue. Moreover, the Regional Government can collect employment, income tax and sales tax revenue.