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FEASIBILITY STUDY
FOR
MILK PROCESSING FACTORY AT WEBUYE
FOR
ROYAL FOOD INDUSTRIES

PREPARED BY
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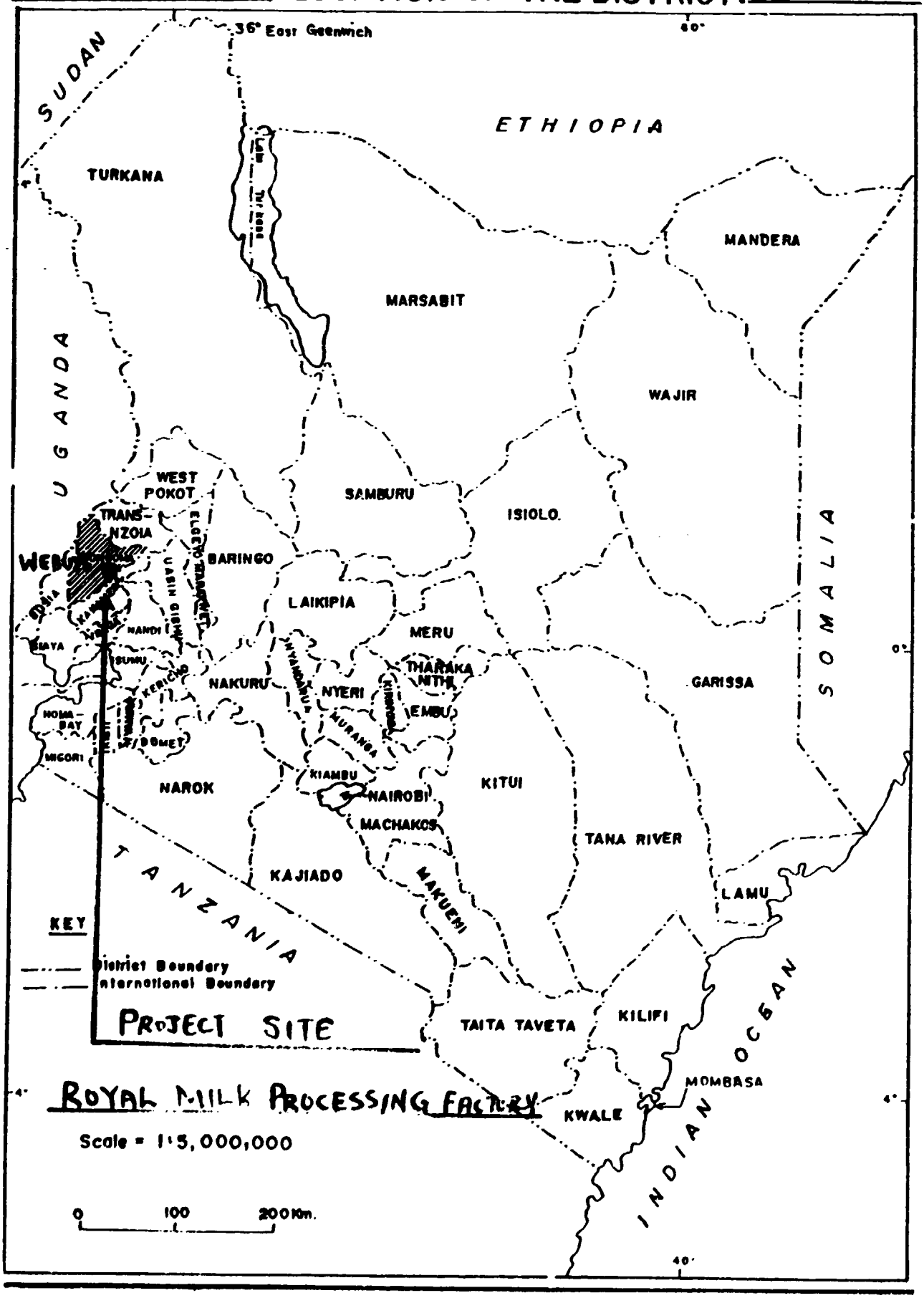
JAN. 1995

LOCATION OF THE DISTRICT



ACKNOWLEDGEMENT

Special thanks go to the major study financiers - the United Nations Industrial Development Organisation (UNIDO) - Vienna in availing funds to assist the project sponsors at Royal Food Industries to make this Feasibility Study possible. To be thanked also are the local UNIDO programme officers and the Ministry of Commerce and Industry officers who gave valuable advice to the study team and all Government and KARI officers in the field who volunteered their time to assist the study team during the field trip to Western Kenya in August 1994.

EXPLANATORY NOTES

References to dollars ($) refer to U.S. Dollars throughout the text. A full stop (.) is used to denote decimals. A comma (,) is used to distinguish thousands and millions in this text.

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THE STUDY TEAM

Total Information System Agency deployed the following researchers for the study which included visits to Western Kenya site, farming areas, and research stations at Kakamega and Kitale during August 1994.

1.	T. S. Isenye	M.P.A.	Principal Consultant
2.	G. J. Lusiola	M.A.	Economist
3.	Dr. R. I. Igobwa	B.V.M.	Dairy Specialist
4.	S. M. Mbugua	M.Sc.	Engineer
5.	K. N. Njuguna	B.Sc	Food Technologist

Several research assistants were also involved in the study. The probable site visits at Webuye and the alternative site at Kakamega town were made. Enquiries centred on location suitability, infrastructure, public policies affecting industries in the local authorities, the possibility of allocation of industrial plot to the sponsor for the project and noting the general governmental responses on the location of this milk processing plant. In this regard, it is noted that unofficial response from members of the Kakamega D.D.C. was excellent and would welcome the project with immediate allocation of 5 acre plot for the project, provided a formal application is made as soon as possible. However, this report is based on Webuye site as selected for the study. Visits to selected farmers in the two districts enabled the researchers to gauge the dairy farmers' responses as to a new factory to serve them in the area; to establish milk yields and compare them with those recorded in official documents. Details of these facts can be found in Chapter 4 of this report.

In order to gauge the size and availability of raw milk for the production of processed milk products, the team studied the production of all milk in the area, and consumption trends to establish surplus milk that could be availed to the factory for continuous production of the four products.

INTRODUCTION

The major reason for this study is to assist Royal Food Industries in determining the technical feasibility and financial viability of a milk processing plant at Webuye, Western Kenya.

The study attempts to analyze the marketing constraints and set strategic plans to market the products, help in cost analysis and revenue generation and advise on manpower requirements and utilization for the project. This is done with the full understanding of the relevant Government policies and regulations for the dairy sub-sector and understanding of the existing industry practices so that the investor can adapt into the system confidently. Key technical information is provided, but what is critical is whether the information will be useful in getting the project work and successfully at that particular level and time in the economy. The conclusions arrived at in this report are of the author and Total Information Systems Agency takes responsibility for the contents in this report.

CHAPTER 1

EXECUTIVE SUMMARY

Milk is a universal drink. Kenyans drink a lot of milk in all forms but the degree of processing the produce is what needs to be developed in the country. The average farmer wants to improve his herd so that he can boost his milk harvest from an average of 1,500 litres per year from his Zebu cow which the majority of farmers keep, to the present average of 4,000 litres of milk per year from grade cattle or cross-breed cattle. The government has projected 9,000 litres of milk per cow by 1996 which would boost the farmers milk harvest substantially. This will then call for more processing plants to tap the potential of milk sales hence increase the farmer's income. More jobs will be created as evidenced by this project which will create a minimum of 60 jobs in the first year of operation. An expansion to double capacity would triple employment. The project if implemented on time will result in the yearly profits of U.S.$ 983,000 (Kshs.44 million), by the second year and double that or US$2.3 million or Kshs. 107 million in the 6th year of production. It is noted that milk production is increasing yearly and less than 50% is being industrially processed while the consuming public is demanding more processed milk products. Liberalization has therefore enabled the establishment of private processing plants which in sum total, will fill the gap between processed milk and milk produced by dairy farmers. Following the flotation of the

Kenya shilling, the Kenyan currency has appreciated in value against the hard currencies. This has translated into lower machinery and equipment prices in terms of the Kenya shillings hence the investors of Royal Food Industries are advised to invest now to benefit from the above positive economic effects.

The Project Promoter is the Royal Food Industries whose directors are Dr. Noah Wekesa and Golden Bridge Insurance Brokers Ltd. The principal investor, Dr. Wekesa is a prominent Dairy Farmer in Trans Nzoia District of Rift Valley Province -- Kenya. His address is P.O. Box 982, Kitale.

The Project's strategy is to manufacture four key products namely pasteurized milk, butter, mala and skim milk for sale in the local market and eventually expand to Common Market for Eastern and Southern Africa (COMESA) particularly for butter. Butter is to be processed as cheaply as possible and sold at comparable rate with margarine and in big volume so that the advantage should be based on mass production utilizing the doctrine of economies of scale. Pasteurized milk has a good market in Kenya and can be improved upon. The four products will generally do well locally.

The project was conceived of by the directors of Golden Bridge Insurance Brokers Ltd., who asked Dr. Wekesa to join hands in the project as he has valuable experience in milk production. His big dairy herd of over 1500 cows can be relied on for the factory's sustained minimum production level during dry seasons. The project was analyzed under

pre-feasibility study in 1993 and found to be profitable hence UNIDO was approached to assist in financing the major feasibility study to ascertain its viability and sustainability. In 1994, Total Information Systems Agency was awarded the contract to study the relevant aspects of this project hence the findings in this report.

The Economic policies supporting this project include a liberalized milk sales market, a deliberate government policy to encourage rural industrialization with specific interest in utilization of locally produced raw materials and labour intensive industries being encouraged to be set up by investors. The project has a chance of earning foreign exchange, it is also supported by the enabling and liberalized foreign exchange regime in the economy.

The market for the four products: pasteurized milk, butter, mala and skim milk is expected to expand due to the rapid urbanization caused by rural-urban migration. More and more people are opting for pasteurized milk which is hygienically produced. In Nairobi alone, the demand outstrips supply. Most people in areas such as Kibera, Kangemi, Kasarani and Embakasi use raw milk from the peri-urban farmers who hawk milk in these areas daily. the price of this unprocessed milk is the same as that of Kenya Cooperative Creameries (KCC). It is sold on the pretext that it is whole milk. These areas under review have a cumulative population of more than one million people, hence accounting for over half of City of Nairobi's population. They are essentially low to medium income areas and good consumers of milk products.

Total sales for the four products will be in excess of US$4.014 million in the 1st year, US$12.7 million in the 5th year and about US$18.7 million in the 10th year of production.

Unless there is unexpected economic down-turn, these sales are projected to be realized in the production years. If there is a drought in the intervening years, butter will be the first product to be suspended in production. Skim milk production may also be suspended in order to concentrate on the production of pasteurized milk and mala for the local market. However, a drought situation in Kenya is not expected until the year 2003 or 2004 which are the years the factory will have built reserve funds for importation of skim milk powder for reconstituting into pasteurized milk for their customers.

Price changes in the economy may also affect the sales of the factory's products. If the inflationary trends set into the economy, the factory will have to analyze the situation and adjust the factory's product prices in line with the competition in the market and the general purchasing power in the economy. This may also affect the factory if farmers demand higher prices for their milk (raw material). This is more evident in the sensitivity analysis in Chapter 11 of this report.

On the technical side, if spare parts are not provided for any reason by the contracted supplier, this could affect the factory production hence sales of the factory's products.

This may happen only if there is a radical political re-alignment in the country which is not anticipated after the 1997 general elections in Kenya. This is why spare parts volume enough for 180 days is recommended here although the study used 120 day lead time.

Raw materials (milk) will be sourced locally. Some auxiliary supplies will be sourced internationally making a total cost of 4.6 million dollars. These materials are listed in the section for supplies. Utilities cost is minimal at less than 1% of total production cost. Spares also will cost about 1% of production cost annually.

The location of the plant will be at Webuye town. However, the investors have shown interest in shifting the site to Kakamega town should the Bungoma District Development Committee (DDC) not help in facilitating the investor's request for land allocation at Webuye. Meanwhile, Dr. Wekesa's 2 1/2 ha. plot in Webuye municipality off the main Webuye-Eldoret road, will be used for the purpose of this feasibility study.

The plot is serviced by municipal water lines, there is electric power supply nearby, Kenya Posts and Telecommunications Corp. has telephone facilities nearby which can be tapped. The plot is accessible from the main tarmac road of Eldoret-Webuye by a murram road of half a kilometre to the site. There will be need to instal effluent cleaning facility which should clean the wastes from the factory before emptying into the public sewers. An engineer

with relevant skills and experience has been identified by APV local office - Nairobi who will develop this facility at a cost of 30,000 to 50,000 US dollars equivalent.

Other than the above facility, there are no environmental impacts expected from the factory processing.

The Engineering section of the plant will follow strict dairy products standards formulated by Kenya Bureau of Standards. The production programme will be based on the selected supplier's operation module for 30,000 litres of milk per 8 hours shift (60,000 litres for 2 shifts). Milk will be received at the reception area in cans, weighed, pumped to the storage tanks and in the process it is filtered and cooled to about 4°C. Milk that is brought in by tankers from cooling stations at Naitiri and Tongaren will be attached directly to the centrifugal pump which will process it as above.

Processing of the products will start at the Treatment plant section where pasteurized milk will be made, butter will be in the butter unit, mala will be processed in the mala unit, skim milk will be processed in pasteurising and butter sections. Factory capacity will be as follows:

1. Pasteurized milk = 5,000 litres per hour
   = 40,000 litres maximum per 8 hour shift

2. Butter Section:

Butter churn	=	1,000 litres per hour
	=	8,000 litres per shift
	=	16,000 litres per day
	=	1.2 M.T. per day
	=	360 M.T. of butter/year

Butter filling unit has a capacity of 75kg per hour, with a batch pasteurizer of 500 litres per hour.

3. Mala Section:

The technology will be locally sourced with the 6 culture tanks able to hold 9,000 litres of milk. A homogenizer to

process 1,000 litres per hour of fermented milk will be sourced from APV, Nairobi.

- 4,500 litres per shift
- 9,000 litres per day
- 2,700 M.T. of milk per year.

4. Skim milk will be small in quantity and may require only one shift work (3 tons per day). The technology is that of pasteurized milk in Section 1, with a skimming device to lower butter fat content to 1% or below.

The main plant equipment to be bought from APV of Denmark - FOB - Copenhagen, paid in U.S. dollars are as under:

	ITEM	COST US DOLLARS
1.	Milk reception	125,000
2.	Milk treatment plant	265,000
3.	Cream pasteurizer	74,000
4.	Filling and storage	262,000
5.	Butter production	166,000
6.	C.I.P. plant	63,000
7.	Refrigeration	194,000
8.	Boiler	80,000
9.	Water, compressed air	80,000
10	Ventilation	42,000
11.	Electrical installation	386,000
12.	Pipes (Stainless)	80,000
13.	Service pipes	102,000
14.	Laboratory	66,000
15.	Workshop	25,000
16.	Dairy equipment	28,000
17.	Spares	75,000
18.	Eng. Design/Planning	116,000
19.	Tech./start up	674,000
	US$	2,940,000

The layout of the project shall be in several buildings, built to specifications complying to Factories Act, public Health Act and those from APV - Denmark. Architectural and civil design, engineering and planning of building works, supervision and site management may be contracted to a local company called Architectura headed by Mr. M. Ayiemba, B. Arch, M. Arch. The attached architectural designs and related cost estimates have been computed by Architectura based on APV-DTD specs.

The main civil engineering works will be contracted to a reputable civil engineering company to carry out site preparation and development and buildings to conform to dairy industry requirements.

The organization is designed to meet medium level industrial set up in Kenya. The Project Director shall be the top executive of the plant, reporting to the investors who will form a Board of Directors. The project director will also be charged with the total implementation of the project under the direction of the Board.

The Project director will be closely assisted by the departmental managers of management and finance, sales and marketing, purchasing and production. These key personnel shall be assisted by qualified assistants in their respective fields. The total workforce is expected to be about 60 when fully operational.

The associated costs for personnel management is expected at slightly over US$100,000 per year for the 1st and 2nd years.

The technical staff shall receive all the training from the machinery supplier who will be at the plant for 3 months. This phase will cost the project an additional US$670,000 which will be capitalized as it is part of the installation, start up and technical advice cost that comes with the machinery and equipment. This cadre of employees for training will be sourced locally.

The implementation schedule should take about six months from date of project funding approval by financiers. The installation, start up and training module will be for 3 months from the date of machinery arrival at Mombasa - Kenya.

The critical actions for timely implementation will be:

1. Sourcing of finance for the purchase of machinery and equipment
2. Bids and selection of civil works contractors and building contractors
3. Installation of all utility facilities
4. Machinery arrival and installation and testing period, training of staff before production.
   - The raw material delivery scheduling
   - Potential market testing and pricing, and sales promotion

FINANCIAL APPRAISAL

The total investment cost is expected to be as below:

- Land and site preparation	US$ 15,000
- Infrastructure/buildings/Structures and civil engineering	957,000
- Plant machinery and equipment	2,944,000
- Auxiliary and service equipment	101,000
- Preproduction capital cost	700,000
- Working capital	450,000
Total Investment cost	US$5,167,000

The above investment will be funded by the sponsors at the rate of 40% equity meaning an outlay of US$ 2.06 million to be raised. The balance of US$3,100,000 will be raised through financial institutions in Kenya.

Loans for the project will principally be in 2 sections. Long Term loan in foreign exchange will be negotiated at 12% annual interest rate. Part of the long term loan will go into financing machinery and equipment from overseas and the rest for local factory construction use. There will be a

short Term loan negotiated locally too in local currency to pay for certain materials and other costs. The interest cost of these funds ranges from U.S $ 44,000 to 388,000 per year depending on the year of production. This is a major expense on the project.

RATIOS

The	IRR as measured by computer is	44%
	IRR as computed manually is	31.04%
The	B.E.P. for the project - 4th year	41.2%
	B.E.P. for 2nd year is	67.4%
	Return investment is	31,2%
	Return on sales at full capacity is	13.6%

TABLE 1

Summary of Project Profile

ROYAL FOOD INDUSTRIES: MILK PROCESSING FACTORY - WEBUYE

CONSTRUCTION PHASE: 12 MONTHS

FINANCIAL SUMMARY IN US$ DOLLARS

1.	Total Investment:	5,167,000
2.	Net present value:	5,905
3.	Discount rate	18%
4.	Internal rate of return	44%
5.	Payback period	4 years
6.	Debt/Equity ratio (initial)	60 : 40
7.	Return on Equity	78% at full operation
8.	Return on total investment at full capacity	31.2%
9.	Return on sales at full capacity	13.6%
10.	Profit with outside financing at full capacity (5th year)	US$ 1,462,000
11.	Profit without outside financing	US$ 2,662,000

SUMMARY OF OPERATIONS DATA

1.	Product	Capacity	Year 2	Year 4	Year 6	Year 8
			Capacity utilization (%)			
a)	Pasteurized milk	13,338,000 lt	85	100	100	100
b)	Butter	142 tonnes	85	100	100	100
c)	Fermented milk	2,667,000 lt	85	100	100	100
d)	Skimmed milk	868,000 lt	85	100	100	100
2.	Total Sales at local -		7,983	10,955	12,778	14,904
3.	Total number of persons employed		54	61	61	61
4.	Break-even point (% Capitalization)		88	57	49	47

Cost of products sold per year will show the following trend:

First Year of Production

Factory costs	US$ 4,756,000
Administrative Costs/Marketing Cost	US$ 1,104,000
Depreciation costs (10% p.a.)	US$ 1,139,000
Financial costs (12%p.a.)	US$ 376,000
Total cost of production	US$ 7,375,000

The financial analysis as reflected in the attendant projected financial statements show the following results:

- That the income statement shows a negative profit performance in the first year simply because of expected heavy financial costs against limited sales. The second year of operations should show improved sales performance hence positive income statement.
- That the balance sheet should show improved cash flow as less inventory held and more goods are manufactured and sold.

On the Cash Flow statement, if the debt service is managed well to extinguish the Long Term loan by repaying consistently then by the 9th year no more loans should be at the factory. The project should also take advantage of tax privileges to hedge against lower profitability. The cumulative cash balance also show positive trend throughout the project years. This will make it possible for the factory to have an increase in working capital in order to sustain profitability.

The IRR for this project is.....44%..... The BEP is.....41.2% ..... in the fourth year of production.

The points to worry the investor will be one, dampened demand for milk products made locally due increased importation of similar products of lower price due to depreciated shilling which makes imports cheap.

Another factor to worry the investor would be the general price increase of goods and services due to inflationary pressures precipitated through irresponsible monetary control at the Treasury. This may lead farmers to demand higher prices for raw materials delivered because of increased cost of dairy feeds at the farm level. The farmer may also be affected at his cheque book level as a goods and services consumer. Since milk is not an absolute necessity for most families, the factory products could be affected, by a scaled down purchasing habit of the consumers.

On the implementation side, the danger spot would be felt when there is a credit squeeze making loanable funds restricted to essential industries only. This being a third world country, it is not a far cry to expect such an eventually either forced on to the political establishment by external factors as in 1991-1993 or internally precipitated economic factors.

CONCLUSIONS

The major advantages anticipated from the project are employment creation, a new industry to use locally available raw materials with minimum import supplies, rural industrialization participant to stem rural-urban migration, an open and increasing profitable industry free from monopolistic tendencies. The disadvantages associated with this project is that initial costs are prohibitive due to importation of machinery and equipment hence the nation loses valuable foreign exchange all-be-it, receiving vital technology transfer from the industrialised north to the developing south.

The chances of implementing the project are high given the enthusiastic support of the sponsors who are keen on implementing it as soon as all modalities are in place. The sponsors would love to implement it now when the dollar appears stabilized between 44/= to 50/= exchange rate (as of December 1994).

CHAPTER 2

PROJECT BACKGROUND AND KENYA GOVERNMENT POLICY

The project was conceived of in order to fill the gap created by an expanding processed milk and milk products demand which cannot be satisfied by K.C.C. and a few other upcoming factories since the government liberalized this sector in 1992. K.C.C. processes less than 15% of milk produced in Kenya hence most milk produced in the country is consumed at the local level before processing. The urbanization taking place in Kenya therefore, is creating an increasing demand for processed milk in the form of pasteurized and homogenized quality milk. This factory therefore will strive to fill this gap and in the process create new jobs and eventually earn some export earnings. This is in line with the government's policy of encouraging rural based industries to help stem the rural-urban migration which is caused principally because of lack of jobs in the rural areas. These industries based outside Nairobi and Mombasa are given tax incentives for their location so that they stem socio-economic pressures on these principal towns and other towns. The government would also like to see a gradual and even distribution of income throughout the country so that there is also a notable elevation in the standard of living by this urban-rural interaction hence increased commercial activity and general improvement of social amenities like better

housing and better educational and health facilities for the benefit of the affected citizens. This milk processing factory will also address the government's stated policy of encouraging small scale milk processing plants to process most of the milk that goes to waste for lack of the market in high milk producing areas since K.C.C. cannot cope with the abundant milk produced nationally. K.C.C. also as the premier manufacturer of milk products in the country, has entered into long term contracts like that with Tetrapak company for the supply of milk packaging material that would be hard to terminate without political consequences. So the government would wish that more small to medium scale milk process industries be operated but to process clean and safe milk and products for use at that level and in the process create regular employment at that level. The investor will benefit by good returns on the invested funds and satisfaction at creating new jobs for Webuye residents.

A PROJECT

FOR

ROYAL FOOD INDUSTRIES
MILK PROCESSING FACTORY
- WEBUYE -

PREFEASIBILITY STUDY

BY

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MILK PROCESSING FACTORY - WEBUYE

This factory will be sponsored by Royal Food Industries of Kakamega and Dr. Noah Wekesa of Kitale Kenya. Milk and milk products shall be the basis of this project.

1.0 GOVERNMENT OF KENYA POLICY

The Kenyan government realizing that only a mixed - economy could spur development in a young country, developed a twin policy of public investment in strategic industries and by promoting and assisting private local and foreign investors with attractive investment policies. Throughout the Kenyatta regime from 1963 till 1978, the government invested it's funds in those industries that called for huge initial costs that an individual citizen could not invest in his savings or those that had long gestation period before any real profits could be realized from the investment. The private sector was also assisted with sound policies allowing for import substitution, flexible foreign exchange rates and price and wage restrictions in the economy. This policy was re-emphasized in 1986 through the "Economic management for Renewed growth" plan which gave the following edicts an added emphasis:-

a) Maintenance of flexible exchange rate which ensures sufficient rewards for exports of goods as well as for efficient import substitution.

*1993 Position: that export processing zones (EPZ) have been established in Kenya to tap foreign investments and earn the country the much needed foreign exchange in addition to job creation in the economy.

b) Maintenance of farm prices which ensure adequate returns to both small scale and large scale farmers. The 1993

position is that, price controls on most cereals and foods are decontrolled with farmers choosing the crops with the best returns from horticultural crops to sugar cane for their farming activities however, price for maize as a staple food is still controlled.

c) Liberalized import policies relying more on tariffs and less on quantitative restrictions:

*1993 Position is that import licensing requirement has been abolished and importers with foreign exchange can import goods of their choice except for certain national security items.

d) Wage policies that contribute to price stability, encourage employment creation and limit disparities between wages in modern and informal sectors.

e) Interest rates policies that are modest:

*1993 Position is that Central Bank Ceilings on interest rates have been scrapped, private and public banks can charge and pay customers rates that the market will bear.

f) For investment priorities, the government gives the highest priority to projects or industries that are Labour-intensive. Milk production on the small scale farms is inevitably labour- intensive particularly with the now popular Zero-grazing in high potential areas. The production process in the factory is labour intensive too, hence it will attract government priority listing for approval.

2.0 AGRICULTURE

The principal reason for the establishment of this factory at Webuye is that it will create an alternative to Kenya Co-operative Creameries Ltd (K.C.C.) and to a lesser extent to the Kitinda milk factory in Bungoma, which produces similar products.

The area around Webuye is endowed with good soils and good climate and dairy farming is already thriving here. The threat to this industry is the recurrent animal diseases such as East Coast Fever (ECF) which has become very expensive to treat because of the need for imported drugs and chemicals to control the menace. With a major factory in this area, government efforts will be enlisted to control the menace.

Commercial hay is not yet popular in this area, but with the continued subdivision of the arable land to family members, this may become necessary and especially so when zero - grazing takes root in the region. It is expected that the factory will look into the possibility of having extension staff to assist contracted farmers with advice or otherwise in maintaining good dairy animals.

The main study will investigate the types of grass grown in the area, the possibility of intercropping of certain cattle feeds with traditional crops, the competing agricultural products that generate cash to the peasant farmers and many other issues. The farmers ability to deliver his milk to the factory using the most direct and efficient route will also be addressed.

The population of the area around Webuye is about 700,000 people including the settlers in the nearby Lugari, Ndalu schemes and Malaba division of Kakamega district. Webuye is a municipality with the giant Panpaper mills factory as the principal employer in town, hence it's expanded population. The factory will be an added benefit both to the rural population and the town residents who will view it as a good sign of more industrialization of their area with a continued job creation factor.

3.0 PROJECT HISTORY

The project was proposed by Dr. Noah Wekesa, a prominent dairy farmer in Trans-Nzoia district. With decontrolled prices for milk and milk products, he did not see any reason why he could not invest in a project that would initially utilize his farm's milk and some from his farming friends in the area. He figured, as a successful farmer, he can run a mini- plant to process his milk into various products that are in demand nationally and even to the local communities around the factory. This would give a competitive atmosphere to the bureaucratic KCC hence generate efficiency for the better service and higher returns to the average dairy farmer.

Webuye town is strategically located in western province with rail link to Nairobi and Mombasa to the east and to Bungoma and Uganda to the west. Tarmac roads lead to Kakamega and Kisumu to the south, Kitale to the north, Bungoma to the west and Nakuru and Nairobi to the east. It is anticipates that farmers and other suppliers will reach the factory with ease using these and other access roads.

3.1 PROJECT STRATEGY

The Investor wishes to take initiative when there is still meagre competition in this industry. With the above infrastructure, the factory hopes to sell some of it's products in the P.T.A. region. There is a good market in Uganda, Southern Sudan, Burundi and Northern Tanzania.

There is a population of up to 5 million people in towns and rural areas of Western Kenya. These people use milk and milk products regularly. The strategy is to tap most of the market in this region with competitive products. The main study will address the technology required to make ghee which is a highly profitable product. If the costs are analysed and found within investment parameters, it will be incorporated on the production line. The main product is ultra - heat treated milk which has a long shelf life and is popular in dry parts of Kenya, will be produced from year 2 of operations. The other products to be produced and sold are pasteurised milk, butter, yorghurt, fermented milk (Mala) and butter milk. A line to produce ice cream will be investigated along with ghee product, so that it can be incorporated later.

4.0 MARKETING AND SALES

4.1 DATA ANALYSIS AND STRATEGIC PLANS

There is an expanding market for milk and milk products in Kenya. An expanding tourist traffic is also an added advantage to the probable sales of the factory products.

The Strategy for the plant will be chiefly to produce as few products as possible in order to satisfy the target market or

segment of the market. The marketing force will evaluate and adjust to customers dictates and preferences as most of the products are customer sensitive. Products such as butter, yorghurt and Mala may be used by certain market sectors and not others.

The second strategy will be to try to distribute the plant's products to every probable outlet (retail) so that the target customer can get or buy it at the most convenient point of sale. This means that the sales staff will be up to date with new markets, including new hotels, new supermarkets and other outlets that would buy the products for resale or for their client use.

A strategy of low price for satisfactory quality for the target market will be used when promoting the products and at the initial penetration into the existing market.

- The plant will need to maintain a low one price strategy for quite some time provided the returns on the sales are adequate.

The study will determine the present and future demand level of the products to be produced. This will be evaluated appropriately by segment and by total market share.

The competitive pressures in the market will be investigated particularly in reference to KCC and private suppliers such as Lord Delamere Estates and others. The study will cover the market share in part and total, their respective marketing strategies employed so far and taking cognizance of the fact that K.C.C. has been a monopoly in this industry and a pace setter until the pressures of deregulation took it's

toll in 1992.

The above strategies will be examined for their effectiveness in market penetration for these products. The study will also project the annual sales revenues to be realized per year coupled with distribution costs. This will enable the factory to develop a detailed production schedule and hence the necessary technolcgy to meet the level of activity at the plant.

The project total sales per year beginning with year 2 of the project shows that U.S.$ 4.2 million dollars will be realized. The 10th year of the project, total sales will be U.S. $ 42.5 million dollars from all products.

*(See attached schedule - No. 1 B)

The above sales measured against projected costs both direct and indirect of year 2 of the project, show that the plant will be profitable at gross margin of U.S. $ 563,000 dollars (includes 1st year's interest expense). The 10th year of the project will register a gross margin of U.S.$ 13,328,000 dollars from all sales. The main study will examine this sales analysis together with associated costs to come up with probable realistic figures the investor has to expect at the plant when fully operational.

4.2 EXPORTS

The investigation will also look in detail at the export potential of various products of the factory. To start, Butter. U.H.T. milk and yorghurt are slated for export in the P.T.A. countries. All these products have a slightly better shelf-life than fresh milk hence they can be

distributed to the points of sale using regular road transport and still be saleable on time. Manufacture of powder milk will also be investigated principally for export to the Middle East. They all have a high proportion of returns in terms of costs vs sales per unit and the factory can rely on these products if a targeted segment of the market is tapped. As the preliminary projections for the two products, U.H.T. milk and butter show on table 4.2A, the total contributions to sales volume is attractive.

4.3 MATERIAL COSTS.

The basic raw material for this plant will be raw milk. The other materials to be used in various products include flavours, sweeteners, starter culture, emulsifiers, stabilizers and colouring. Most of these intermediate materials will be imported mostly from the E.C. countries. Other factory supplies will be identified and used as need arises. Spare parts for the machinery and equipment will also be sourced from E.C. countries where the bulk of the plant fixtures will be acquired from.

The study will examine in detail, the quantities required, the quality required, the likely sources of supply with quotations, availability schedules and unit costs. These will help the factory plan a continuous production schedule with minimal interruptions on account of lack of spares or other supplies. The investigation will also establish the storage needs for the factory beginning with raw materials goods in process and finished products at the plant. This element is crucial because of the nature of the principal raw

material - Milk. It has an extremely short shelf life unless coolers are installed at the plant at substantially high cost but quite necessary investment. The estimated material cost is U.S. $ 2.7. million dollars in year 2 of the project rising to U.S. $ 27.3 million dollars in the 10th year. This is an average of just over 11% increase per year. This principal input is in effect the most expensive item at the plant. Looked at it from another angle, this direct cost will be a direct benefit to the farmers supplying the factory with this raw material, hence the area economy will be richer by this level of consumption.

* See table 1.B attached.

5.0. LOCATION, SITE AND ENVIRONMENTAL IMPACTS:

5.1 LOCATION

The investigation will examine the requirements of the plant and confirm the suitability of Webuye as the plant location. The investigators will conduct interviews with prospective contract farmers, interview the residents of the area for their views on plant siting and make an appropriate report.

The investor believes that Webuye town is ideal for this project because of its geographic situation. Webuye town is a convenient location in that milk which is the major raw material is available within a radius of 50 kilometres of the town. The settlement schemes in this perimeter including Uasin Gishu, and Trans Nzoia districts will provide enough milk for the plant. The principal investor, Dr. Noah Wekesa has a good herd of dairy cattle which will provide a cushion similar to a nucleus farm, to provide adequate supplies

during emergencies.It is anticipated that Dr. Wekesa's farming friends in Uasin Gishu and Trans Nzoia doing large scale dairy farming, will be contracted in order to provide a total of 60% plant's capacity and the balance of 40% will be reserved for small scale dairy farmers. This arrangement should provide plant security in terms of production in order to service at least 60% of outlets at any given time.

Kakamega town is also an alternative project site, should the investor find unreasonable resistance from the residents of Webuye or the Kitinda factory of Bungoma trying to block the project's take-off. The researcher will be advised to look at both locations and report appropriately with differential costs.

5.2 SITE AND INFRASTRUCTURE:

Development of the site will commence when all legal formalities have been finalized. This forms part of the initial capitalization of the plant. It is estimated that land in Webuye township where the project will be located, sells upwards of Kshs.120,000/= per hectare. The project will require five to ten hectares of land for plant and infrastructure. The exact location will be identified after consultation with Industrial Promotion Centre (IPC) and the Local District Development Committee.

The site of the location is likely to be east of Webuye town centre along the tarmac road leading to Eldoret. The area has ample supply of water and a good waste disposal system can be established at a reasonable cost.

There are points of utility connections at Webuye made possible by various agencies such as K.P.L. Co. for electricity, KPT corp. for telecommunications, water pipeline corp. for water and others. The civil works at the site will be done by compe ent contractors selected by the investor. A thorough analysis of the underground conditions and site conditions at the plant location will be carried out during the main study.

5.3 ENVIRONMENTAL ASSESSMENT:

There will be a thorough investigation into the impacts to be created by the establishment of the plant in this area. The technology to be used in this area will be of mechanical nature and some effluents are likely to be generated at the plant. The investor will be advised accordingly so that specific measures are taken to safeguard the environment for posterity. In the investigation socio-economic, financial and technical feasibility of the project will be analysed. The impact areas to be assessed will include the following:-

: The type of process(es) to be involved at the factory.

: The size of the plant

: The actual wastes to be generated at the plant and the mode of their disposal.

: The quantities and quality of wastes

: The installation of "Receptors" for waste water at the plant.

: How flue-gases will be treated

: The capacity of the environment to absorb any discharges from the plant and their specific impacts on humans, fauna and flora.

Addressing the above elements, the cost structure will also be taken into consideration. The study will also look at the alternative technology available, its suitability for this plant and cost structure. A detailed analysis on possible future process changes and their impacts should be incorporated for they are likely to affect production schedules and sales levels of the factory.

6.0 INVESTMENT*

The total investment for this project is estimated to be U.S. $ 2.5 million dollars. Of this amount external financing is expected due to the nature of equipment and machinery to be acquired coupled with our poor foreign exchange reserve position in this country. The principal suppliers of plant machinery and equipment will be expected to provide spare parts for the machinery during the initial 10 years of the project and thereafter. This requirements should be made principal during the study so that production is not held up on account of lack of spares or supplies from the suppliers of plant machinery and equipment. However, a small Research and Development section could be incorporated in the plant structure so that those parts that could be fabricated locally,can be done with minimal work stoppage. This will also provide some work for our Jua Kali artisans locally whenever feasible.

The following is the list of machinery and equipment needed for establishment of the factory to be sourced from E.C. countries particularly the Netherlands. The items are:-

1. Compressor
2. Steam boilers

3. Walk-in and movable refrigerators
4. Deep freezers
5. Bulk coolers
6. Incubators
7. Agitators
8. Surface coolers
9. Separators
10. Plate Heat Exchangers
11. Homogenizers
12. Deodorisers
13. Pasteuriser

* See Table No. 6.1A

The projected cost of plant machinery and equipment will be U.S. $ 1.5 million dollars including service facilities and engineering and designing of the plant. A further sum of U.S.$ 100,000 dollars will be needed for plant infrastructure and transport vehicles. Transport cost are crucial in the rural areas because of usually poor access road structure to be used by the small scale farmers. This fact would make it double hard for the small scale farmers to deliver their raw milk to the factory on time, hence an effort should be made for milk collection from centralized points in the milk producing areas. This aspect will need to be thoroughly analysed in the main study since its impact will directly affect the income statement of the plant. The study should recommend at what stage the factory should be able to commence collecting milk and at what cost.

6.1 ENGINEERING AND TECHNOLOGY:

The technology selected will be relevant to the Kenyan economic standards. For local consumption, it will be ideal in meeting the minimum acceptable consumer standards. Those products destined for export, must meet the relevant international standards in milk products hence the relevant technology must be acquired. The acquisition of this technology will also be consistent with the plant capacity and lines of production anticipated. The investor is interested in identifying collaborators who could give suppliers credit, in terms of machinery and equipment or a joint venture basis or any other workable plan of equity participation.

6.2 . PRODUCTION PROGRAMME:

In determining the production programme, the anticipated sales will be used as a basis for the technology to be acquired. A thorough investigation will be done to establish the level of finished goods storage facilities for these goods and raw materials, goods in process and after sales requirements both for storage before customer pick-up and shipping lines.

A detailed analysis of each product's production programme in terms of quality specifications, the quantity to be produced, time scheduling of its production through to full-production.*

The plant will also schedule some time during production year for maintenance and repairs particularly during low

season of production. This is necessary as preventive maintenance helps stem obsolescence hence production stoppage and loss of customers in such a competitive industry.

6.3 PLANT CAPACITY*

This plant will initially be geared towards producing 6 products namely U.H.T. milk, Pasteurized milk, Butter, Yorghurt, Fermented (mala) milk, and Butter milk. The projected capacity will be 10,000 MT, 3,000 MT, 300 MT, 1000 MT and 200 MT of these products respectively. This means that the plant will be small in nature but could be expanded when the need arises. Other products to be added are ghee ice-cream and milk powder whose production costs will be incorporated in the main study if available. If their costs substantially increase the projected plant cost then they may not be incorporated in the initial lines of production.

*See tables 6.2 A and 6.3 A

6.4 PROJECT SCOPE:

The financial and physical layouts of the project will be detailed so that all the required data on production, supply, technology, equipment, civil works and local conditions will be addressed when the issues have been analysed, including cost, then selection will be done appropriately and the investor advised accordingly.

7.0 FACTORY ORGANIZATION AND MANAGEMENT:

There will be two principal departments headed by qualified managers. These managers will report directly to the

director. The finance manager will head accounting and personnel services while the production manager will be in charge of the factory's operations in their entirety.

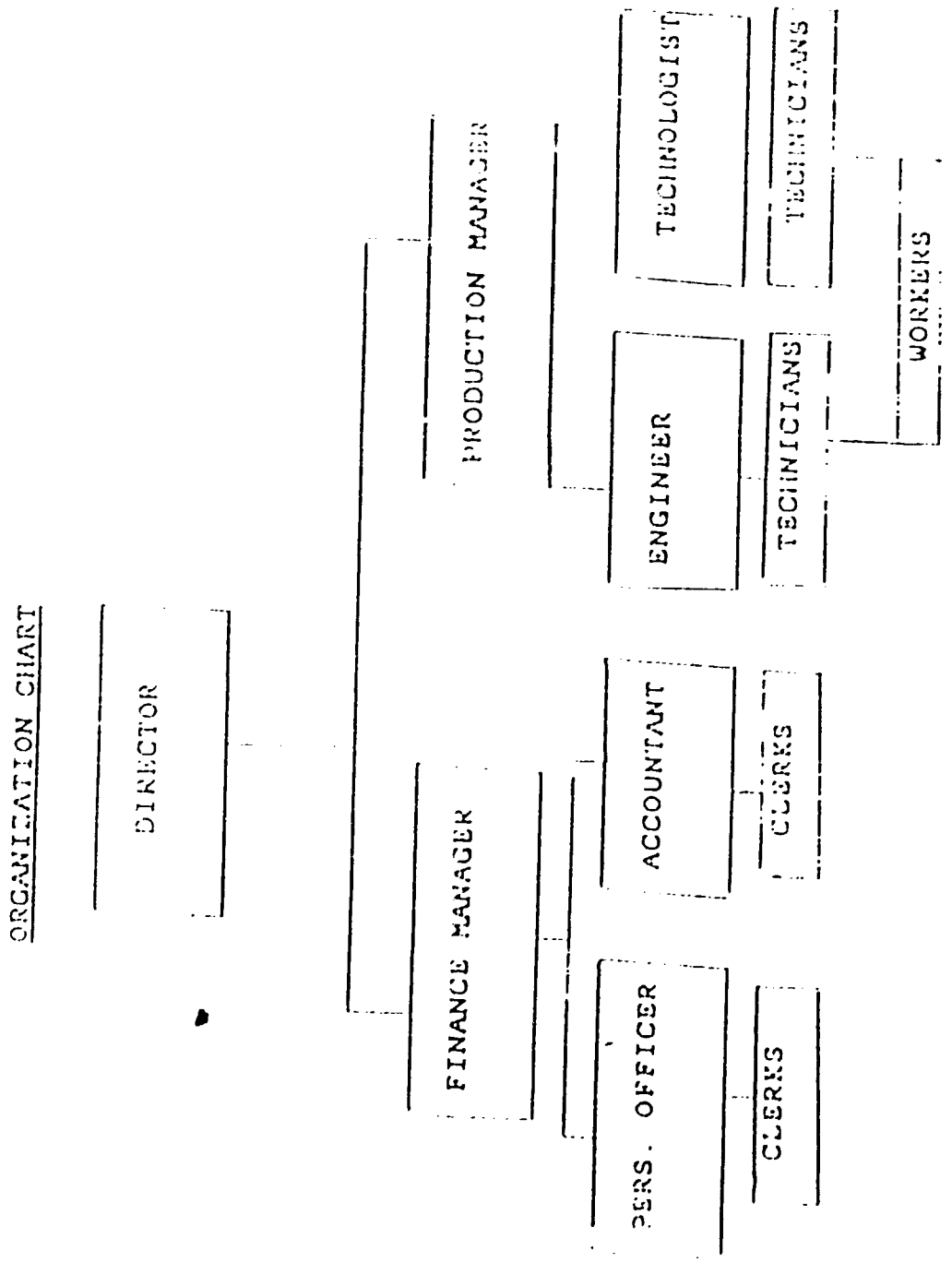
The finance manager will be a qualified accountant with some experience or additional qualification in personnel management. The production manager will be an engineer qualified probably in process technology engineering with a bias towards food machinery coupled with some experience in general machinery maintenance.

There will be two sections in each department headed by specialists in accounts, personnel management, Food technology, and process technology engineering. This specialists will have Kenya Polytechnic level training or higher qualifications.

There will be many technicians working in the respective sections according to their back grounds. The technicians will be recruited from such institutes as Weco and Sigalagala for technical staff and from Dairy Training School - Naivasha for food processing technicians. The calibre of trainees from those institutes is quite high and job training will make them specialists in the area of milk (products) processing technology. The supply of these graduates is higher than the market demand hence the better candidates will be absorbed.

7.1 MILK PROCESSING PLANT-WEBUYE

ORGANIZATION CHART:



7.2 FACTORY EXPENDITURE:

All expenditures will be approved by the Finance Chief, including purchases, salaries and servicing expenses. It will be noted that salaries in this area of Kenya are not out of line with the national rates, may even be lower, a factor that will be analysed later.

The salaries to be projected for various positions at the plant will be reflective of the national levels hence this preliminary set up:

1.	Heads of department	U.S. $ 4,200 P.a.
2.	Senior staff	U.S. $ 2,400 p.a.
3.	Skilled/Technical	U.S. $ 1,500 p.a.
4.	Workers @ $ 1 per day	U.S. $ 400 p.a.

The entire budget for the second project year when the operations should start is about U.S. $ 40,000 rising to U.S.$ 320,000 p.a. in the 10th year.

*In case of foreign experts, the investor does not anticipate to recruit any since they tend to escalate the cost of production.

There will be an investigation into this possibility however, to gauge the several aspects of the plant and see if there will be any need for this type of expertise which could serve as skills transfer.

* See table 7.3 A.

7.3 UTILITIES AND OVERHEAD COSTS.*

These overheads which include electricity, liquid fuel, water, maintenance, insurance, and transportation are significant at this factory. The second year of the project shows a projected cost of U.S. $ 400,000 dollars rising to U.S. $ 700,000 in the 10th year. Marketing and product related costs are also significant because of initial market penetration and continued advertising and sales promotion which will need U.S. $ 70,000 in second year to a hefty U.S. $ 500,000 dollars for this plant. These costs will inevitably affect the income statement of the project on a yearly basis hence a notation has to be made to gauge this aspect of cost.

Depreciation expense will cushion this outlay of finance in the initial years. This portion will also be addressed in the finance analysis and government policy as relates to industrial projects such as this one.

8.0 HUMAN RESOURCE MANAGEMENT.

The plant will be operated on a 3 shift basis in order to utilize the machinery and labour advantageously. Initial number of workers is slated for between 60 and 70 excluding casual labourers. The plant will be operational from the second year of the project.

The top managers will be recruited nationally. They will be expected to have wide experience in the food processing industry. The managers will be result oriented individuals with growth oriented bias so that they can build this plant into a major competitor to K.C.C. and serve the populous West

Kenya market. The start of quantities will be limited but should grow by slightly over 10% per year to be able to meet it' obligations and surplus for re-investment. initially marketing support affordable rates. The study will analyse whether it would be cost effective to keep such option or develop an internal department to market it's products.

The technical team will be sourced from food processing industry with a sizeable number of graduates from the polytechnics and institutes of technology. The plant should look at the manpower development schemes relevant to it's line of operations and set aside funds for skills upgrading and utilization. This will help the factory have adequate staff to man workshops and production lines at the plant.

Extension services will be made an integral part of Royal Food industries so that farmers are aware of the factory's standards and delivery schedules. In the long term, assistance in certain services and drugs on credit for contracted farmers may be planned. The investigation will ascertain the cost structure and recommend the line of action or relevant scheduling necessary for such a service to farmers.

The other non-production staff in inventory control finance and administration will be encouraged to work as part of the factory team in order to develop family environment in this highly competitive industry.

8.1 BUDGETING AND IMPLEMENTATION PLANS

The analysis will focus on elements of planning so that the project takes off on schedule. Some of the aspects to be assessed will be:

- How the project implementation will be managed.
- The arrangements for technology supply (source, time and installation).
- Details of engineering specs.
- Contracts to be awarded and their management.
- Financing of the project.
- Construction period plans.
- The land purchase or allocation by the relevant authority.
- Plant construction, supervision and coordination of machinery and equipment installation, testing and commissioning of the same.
- The labour force: Recruitment, selection, training (for specific - Royal Food industries skills attitudes and knowledge and placement
- Detailed arrangements for supplies and storage.
- Licences for operating the plant.
- Budgeted costs to implement all plans of the factory.

9.0 FINANCIAL APPRAISAL.

The principal reason for analysing all the foregoing data and projections is to be able to compute the total investment costs and the project's production costs. These costs will then be measured against projected sales and related costs in order to determine the proper investment decision for the sponsor.

In this case, total investment is projected to be U.S. $ 2.5 million dollars at current prices. When this amount is invested now it's Net present value (N P V) is estimated at

U.S $ 8.9 million dollars using 25% discounting value. The following financial capsule will shed some light on the investment:

A.	Total Investment	U.S. $ 2.5 million
B.	Net present value	8.896 million
C.	Internal rate of return	67%
D.	Payback period estimated	4 years
E.	Debt/Equity Ratio	60 : 40
F.	Return on Equity (at full capacity)	218%
G.	Total sales U.S $	4.159 million
H.	Exports (part of sales above	I.761 million
I.	Break Even Point	77% (2nd year) 38% (year 6)

9.1 The above capsule and attendant tables at the end of this booklet show that the debt equity ratio projected is high and actual sources of finance will have to be identified. The debt servicing rates are quite high in Kenya making project financing to be quite expensive hence this impact must be thoroughly analysed.

A sensitivity analysis showing the probable changes in sales price, variable cost together with fixed production cost, any other investment cost changes that may affect the viability of the project will be analysed systematically to arrive at alternative course of action for the project.

9.2 <u>THE SPONSOR AND TAXES.</u>

The project sponsor will also be advised to take every opportunity in reducing taxes or taxable amounts. This will be effected through use of depreciation expense which the government allows on plant and equipment on industrial

projects. The more the shifts of work at the plant the higher the rate allowable. Also the Kenya government allows for loss-carry forwards to be set-off against taxable profits. The government also makes an allowance to be taken duty payable for projects set up in rural areas of which this Webuye factory will qualify.

NET INCOME STATEMENT

Item	Period	1	2	3	4	5	6	7	8	9	10
Total Sales		0	1,159	6,087	8,799	11,139	14,870	19,132	25,131	32,670	42,471
DIRECT COSTS		0	2,708	3,960	5,720	7,806	9,667	12,567	16,138	21,229	27,611
Materials		0	2,680	3,919	5,661	7,729	9,566	12,436	16,167	21,017	27,323
Direct Labour		0	28	41	59	77	100	130	169	219	285
Utilities		0	0	0	1	1	1	1	2	2	3
GROSS MARGIN ON SALES		0	1,451	2,127	3,079	4,002	5,203	6,764	8,793	11,441	14,861
INDIRECT COSTS		0	299	357	418	499	581	633	816	1,046	1,345
Adv. & Marketing		0	65	85	110	143	186	241	314	408	530
Management & Techn.		0	39	51	66	86	112	145	189	245	319
Other Overheads		0	195	121	143	170	206	251	311	393	496
DEPRECIATION		0	299	299	194	194	194	198	188	189	188
OPERATING PROFIT		0	953	1,572	2,567	3,410	4,506	5,936	7,789	10,197	13,328
INTEREST EXPENSES		190	190	136	82	59	33	9	0	0	0
GROSS PROFIT		(190)	753	1,436	2,484	3,352	4,472	5,927	7,793	10,197	13,328
INCOME TAX		0	197	503	869	1,173	1,565	2,074	2,726	3,569	4,665
NET PROFIT		(190)	556	933	1,615	2,179	2,907	3,853	5,063	6,629	8,663
DIVIDENDS		0	0	0	0	0	0	0	0	0	0
UNDISTRIBUTED PROFIT		(190)	556	933	1,615	2,179	2,907	3,853	5,063	6,629	8,663
RETAIN. PROF. PROFIT		(190)	166	1,299	2,911	4,993	8,000	11,852	16,915	23,543	32,206

The major project parameters for this study are centred on the type of products and how they fit into the market system in Kenya - milk and milk products, the optimum plant capacity, in this case 30,000 litres of fresh milk per shift can be processed at the factory and the selected plant location of Webuye. The Webuye location is thought to be ideal for the milk and milk products manufacture. The raw material orientation of the factory also makes it possible to receive all the required plant's inputs. The management of the factory can implement the factory's plans on schedule if proper advice is consistently followed.

The project's main objective was to fill the gap created by an expanding demand for processed milk products which can not be met by K.C.C. either because of pricing or general marketing inefficiency.

CHAPTER 3

3.0 MARKETING ANLAYISIS AND MARKETING STRATEGY:

INTRODUCTION

3.1.1 Kenya has been self-sufficient in milk and milk products since independence in 1963. Only limited stock of tinned milk or butter have been imported for various reasons other than one of national demand . Processed milk takes only 15% of the daily production of milk in the country hence the bulk of milk eitner is consumed at farm level or is hawked by small scale farmers for daily income or goes to waste. Since 80% of Kenya's population is rural based, it will take sometime to get this population to move to the level of buying processed milk although on occasion they buy the other milk products - when important visitors have shown up in their homestead. This changing demand and habits may mean that the industry should develop strategies to take care of the medium term demand supply equilibrium thereby maximising on the expected upsurge in demand for processed milk and milk products in order to maintain the self-sufficiency in the economy. In this study, specific aspects are covered thus:-

i) Consumption and production trends of the past 10 years has been analysed. See table 3.1.

ii) Demand and supply forecasts for the next 10 years will be made

iii) Recommended policy framework and future strategies to achieve the desired goals of sustained growth of milk and milk products production and sales in this industry.

3.1.2 Sources of milk and milk products data

3.1.3 The data used in this study originated mainly from the following sources:-

i) Field visits to Bungoma, Kakamega, Vasin Gishu, Nzoia and Nandi districts and Nairobi.

ii) Kenya Dairy Board Hqs in Nairobi.

iii) Ministry of Agriculture, Livestock and Marketing

iv) Government of Kenya publications (sessional paper no.1 of 1986, National Development Plan (1994-96), District Development plans and others).

3.1.4 Discussions with responsible government officials and industry people.

3.1.5 The data collected was then analysed and processed for relevance to incorporate into the report.

3.1.6 Other estimates and forecasts by various government departments have been referred to and compared with those independently gathered and appropriately utilized.

3.1.7. The factual data hereby drawn from various sources and gladly acknowledged has made it possible to express independent opinions and conclusions in this report.

3.2.0. **MILK INDUSTRY IN KENYA**

3.2.1 In 1993 the K.C.C. Ltd. and 5 other milk processing factories produced only 400 million litres of processed milk for a potential market consuming 2.5 billion litres of milk, mostly unprocessed. Most cooperative societies that receive the bulk of milk only cool the milk and sell it to consumers. In 1990, cooperatives handled a total of 600 million litres of milk in Kenya.

There is a very small percentage of tinned milk entering the country mostly for prestigious reasons, otherwise, Kenya is self sufficient in milk supplies. K.C.C. also produces the bulk of butter consumed in Kenya. The imported butter that can be found in supermarkets is exorbitantly priced and attracts only a limited clientele in the expatriate community.

3.2.2 Skimmed milk another targeted product by R.F.I. is limited in supplies in the country. Most of it is in powder form and usually it is used by industrial companies as intermediary material.

3.2.3. Mala generally known as fermented milk, has a wide appeal to the working class section of society. K.C.C. has the major processing plant in the country for commercial purposes. The other ones

known are in the teaching institutions and most of the time Kenyans use the traditionally prepared mala at farm level. K.C.C. produced 20 million litres of mala in 1989 and distributed it nationwide.

3.2.4. From the above, for the purposes of this report, an analysis will be made on direct consumption market where fresh milk produced by R.F.I. will sell most of its products. The industrial segment of the market is negligible for this investor. The direct market will include milk used in households, hotels, schools, and universities, institutions such as the army, hospitals, etc. The industrial market would include those who manufacture yoghurt, ice-cream, shakes, confectionary and bakery, among others - Which use milk as intermediate supply to make their finished products.

For the purpose of this study, only fresh milk demand and consumption will be analysed as the envisaged production will be principally fresh milk based. The other supporting products of butter, mala, skimmed milk will not affect the net effect of this production and consumption forecast. Also, consumption figures based on industrial use are mixed up in government reports such that one would have to make generalized assumptions to reach any worthwhile conclusions.

3.2.5 Total fresh milk consumption in Kenya appears to be steady over the ten years prior to 1994 except for the dry years of 1992 and 1993 where production went down as was the case in 1983 and 84, hence the years 2002 and 2003 are likely to have this cyclical down-turn.

Table 3.1. shows the total consumption of processed milk in Kenya over the past 10 years. Table No.3.2 shows 'direct consumption of milk in Kenya' with per capita amounts.

TABLE 3.1.

TOTAL PROCESSED FRESH MILK CONSUMPTION IN KENYA (10 YRS)
(Figures in Millions of litres)

1983	274.0
1984	190.0
1985	232.0
1986	316.00
1987	347.0
1988	359.0
1989	351.0
1990	392.0
1991	337.0
1992	247.0

3.2 1992 TOTAL MILK PRODUCED IN KENYA

1.	Grade Cattle	1,499.5 million Kg.
2.	Zebra cattle	459 million Kg.
3.	Camels	308 million Kg.
4.	Dairy goats	97.5 million Kg
5.	Indigenous goats	97.5 million Kg.
		2,365.3 million Kg

TABLE 3.2
DIRECT CONSUMPTION OF MILK IN KENYA

YEAR	Total Direct consumption in mill.lts.	% Increase : decrease in consumption	Population (000)	Per capita consumption lts/annum	% Increase decrease in per capita consumption
1983	274.0	0	17.900	15.31	0
1984	190.0	(31)	18.581	10.23	33.1
1985	232.0	22	19.281	12.03	17.6
1986	316.0	36	19.904	15.88	32.0
1987	347.0	9.8	20.600	16.84	6
1988	359.0	3.4	21.321	16.84	0
1989	351.0	(2.2)	21.444	15.96	(5.5)
1990	392.0	1.2	23.242	16.87	5.7
1991	337.0	(14)	24.055	14.01	(16.95)
1992	247.0	(27)	24.897	9.92	(29.19)

* Population estimates calculated at 3.5% annual increase from 1983 (1989 is actual)

TABLE 3.3.

MILK PRODUCTION

YEAR	PRODUCTION IN MILLION LTS.	GROWTH %
1983	274.0	0
1984	190	(31.0)
1985	231	21.5
1986	316	36.7
1987	347	9.8
1988	359	3.4
1989	353	(1.6)
1990	392	11.1
1991	359	(8.4)
1992	220	(38.7)

3.3.0 DEMAND ANALYSIS

3.3.1 The Direct Consumption Market.

The consumption figures used in demand forecasting in normal economics terms would refer to the 'apparent demand' and may not necessarily be equal to the consumers 'purchasing intentions'. When these intentions are then backed by purchasing power, then sales are completed. To the researcher, the initial concern is to examine the market potential at the national level then by segment and establish the relevant demand and consumption patterns in the economy. For purposes of this report, apparent consumption even at wholesaler point - by major consumers such as institutions - will be considered synonymous with actual consumption.

3.3.2. A look at the total raw milk production in Kenya will reveal that only about 15% of this is ever processed into various products by the giant K.C.C. and to a lesser extent by the new factories - Delamere, Brookside, Meru co-op. and Kitinda, and Kilifi Dairies.

As there is rural-urban migration due to jobs search and actually getting employed the general public enhances its purchasing power in the cash economy, more processed fresh milk will be demanded by this group of workers. These people will also become increasingly aware of the need to consume clean factory processed milk and milk products. Hence the challenge to the industrialist is not the lack of raw materials or lack of the market but the timing of entry into the market for the optimum profitability. For the purposes of this report, economic growth will therefore generate an improvement in the standard of living of the Kenyan population hence a corresponding budgetary allocation for such luxurious as butter, ice-cream, yoghurt and increased intake of processed fresh milk.

3.3.3. **Factors influencing milk consumption**

3.3.4 The likely factors that will influence milk consumption forecasting include

a) Population Growth

b) Income levels in the economy

c) Distribution pattern of this income

d) The general price level

e) The price paid for milk at retail level

f) That tastes and habits of the people targeted.

3.3.5 The population growth

All other factors remaining equal, population growth rate was at one time one of the highest in the world at 3.9% per annum. By 1993, the estimate had declined to 3.1% thanks to government's efforts in encouraging a combination of population control techniques and Kenya having an increasingly literate population. By 1990 Kenya's population had doubled to 23 million from that of 1969 at 11 million (that is double in 20 years). Urban population has been growing at 7.7 per annum at the very minimum, which means every ten years Urban population doubles nationwide. This urbanisation means a concentration of a population in a relatively small geographical area which makes rural-urban interaction easier. More urban centres therefore create demand for more supplies and services hence processed milk will benefit from such a situation in the economy.

3.3.6. Income levels

This factor has a positive and direct influence on processed milk and milk products. Consumption of milk based products will justify the expectation of high elasticity of demand for milk and milk products for the medium range of plans.

The per capita GDP at 1984 prices was Ksh.220 while the real per capita GDP went up at the rate of 1% from 1984-88 and projected 2.1% for 1988-2000.[1]

3.3.7 Pattern of Income Distribution

Kenya has a large proportion of low income group as opposed to countries such as U.S.A. where middle income group is the largest in the economy.

People in the lower income group, generally have a higher marginal propensity to consume. Milk being a universal product and being widely available in the country, most people would consume this commodity. This would mean that, with better and more progressive income distribution in the economy one can expect a geometric increase in processed milk and milk products consumption.

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[1]Economic management for Renewed growth (1986 Sessional paper No. 1).

The governments sessional paper No.1 of 1986 says just as much "Economic growth .....will provide widespread benefits for Kenyans of all income levels, improving the distribution of income. Indeed, there is little conflict between growth and income distribution in Kenya, because growth can only be sustained by the rising productivity and incomes of farmers, herdsmen and workers....."

3.3.8 General Price Level and Milk Prices

The influence of price on milk consumption would be a combination of the effect of changes in the general price level (which affect specific purchasing power) and if an increase in milk prices is far in excess of the increase in general price level, this can precipitate an adverse effect on the overall milk consumption in the market.

TABLE 3.4 shows a comparison between changes in general price levels and changes in milk price for the previous 10 years to 1992. The price of milk has steadily gone up from 1983, but when the price remained stable (as in 1986, 1987) an increase in direct milk consumption is noted as per 1986 increase of 36%. Between 1986 and 1990, there was both price stability and sustained growth rate in direct milk consumption. Tables 3.4 and 3.1 show this trend.

The price of milk must have had an influence on the consumption. The coefficient correlation between retail milk price (adjusted to general price level terms) and per capita direct milk consumption, using 1983-1992 data was found to be 9.7453.

3.3.9 Habits and Tastes of People

Different people in the populace have different habits and tastes which develop over a long period of time through tradition, customs and a way of life among others, that influence the purchase and consumption of various commodities. In Kenya, most people have developed a taste for tea with milk while most Americans would prefer iced tea (without milk). This habit (tradition) of consuming tea brewed in milk, will make the marketing manager develop sales strategy that is compatible with this habit.

3.3.10 Methodology for Demand Forecasts

The forecasts are based on linear-regression model, using three variables. The decision variable is the average per capita expenditure on the milk for direct consumption, defined as the product of the per capita direct consumption of milk and the average milk price for the year(expressed in constant 1984 price level terms). At the individual level, consumption of any commodity is determined by the amount of money allocated by the individual to purchase that item. The aggregate of all those individual decisions determine the national consumption levels of the commodity.

3.3.11 At the personal level, income, general price level, the price of the item, the individuals consumption habits would determine the amount to be spent on that item. The national milk consumption on the other hand - the average per capita expenditure on milk would depend on income levels, the pattern of income distribution, population, general price levels, the price of milk and other factors such as habits and tastes of the people.

3.3.12 The independent variables used in this model include:-

(i) Per capita real income (at constant & 1984 prices)

(ii) Retail milk prices (in 1984 constant general prices levels)

iii) Time - representing the effect of structural charges and unquantifiable factors named above.

3.3.13 The observed correlation co-efficient between the variable and the first two independent variables based on the past data was:

(a) Between per capita real income and average capita expenditure on milk.

b) Between retail milk price and average per capita expenditure on milk.

3.4.1 **Forecast of Independent Variables**

The growth rate of 2.7 per capita in real per capita has been assumed for 1997 -2004 projections.

3.4.2. **Population**

The growth rate of population has been projected at 3.1% per annum for the period 1994 - 1996. There is noticeable reduction in official forecast of 3.7 in earlier years and the real growth by 1993 of 3.1% making it possible to expect an average of 2.5% population growth rate by the year 2000 but for the purpose of this analysis the 3.1% will be sufficient.

3.4.3 **Milk Price**

The retail price of milk per litre has steadily risen since 1988 mainly due to increased producer prices and later due to decontrolled prices in 1992 and hyper inflationary pressures in the economy in 1993. In this analysis a retail price of Kshs.28,00 per litre offered by K.C.C. in 1994 is assumed. With the dollar against the Kenyan shilling stabilizing and new entrants are getting into the market, this price is realistic.

However, Royal Food Industries will set the retail price independent of the K.C.C.'s price structure - see under pricing and promotion section.

TABLE 3.4

MILK PRODUCTION 1982 - 1992

YEAR x	RECORDED PRODUCTION 000,000 litres y	% CHANGE IN PRODUCTION	RETAIL PRICE Sh.1Ltr	%CHANGE IN RETAIL MILK PRICES	CODED TIME x=x-X	x^2	xy	ESTIMATED PRODUCTION y=a+bx
								Y=300+9.75X
1982	260	-	-	-	-5	25	-1300	251.25
1983	274	5.38	2.06	-	-4	16	-1096	261
1984	190	-30.65	2.40	16.5	-3	9	-570	270.75
1985	231	21.6	2.85	18.8	-2	4	-462	280.5
1986	316	36.8	3.25	14.0	-1	1	-316	290.25
1987	347	9.8	3.25	0	0	0	0	300
1988	359	3.5	3.40	4.6	1	1	359	309.75
1989	353	-1.7	3.75	10.3	2	4	706	319.5
1990	392	11.1	4.30	14.7	3	9	1176	329.25
1991	359	-8.4	4.95	12.9	4	16	1436	339
1992	220	-38.7	6.70	38.1	5	25	1100	348.75
TOTAL	3301					106	1099	3300

Since we have an odd number of years (i.e 11), mean = median.

$x = x - \bar{x}$ Where $\bar{x}$ = mean/median (for odd number of years)

x = Actual year

X = Coded time

$\hat{y} = \hat{a} + \hat{b}X$ Where y = predicted total milk consumption

$\hat{a}$ = fixed milk consumption (not based on time/y-intercept)

$\hat{b}$ = regression coefficient that measure the change in milk consumption associated with a unit change in each independent variable (year) i.e change in consumption after every change in unit time.

X = variable influencing consumption (coded time)

$$\hat{a} = \bar{y} = \frac{\Sigma y}{N}$$

$$= \frac{3301}{11} = 300.1$$

$$b = \frac{\Sigma xy}{\Sigma x^2} = \frac{1033}{106} = 9.7453$$

Hence $\hat{y} = 300 + 9.75x$

TABLE 3-5

Forecasts '000,000 litres

$1993_{(6)}$	=	300 + 9.75 (6)	=	358.5
$1994_{(7)}$	=	300 + 9.75 (7)	=	368.25
$1995_{(8)}$	=	300 + 9.75(8)	=	378
$1996_{(9)}$	=	300 + 9.75(9)	=	387.75
$1997_{(10)}$	=	300 + 9.75(10)	=	397.5

TABLE 3.5

$1998_{(11)}$ = 300 + 9.75(11) = 407.25

$1999_{(12)}$ = 300 + 9.75(12) = 417

$2000_{(13)}$ = 300 + 9.75(13) = 426.75

$2001_{(14)}$ = 300 +9.75 (14) = 436.5

$2002_{(15)}$ = 300 + 9.75(15) = 446.25

$2003_{(16)}$ = 300 + 9.75(16) = 456

$2004_{(17)}$ = 300 + 9.75(17) = 465.75

Forecast milk production 1994 -2003 Table 3.6

YEAR	FORECAST PRODUCTION '000,000 litres
x	y
1994	368.25
1995	378
1996	387.75
1997	397.5
1998	407.25
1999	417
2000	426.75
2001	436.5
2002	446.25
2003	456

3.5.0. **Demand Forecast**

The forecasts here have been made using the described model.

The forecast values for independent variables (per capita GDP and population) are in table 3.4.

The forecast values for decision variable - Average per capita expenditure on milk and per capita direct milk consumption derived from here are in table 3.5.

Using these figures and the projected population figures, the demand forecast for direct consumption market has been arrived at. These forecasts are in table 3.6

3.5.1 The per capita milk consumption is expected to reduce from 17.7 Lts. in 1994 to 17.03Lts. and decrease to 13 Lts. in 2003 because of population increase.

3.5.2 Sensitivity Analysis (see conclusions)

3.6.0 **SUPPLY**

3.6.1 Milk Production in Kenya

There are 11 Kenya Co-operative Creameries Ltd. and 5 independent milk and milk products factories

in Kenya (1994). The K.C.C. factories are spread all over the country since it was a monopoly until 1992. There was limited licensing before 1992 to two co-operatives - Meru Co-operative Society and Kitinda Dairy Co-operative society producing mostly U.H.T. milk. Brookside and Delamere Estate factories are latter additions to the milk processing industry. Kenya Co-operative Creameries Ltd. produces over 95% of processed milk in Kenya according to the 1994-96 development plan, where the government is encouraging smaller rural based dairy products factories. With this K.C.C.'s domination in the market, it can be inferred that the present national production is actually K.C.C.'s.

3.6.2 Milk production has been going up steadily since 1983 principally because K.C.C. has a strategic reserve in terms of dry skim milk powder which is converted to fresh milk state for public consumption. Also, K.C.C. pays farmers extra cash (premium) during dry spells to encourage delivery. This explains why butter production was low in 1984, and sales revenue for fresh milk went down in the same year.

3.6.3 Demand - Supply Balance

Year	Production million Lts.	Consumption Milk Lts.	Consumption Butter Tons.	Surplus
1983	274	215	3721	0
1984	190	230	2301	0
1985	231	249	3424	0
1986	316	292	4215	0
1987	347	301	4550	0
1988	359	345	4187	0
1989	351	372	4195	0
1990	392	339	4550	0
1991	337	321	3479	0
1992	247	207	3143	0

3.7.0 **MARKETING STRATEGIES:**

3.7.1 **Strategic Plans**

The principal marketing strategy for Royal Food Industries would be to concentrate its sales efforts on pasteurized, homogenized and deodorized fresh milk which will be produced at close to 85% of milk intake. K.C.C.'s production is virtually a sell-out, yearly. R.F.I.'s factory at Webuye producing over 60,000 litres of milk daily, will make it the second largest privately owned milk processing factory in the country. Kitinda and Meru Co-operative produce mainly U.H.T. products which have a different market to fresh milk market. Delamere Estates produce whole milk products but at 6,000 litres a day, K.C.C. is still dominant.

3.7.2. The support products of butter, mala and scheme milk will be processed and offered to consumers alongside fresh milk products. R.F.Industries will target major urban centres for its milk products. These markets will be Nairobi, Nakuru, Eldoret, Kakamega, Bungoma and other market centres in Bungoma and Kakamega districts.

3.7.3 Pricing will be a major component of R.F.I.'s strategy in capturing and retaining a substantial market of fresh milk sales. The same strategy will be used on support products of butter, mala and skim milk. Fresh milk from Royal Food Industries will be sold always at a lower price than K.C.C.'s after saving on operational costs. The most expensive items in R.F.I. production and selling programmes are raw materials costs. There will be little control over this except higher price for delivery at factory. That could save the factory on transportation cost.

3.7.4 Butter will have to be produced at the most economical level so that it can compete with the pricing of margarine. The study is recommending an additional butter making machinery from India which would be easy to operate and have lower costs hence a strategy of reduced price. The butter will still taste as well as any available on the market.

The pricing strategy is meant to tap the lower end of butter consuming public with limited income that would prefer butter to margarine. The price structure usually makes butter unaffordable to most workers.

Mala processing will follow the same pattern hence controlled production costs and better end prices.

3.7.5 A strategy of direct sales by use of the manufacturers outlets may be tried. 60,000 litres of milk daily is not much and can be sold through this system without any problem. That would entail an establishment of a trading company that would co-ordinate all the marketing activities of Royal Food Industries. This strategy may increase the labour force for the retail function and the transportation scheduling. But still, sales through certain supermarkets may be twinned with this selling strategy. It is also hoped that all the skim milk produced will find a ready market at tourist hotels. The quantity is limited hence no elaborate selling scheme is necessary. For this, skim milk can be delivered in bulk hence lowering the selling and production costs.

3.7.6 To penetrate and stay in the market as a serious challenger, the above strategies will need to be adopted and adhered to by Royal Food Industries and in addition the following would help achieve the goals:-

- Product cost control - machinery and equipment acquired will be the latest in the industry hence economical costs are anticipated.
- The senior staff hired will be competent and will be trained on the essentials of cost control.
- Labour costs will be strictly controlled, to make sure only the necessary costs are met.
- Will buy raw-milk at the most competitive price from the farmers and prompt payment made in order to sustain a continuous flow of milk from farmers.

- Intermediary supplies should be bought directly from the manufacturers in order to reduce extra cost. The factory will also take advantage of tax remission on such supplies.

- Invest in the latest management information system to check on production, marketing and financial cost so that pilferage and waste is kept to absolute minimum and the profits be passed on to the farmer by way of higher raw milk prices than those which competitors offer.

  Milk should be processed as early as possible possibly within two hours of milking in order to optimize on longer shelf-life of the processed milk. This is why the factory should be located nearest to the best milk producing area such as Webuye.

FACTORY PRODUCTION TO ACHIEVE TARGET SALES:

	Product	Quantity	Price with 8% inflator p.a.
1.	Pasteurized milk (lt)	13,338,000	US$ 489 per 1000 lt
2.	Butter (MT)	142	US$ 3174 (MT)
3.	Mala (LT)	2,667,000	US$ 533 per 1000 lts
4.	Skim milk (LT)	888,000	US$ 348 per 1000 lts

Annual production scheduling will be 50% in 1st year, 85% - 2nd yr, 90% - 3rd yr. and 100% from 4th yr.

PROJECTED SALES BY PRODUCT AND TOTAL

TABLE 3.8

	Unit values	Years					
		1	2	4	6	8	10
	All values in thousands of US$, except unit prices which are in US$						
Product No. 1	PASTEURIZED MILK						
Capacity Utilization	(Z)	50	85	100	100	100	100
Unit production		6,669	11,337	12,338	13,338	13,338	13,338
Unit price - local		489.00	528.12	616.00	718.50	838.06	977.51
Sales value - local		3.261	5,987	8,216	9,583	11,178	13,028
Product No. 2	BUTTER						
Capacity Utilization	(Z)	50	85	100	100	100	100
Unit production		71	121	142	142	142	142
Unit price - local		3174.00	3427.92	3998.33	4663.65	5439.68	6344.84
Sales value - local		.225	414	568	662	772	901
Product No.2 sales:		.225	414	568	662	772	901
Product No. 3	FERMENTED MILK						
Capacity Utilization	(Z)	50	85	100	100	100	100
Unit production		1334	2,267	2,667	2,667	2,667	2,667
Unit price - local		533.00	575.64	671.43	783.15	913.47	1065.47
Sales value - local		.711	1m305	1,791	2,089	2,436	2,842
Product No. 3 sales	.711	1,305	1,791	2,089	2,436	2,842	
Product No. 4	SKIMMED MILK						
Capacity Utilization	(Z)	50	85	100	100	100	100
Unit production		434	738	868	868	868	868
Unit price - local		348.00	375.84	438.38	511.33	596.41	695.65
Sales value - local		.151	277	381	444	518	604
Product No. 4 sales		.151	277	381	444	518	604
TOTAL SALES		4.348	7.983	10.955	12.778	14.904	17.384

The se sales will be met by selling the principle product - pasteurized fresh milk at Kshs. 22/- per litre to distributors. The butter product will be sold at Kshs. 178/= per kilogram in the second year - or 90/= per half kilogram - ex-factory. The other product, mala will be sold for Kshs. 23/- per litre - ex-factory. The skim milk product will be sold at Kshs. 19/- per litre - ex-factory price.

3.7.8 COST OF SALES OF THE FOUR PRODUCTS

The corresponding cost of producing these four products are as under:

	ITEM	Yr. 1 (US$Millions)	2	4	6
1.	Fresh milk, culture, salt	4.00	4.60	5.98	6.67
2.	Waxed paper, film chemicals	0.03	0.04	0.05	0.07
3.	Utilities	.03	0.04	0.05	0.07
4.	Direct labour	.06	0.07	0.09	0.11
5.	Repairs/ servicing	.20	0.23	0.30	0.33
6.	Spare parts	.20	0.23	0.30	0.33
7.	Factory overheads	.09	0.11	0.14	0.16
8.	Administrative labour costs	0.35	0.45	0.58	0.66
9.	Non-labour admin. cost	0.05	0.06	0.08	0.10
10.	Marketing labour	0.73	0.84	1.09	1.22
11.	Marketing non-labour	0.05	0.06	0.08	0.10
	Total cost in million	US$5.84	6.73	8.74	9.82

The above cost of producing the four products at the Webuye factory indicates that, when measured against the sales in the respective years, the 1st year of production will realize a net loss. This situation is so because of the high cost of finance and material acquisition in the first phase of the plant's production. Profitability is enhanced in the subsequent years.

3.7.9 SALES PROJECTIONS AND DANGER POINTS

The sales programme could be tipped over if certain factors in the economy crop up. They include:

- Uncontrolled imports into the market of similar milk products produced locally and there is price instability due to Kenyan's curiosity with imported items.
- If there is unanticipated cyclical drought stretching for a year or longer which may require importation of milk powder for reconstituting into fresh milk. This may require an additional investment for this plant.
- If there are astronomical increases in oil prices requiring adjustments in transportation costs. This could be precipitated by external factors beyond Kenya's control.
- In a liberalized economy, a major investor could move into this market and become a major competitor to K.C.C. and hence trigger a price war with spillover effects on smaller plants like this one of Royal Food Industries.
- If there is over investment in Kenya due to the liberalized market as our consultants have witnessed a flood of machinery salesmen from the European Union and even Russia with different technologies, which would change the present shape of industry projections.
- Change in family budgets particulary in times of rising prices, would affect the market strategies of these products. If the government levies some tax on farm products including dairy products, the whole projections would change dramatically.

CHAPTER 4

4.1.0 RAW MATERIALS AND SUPPLIES

PART ONE

4.1.1 SURVEY ON AGRICULTURE AND LIVESTOCK

This milk factory will be established in this area of Webuye not necessarily to give competition to K.C.C. but to provide an outlet for the farmers whose milk is dumped in the evenings when the same could be processed and cash paid to the farmer. The area around Webuye is endowed with good climate and good soils as noted in the charts - rainfall and temperatures and the ecological map attached. The dairy farming practice is already thriving in this area including the adjacent reference districts of Kakamega, Trans Nzoia, Nandi and Uasin Gishu.

4.1.2 THE WEATHER PATTERN

a) The weather patterns in Bungoma showed that long rains start in February to June every year and short rains are heaviest in September and October of every year (1988-1992) with a mean monthly rainfall of 135.9mm (1988), 107.3mm (1989), 132mm 1990) 87.6 (1992) Bungoma is one of the wettest districts in the country.

b) The temperature are also pleasant with the minimum being 13.4 degrees centigrade (August 1990) and about

the same for every year 1988-1992, the monthly maximum recorded in the period being 31.9 degrees centigrade (Jan.1992) The weather patterns of Kakamega district where a substantial amount of milk will be sourced are similar to Bungoma's. The monthly mean of rainfall figures show even distribution from March to November of every year (1988-92) with well over 100mm each. January and December re a bit drier but still wetter than most areas of enya. The annual rainfall is consistently over 19(mm which makes Kakamega one of the wettest districts in the country.

The monthly temperatures show that the minimum recorded figure between 1988 and 1992 is 18.7 degrees centigrade in June 1989 with the highest during the period being 27.1 degrees centigrade in November, 1992. The effects caused by this type of climate is the high incidence of both animal and human diseases. Heavy showers also cause soil erosion and with it soil nutrients are lost. The breeding of certain animal and plant pest is of interest for this project. Transportation of milk from farming areas is also hampered by heavy downpour since the road infrastructure in the two districts is poor.

In Kakamega the climate is good for such crops as bananas, napier grass (both can be used for zero grazing) beans, sugarcane, and keeping of mostly Zebu cattle for milk and meat for family use and income.

4.1.3 LAND AND SOILS

Bungoma district has a variety of soils but of interest to researchers were soils close to the factory at Webuye, so as to ascertain pasture condition and to encourage concurrent crop farming by the dairy farmers for family food.

a) Soils on the foot slopes

The soils are well drained, very deep and dark reddish brown soils. They exhibit moderately calcarean clay and in some cases they are dark yellow brown of varying consistency and texture mostly found in the northern part of Bungoma just below Mt. Elgon forest zone.

b) Soils on lower middle level uplands

They are drained, deep to very deep which vary from re-dark to red nitosols and farrasol and brown to dark-brown acrisols. They have developed on basic igneous rocks and granites and are found in the north-eastern Bungoma, the area around Kimili & Naitiri.

c) Soils on lower uplands are those well drained moderately deep to very deep, reddish brown to yellowish brown or dark brown clay ferralsols and acrisols. They occur mostly in the eastern part of Bungoma around Tongaren, Webuye and parts of Naitiri.

d) The northern part of Kakamega district which is the area of interest for this project has well drained dark brown sandy loams. This is the area with most grade cattle in Lugari and Kabras in the district.

The above soils details were obtained from the National Soils Laboratories at Kabete. The good soils above coupled with undulating terrain in most parts of Bungoma and Kakamega makes the area be considered as part of high potential farming districts in Kenya.

4.2.0 DAIRY FARMING IN BUNGOMA AND KAKAMEGA

4.2.1 The typical dairy farmer in the two districts would be keeping at least one grade cattle of any of the following species Ayrshire, Friesian, Guernsey, Jersey or a cross between the above and the local Zebu cattle.

The small scale farmer in this region and anywhere in the country , still produces 80% of the total milk produced in the region and the country. The majority of the farmer get so little that all of it is used at farm level before reaching the organized market. In 1990 when the highest national milk production in ten years was recorded at 2.4 billion litres, only 15% of it was processed by K.C.C. Ltd. and about 25% was processed by the smaller factories at Meru co-op, Kitinda Co-op. Kilifi plantations.

4.2.2 Dairy improvement schemes in the two districts has made it possible for the local farmers to improve their herds to at least a cross breed level, whose total milk production is second only to Friesian cows. In Kakamega district, the highest division in milk production is Lugari and has a high proportion of cross breed cattle, probably 35% of the cattle population.

This would also explain why milk production in this area is higher than the southern and western parts of the district although the overall cattle population in latter areas is higher than in Lugari.

4.2.3 Characteristics of the dairy cattle in the area **Ayrshire** breed is a relatively big, humpless brown and white cow, the belly is normally white. The recorded milk production per cow in this area is 3,600 Kg per year with butterfat content of 135 Kg or 3.75% fat. **Friesian** breed is a relatively big humpless black and white cow producing 4000Kg of milk containing 140Kg of butterfat or 3.5% of fat. Guernsey is a breed of relatively small built cow that is beige to brown in colour. It produces about 3,200Kg of milk per year with butter fat content of 4.25%. Jersey is a breed that is brown in colour, its face is dish shaped and had dark protruding eyes and produces 2,900Kg of milk per year with butterfat at 4.8%. Zebu is a small big humped cow with a penculous dewlap.

It produces 1,472Kg of milk per year with high butter content. If the factory were to go in for more butter production, then they would contract more farmer with cattle having higher butter fat content in milk like the Zebu, Jersey and Guernsey.

4.3.0 **CONSTRAINTS TO MILK PRODUCTION**

Some of the constraints to adequate milk production in the area could be associated with low animal husbandry standards. Most farmers tend to care for their dairy animals in the African Traditional style where the cattle (even grade cattle) are grazed along roads, or river valleys and the mixing of neighbourhood herds hence the prevalence of diseases caused by ticks and other pest. This eventually causes calf mortality of up to 50% thereby reducing replacement stock.

4.3.1 There is also lack of breeding programs especially on small scale farms. Artificial Insemination (A.I.) has not been very successful because of its rising cost since the government privatized the practice. The farmers, in the meantime, rely on poor bulls serving the dairy cows hence there is poor stock replacement by the small scale dairy farmer.

4.3.2 There is also the poor nutrition contributing to animal husbandry. The cow tends to have:-

i) inadequate dry matter

ii) inadequate quality feeds

iii) inadequate mineral nutrition

iv) Restricted grazing period.

4.3.3 Reduced milk production in the area could also be associated with poor milking techniques. The farmer may lose up to 20% of the milk here. Milking techniques have on occasion led to cases of mastitis in the milking cows, hence the farmer loses income until the cow are treated and are milkable.

4.3.4 Many farmers in the area have put into dairy farming inadequate investment due to lack of finance. This make the farmer not be able to supply the animals with basic requirements like adequate drinking water. Each animal requires about 300lts of water per day.

4.3.5 The other constraint is poor and often scarce veterinary services to the farmer. The farmer is increasingly being asked to shoulder the cost of this service as the government concentrates in developing infrastructure and privatising veterinary services.

4.3.6 The other constraint is the incorrect stocking rates in the area. The farmer spends most of his time searching for the market for his milk rather than producing it for a ready market; This lack of an organized marketing policy has left the average dairy farmer to rely on K.C.C. or worse to the milk hawker who pays him any price for the produce.

4.3.7 Poor pastures and fodders are also constraints to adequate milk production in that there is:

- Lack of dry matter production
- Lack of quality pastures'
- Nitrogen deficiency or pastures
- Phosphate deficiency and
- Lack of good quality grass seed for the small scale farmer to plant for better yield of milk.

4.4.0 **PESTS DISEASES AND CONTROL MEASURES**

4.4.1 Ticks and Tick Control

The ticks of importance in dairy farming are:-

i) Boophilus decolaratus (blue tick)

ii) Rhipecophalus appendiculatus (brown ear tick

Boophilus decolaratus is a one host tick. The adult tick attaches itself on the sides of the body, shoulders, neck & develops the larvae & nymphs attach themselves onto the tips and sides of the ears.

Boophilus decolaratus is the transmitter of bovine hemiparasites:-

i) Babesia bigemina causing babesiosis (red water)

ii) Anaplasma centrale causing milk anaplasmosis

iii) Anaplasma marginale main cause of anaplasmosis.

* Anaplasmosis was reported as to have occurred in Western Kenya by Goldson, Bauer & Okech in their Technical Report No. 19

4.4.2 **Anaplasmosis** (Gall Sickness)

This is an acute or subacute febrile disease of cattle.

Clinical signs

1) In acute cases, temperature may rise to 40.5 degrees centigrade.
2) Incubation period 15-100 days
3) Anaemia - pounding heart
4) Icterus
5) Death
6) Drop in milk yield

Death occurs especially in high producing exotic stock. Young calves and the local Zebus get the milk disease as they have some resistance to the disease.

4.4.3 **TREATMENT**

Terramycin (in early stages)

Laxatives to relieve constipation

Intravascular infusions with glucose and dextrose blood transfusion often produce dramatic recovery however harmful side effects may occur.

Control:

Tick control should be emphasised by use of dips spraying of herd on regular basis and avoiding neighbour herds mix.

4.4.4 Rhipecepharus appediculatus is the transmitter of theileria pava (borrine hemoparasites. This protozoan parasite cause Theileriosis (East Cost fever) in cattle R. appendiculatus is a three host tick.

4.4.5 **EAST COAST FEVER**

This is a very virulent and highly fatal disease. Incubation period 8-31 days (average - 13 days) According to symptom, E.C.F may be classified into:

1) The acute form

- Sharp rise of body temperature 1st day 39.5 - 40 degrees centigrade, 2nd day 40.5 - 41 degrees centigrade

This high temperature is sustained at this level till recovery or death.

- Decrease in milk yield
- Decrease in appetite
- Rumination ceases
- Staring hair coat
- Lacrimation
- Nasal discharge
- Coneal opacity
- Difficult breathing & high respiration rate
- coughing
- Firm faeces in the beginning and later diarrhoea which is frequently mixed with blood and mucus.
- Death occurs in 4-14 days of fever

Sub acute form

- affects animals with some resistance i.e calves & to a lesser extent - adult zebus. There is intermittent fever of 5-10 days and then recovery.

The mild form

- Mild fever for 3-7 days. There is listlessness & swelling of superficial lymphatic glands.

The inapparent form

- such animal show no clinical signs but develop immunity.
- Cerebral form (turning sickness of cattle)

The affected animals show circling or turning movements, dizziness and collapse. Consciousness returns and they stand on their feet. In sub-acute cases, there is head pressing. In the chronic cases there is muscular incoordination and blindness. This form always terminates fatally.

4.4.6 **TREATMENT**

Oxytetracycline in early stages of the disease
Bupavaquone (butalex) is the drug of choice

4.4.7 **CONTROL** (Tick Control)

4.4.8 **MASTITIS**

This is the inflammation of the udder. It is a disease that causes great losses in milk production. The most frequent causative organism is streptococcus agalactiae (44% isolation) Mastitis is attributed to badly constructed milk snades, poor water supplies, inadequate sterilisation of udder clothes, ignorance of milking practices and inadequate supervision.

There is also lack of interest/unwillingness to make improvements in the standards of milk hygiene by farmers.

The extension officers should emphasize to the farmers, the menace caused by the disease, the methods of diagnosis and the available treatments. The farmers should use strip cups always. The sick cows should be isolated and treated. Post lactation prophylaxis should be introduced.

4.4.9 **CLINICAL SIGNS**

- Reduced milk yield
- Red, hot painful udder
- Temperature rise in acute cases
- Milk may be serous and may have white flakes

4.4.10 **TREATMENT**

- Antibiotics e.g. Penicillin, Tetracycline, sulphonamides
- Antinflamamatory drugs
- Hot fermentation of the udder & frequent milking

4.4.11 **TICK CONTROL**

1. Destruction of tick by chemical agents (acaricides)
   - dipping

- spraying
- hand dressing

2. Destruction of ticks by burning fields or by manual removal of ticks.
3. Oxpeckers and tick birds unfortunately this prefer to eat fully engorged ticks which by this time have already transmitted the disease.
4. Ticks are starved to death by withdrawal of their hosts. It is however difficult to withdraw rodents and wild animals.
5. Exposure to unfavourable environment. Ticks have specific conditions in which they thrive. Rotational grazing and controlled grass burning are useful.

4.4.12 **HELMINTHIASIS** (worms in the gastro-intestinal tract)

- Symptoms
- Pot belly appearance
- Staring hair coat
- diarrhoea
- loss of body condition even when the animal eats enough.

4.4.13 **TREATMENT**

- Antihelminthics

4.4.14 **CONTROL**

Strategic deworming of animals - before and after the rains.

4.4.15 **BLOAT**

Symptoms

- Lack of ruminal movements
- Empty/mucoid with scanty faeces rectum
- Distended rumen
- Difficult breathing

TREATMENT

- Stop bloat (antifoaming agent) is given in mild cases otherwise a veterinarian should be called as this is an emergency.
- Farmers should be taught to first of all bloat
- Remove the animal from the bloating pastures
- Emergency rumirotomy

4.4.16 **PHOSPHOROUS DEFICIENCY**

- SYMPTOMS

1. Pica - eating objects (not food) e.g sticks, stones, e..t.c.
2. Poor growth & weak bones
3. Infertility

TREATMENT/ CONTROL

- High phosphorus mineral licks
- In cases of urgent need for phosphorus a vet should be called to give an intravenous dose of sodium acid phosphate solution.

4.4.17 **PROTEIN ENERGY MALNUTRITION**

This condition arises when there is general reduced dry matter intake by animals. Protein and carbohydrates deficiency leads to general weakness and poor performance. Milk yield is reduced and this greatly affects dairy farming.

4.4.18 **CONTROL**

- Animal feed concentrates to be given.
- Vitamins should be administered as these improve appetite.

4.5.0 **THE DAIRY FARMER**

He would be entering into a cash economy from the day of investment. Once the farmer decides to go dairy farming, he will be earning cash daily when the cows are lactating. It is an intensive exercise generating a few farm hands for help thereby creating jobs for the youth. The farmer can do crop farming alongside dairy Farming hence use urea and manure for the crops instead of

inorganic fertilizers. The farmer will also benefit by the family using the extra (unsold) milk as food (mala) and beverage. The other benefit is the use of offspring in paying of dowry, which is an age old tradition in the area, that is fervently carried on to date.

A farmer with well looked after 4 milking friesian cows can expect up to 250,000/= per year as income which can leave him with a net income of no less than 75,000/= per year meaning a monthly salary of 6,000/=

4.5.1 ZERO GRAZING

As the land size for farming shrinks due to subdivision, more farmers would be encouraged to take to zero grazing practice. With zero grazing certain diseases can be controlled easily if proper management is carried out. The shed has to be constructed professionally with provision of good supply of water. The following grasses can be good for zero-grazing or even range management.

1. Napier grass
2. Lucern
3. Kikuyu grass
4. Lucaena tree
5. Banana leaves/stems
6. Potato vines/maize stalks e.t.c.

4.5.2. The napier grass should be planted at least 3 -4 months before acquiring the animals. The grass planted during the long rains of March to July in the area would do well for the small herd. Between 3 and 4 acres of Napier grass and smaller portion for lucern should be planted in readiness for the animals. Ideally 660 Kg of napier grass should be provided daily for the 4 Milking animals. The farmer should acquire a chaff-cutter too.

4.5.3 Commercial feeds are also available at trading centres and major towns such as Kakamega, Turbo, Bungoma, Kimilili, and Webuye. These feeds would have wheat, bran base, or maize germ and a provision for mineral licks and salts should be offered to the dairy animals.

4.5.4 A zero grazing structure for 4 grade cattle will need spacing of 16M x 5 5 M with feed-troughs for water and feeds. A composite pit for manure should be planned.

4.5.5 As a start, the small scale farmer may need these drugs and aides to assure optimum milk production.

- 3 bottles of clexon parvoquone
- 3 bottles of terramycin
- 3 bottles of multivitamin
- 2 bottles of streptopen forte
- 1 litre of nilzan plus

- 5 litres of triatax (acaricide) and a spray pump
- 1 milking salve
- 2 milking buckets
- 3 (10 litres) aluminium cans.

Above all, when the farmer suspects infection of the animals, he should alert his veterinary surgeon as early as possible for professional services. He should plan for preventive measures rather than curative measures.

4.5.6 In the latter stages, the factory may plan on assisting selected small scale farmers with extension services of A. I. with a qualified member of staff to run it at marginal profit. This could improve the quality of milk received at the factory.

4.6.0 **FOOD CROPS FOR THE DAIRY FARMER** (6th year)

4.6.1 **LAND CLASSIFICATION**

The land classes designated as suitable for dairy farming will also suit food crop but shallower soils, 50-80 cm deep as in some part of Kakamega district, will be suitable for short season crops such as sorghum, beans, sweet potato, cassava which can be planted in October-November period. Maize is usually planted in March-May long rains

in this area of Bungoma and Kakamega. The factory may encourage the dairy farmers to plant food crops that enhance food security to avoid the temptation of farmers making a complete switch to crop farming from dairy farming because of marginal profits anticipated from crop farming.

4.6.2 **SOIL MANAGEMENT**

The basic principles of soil management will apply to food crops production. In addition however, there are further problems with food crops since these are planted specifically to take advantage of the wet seasons, when the dangers of erosion are potentially greater since exposure of bare seed beds can often coincide with periods of highest rainfall intensity.

Preservation of surface structure would therefore be of greatest importance, and breakdown of tilth by overploughing must be carefully avoided.

4.6.3 If certain aspects of food production is mechanised, the dangers of compaction, smearing and pan formation would apply. Land preparation would therefore be largely completed before the onset of the rains, as is already the local practise.

4.6.4 Having regard to the dangers of damage to the soils of the region by a combination of weather effects and more intensive cultivation, farmers should be encouraged to grow tree species wherever possible. This would generate wood for fuel and for construction purposes as well as create a market for fruiting types.

4.6.5 **CROP/CULTIVATION SEASONS**

Main rains: Rainfall and other climatic data are described elsewhere. The main rains are reliable and the vegetative growth period extends from March to June. The data of planting is very critical for most crops. The farmers would be expected to clear any weeds just prior to planting, sow seed at an optimal spacing with a dibbler (broadcasting would lead to poorer yields), fertilizing, keep the field clean of weeds with a hand hoe harvest, and store or market any crop surplus for their subsistence requirements.

4.6.6 **Short rains:** This season has a much more uncertain rainfall pattern than the main rains, and the yields will be more unreliable; the season lasts from August to November and the work can be more spread out than for the main rains. Indeed farmers should plant at intervals to reduce the chances of crop failure. The project would offer advice to farmer on the following lines:

a) Ideally the main rains cultivation sequence would be followed. The same land would be used as for the main rain plantings. The minimum cultivation to remove weeds, with a hand hoe would be an alternative to reploughing, the land having been ploughed for the previous crop in February. The soil must be disturbed to the minimum extent to conserve moisture but it will have compacted during the hand weeding and harvest sequence of the previous crop.

b) Grain crops can be sown with a dibbler when there is sufficient moisture. Some crops, such as sweet potatoes, should be planted in ridges. The ridges should be made when the soil is damp and the crops planted the same day. This has always been the practice in the area anyway.

c) Drought-resistant crops, such as sorghum, beans, cowpeas, e.t.c. should be grown.

d) The farm must be maintained clean of weeds. Surface trash would help to conserve moisture so the crop residues should not be burnt. Whether tractor ploughing/harrowing or manual hand digging is used will depend on the resources available to the farmer.

4.6.7 Mechanical operations required are highly seasonal. Planting is dependent upon the advent of the March-May rains and those in September-November. Planting must take place as soon as possible after the first heavy rain. Land must be prepared in advance of this or immediately the rains begin. There is, therefore, an opportunity period of some 60 days before each rainy season for most mechanical inputs. This short season of intensive activity calls for a peak in equipment requirement and a relatively short number of working hours per annum (1200 hrs/annum).

4.6.8 The necessary operations required for establishing the food crops are calculated as:

a) Cultivation with ripper tines using a 77 hp wheel tractor with cultivation depth of 18cm and output of 0.75 ha per hour.

b) Hand hoeing to break up surface clods and remove weeds prior to planting.

c) Provision of seed and fertilizer. The project may acquire seed at wholesale prices and sold to dairy farmers at retail prices. The farmers will be encouraged to use farm manure in planting the crops.

4.6.9 Varietal choice is an important factor, not only to maximise yields but also to take account of local and market preferences. The project would seek the advice of Government and other agencies,

and carry out trials on farmers land so that the varietal recommendations could be reviewed at intervals. Table 20 outlines some of the possible choices of varieties. Newer varieties are continually being released via the Ministry Of Agriculture staff.

4.6.10 **Pests:** Termites can be controlled by digging up the queens and by treatment with Aldrin dust. Army worms can be a menace and the project would store chemicals and spraying equipment for use during an invasion. There are a large number of insect pests of crops but, except for vegetables and fruit, insecticides are too expensive and difficult to apply. Other pests, such as rats and wild pigs, would have to be controlled by the farmers themselves.

4.6.11 **Diseases:** Chemical treatments for diseases are expensive and difficult to apply. Resistant varieties and care with planting dates would be the chief defense against food crop diseases.

4.7.0 **PROPOSAL FOR FOOD CROPS DEVELOPMENT**

The development of the Webuye Dairy Project as integrated with food crops farming may require further research - which can establish the level of participation, total acreage and the optimum returns for the farmer. This should be possible after 5 years of the factory's operations.

An analysis of the competing crops in the area which should be used as parallel crops by the dairy farmer, shows that the farmer will be able to earn an extra income as under on one hectare of land in the area:

- cowpeas - one year at 4800/= bag = 200,000/=
- Green grams at 400 /= = 60,000/=
- Beans - Rose coco at 2400/= = 48,000/=

Total: 308,000/=

This income coupled with milk income from four grade cattle at Kshs.250,000/= a year would make the average farmer quite comfortable financially. The inter cropping exercise is strongly encouraged as a buffer against hunger and for the farmer's cash requirements.

PART TWO

4.8.0 SOURCES OF RAW MILK AND OTHER SUPPLIES

4.8.1 The basic raw material for Royal Food Industries(RFI) Project will be raw cows' milk. Most milk will be received direct from local farmers who can deliver to the factory. Some milk will be sourced from the underutilised milk cooling stations at Naitiri and Tongaren in Bungoma District and Lumakanda and Kakamega Dairy Co-op Society in Kakamega district.

The factory will purchase 60,000 litres of milk daily from these sources. Co-operative Societies which deliver milk to the factory would usually charge a service charge to its members out of the basic factory price paid to them by Royal Food Industry.

The average butterfat content of the milk will be assumed at 3.7%. The incoming milk will be tested for butterfat content and acidity as a measure of quality. Milk not meeting the minimum set standards in terms of butterfat content and acidity will be rejected and the supplier cautioned. Any supplier who is cautioned for a third time will be discontinued. All quality milk will be paid for at a flat rate of Kshs.16 per litre(US $ 0.36/litre) on weekly basis.

4.8.2 In 1983/84 K.C.C. on average paid to farmers at the rate of Shs.2/50 per litre after deducting the transportation charge of 140/= per litre K.C.C. paid Shs.2/95 per litre to cooperative that it collected milk from in the same period. In 1984, K.C.C. paid to the farmer the following prices in West Kenya

1.	Nandi Farmers	Kshs.2/56 per litre
2.	Trans Nzoia	Kshs.2/02 per litre
3.	Nakuru	Kshs.1/90 per litre
	Nakuru others	Kshs.2/20 per litre

In every above case, after deducting transportation charge and or Cess in the area. These prices compared unfavourably with prices offered by milk hawkers at shs.2/70 per bottle of 750 ml which translates into 3/60 per litre and the farmers do not have to wait to be paid after 30 days or longer but only a small fraction of this milk is hawked at such a price. The incentive is the immediate payment. In Bungoma and some parts of Kakamega district, Kitinda was paying way below the price paid to farmers by K.C.C. in the area. This was one of the reasons dairy farmers from Naitiri and Tongaren preferred to deliver their milk to K.C.C. factory in Kitale. But still, K.C.C. could not cope with the afternoon deliveries in these areas hence most farmers hawked this produce. This is the milk that R.F.I.

would go for since it will be collected and stored in the expanded cooling stations at Naitiri and Tongaren.

4.8.3 Milk to be produced in the divisions of Kakamega - Lugari, Matete, Kabras as projected in the development plan 1994-96, show the following trend:-

DIVISION	1995(Kg)	1996(Kg)
Lugari	50.2 million	52.8
Matete	5.4 million	5.7
Kabras	20.4 million	21.4
	76.0 million	79.9 million

These divisions which are close to the proposed factory will produce more milk than the factory's annual processing capacity of 18 million kg.

4.8.4 Bungoma district on the other hand has poor milk recording system. However, Kitinda milk processing factory has only been able to process 2.7 million litres of milk (1990) and then the yearly intake has declined substantially to 300,000 litres per year (1992). The farmers in Bungoma earned Kshs.10 million from milk in 1991, compared to Lugari division of Kakamega's Kshs.317 million (1991).

4.8.5 The factory will operate on 2 shift basis, the milk will be received continuously from 5.00 am in the morning to 8 pm in the evening. Storage facilities will be provided to cater for 1 shift production ie 30,000 litres.

4.8.6 The factory is expected to operate every day of the week and every month of the year as consumers will expect deliveries on a continuous basis. The actual delivery schedules will be worked out by the management of the factory based on these lines.

4.9.0 RAW MATERIALS

Input - Milk reception (3.2% fat) at the rate of 30,000 litres a day. There will also be other materials for use such as salt, starter culture, film and waxed paper.

Output:

a) Pasteurized milk filled into plastic pouches at 23,500 litres a day

b) Butter in cups at 300 kg per day

c) Mala in plastic pouches @4,500 l/day

d) Skim milk in plastic pouches @1,500 l/day

4.9.1 **SUPPLY PROGRAM:**

To meet the above raw material input, a supply programme of the respective raw materials and auxiliary materials has to be scheduled. The following is the supply programme covering 1st, 2nd, 4th and sixth years of production and the respective costs. The following program shows that the material costs are US$ 2.8 million dollars in the first year, US$ 6.8 million dollars in the 2nd year, almost $10 million in the 4th year and $14 million dollars in the sixth year of production.

A. RAW MATERIALS AND UTILITY COSTS

1.	Fresh milk in M.T. purchased at	US$ 259
2.	Salt in M.T. purchased @	US$ 270
3.	Starter culture in kg purchased @	US$ 4
4.	Polyethene film to be in kg @	US$ 5
5.	Waxed paper to be in kg @	US$ 5
6.	Electricity in Kwh @	US$ .10
7.	Liquid fuels in lts @	US$ .47
8.	Diesels in lts @	US$ .47
9.	Water in 1000 lts @	US$ .22

B. MATERIAL CONSUMPTION PER UNIT OF OUTPUT

	MATERIAL	PRODUCT			
		Pasteurized Milk	Butter	Mala	Skim Milk
1.	Fresh milk	1.03	-	1.03	1.03
2.	Salt	-	0.03	-	-
3.	Starter culture	-	0.03	0.03	-
4.	Polythene film	6.25	-	6.25	6.25
5.	Waxed paper	-	8.6	-	-
	UTILITIES				
6.	Electricity	40	0	0	0
7.	Liquid	1.62	0	0	0
8.	Diesel	-	0	0	0
9.	Water	3.10	.30	.40	.60

RAW MATERIAL INPUT TABLE £ 000's

TABLE 4.2

MATERIALS:	Unit	1	2	4	6	8	10
Item 1:	FRESH MILK						
Average use/year MT		8,500	17,37[illegible]	17,379	17,379	17,379	17,379
Cost/unit of item	0	259.00	279.7[illegible]	326.72	380.56	443.88	517.74
Total Item Cost		2.20	4,132	5,670	6,614	7,714	8,998
Item 2:	SALT						
Average use/year - MT.		2	4	4	4	4	4
Cost/unit of item	0	270.00	291.6[illegible]	340.12	395.72	462.73	539.73
Total Item cost		.0735	1	1	2	2	2
Item 3:	STARTER CULTURE						
Average use/year Kg.		42	72	84	84	84	84
Cost/unit of item	0	3.85	4.16	4.85	5.66	6.60	7.70
Total item cost		.016	.0[illegible]	0.[illegible]	0.[illegible]	1	1
Item 4:	POLYTHENE FILM						
Average use/year Kg.		52,500	89,63[illegible]	105,456	105,456	105,456	105,456
Cost/Unit of Item	0	5.00	5.40	6.30	7.35	8.57	10.00
Total Item Cost		0.262	484	664	775	904	1,054
Item 5:	WAXED PAPER (BUTTER)						
Average use/year Kg.		610	1,038	1,221	1,221	1,221	1,221
Cost/unit of item	0	4.50	4.86	5.67	6.61	7.71	9.00
Total item cost		.002745	5	7	8	9	11
Total Material cost		2.49	4,623	6,343	7,399	8,630	10,066
			4,623	6,343	7,399	8,630	10,066

After the products have been processed, they will be stored in a cool warehouse ready for shipping to the market. Pilferage during processing is to be minimised through this high technology machinery and equipment. But pilferage through storage, distribution may not be quaranteed except an allowance of up to 5% of sales value should be budgeted for. For distributors, it is better to make in-kind (credit) replacement after ascertaining the loss due to the factory's fault.

4.9. **DELIVERY AND STORAGE OF SUPPLIES**

The raw materials will be supplied to the factory with a lead time of seven days minimum. For inputs being processed, two days lead time is required. Finished products can be stored for up to 14 days so as not to tie up useful funds in inventories.

Factory supplies at the warehouse, should be enough for 120 days of factory operations.

4.10.0 **Spare Parts:**

The spare parts for machinery are a very crucial component of supplies hence procurement procedures must be co-ordinated by the production's service section. There should be enough spare parts supplied by the machinery and equipment supplier for 10 years.

CHAPTER 5

5.1.0 LOCATION, SITE AND ENVIRONMENTAL ASSESSMENT

Two locations were considered for this project which were:

- Webuye
- Kakamega Town

The location had to meet certain minimum requirements for effective raw material availability, infrastructural set up, the ability to reach its target market and availability of the labour force in the area.

5.1.1 RAW MATERIAL AVAILABILITY

Webuye town was selected because it is closer to the abundant milk in the area of Lugari, Naitiri, Tongaren, Nandi, Uasin Gishu and the other Kakamega divisions of Matete and Kabras. They jointly produce over 100 million kg of milk annually, which K.C.C. plant at Eldoret cannot cope with. This plant requires a maximum milk intake of 20 million kilograms per year which can be satisfied by a fraction of the production in the area.

5.1.2 **INFRASTRUCTURE**

Webuye town is well connected to the rest of the country through tarmac roads to Kakamega, Eldoret, Kitale, Bungoma (to Uganda). There is good power supply from Kenya Power and Lighting Company for the factory to run smoothly.

Water:

There is plenty of water for processing the milk as the other major industry - Pan Paper Mills has made the government provide adequate supply of water. However, the milk factory will have to treat its water for processing. The water tanks will have a capacity of 90,000 litres, fitted with pumps. After the plant has processed its products, the factory will have a waste disposal treatment plant to clean up the chemical residues before emptying in public systems.

Manpower:

There is a good pool of educated labour force in the area which will readily work for the factory with minimum training. The other specialised employees can be sourced anywhere in the national market.

Legal and Fiscal Regulations

They are generally conducive to industrial projects. This is why two major industries are located in the

town. One is the giant Pan Paper Mills and the other is the Webuye Heavy Industries plant. The approval process should be more of a formality.

Construction of the Plant:

(The supply of material for buildings is adequate at Webuye).

The structure to house the machinery and equipment will meet the normal standards under the relevant building codes. In particular, the following will be adhered to:-

The construction shall be of re-enforced concrete frmed structures with 9" infill walls both external and internally. The floor shall be of 6" thick reinforced with fabric mesh. The factory shall be provided with two mild-steel sliding doors for security of the investment. The gutters will be of reinforced concrete lined asphalt water-proofing. The roof will be supported by a 50ft wide span structure steel-trusses at intervals of 20ft. Some fibre-glass roof sheets for day-light will be used. An ablution block will be constructed for the use of workers. Electricity from mains is available at Webuye. Total built up area will be approximately 7800 sq. ft., with concrete parking area and fenced off at the periphery.

In addition, certain building materials suitable for a dairy plant floor (such as tiles) may be imported from

APV Denmark. The full list of these materials from APV is with the sponsors.
(Also see factory layout drawings attached)'

Site:

The site will be on a private plot off - Webuye-Eldoret Road about 2 kilometres from Webuye Town Centre. The climate in the area is good although it has a high humidity level most of the year.

Roads:

There is the main trunk road to Eldoret which is tarmacked. The earth road to the plot shall be re-done and murram grading done for easy access. Utility connections are public systems which exist in the neighbourhood.

Cost Estimates:

The cost of land is minimal and in any case, it is already acquired except when an industrial plot is allocated, the funds for this part will be used for site development. The present budget for this plot is US$ 15,000 dollars.

Government land taxes are standard and may not affect the above budget. Legal expenses will however be substantial but will be met from the pre-production

cost estimates. There should be no need to pay any neighbours any money.

Physical and Social-Economic Structure:

The area selected for location of the plant is a previously rural area of the municipality hence not heavily populated needing population relocation. The plant will also contribute to the social weebeing of the population around the location. The surrounding community appears friendly and are enthusiastic about a new factory to absorb the youth for gainful employment. This augurs well for the factory as goodwill from social groups is vital for any industry's location.

ENVIRONMENTAL IMPACTS:

Type of Process

Milk processing is a clean operation from reception to products output. If erected according to technical standards, there should be no air pollution to affect the neighbours. There is the milk-treatment plant, in-compound storage tanks and CIP plant. The system of heating and cooling through extensive piping system has little air pollution. The chemicals used for cleaning the plant will make it mandatory to clean this waste

before disposal to public systems. A detailed waste disposal plant description will be made available from a local consultant at the time of project implementation. This system is estimated by APV to cost about US$ 80,000 dollars to erect and fit at the plant.

After fitting of this unit, there should be no environmental problem at the factory. The environment can absorb minimum treatment waste discharge into the local systems.

CHAPTER 6

ENGINEERING AND TECHNOLOGY

PART 1

6.1.0 PLANT DESCRIPTION

Below you will find a description of the dairy plant with the greatest importance attached to the capacities, the product flow, and the operation principles of the plant.

To get a better understanding of the product flow description, we suggest that it is read with the production diagram, the flow sheet, drawing attached and the machinery layout, drawing attached as supporting material.

6.1.1 Milk Reception - Section 01

The milk is received in cans and by road tankers.

Cans

The cans are transferred to the scale, from the platform. The milk is poured into the bowl of the scale. When the quantity is registered, the milk is led into the vat, from which it is pumped by the centrifugal pump, through the filter, and the plate cooler, in which the milk is cooled down from approximately 10°C to 4°C, before being led

into one of the storage tanks,in the layout drawing. The empty cars are placed on the drip saver, and before being returned to the farmers, washed in the vats, and the can rinser.

6.1.2 **Milk Treatment Plant - Section 02**

Fresh milk - approx. 30 000 l

The milk is pumped from one of the tanks, by the centrifugal pump, the balance stays in the tank. The milk is pre-heated from 4°C to approx. 50°C before being led to the separator, where the milk is standardized to 1.5% fat. The surplus cream (40% fat) is led to the cream pasteurization plant, section 03, and back through the plate heat exchanger, where it is heated up to approx. 64°C before homogenization in the homogenizer. The milk is led back through the plate heat exchanger where it is pasteurized at 74°C and kept at this temperature for 16 seconds in the holding cell, and finally regeneratively and by means of ice water cooled down to 4°C before being led into the storage tanks.

The controller, controls and regulates the temperatures during pasteurization.

Capacities:

Milk pasteurization for fresh whole milk	5,000 L/h
Temperatures:	4-50-64-74-4°C
Balance tank,	1000L
Plate heat exchanger,	5,000 L/h
Holding cell,	16 sec.
Separator,	5,000 L/h
Homogenizer,	5,000 L/h

6.1.3 **MALA PRODUCTION**

Mala milk processing starts after the milk has gone through the milk treatment plant that turn the milk into pasteurized milk. The pasteurized milk will have a fat content level of 2.5% and is pumped into the ripening tank at 35°c. The ripening tank for this unit has a capacity of 5,000 litres and when this is attained, starter culture is added to the milk and left to ripen overnight. The factory will need two ripening tanks to meet the projected production of 9,000 litres per day. Culture for mala is prepared in the steter heater fitted with 6 culture jars and culture bottles used for both mala and butter lines. In the morning following the ripening, mala is pumped through the heat exchanger where it is cooled down to 7°c. From this section of the unit the mala milk is pumped to the buffer tanks from where it is filled in 1/4, 1/2 1 litre pouches ready for the market. From the filling plant, it is taken to the stores. Detailed technical specifications are with the sponsor.

MALA PRODUCTION

1 - Vertical tank, type MA7 (704.10.01).

The tank is made of cold-rolled stainless steel (AISI 304). The tank has conical top and bottom; it is mounted on pipe legs with adjustable ball type feet.

The shell, and bottom of the tank are insulated with 50 mm mineral wool.

Standard Equipment:

- Air vent
- Cleaning turbine
- Dial thermometer
- Sandblasted capacity indication scale on the interior jacket
- Stainless supporting plates for the ball type feet of the tank

ACCESSORIES:

- Vertical agitator, type RCI-1 (4531-1) complete with bracket fitted on top of the tank. The agitator is equipped with through-going shaft in stainless steel, embedded in foot-step bearing and equipped with one stainless two-bladed propeller.

  The agitator is driven by a gear with a flange type fan-cooled electric motor. Gear and motor are fitted on a stainless bracket and equipped with a stainless protective casing.

- Manway cover fitted in the tank top
- Stainless ladder

TECHNICAL DATA:

Volume: 5,000 l

1 - Centrifugal pump, model W.

This item is in the same execution as item 01.15 on page 9.

TECHNICAL DATA:

Type: W-20/20

Capacity: 5,000 l/h

Motor size: 2.2 kW

1 - Plate heat exchanger, type N 35 RK.

The plate heat exchanger, which is equipped with adjustable ball type feet, is made of steel with stainless steel plating.

It is supplied with plates in stainless steel and suspended by means of carrying bar, guide bar and bolts in stainless steel.

The heat exchange takes place in a clamped plate pack, the pressed stainless steel plates being equipped with corrugations, designed to give a highly turbulent flow at a minimum loss of pressure. The specially designed corrugations produce a liquid flow in channels connected in parallel and/or in series, thereby providing for a gentle treatment of the product.

The plate heat exchanger comprises the following sections:

- Ice water section.

TECHNICAL DATA:

Product:	Mala
Capacity:	5,000 l/h
Inlet temperature:	35°C
Outlet temperature:	7°C

1 - Set of ice water circulation equipment comprising:

1 - Circulation pump, type W

1 - Set of pipes and fittings

1 - Vertical tank, type MAV (704.10.01).

This item is in the same execution as item 03.01 on page 18.

ACCESSORIES:

- Vertical agitator, type RCI-1 (4531-1) complete with bracket fitted on top of the tank. The agitator is equipped with through-going shaft in stainless steel, embedded in foot-step bearing and equipped with one stainless two-bladed propeller.

  The agitator is driven by a gear with a flange type fan-cooled electric motor. Gear and motor are fitted on a stainless bracket and equipped with a stainless protective casing.

- Manway cover fitted on the tank top

- Stainless ladder

TECHNICAL DATA:

Volume: 5,000 l

1 - Hetotherm incubator bath, type 101A923M6/4.

The incubator is complete with thermostat, bath, lid, false bottom and 4 lids for holes for culture bottles.

The incubator bath is designed to be placed on a table.

ACCESSORIES:

6 - milk jars, 5 litres

6 - lids for milk jars

4 - culture bottles, 0.5 litres

1 - hand stirrer

1 - Relay based control panel, type APV UTC-1

The panel is designed for temperature regulation for the above plate heat exchanger.

The panel comprises the following main components:

1 - PI temperature regulator

5 - Start/stop push buttons with signal lamps for motors

1 - Main switch

The instruments are mounted in a polyester cabinet prepared for wall mounting.

Operation features:

Regulation of the heating (or cooling) temperature

1 - Set of accessories for APV UTC-1 panel.

The accessories include the following items:

1 - PT 100/1" RG sensor, single, for control of heating (or cooling) temperature

1 - Steam (or ice water) regulation valve

6.1.4 Cream Pasteurization - Section 03

The cream (40% fat) is received in the batch pasteurizer, from the separator, at a temperature of approx. 50°C. It is then heated to pasteurization temperature and subsequently cooled to approx. 6°C. It is then pumped to the filling section, by means of the centrifugal pump, (Part of the cream is pasteurized in the butter section).

CAPACITIES:

Batch pasteurizer, 1,000 L

6.1.5 Filling/Packing - Section 04

Whole milk - approx. 28,500 l

The whole milk is pumped from the storage tank by the centrifugal pump, to the filling machines, where the milk is filled in sachets.

6.1.6 Butter Production - Section 05

Part of the surplus cream (40% fat) from the standardization of the milk is led from the separator, at the batch pasteurizer, in which the cream is pasteurized and cooled down to approx. 8°C.

The cream is then, by the centrifugal pump, pumped into the butter churn in which the cream is churned into butter and butter milk.

The butter milk is pumped by the centrifugal pump to the tank where it is pasteurized and cooled to filling temperature before being pumped to the filling section, section 04. The butter is manually transferred to the manual butter forming the filling unit. The butter is filled into 250 cc cups, manually closed with lids and then transferred to the cold store.

CAPACITIES:

Batch pasteurizer	500 L
Butter churn	1,000 L
Water plate cooler	200 L/h
Butter filling unit	75 kg
Butter milk batch pasteurizer	320 L

6.1.7 **Cleaning Plant - Section 06**

The CIP plant is based on manual operation and is equipped to run three CIP programmes.

Adjustments of cocks, valves and flow split to bring the CIP media to and from the tank, piping system, or machines which are going to be cleaned, is effected manually, whereas the cleaning itself is carried out automatically in accordance with the selected CIP programme.

The CIP plant consists of the following main components:

- one outer stainless steel tank with three 1000 L rooms for lye solution, acid solution and hot water. The tank are equipped with heating coils for heating of the CIP media
- one stainless steel tank for cold rinse,500L
- one CIP forward pumps and three CIP return pumps
- manual dosing system for lye and acid

6.1.8 Refrigeration Plant - Section 08

The refrigeration plant has been divided into the following main groups:

- Compressor plant
- Condenser plant
- Ice water plant
- Evaporator plant for cold store
- Ice water distribution plant

6.1.9 Boiler Plant - Section 09

The boiler plant consists of a boiler unit with a capacity of 650 kg steam/hour. Furthermore, APV has included feed water tank, water softening unit as well as chimney.

The boiler plant is designed for diesel oil.

6.1.10 Water and Compressed Air Supply Plant - Section 10

This section has been divided into two main groups as follows:

- Compressed air supply plant
- Water supply plant

Compressed air supply plant

The compressed air supply plant consists of a double air compressor unit and a refrigerated air drier.

Water supply plant

The water supply plant comprises the following:

- Two Braithwaite water tanks, each with a capacity of 45,000 l
- Two multi-stage in-line centrifugal pumps
- Two diaphragm tanks, each with a capacity of 325 l

6.1.11 Ventilation System - Section 11

The ventilation system is designed for mechanical exhaustion of air, which is replaced by air to be sucked in through filter grids.

Please note that air conditioning is NOT included.

The following rooms are equipped with ventilation systems:

- Milk reception
- Production room
- Raw material store
- Recombination room
- Main switch room
- Workshop
- Refrigeration room
- Boiler room
- CIP room
- Packing material store
- Laboratory

6.1.12 **Electrical Installation - Section 12**

The electrical installation comprises delivery of the following:

- Switchboard installation
- Power installation
- Indoor lighting installation
- Outdoor lighting installation

6.1.13 **Stainless Steel Pipe System - Section 13**

All stainless steel pipes, fittings, valves and installation materials in sufficient quantities are included for interconnection of machines at site, and for running sanitary pipework for the

product as well as for the CIP medial, in order to allow for erection in accordance with the machinery lay-out and detailed erection drawing.

6.1.14 **Service Pipe System - Section 14**

All service pipes, fittings, valves and pipe insulation material in sufficient quantities are included for interconnection of service utilities at site, and for running pipework for steam, water, ice water, condensate, compressed air, etc., as well as refrigerant to the various processing machines and to other service installations, in order to allow for erection in accordance with the machinery lay-out and detailed erection drawings.

6.1.15 **Laboratory Equipment - Section 15**

We have included laboratory equipment for the following tests:

- Acidity test
- Density test by lactometer
- Fat determination test by Gerbyer
- Total plate count test
- Resazurin/reductase test
- Freezing point test
- Total solids non-fat test
- Sediment test
- PH value test

6.1.16 **Workshop Equipment - Section 16**

APV have included tools and equipment for the maintenance of the plant. The delivery comprises the following main groups of elements:

- Electric tools and equipment
- Welding equipment
- Threading tools
- Hand tools
- Joiner's tools
- Various workshop equipment

6.1.17 **Various Dairy Equipment - Section 17**

Various essential utilities for the running of the plant have been included. The delivery comprises the following main groups of elements:

- Various brushes
- Utensils
- Uniforms
- Ladders
- Hoses
- Detergents

6.1.18 **Transport Equipment - Section 18**

For the transportation of milk powder pallets etc. within the frames of the plant area, we have included the following:

1 - Forklift truck

3 - Hydraulic pallet lifters

6.1.19 **Spare Parts - Section 19**

Reservations have been made to include a reasonable quantity of spare parts for the machinery and equipment of the plant.

A complete list of the spare parts included in the supply will be provided at the time of shipment of the machinery and equipment by APV Denmark.

6.1.20 **"Soft-Ware" Services - Section 20, 21 and 23**

Apart from the delivery of machinery and equipment, the project supply also includes the supply of "Soft-Ware" services. and in this respect, APV have included the following:

- Mechanical Engineering, Design and Planning, Section 20
- Installation, Start-up and Technical Advice, Section 21
- Architectural and Civil Design, Engineering and Planning of Building Work, Supervision and Site-management, Section 23.

6.1.21 **Building Materials from Denmark - Section 22**

Cold store insulation panels, cold store doors, industrial doors, Stelcon tiles, acid resistant tiles, jointing materials and stainless steel floor outlets etc. will be imported from Denmark.

6.1.22 **Dairy Building/External Works - Sections 24 and 25**

The dairy building and external works will be contracted in Kenya by the sponsors.

The dairy building will be designed with use of prefabricated steel structure and roofing, combined with traditional block walling.

6.1.23 **SUPPLIES BY ROYAL FOOD INDUSTRIES**

Various Materials and Equipment

The following materials and equipment are not included in our quotation and must consequently be provided by the Client(RFI)

- Raw materials, packing materials, detergents, oils, etc. necessary for start-up
- Shelves for the store (if required)
- Pallets for the stores
- Distribution equipment (lorries, vans, etc.)
- Staff change room furniture
- Kitchen furniture and equipment
- Office furniture and equipment

- Canteen furniture and equipment
- Other materials and equipment not specified in "Specification of supply".
- Telephone sets and PABX system

6.1.24 **Approvals, Permits and Various Charges**

The RFI shall in due course provide for:

- Approvals and permits necessary for construction, installation and production
- Bank charges as stated in the "Contractual Terms"
- Permits as stated in "Contractual Terms"
- Taxation as stated in "Contractual Terms"
- Insurance as stated in "Contractual Terms"

6.1.25 **Facilities on Site**

During the entire period of construction and start-up, the RFI shall provide the following facilities:

- Supply of electricity - Variation in nominal voltage is not to exceed - 5% or + 10% of the nominal voltage of 380V
- Storage facilities for APV DTD's supplies
- Guards and fencing
- Crane and forklift facilities
- Telephone, telefax/telex
- Supply of treated water

6.1.26 Machinery and Equipment

The following machinery and equipment are not included in APV quotation and are thus to be supplied and installed at the expense of the RFI:

- Water supply line from the main municipal line to the water tank
- Water supply wells, if required
- Complete effluent water treatment plant (if required)
- Supply cable from the main municipal cable to the transformer
- Transformer
- Supply cables from the transformer to the main switchboard (location of transformer unknown)
- Fire fighting equipment
- Other machinery and equipment not specified in "List of Machinery"

6.1.27 Various Information

The study has contracted an architetura as design consultant to give information on the following:

- Site drawings with level indications
- Soil, including detailed report of foundation conditions
- Main road connections

- Sewage connections and approvals from relevant authorities
- Water supply conditions and capacity of main supply
- Water quality, including detailed water analysis
- Electrical supply (local regulations, voltage, etc.)
- Telephone connections
- Climatic conditions

Relevant drawings are included in this study.

6.1.28 **MACHINERY COSTS**

The main plant equipment to be bought from APV of Denmark - FOB - US Dollars are as under:

		US Dollars
1.	Milk reception	125,000
2.	Milk treatment	265,000
3.	Cream pasteurizer	74,000
4.	Filling and storage	262,000
5.	Butter production	166,000
6.	C.I.P. plant	63,000
7.	Refrigeration	194,000
8.	Boiler	80,000
9.	Water, compressed air	80,000
10	Ventilation	42,000
11.	Electrical installation	386,000
12.	Pipes (Stainless)	80,000
13.	Service pipes	102,000
14.	Laboratory	66,000
15.	Workshop	25,000
16.	Dairy	28,000
17.	Spares	75,000
18.	Eng. Design/Planning	116,000
19.	Tech./start up	674,000
		2,940,000

6.1.29	Building and Civil Work Contracted in Kenya - Dairy Building	US$ 957,000
6.1.30	Building and Civil Works Contracted in Kenya - External Works	US$ 11,000
	Total price for Part II	US$ 968,000
	GRAND TOTAL FOR THE PROJECT	US$3,908,000

Note:

The freight and insurance charges not included.

6.1.31 **Packaging**

Polythene film from Prepac Searl of France will be utilized for retail packaging of milk. Polythene has been preferred to Tetrapak and plastic bottles due to its cheapness. Tetrapak and bottles account for at least 45% of the retail cost of milk. On the other hand polythene only accounts for at most 1.5% the retail cost of milk.

Prepac Searl manufactures various grades of polythene. Their prices depend on the number of colours and the shelf life of the product. There are different polythene films for the different kind of foods such as milk, oil and fruit juices. Up to 6 colours are possible. The simplest film had only 2 colours.

The following are F.O.B. Marseilles prices for different packages and film from Prepac searl for minimum quantity of 5 tons of film.

(a) Milk packaging

(i) Milk of shelf life 3 months of UHT milk

2 colours 38 FF per Kg

0/50 FF for every assitional colour 130 pouches of 1 litre each can be estimated from one Kg of film.

(ii) Pasteurized milk of shelf life not exceeding 1 week

2 colours 14FF per Kg

0.50 FF for every additional colour

160 pouches of 1 litre capacity can be obtained from one Kg of film

(b) Fruit packaging

(i) Simple film for pasteurized fruit juice

2 colours 13 FF per Kg

0.5 FF for every additional colour

(ii) Dark film and barrier film capable of 3-4 months shelf life

38 FF per Kg

iii) Complex film for fruit juice packages, hot filling, up to 2 months' shelf life

35 FF per Kg

(c) Film for packaging vegetable is

2 colours 23 FF per Kg

0.50 FF for assitinal colour

160 pouches of 1 litre of

238 pouches of 1/2 litre of

350 pouches of 1/4 litre

For the purpose of this study the film for pasteurized milk with 2 colours were considered. For simplicity, it is assumed that all the milk is packaged in 1 litre pouches.

6.2.0 DESIGN AND LAYOUT OF THE FACTORY

The basic goal in planning this site has been achieved by layout distribution of built form and associated auxiliary areas which will permit flexibility for future expansion, overall result in all phases which will be visually and operational effective and lastly satisfy industrial development and planning control. The factory consists of the main plant building, workshop warehouse and other auxillary areas.

The main plant building houses the office block for administrative purposes. The factory has the following areas incorporated;

- milk reception area
- storage tanks
- Production line consisting of;
- Pasteurized milk production
- Butter production
- Fermented (mala) milk production
- Filling/Packaging area
- Warehouse storage
- Cold storage and
- Loading bays

Among the other structures, a platform has been provided for receiving milk from tankers and trailers through pump/injectors.

The factory layout has been designed to allow for flexible phasing and future expansion. the buildings located and oriented to minimise operating costs, both from energy wastes and handling of materials. the layout allows for effecient vehicle access. The external plants are sited where they will be effecient for the production process and also where they will not constrict expansion. A rationalised network of underground services to accept current and future development has been carefully planned. Auncillary buildings such as pumping platform- positioned adjacent to the services or built areas that they serve.

The building located to fulfil all the environmental requirements, particularly boundary conflicts such as noise, fumes, smell, truck parking.

PART II

6.2.1 CONSTRUCTION AND MATERIALS

A. BUILDINGS

The main structural elements of the building will be structure steel. This will allcw fabrication to proceed whether the site work preparation and construction of the foundaitcns are corcurrently completed.

(i) Foundation and Floor Slab:

These are from reinforced concrete materials.

(ii) Roof

5 Galsheet or Double speltes fluted corrugated Iron acrylic coloured sheets.

(iii) Walls

Concrete current blocks plastored internally with appropriate gloss paints with burnt brick fotering i some areas for aesthetic values. Wet areas ceremic and tiles/terazzon worktops.

(iv) Ceiling: (where applicable)

Celotex and fibre glass blanket.

(v) Floor

- Production areas - Industrial acid resistant floor tiles
- Offices/Corridors- PVC floor tiles or

  Corridors ceramic floor tiles (anti-skid)
- Wet areas - Terrazzo

(vi) External Doors

- Factory - Galvanished and painted to the shutter doors
- Offices - T and O timber doors

(vii) Internal doors

- Factory - Glazed shtter rollr doors
- Offices - Flush doors

(viii) Partitions Internally

- Double speller fluted corrugated Iron acylic coloured in factory areas.

  In offices stramit boards or any approved timber partitions.

(ix) Windows

Factory - High level windows - PVA or fibre glass sheets

Offices - Normal glazing 4 mm thickness clear glass.

B. **CIVIL AND EXTERNAL WORKS**

Civil and External works include amongst othes roads, storm water drains, drainage, sewerage open gullies for water disposal, platform for receiving milk transported by tankers.

Parking area for both visitors and tracks. All roads circuit will have reinforced concrete finish within the factory premises, while outside and parking area bitumen finish. Loading and off loading bays made from reinfored concrete materials.

The entire site will be hit by a series of street lights and security lights at intervals around the boundary perimeter.

6.2.2 **COST ESTIMATE BASED ON SKETCH PLANS**

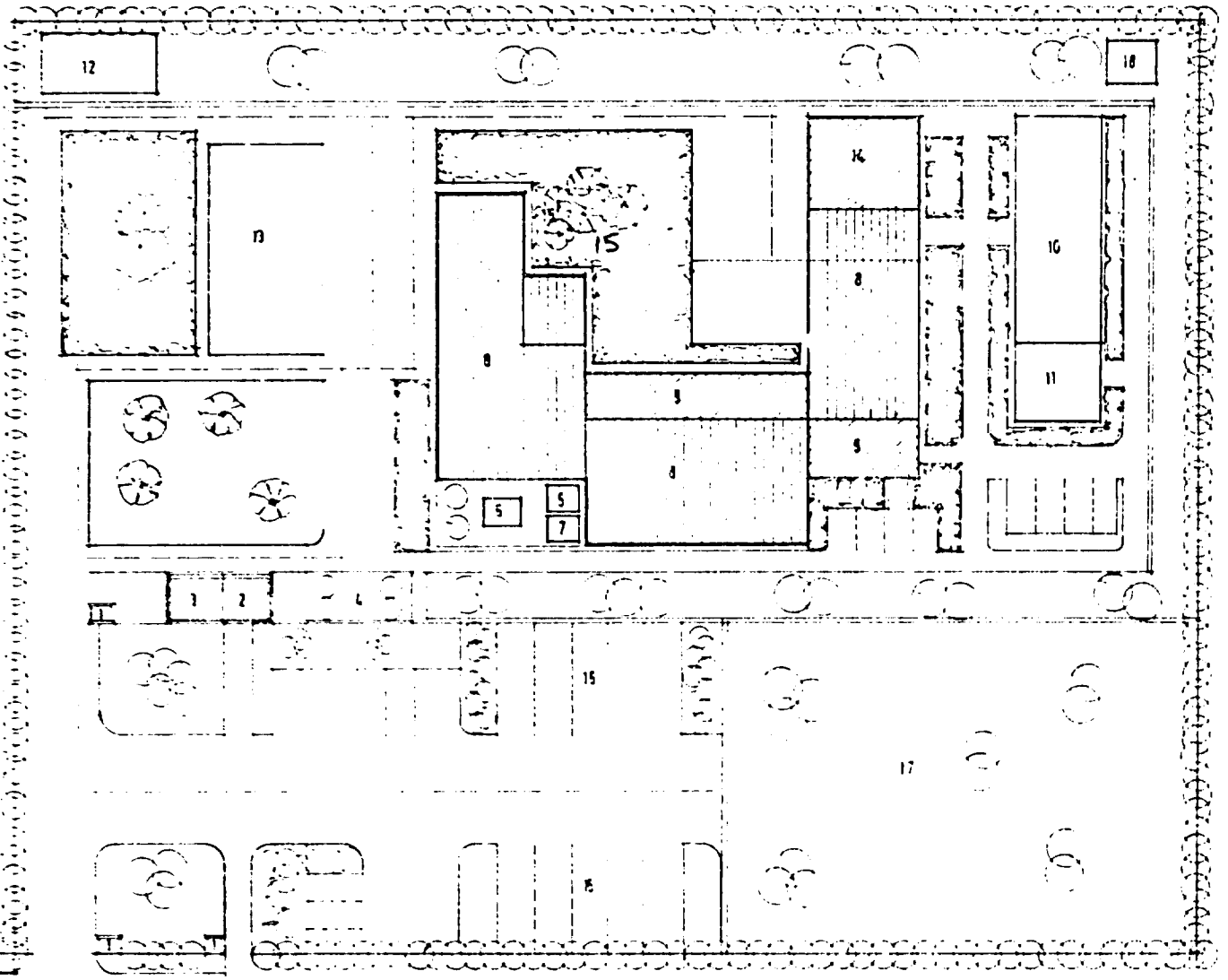
A. Main Factory Building and Associated buildings with a total areas of approximately 2000 m^2 - US$ 574,400

B. Civil and Associated external works occupying an approximate area 4,000M^2 - US$ 393,600

The total Estimates for Buildings and Civil works is - US$ 968,000

PART III

DRAWINGS



→ INCOMING DELIVERIES
→ OUTBOUND VEHICLES

1 CONTROL POINTS
2 STAFF ENTRANCE
3 STAFF CANTEEN
4 WATER RESERVIORS
5 GENERATOR ROOM
6 BOILER
7 C I PLANT
8 FACTORY PLANT
9 ADMINISTRATIVE BLOCK
10 WORKSHOPS
11 WAREHOUSE
12 MAINTENANCE GARAGE
13 PLATFORM RECEPTION
14 COLD STORAGE
15 MILK STORAGE
16 DISTRIBUTORS PARKING
17 LAND RESERVE FOR EXPANSION
18 REFUSE COLLECTION POINT

FACTORY LAYOUT PLAN

ARCHI-TECTURA

PROJECT
PROPOSED DAIRY FACTORY PLANT

REVISIONS	DATE	BY	DATE	DRAWN	SCALE
1					
2				APPROVED	DRG. NO.
3				M.C.A.	

CHAPTER 7

7.1.0 FACTORY ORGANIZATION PLANNING

The personnel in the factory will be spread out from reception area where all raw milk will be received, the cans emptied, cleaned and given back to the farmers while milk is being pumped to the cooling unit and storage. There will be a good number of workers at the milk treatment plant which will serve the other units of pasteurising, butter, mala and skim milk production centres. Filling and packing, CIP plant personnel will also fall under production department. Strictly speaking, some of these units like reception, CIP plant and maintenance crew are service departments which are incidental to production.

Administratively, the plant will be organized on a functional basis i.e. Finance and Management Marketing and Sales, Purchasing and Production departments. In accounting process, the costs will be divided up depending on whether they are direct to production of the products or are service administrative costs which include salaries and wages for workers not directly associated in manufacturing such as accountants, clerks, drivers, purchasing, personnel and training will be treated as overhead costs. The other costs such as marketing costs could be included in this area.

Depreciation expense which in this case is based on 10 year useful life of the machinery is estimated at US$ 388,000 per year. The financial costs are quite hefty for this size of investment but we purposely used foreign exchange interest rates which are about half the prevailing rates in the Kenyan banking system. Nevertheless, if the sponsors acquire US$ 2.94 million for the purchase of equipment and machinery as expected, an average of US$ 370,000 in interest expenses per year on declining balance should be budgeted for costs. In this connection, a capsule of costs will be as follows:

Item	Period 2	4	6	8	10
Total sales US$ 000's	7,983	10,955	12,778	14,904	17,384
Materials	4,623	6,343	7,399	8,630	10,066
Direct labour	67	91	106	124	145
Utilities	67	92	107	125	145
Total Direct Cost	4,756	6,526	7,612	8,879	10,357
Gross Margin on sales	3,227	4,429	5,166	6,025	7,028
Adm. & Marketing	787	918	1,071	1,249	1,457
Management & Techn.	92	107	125	146	170
Other overheads	225	244	266	292	324
Total Indirect costs	1,104	1,269	1,462	1,887	1,950

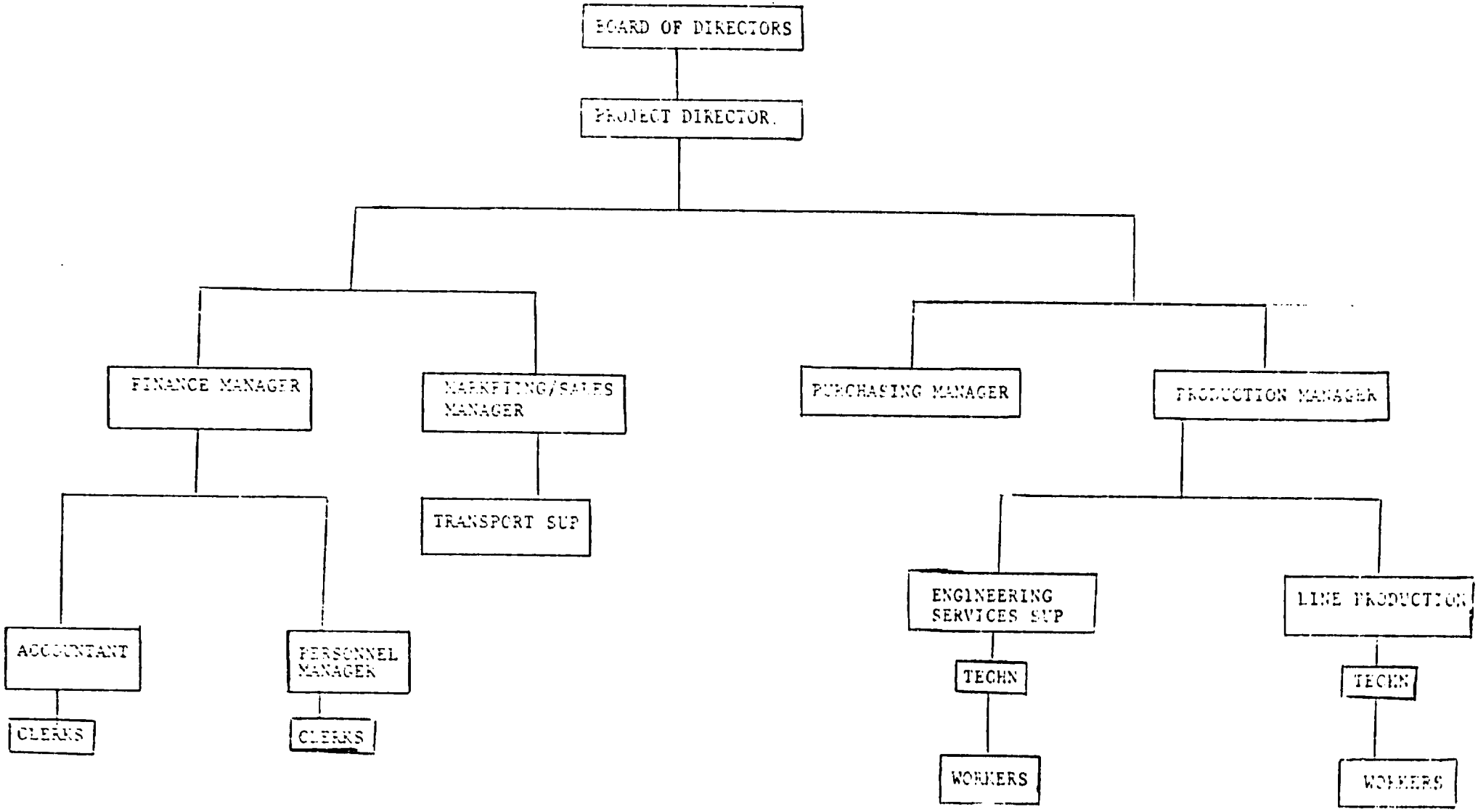
The above costs have an 8% annual inflator.

In the above analysis, indirect costs will include such functions as managing production workshops, off-plant transporation, spare parts and supplies, packing material, repairs and maintenance, electricity for general use, water supply, laboratory processes, effluent disposal, personnel and health services etc. Property Insurance and taxes paid will also fall under indirect costs.

DEPRECIATION EXPENSE A/C

		Yr. 1	2	4	6	8	10
1.	Buildings (Investment).	957,000	957,000	957,000	957,000	957,000	957,000
	Yearly Dep.	0	24,000	24,000	24,000	24,000	24,000
2.	Infrastru-cture Cumulative (Invest)	11,000	11,000	11,000	11,000	11,000	11,000
	Yearly Dep.	0	0	1,000	1,000	2,000	2,000
3.	Transport cum. Invest	50,000	50,000	50,000	50,000	100,000	100,000
	Dep. Exp.	0	13,000	13,000	13,000	13,000	13,000
4.	Plant/Mac/ Eq. cum Inv.	2,944,000	2,944,000	2,944,000	2,944,000	2,944,000	2,944,000
	Dep. exp.	0	736,000	736,000	736,000	736,000	736,000
5.	Preproduction Expense	707,000	707,000	707,000	707,000	707,000	707,000
	Dep. Exp.	0	354,000	354,000	0	0	0
6.	Total cum Dep. Exp.	0	1,139,000	785,000	785,000	785,000	785,000

ROYAL FOOD INDUSTRIES ORGANIZATION CHART



CHAPTER 8

HUMAN RESOURCES MANAGEMENT

8.1.0 ORGANIZATION STRUCTURE

8.1.1 The project will be organized on the basis of key functional departments Management and Finance, Sales and marketing, Purchasing, Production. These units will report to the Project director will in-turn report to the Board of Directors.

8.1.2 Under these functional departments, will be heads hired based on technical knowledge and varied experiences for effective supervision of the technicians and support or line staff. The Production Manager will be an Engineer experienced in dairy technology and so will the other heads as per the job specifications under.

8.2.0 Management Of The Factory

8.2.1 Project Director

The incumbent will be an experienced project manager preferably an economist with wide experience in dairy industry. The educational experience should specify no less than a masters degree in economics with finance bias and

personnel administration experience coupled with some marketing and sales exposure. The holder must be a local Kenyan who understands Kenyan economic trends and is able to adjust to changing political, social educational, and business environments with ease. Above all, he must be an operations manager at heart who can steer the factory's operations to profitability at the earliest time possible and maintain or exceed the projected quota's in subsequent years. His other major responsibility would be to control the factory's overheads, administrative overheads, financial costs, and at the same time steer the marketing function to new heights in exploiting all its potential for growth. It would be his responsibility to select the best departmental heads who are competent to help him achieve the standards set by the board of directors. He should have the limited discretion to discipline errant heads of departments and other management staff without recourse to the board. He should be able to set management performance based schemes to keep the managers both well remunerated and disciplined. The success or failure of the project ultimately rest with this individual, hence he must be expected to be the key player throughout the project development phases until it is an established entity in the industry.

8.2.3 Purchasing

This is an important department that should handle both raw material and supplies purchases and equipment and machinery. The occupant of the position should be ideally an accountant by training and have experience in pricing structures. The individual must be someone with cost control as the guiding principle in order to save the project of unnecessary cost. The individual should be able to advise the accounting department accordingly so that appropriate tax remissions or exemptions are taken care of in good time.

8.2.4 Marketing and Sales Manager

This is also a key department that must be held by a well-educated individual preferably (B.Com) with actual success in Marketing and sales administration. The manager should be able to explore and exploit all and every potential market for the factory's products. He will liaise with the production manager so that all production is sold and that there is a steady growth of both production and sales.

8.2.5 Finance Manager

The manager here will be someone with a B.Com. degree (with accounting option) with thorough grounding in accounts preferably CPA finalist with experience in personnel administration. Will coordinate all employee related affairs. The preferred candidate should be a person able to work with both senior staff (to advise) and junior staff to train, deploy, discipline and at the extreme, terminate services of undesirable staff. He will also make sure that industrial safety measures are adhered to according to the law and make sure an adverse industrial action does not unnecessarily cause work stoppage. The administration of salaries, wages and benefits will come under this department in personnel section. All accounting functions will fall under their own section head.

8.2.6 Support Staff and Production Workers

The production workers under the technical staff will be trained on the job. The other support staff such as drivers, clerks, purchasing assistants, maintanance staff will be supervised by technically qualified staff.

8.2.7 **Factory Expenditure**

All factory expenditures will be approved by the Finance Manager. The expenses may cover purchases, salaries and wages, contracted services, taxes and other payables. For this study, the projected level of salaries will be as below:-

1.	Heads of department	US $	12,000 p.a
2.	Senior staff	US $	6,700 p.a
3.	Skilled and Technical	US $	3,600 p.a
4.	Workers		800 p.a

The majority of workers will be operations staff in the factory. These workers will be trained on the job in order for their skills to be specifically geared towards milk and milk products career. Such costs will then be included in the factory overheads budget. The envisaged number of employees at the start of operations will be 61.

8.3.0 Total cost of manpower will be US$ 158,000 dollars the first year of production. See attached chart.

8.3.1 **Labour Distribution per Product**

		1	2	3	4
1.	Skilled/ Technical	3	3	2	1
2.	Semi skilled	6	4	3	2
3.	Unskilled	11	3	3	3
	Sub-total	20	10	8	6

Total workers:	44	
For all products:		+
Clerical/Adm:	12	+
Managers	5	
Total	61	

8.40 **TOTAL MANPOWER COSTS**

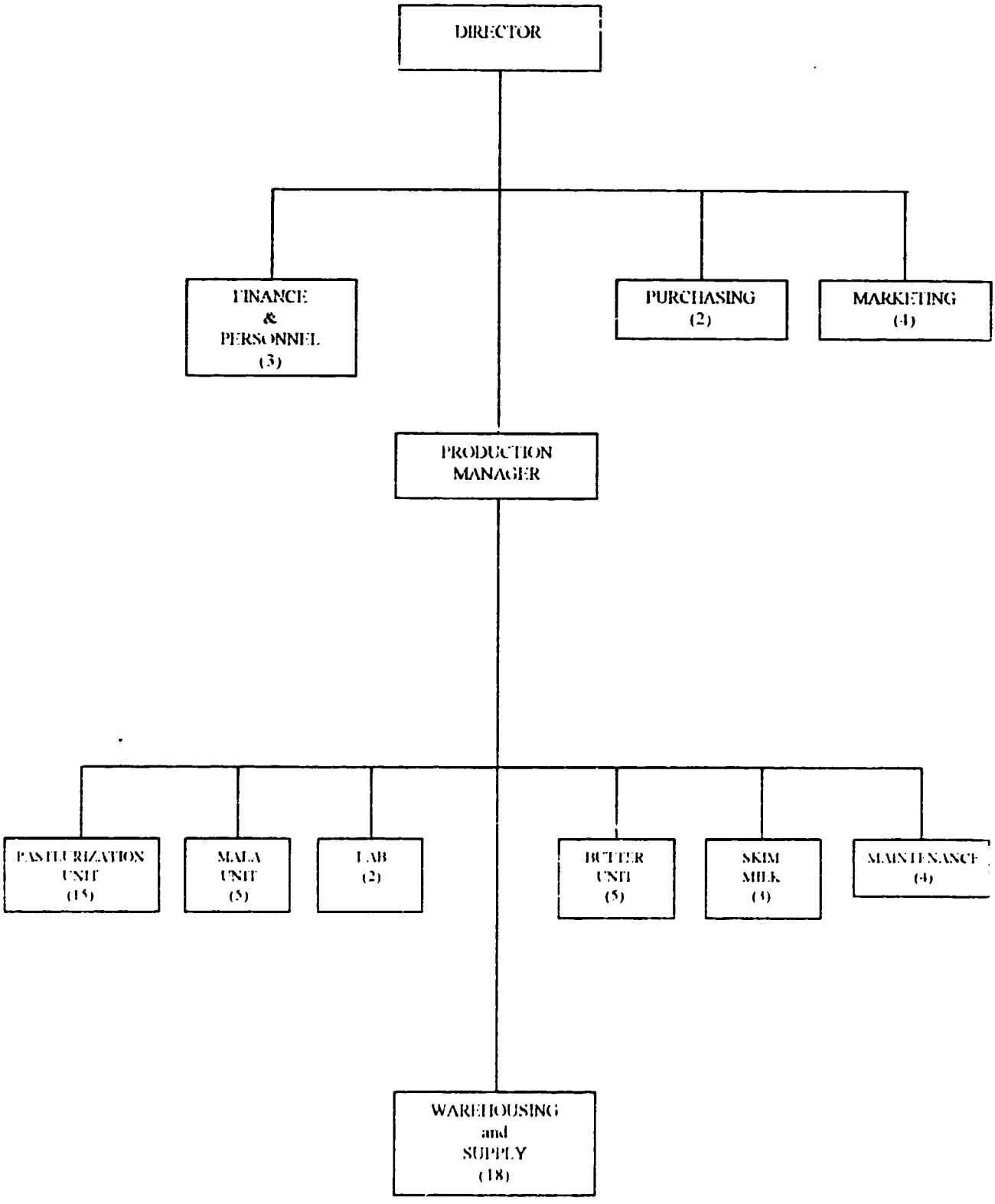
Total labour and salary costs as scheduled from year one of productionwill be as under:-

1st	year	54 workers	US$ 158,000
2nd	year	54 workers	US$ 158,000
4th	year	61 workers	US$ 198,000
6th	year	61 workers	US$ 231,000

From this table, one can project a moderate increase in labour costs for the period.

* See attached table 8.4

PROCESS MANNING CHART
WEBUYE MILK PROCESSING FACTORY



9.1

LABOUR USAGE TABLE (represnting 2nd year of operations)

	Production Department: (Two shifts)		Wage Grade	Monthly	Yearly	TOTAL
a)	Function: Milk Treatment					
b)	Job Designation					
	- Supervising Food Technologist	(2)	A	300	3600	7200
	- Food Technologists	(6)	B	174	2088	12600
	- Maint. Technicians	(2)	B	174	2088	4200
	- Dairy Tech. Supervisors	(2)	B	174	2088	4200
	- Dairy Technicians	(8)	C	84	1008	8070
	- Machine operators	(10)	D	94	1130	11300
	- Packers	(20)	D	94	1130	22600
	No. of Workers	50	Total Cost			70,170

8.2

LABOUR USAGE TABLE: SALARIED STAFF

Department: General Management (All Departments)

Designation		Pay: Monthly	Yearly	TOTAL
Assistant Production Managers	(2)	550	6600	13,200
Clerical Staff	(4)	300	3600	14,400
Managers	(5)	1000	12000	60,000
TOTAL	11			87,000

Production Department and General Management labour costs amount to US$ 88,000 + 70,000 = 158,000 dollars per year

LABOUR USAGE IN PLANT PER PRODUCT

	Skilled and Technical workers	Semi-skilled staff	Unskilled	Total
1. Pasteurized milk	6	10	10	26
2 Butter	2	4	4	10
3. Mala	2	3	4	9
4. Skim milk	1	2	2	5
TOTAL	11	19	20	50

8.3

MAN POWER REQUIREMENTS AND COSTS

Type of worker	Years of operation 4	5	6	7	8	9	10
Unskilled - Number	20	20	20	20	20	20	20
Payrate/year	1,020	1,102	1,190	1,285	1,388	1,499	1,619
Period cost (000's $)	20	22	24	26	28	30	32
Semi-skilled - Number	15	15	15	15	15	15	15
Payrate/year	2,003	2,163	2,336	2,523	2,725	2,943	3,178
Period cost (000's $)	30	32	35	38	41	44	48
Skilled & Technical - Number	9	9	9	9	9	9	9
Payrate/year	4,535	4,898	5,290	5,713	6,170	6,663	7,196
Period cost (000's $)	41	44	48	51	56	60	65
Total Direct Cost (000's $)	91	99	106	115	124	134	145
Clerical/ Administrative - No.	12	12	12	12	12	1	12
Payrate/year	2,630	2,841	3,068	3,313	3,578	3,865	4,174
Period cost (000's $)	32	34	37	40	43	46	50
Management - Number	5	5	5	5	5	5	5
Payrate/year	15,117	16,326	17,632	19,042	20,566	22,211	23,988
Period (000's $)	76	82	88	95	103	111	120
Total salaries	107	116	125	135	146	157	170
Total payroll (Wages + Salaries)	198	214	231	250	270	292	315
Total No. Employees	61	61	61	61	61	61	61

Table

CHAPTER 9

9.1.0. IMPLEMENTATION PLANNING AND BUDGETING

The sponsors of this project would be advised to embark on implementation procedures after the final feasibility study report is accepted. This is because the dollar value against the Kenya shilling has stabilized (1994) at just under 50/= per dollar against 72/= per dollar in 1993. The strong component of foreign exchange involved in the purchase of equipment and machinery at U.S. $ 2.94 million is justification for this. If the dollar should adjust upward in value against the shilling, it could accelerate the investment cost hence delay the proper implementation of the project.

9.1.1. Project Implementation

Managing the implementation phase should be the responsibility of the executive director as directed by the Board of Directors of Royal Food Industries. The executive director could easily be referred to as the Project Director who will be the first employee to be hired for the factory to oversee every aspect of planning and construction of the plant and the following:-

9.1.2 a) Pursuing Webuye Municipal Council for industrial plot allocation as indicated by the District Industrial Development Officer as a priority item.

b) With the assistance of the project consultant, seek principal financiers for the project through equity participation or a combination of long term industrial loan and equity participation.

c) Supervise the construction of the plant building according to machinery supplier's specifications and the architects plans

d) The study recommends APV of Denmark supply machinery and equipment/technology for this project.

e) Plan the timing of the above for delivery and installation testing and commissioning of the equipment and machinery.

f) Formalise the contracting of the supply of the above while adhering to specific engineering specifications as noted in the study, and instal as expediently as possible.

g) Make plans to recruit, select, place and train operations staff before commissioning as follows:-

- Hiring senior staff - 2 months
- Hiring Technical staff - 1 month
- Hiring semi skilled/workers - on-going

h) Training will be geared towards Royal Food Industries peculiar management style, product development, work ethics, skills, attitudes and knowledge sharing, remuneration and benefits.

i) Supplies for equipment will be stored in the warehouse under a competent clerk to avoid work stoppages.

j) The project director to acquire all the relevant licences for the plant operations prior to commissioning.

k) To capitalize all implementation cost as part of pre-production investment costs.

9.1.3. TOTAL COST OF IMPLEMENTATION

1.	Land/site preparation	US$ 15,000
2.	Technology acquisition costs	20,000
3.	Engineering documentation other than APV's	107,000
4.	Civil works tendering	20,000
5.	Arrangements for financing	125,000
6.	Supervision, testing, commissioning	50,000
7.	Staff recruitment/training	20,000
8.	Supplies arrangements	50,000
9.	Marketing plans	125,000
10.	Licence approval arrangements	50,000
11.	Capital issue expense	125,000
12.	Project implementation mugt.	50,000
	Total	US$ 757,000

IMPLEMENTATION CHART TABLE 9

ACTIVITY			RESPONSIBLE OFFICER	1ST YEAR 1995/96												2ND YEAR 1996/97											
				J	A	S	D	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
Project Financing			Board of Directors																								
Plot Allocation			Board of Directors																								
Building			Board of Directors																								
Equipment Mach			Project Director																								
Manpower Selection			Project Director																								
Manpower Training			Project Director																								
Supplies & Spares			Project Director																								
Project Licenses			Project Director																								
Commissioning			Board of Directors																								

CHAPTER 10

10.1.0 FINANCIAL APPRAISAL

10.1.1 Investment Costs

Total investment costs for the Webuye Factory are expected to be as follows:-

Land/site	US$ 15,000
Structure/C.E. Works	957,000
Machinery/Equip.	2,944,000
Auxiliary/Service Equip.	101,000
Pre-production costs	700,000
Working capital costs	450,000
Total Investment	US$5,167,000

These are mandatory costs for the investor to plan on implementing the project. Good working capital is a prerequisite for proper implementation of the project hence a minimum of 3 months working capital requirements is recommended. Investment cost has been adjusted downward because of two factors, one is the rapid gain by the Kenya is the rapid gain by the Kenya shilling making imports cheaper hence the price of machinery is now cheaper by 30% since 1993. The second factor is that the investor would prefer a more manageable project in terms of cost for proper implementation.

The other key factor that is relevant is that Kenyan industrialists are now allowed to borrow from overseas (off-shore borrowing) up to US$ 5 million. The interest rates of between 8% and 12% per annum. Even Kenyan based financial institutions are having separate interest rates (lower) for foreign exchange borrowing locally.

10.1.2 FINANCING

The sources of finance will be from own sources and the bulk of it from the local banking institutions which will be approached for long term loan facilities. The long term loan facilities are expected to cover about 58% of the total investment. The 42% to be invested by the sponsors of the project will cover a working capital funding level of US$ s450,000 equivalent, at the current exchange rate of 45/= per dollar (December 1994).

ROYAL FOOD INDUSTRIES

SOURCES AND USE OF INVESTMENT FUNDS

Sources:

1.	Equity 1st year - local	US$ 2.067 million dollars
2.	Long term loans in foreign exchange	US$ 2.944 million dollars
3.	Short term loan - local	US$ .134 million dollars
	S.T. loan - foreign currency	US$ .022 " "
	Total	US$5.167 " "
	of which debt is	US$ 3.100 " "

USES OF FUNDS: INVESTMENT

1.	Land	million dollar	0.004
2.	Infrastructure	million dollars	0.011
3.	Building/civil	" "	0.957
4.	Transport	" "	0.100
5.	Plant/Equip/machinery	" "	2.944
6.	Preproduction capitalization	" "	.707
7.	Working capital	" "	.444
	Total US$		5.167

Most of these funds will be used in the first year of operations. Interest rates are 12% on Foreign Exchange and 24% on long term and short term locally sourced funds. There will be 2 year grace period on long term industrial loans and no grace period on short term loans.

LOANS AFFECTING PROJECT INVESTMENT

A. Long Term Loan - Foreign Exchange Disbursment

	1st Yr.	2	4	6	8	10
Balance $	2,944,000	2,944,000	2,576,000	1,840,000	1,104,000	368,000
Repayment	0	0	368,000	368,000	368,000	368,000
Interest $	353,000	353,000	309,000	221,000	132,000	44,000

B. Short Term Loan - Local Funds Disbursement:

Balance $	134,000	89,000	0	0		
Repayment $	45,000	45,000	0	0		
Interest	32,000	21,000	0	0		

C. Total

Payment	45,000	52,000	420,000	368,000	368,000	368,000
Balance	3,100,000	3,048,000	2,576,000	1,840,000	1,104,000	368,000
Total Interest	388,000	376,000	309,000	221,000	132,000	44,000

10.1.3 **COSTS OF PRODUCTS SOLD**

The yearly cost of products sold will reflect the following expenses:

1.	Factory costs	US$ 4,000,000
2.	Administrative costs	456,000
3.	Marketing expenses	729,000
4.	Depreciation expenses	388,000
5.	Financial costs	293,000
		US$ ~~5,7~~ ~~56~~, 5,916,000

Total production cost is estimated at US$ 5.9 million dollars for the first year of operations.

10.1.4 The following financial capsule will show the position of Royal Food Industries projected financial performance over the years.

A.	Total investment U.S.	$ 5.16 million
B.	Net Present value U.S.	$ 5.91 million
C.	Internal rate of return (IRR)	44%
D.	payback period estimated	4 years
E.	Debt/equity ratio	60:40
F.	Return on equity at full capacity	78%
G.	Total annual sales U.S.	$ 7.9 million
H.	Break Even point 2nd year	88%
	4th year	41.2%
	6th year	49%

* see this table in appendix.

The debt servicing rate used was based on the prevailing industrial loan rates of 24% in the Kenya economy (1994) but an adjustment is likely by the year end. The alternative is to borrow off-shore as indicated above and the servicing costs will reduce by more than half.

10.1.5 Cash flow : The negative cash flow would be in the first year of operations only, otherwise the factory can sustain itself thereafter.

SUMMARY OF PROJECT PROFILE

ROYAL FOOD INDUSTRIES

MILK PROCESSING FACTORY-WEBUYE

CONSTRUCTION PHASE: 12 MONTHS

FINANCIAL SUMMARY IN US$ DOLLARS

1.	Total Investment	5,167
2.	Net present Value	5,905
3.	Discount Rate 18%	18%
4.	Internal Rate Return	44%
5.	Payback period	4 years
6.	Debt/Equity Ration(Initial	60:40
7.	Return on Equity:	78% at Full Operation
8.	Return on Total Investment at full capacity	31.2%
9.	Return on sales at full capacity	13.6%
10.	Profit with outside financing at full capacity (5th year)	U.S.$ 1,462,000
11.	Profit without outside financing	U.S.$ 2,662,000

SUMMARY OF OPERATIONS DATA

PRODUCTS	CAPACITY	YEAR 2	YEAR 4	YEAR 6	YEAR 8
		CAPACITY UTILIZATION (%)			
(a) Pasturized milk	13,[illegible] Lt	85	100	100	100
(b) Butter	142 Tonnes	85	100	100	100
(c) Fermented Milk	2,667,000 Lt	85	100	100	100
(d) Skimmed Milk	868,000 Lt	85	100	100	100
Total Sales all local -		7,983	10,955	12,778	14,904
Total Number of Persons Employed		54	61	61	61
Break-even point (% Cap Utilization.		88	57	49	47

CHAPTER 11

PART I

11.1.0 COMMENTS ON FINANCIAL STATEMENTS, RATIOS AND CONCLUSIONS

The attached (projected) financial statements give an indication as to the level of operation and the resultant operating and net profit margins for the factory at Webuye if established on time. The projected 10 year summary shows that this project by Royal Food Industries will be profitable throughout the period of project analysis barring any unforeseen economic down-turn in the national economy.

11.1.1 THE BALANCE SHEET TABLE 11.1

The net effect is that, the operating profit before providing for government tax, moves from Kshs. 17.1million or U.S.$380 thousand dollars in the second year of production to Kshs.630 million or U.S.$ 14 million dollars in the 10th year of production. If part of the profits are reinvested in the project, equity level will show positive improvement as shown in table number 11.2.

If actual figures match the projected performance, the potential investors will be attracted to invest in this company and enhance its capital

base for expansion to match the expected demand in the Kenyan economy. Disciplined and tough financial controller may look at such things as cost control such as monitoring output per labour-hour or overtime restrictions and capacity utilization so that products (resource) not sold means a loss to the factory. There should not be a backlog of orders which would indicate a problem in production plans which may necessitate total change in production plans or a change in particular line of products at Royal Food Industries.

11.1.2. Quality control will have direct effect on unit costs hence less customer returns which would translate positively on the balance sheet. In this connection, milk products that are produced from a given input of raw material and are saleable, translate into better profitability, hence any unexpected changes must be addressed promptly.

11.1.3. Raw material costs (price) have to be watched closely so that management decision is taken appropriately so that there is change in stock levels, change product prices or adopt different product formulations which will affect the balance sheet profitability.

TABLE NO. 11.1

ROYAL FOOD INDUSTRIES
PROJECTED BALANCE SHEET

Period	Work Cap. (days)	1	2	3	4	5	6	7	8	9	10
1. ASSETS											
1.1 CURRENT ASSETS											
Cash balance		56	1,163	2,682	4,181	5,899	7,736	9,908	12,332	15,024	17,905
Account receivable	15	0	333	380	456	493	532	575	621	671	724
Inventory											
Raw Material	7	0	90	103	123	133	144	155	168	181	196
Work in progress	2	0	28	32	38	41	44	48	52	56	60
Finished goods	14	0	228	258	303	327	355	381	411	443	479
Spares	120	0	18	18	18	18	18	18	18	18	18
1.2 FIXED ASSETS											
Cum. investment		4,723	4,723	4,723	4,723	4,723	4,823	4,823	4,823	4,823	4,923
Cum depreciation		0	697	1,394	1,738	2,081	2,425	2,769	3,112	3,456	3,799
Net fixed assets		4,723	4,026	3,329	2,985	2,642	2,398	2,054	1,711	1,367	1,124
TOTAL ASSETS		4,779	5,586	6,802	8,106	9,554	11,226	13,140	15,313	17,761	20,506
2. LIABILITIES											
2.1 CURRENT LIABILITIES											
Account payable	30	0	391	447	536	579	625	676	730	788	851
Short term loans		156	104	52	0	0	0	0	0	0	0
2.2 MEDIUM & LONG TERM LOANS		2,944	2,944	2,944	2,576	2,208	1,840	1,472	1,104	736	368
2.3 EQUITY		2,067	2,067	2,067	2,067	2,067	2,067	2,067	2,067	2,067	2,067
2.4 ACCUM. UND. PROFIT		0	(388)	380	1,293	2,927	4,699	6,694	8,826	11,412	14,170
2.5 UNDISTRIBUTED PROFIT		(388)	768	913	1,634	1,772	1,995	2,232	2,486	2,758	3,050
TOTAL LIABILITIES		4,779	5,586	6,802	8,106	9,554	11,226	13,140	15,313	17,761	20,506

11.2.0 INCOME STATEMENT TABLE 11.2

This internal statement shows that when costs are properly controlled and there is better asset management, good profits can be expected. The control of raw material costs (milk) , factory labour, fixed factory costs, overhead costs, transportation expense would yield good gross margin. Further control of administrative expenses, salaries, selling expenses, telephone expenses, advertising, travel and entertainment would generate a good operating profit. The factory can take advantage of the rural area investment allowance to reduce or pay no tax on the operating profit resulting in a good net profit statement. In any case, the profitability of this project as indicated on the statement shows that 2nd year, the factory earned 380 thousand and in the 10th year US $14 million.

11.3.0 CASH FLOW ANALYSIS TABLE 11.3

The statement shows that a lot of funds will be required in the first two years of the project. Iff short term loans are acquired with the high interest costs in the country, funds, for re-investment would be limited in those early years. The cumulative excess cash indicated, presumes that re-investment is not a priority for the factory hence the figures.

TABLE 11-2

ROYAL FOOD INDUSTRIES

PROJECTED NET INCOME STATEMENT

Item	Year 1	2	3	4	5	6	7	8	9	10
Total Sales (000's $)	7,983	9,129	10,955	11,832	12,778	13,800	14,904	16,097	17,384	18,775
DIRECT COSTS	4,756	5,439	6,526	7,049	7,612	8,221	8,879	9,589	10,357	11,185
Materials	4,623	5,286	6,343	6,851	7,399	7,991	8,630	9,320	10,066	10,871
Direct labour	67	76	91	99	106	115	124	134	145	156
Utilities	67	77	92	99	107	116	125	135	146	158
GROSS MARGIN ON SALES	3,227	3,691	4,429	4,783	5,166	5,579	6,025	6,507	7,028	7,590
INDIRECT COSTS	1,104	1,184	1,269	1,362	1,462	1,570	1,687	1,813	1,950	2,097
Adm. & Marketing	787	850	918	992	1,071	1,157	1,249	1,349	1,457	1,574
Management & Technical	92	99	107	116	125	135	146	157	170	184
Other overheads	225	234	244	255	266	279	292	307	322	339
DEPRECIATION	697	697	344	344	344	344	344	344	344	344
OPERATING PROFIT	1,426	1,810	2,816	3,077	3,360	3,665	3,994	4,350	4,735	5,150
INTERESTS EXPENSES	376	365	309	265	221	177	132	88	44	0
GROSS PROFIT	1,050	1,445	2,507	2,812	3,139	3,488	3,862	4,262	4,690	5,150
INCOME TAX	212	462	802	900	1,004	1,116	1,236	1,364	1,501	1,648
NET PROFIT	838	983	1,704	1,912	2,135	2,372	2,626	2,898	3,190	3,502
DIVIDENDS	70	70	70	140	140	140	140	140	140	140
PROFIT	380	1,293	2,927	4,699	6,694	8,926	11,412	14,170	17,220	20,581

TABLE 11.3

ROYAL FOOD INDUSTRIES

PROJECTED CASH FLOW

Year	1	2	3	4	5	6	7	8	9	10
SOURCE OF CASH	5,167	2,123	2,507	3,159	3,421	3,703	4,008	4,338	4,694	5,078
EQUITY	2,067	0	0	0	0					
LOANS	3,100	0	0	0	0	0	0	0	0	0
OPERATING PROFIT	0	1,426	1,810	2,816	3,077	3,360	3,665	3,994	4,350	4,735
DEPRECIATION	0	697	697	344	344	344	344	344	344	344
USES OF CASH	5,111	1,059	990	1,662	1,705	1,868	1,838	1,917	2,004	2,201
INVESTMENT & REPLAC.	4,723	0	0	0	0	100	0	0	0	100
VAR. IN WORKING CAP.	0	349	40	60	32	35	37	41	44	48
DEBT SERVICE										
Interest	388	376	365	309	265	221	177	132	88	44
Repayment	0	52	52	420	368	368	368	368	368	368
TAXES	0	212	462	802	900	1,004	1,116	1,236	1,364	1,501
DIVIDENDS	0	70	70	70	140	140	140	140	140	140
EXCESS/DEFICIT	56	1,064	1,517	1,498	1,716	1,835	2,170	2,421	2,690	2,878
CUMULATED CASH BALANCE .000	56	1,120	2,637	4,135	5,851	7,687	9,857	12,278	14,968	17,845

TABLE NO. 4

ROYAL FOOD INDUSTRIES

PROJECTED - WORKING CAPITAL ANALYSIS FOR YEAR 2, 4, 6, 8 AND 10

Period	Work Cap (Days)	2	4	6	8	10
1. CURRENT ASSETS						
1.1 ACCOUNTS RECEIVABLE	15	333	456	532	621	724
1.2 INVENTORIES						
- Raw materials	7	90	123	144	168	196
- Work in progress	2	28	38	44	52	60
- Spares	120	18	18	18	18	18
1.3 CASH IN HAND	10	43	46	50	54	59
TOTAL CURRENT ASSETS		740	986	1,142	1,324	1,537
2. ACCOUNTS PAYABLE	30	391	536	625	730	851
3. NET WORKING CAPITAL		349	450	516	594	686
4 INCREASE/DECREASE IN WORKING CAPITAL		349	60	35	41	48

11.4.0 **WORKING CAPITAL ANALYSIS TABLE 11.4**

This portion shows a deliberate increase in the working capital in the first year due to either investor injection of cash or short term borrowing plus end of year projected profit. If dividends are declared and paid out, then working capital figures change showing a dip in working capital position in those early years. If stable dividend payments are maintained. working capital projections also remain stable making the project appear viable.

11.5.0 **RATIO ANALYSIS CHART NO. 3**

Using the discounting rate of 18% working capital days of the statement shows that there is low investment required and high returns consistently achieved for 10 yrs from 2nd year of operations.

11.6.0 Returns on total investment shows 31.2% in fourth year of production.

11.7.0 Returns on equity is also impressive at 78% in 4th year. There is some re-adjustment in third year due to loans repayment

11.8.0 **BREAK EVEN POINT**

The project should make sales of US$9.17 Million in the second year to break even at 88%.

The 4th year, the factory should break even at 41.2% of production or sales of 11.8 Million Dollars.

11.8.1 BREAK EVEN POINT ANALYSIS MANUAL COMPUTATION

TABLE: 11.5 (IN OOO'S $)

	Year			
	1	2	3	4
SALES REVENUE	7,983	9,129	10,955	11,832
Variable Costs (total)	4,756	5,439	6,526	7,049
Fixed Costs (total)	2,177	2,246	1,922	1,971

Where variable costs (V.C) are made up of materials, direct labour, and utilities expenses. The fixed costs (FC) are made up of, Administrative costs, marketing expenses, senior management salaries and benefits, and other overhead costs including insurance, depreciation, and interest costs.

The following formular is used in this model:-

$$BEP = \frac{FC \times 100}{S - VC}$$

The 4th year when production level reaches 100% is used in this example.

$$BEP = \frac{FC \times 100}{S - VC} = \frac{1971 \times 100}{11,832 - 7049}$$

$$= \frac{1971 \times 100}{4783}$$

$$B.E.P = 41.2\%$$

Year 2 of production or 1st year of project scheduling as in Table 11.5 will show the following trend.

$$BEP = \frac{FC \times 100}{S - VC}$$

$$= \frac{2177 \times 100\%}{7,983 - 4756}$$

$$= \frac{2177 \times 100}{3227}$$

$$= 67.4\%$$

BEP.3

From the above analysis, the project has good performance rate. The initial year of production when the sales are

projected to be low and the initial cost at the plant high - especially the financing costs and depreciation, the project's BEP is 67.4% which is slightly above the economically acceptable level of 65%. The 4th year when the factory's production capacity is at 100%, we note that BEP is at 41.2% which is very good performance for a new project.

MANUAL COMPUTATION OF INTERNAL RATE OF RETURN (IRR)

Year	Net Cash Flow at 31%	Discount factor	NPV at 31%	Discount factor at 32%	NPV at 32%
1	(4,723)	0.763	(3,603.65)	0.756	(3,570.59)
2	1,084	0.583	631.97	0.574	622.22
3	1,517	0.445	675.06	0.435	659.90
4	1,498	0.340	509.32	0.329	492.84
5	1,716	0.259	444.44	0.250	429.00
6	1,835	0.198	363.33	0.189	346.82
7	2,170	0.115	327.67	0.143	301.31
8	2,421	0.115	278.41	0.108	261.47
9	2,690	0.088	236.72	0.082	220.58
10	2,878	0.067	192.83	0.062	178.44
			56.10		-51.63

CALCULATION [illegible]

$$IRR = 31 - \frac{56.10 - 51.63}{51.63 - 56.10} = \frac{4.47}{107.73} = 31 - 0.4 = 30.4\%$$

The difference with the computer IRR at 44% is assumed on 15 year basis less salvage value

PART II

SENSITIVITY ANALYSIS

This project could be sensitive to three main parameters in the Kenyan economy. The fall in the price of milk sold to the end user due to intense completion in the market. The cold parameter to affect the factory's performance would be an increase in fixed cost either through general increase of salaries paid to senior managers, marketing costs increase - promotional costs, advertising, selling costs in transport, and other increases as in insurance premiums, rents if any and interest costs on borrowed funds. The other major parameter to affect the plant's performance would be an increase in variable cost particularly on materials. If farmers demand higher prices for their raw milk, this will affect the plant's capacity utilization. The following is a sketch on the effect on the factory's performance as per the above changes in parameters.

The principal product at Royal Food Industries will be pasteurized milk hence we will assume that the changes affect the factory at 100% production, although this product's intake of raw materials will be 75%.

Items	Year 3	Year 4
Sales revenue	10,955,000	11,832.000
Variable Costs	6,526,000	7,049,000
Fixed Costs	1,922,000	1,971,000

(a) 8% Fall in Sales Price

3rd year - $\frac{FC \times 100}{S - VC}$

- $\frac{1922 \times 100}{10,070 - 6526}$

$$= \frac{1922 \times 100}{3553}$$

$$= 54\%$$

(b) 4th year BEP with 8% fall in Sales Prices

$$\frac{FC \times 100}{S - VC}$$

$$= \frac{1971 \times 100}{10,885 - 7049}$$

$$= \frac{1971 \times 100}{3836}$$

$$= 51.4\%$$

c) BEP with increase of 8% in Fixed Costs, while other parameters remain constant.

3rd year B.E.D $\frac{FC}{S - VC}$

$$= \frac{2,076 \times 100}{10,955 - 6526}$$

$$= \frac{2076 \times 100}{4429}$$

$$= \underline{46.9\%}$$

4th year B.E.P $= \frac{2129 \times 100}{11,832 - 7049}$

$$= \frac{2129 \times 100}{4783}$$

$$= 44.5\%$$

(d) If there is an 8% increase in variable costs (materials) while other parameters remain constant.

3rd year B.E.P $= \frac{FC \times 100}{S - VC}$

$$= \frac{1922 \times 100}{10,955 - 7,048}$$

$$= \frac{1922 \times 100}{3907}$$

$$= 49.2\ \%$$

4th year BEP $= \frac{FC \times 100}{S - VC}$

$$= \frac{1971 \times 100}{S - VC}$$

$$= \frac{1971 \times 100}{11,832 - 7613}$$

$$= \frac{1971 \times 100}{4219}$$

$$= 46.7\%$$

The net effect of the sensitivity analysis above is that the factory has a fairly stable Break even point under moderate changes in the prime parameters. The B.E.P is lowest when fixed costs are increased by 8% in 4th year which reflects the point at 44.5%. The highest BEP is noted when there is a general price fall of 8% in the 3rd year of production at 54%.

The analysis confirms the fact that a sales price increase in the economy above 8%, will have a dangerous effect on the factory's profitability. The BEP is likely to be above 65% which may be unacceptable as the factory will be producing at full capacity from the 4th year. In conclusion, a slight increase in ex-factory price or a general price increase in the economy to affect this sales price - dow-ward would trigger production readjustment while reducing other non-essential costs at the factory.

* See also computer analysed BEP chart No.2 in appendix.

AREAS THE PROJECT IS SENSITIVE TO:

The investors should watch out for another major competitor whose pricing could make the factory's products uncompetitive hence lose the potential market.

The investors also should make arrangements to invest in milk reconstituting plant for milk powder so that they can supply the market even during drought periods in the economy. Even without major droughts, there are dry months of January to March every year when K.C.C. normally pays a premium to farmers to persuade them to deliver whatever amounts of milk available. This should be looked into with a view of doing the same. Uncontrolled imports of milk products - such as butter into the Kenyan market may also affect the final sales hence, it has to be anticipated as a problem to find a solution to:

- controlling of running costs must be a priority for the factory if it is to remain competitive.

EMPLOYMENT GENERATION

From the foregoing, Royal Food Industries factory at Webuye will contribute to new employment avenues for the youths. To start, there will be 60 employees supporting approximately 600 people. The revenue generated by the volume of US$7 million in the first year and 9 million in the second year would have multiplier effect of up to US$40 million in the economy. This alone will support more people in terms of employment and investment.

INCOME DISTRIBUTION

The $9 million dollars new income in the economy and especially at Webuye, will mean some distribution of wealth in the area for all those participating in the factory sales and purchases of goods and services at the factory. There will be a general increase in disposable income for the affected citizens hence a higher sustained purchasing power than the average consumers in the area. This is evident from the salaries to be paid to the factory staff at a minimum of US$ 800 per year.

FOREIGN EXCHANGE

There will be no immediate benefit from the factory's operations in terms of foreign exchange, but later, Kenya will earn good returns from sales of the factory's products to the neighbouring countries.

ENVIRONMENTAL IMPACTS

No major environmental impacts are anticipated although chemicals used in milk plant cleaning will need proper waste control facility before disposal into natural rivers or municipal systems, which has been provided for in this study.

ECONOMIC CONTRIBUTION CAPSULE (See attached table)

ECONOMIC CONTRIBUTION (VALUE ADDED) CAPSULE (in millions)

		1	2	3	4	5	6	7	8	9	10
1.	Value of factory output (domestic)	0	7.98	9.13	10.96	11.83	12.78	13.8	14.9	16.1	17.38
2.	Value of material input	4.72	4.69	5.36	6.43	6.95	10.55	8.11	8.75	9.45	13.27
	Investments	4.72	-	-	-	-	3.04	-	-	-	3.04
	a) Imported	2.94	-	-	-	-	2.94	-	-	-	2.94
	b) Domestic	1.78	-	-	-	-	0.10	-	-	-	0.10
3.	Current Material Input	-	4.69	5.38	6.43	6.95	7.5	8.11	8.75	9.45	10.21
	a) Domestic	-	4.62	5.29	6.34	6.85	7.40	7.99	8.63	9.32	10.06
	b) Utilities	-	.07	0.08	0.09	0.10	0.11	0.12	0.13	0.12	0.15
	c) Imports	-	-	-	-	-	-	-	-	-	-
4.	NET DOMESTIC VALUE ADDED	(4.72)	3.29	3.77	4.52	4.88	2.23	5.69	6.15	6.64	4.13
5.	REPATRIATED INTEREST	.36	.36	.35	.31	.26	.22	.18	.13	.09	.04
6.	NET NATIONAL VALUE ADDED TO ECONOMY	(5.08)	2.94	3.41	4.21	4.62	2.01	5.52	6.02	6.55	4.08

CONCLUSIONS

It has been established that more than 50% of the milk produced in the country never reaches the organised market where it is processed, sold and in the process, earns the government revenue, create jobs and improve the general living standards of the population.

It has been established that Kenya's urban population is increasing at an alarming rate of 7.7% per annum which dwarf's the national population growth of 3.1% . This urban population eventually gets into the formal labour force or business hence net consumers of processed products such as pasteurized fresh milk and other milk products.

It has been established that Kenya hosts enormous number of refugees (1994) hence this is a new market for processed products and for milk, When U.H.T milk is diverted to this market, a shortfall fresh milk is experienced in the economy.

It has been established that, liberalisation of the milk industry is creating better prices for the farmer through competitive bids for his milk by different vendors unlike in gone years of the KCC monopoly.

Raw milk production in the country has been increasing yearly from 1986, 1.5 billion litres to 1993, 2.4 billion litres which has reduced KCC's total processed milk level from 30% to 15% meaning the production capacity of KCC is stagnant inspite of increasing availability of raw milk. The new

industries have not made any impact because of their small volumes and unreliable production records. New factories are definitely required to cope with this situation.

The records in the study show that this factory will be profitable if implemented on schedule. A decline in dollar value againist the Kenya Shilling has lower the cost of machinery substantially since 1993 when the prefeasibility study was made and the dollar was at 72/= to one dollar against the present 45/= to one dollar (37% drop). The machinery and equipment would be imported hence payments will be in dollars making a corresponding saving in cost.

The project is viable with good projected profits, it will create new jobs and be an addition to industrial development in the Kenyan economy. Chances of implementing the project are high.

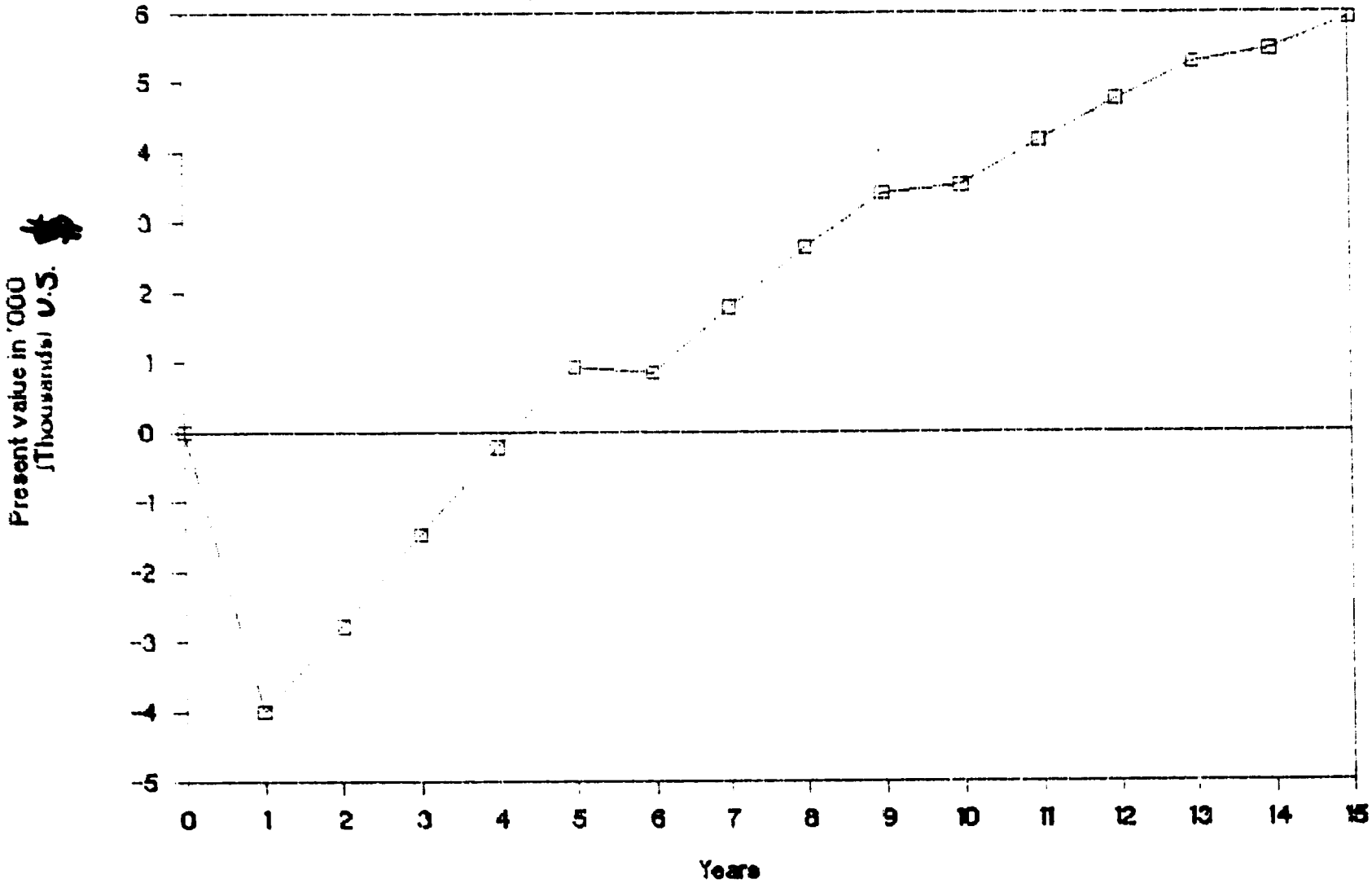
APPENDIX

ROYAL FOOD INDUSTRIES

No. 3

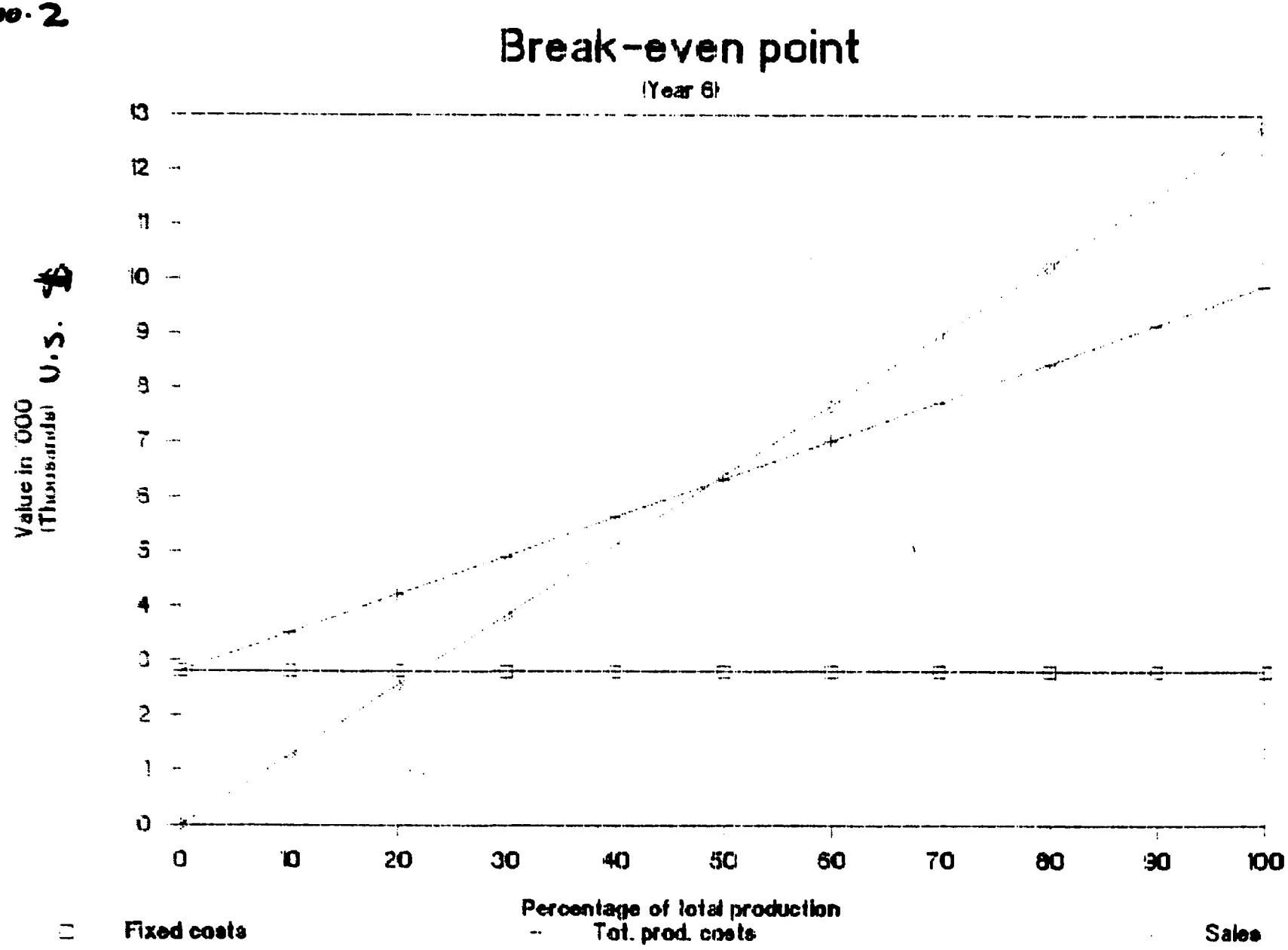
PROJECT'S Economic profile

(Npv of net cashflow at discount rate)



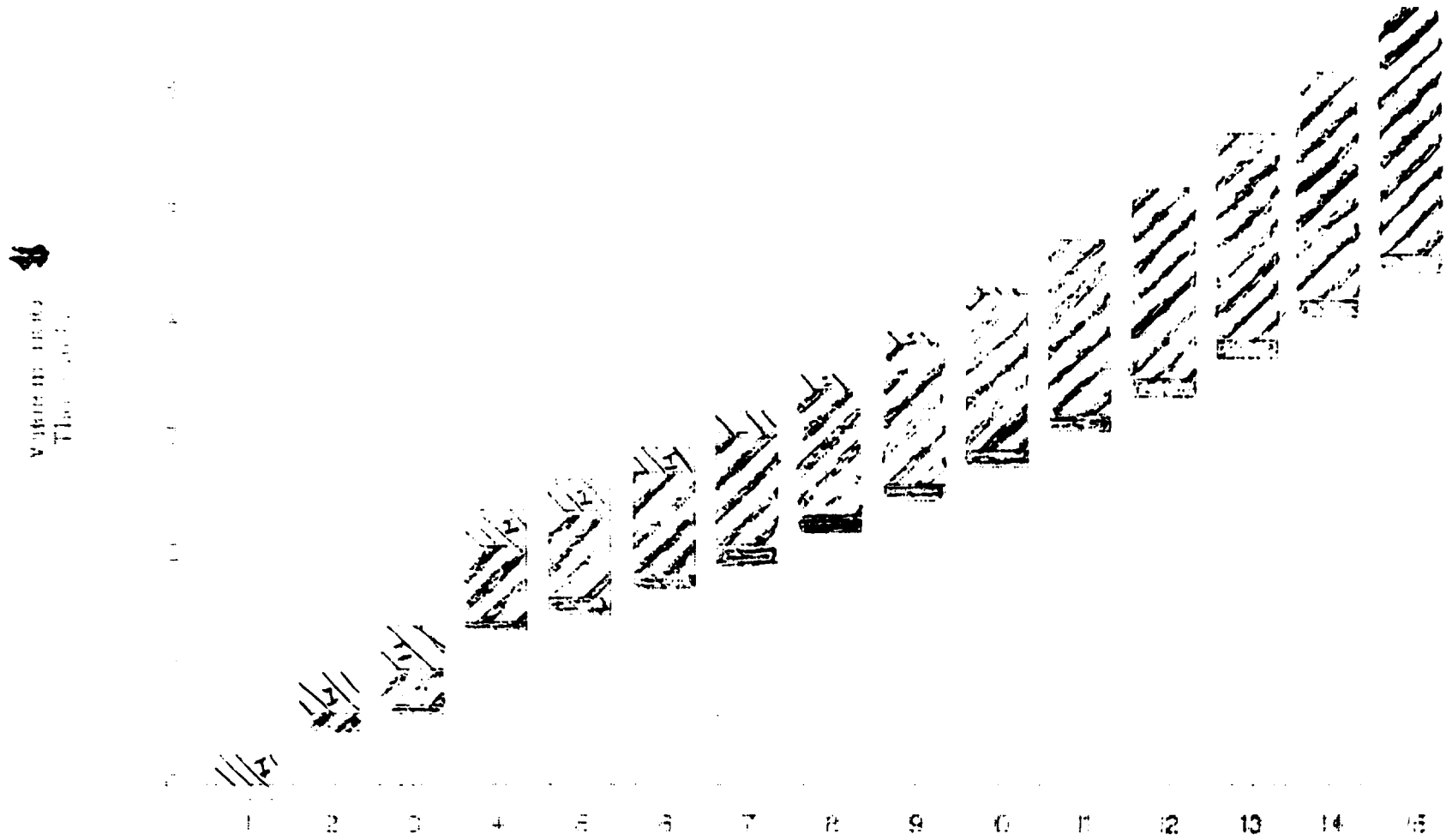
ROYAL FOOD INDUSTRIES

No. 2



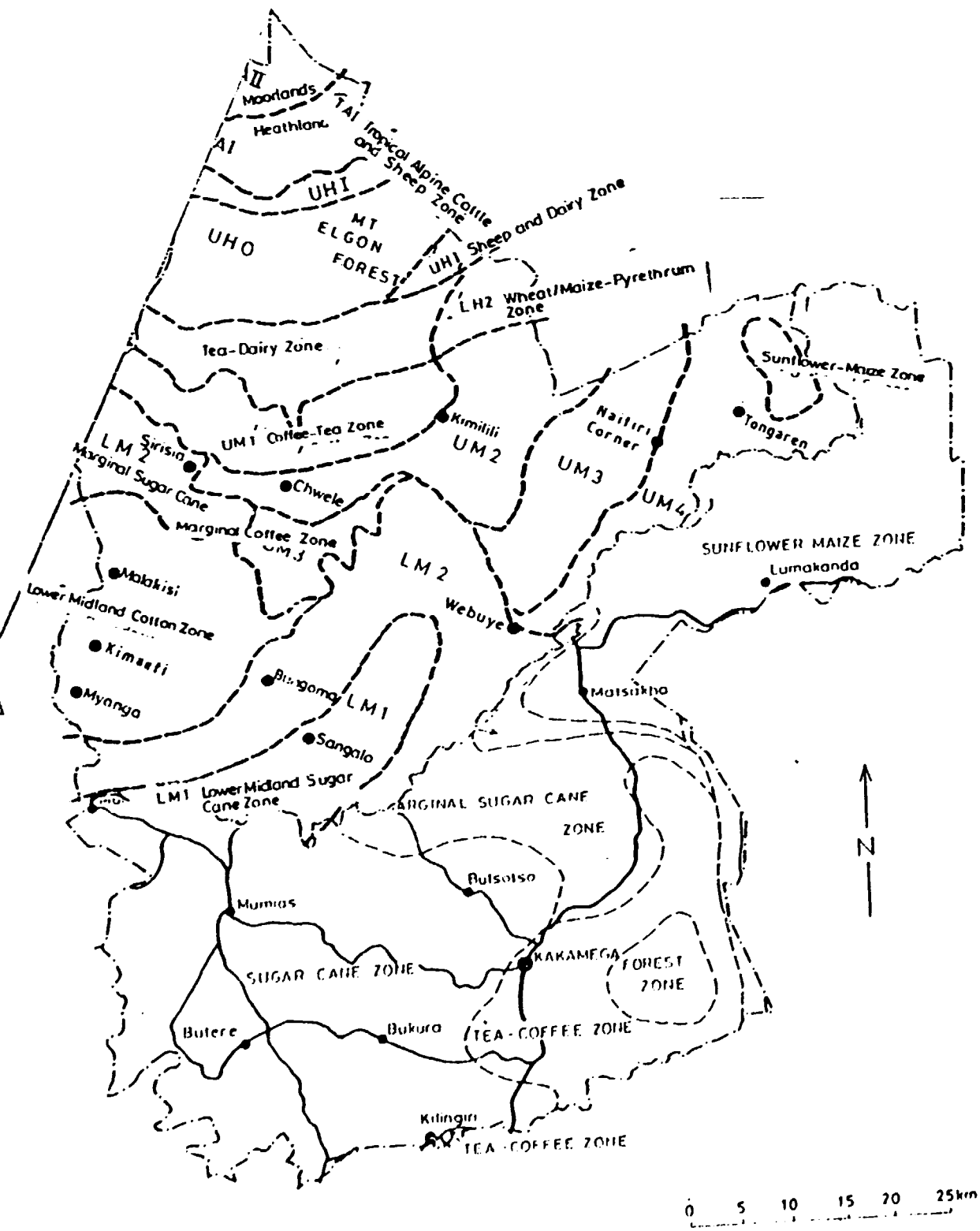
ROYAL FOOD INDUSTRIES

Operating profit analysis

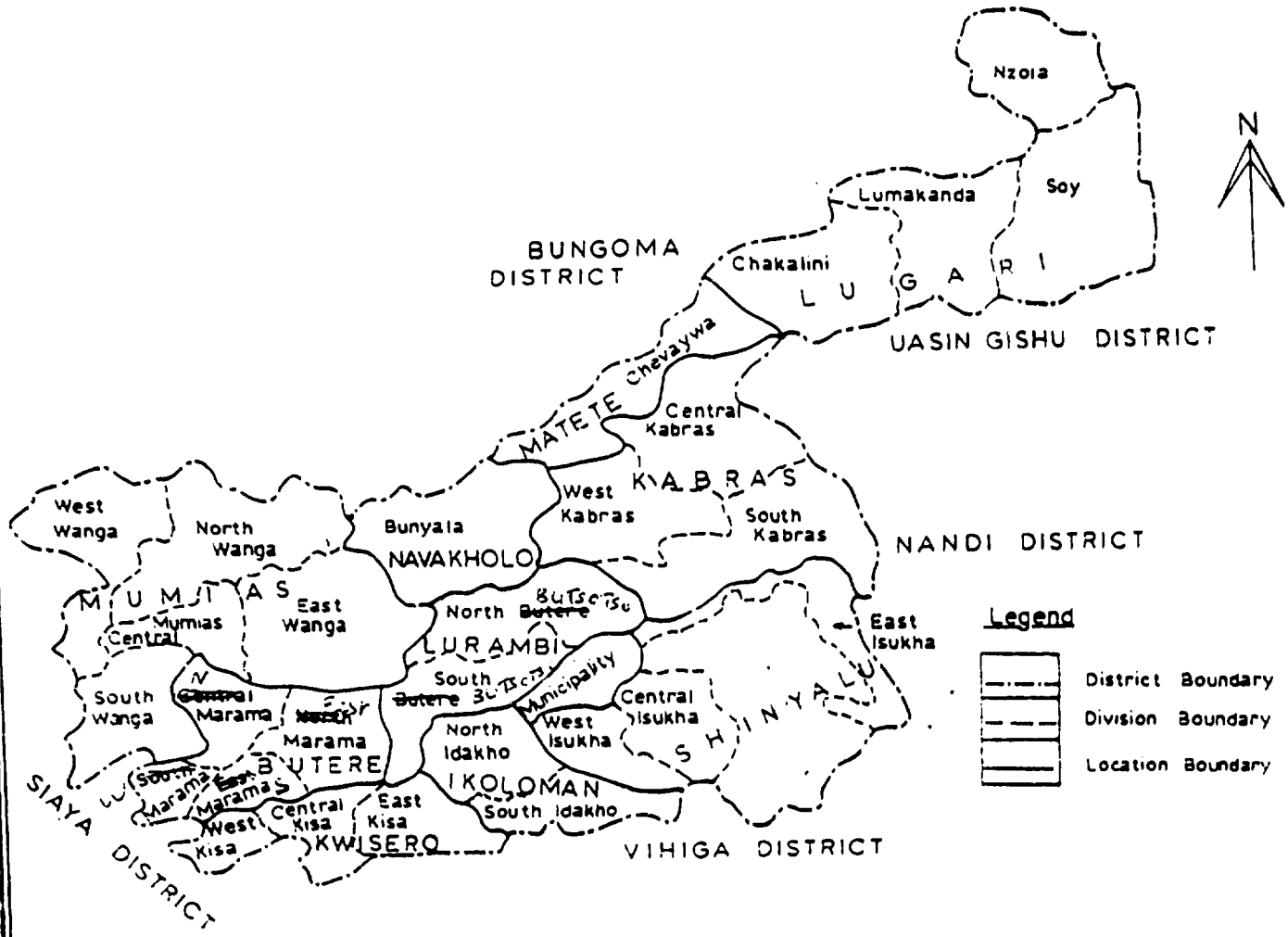


BUNGOMA DISTRICT

KAKAMEGA DISTRICT



KAKAMEGA DISTRICT ADMINISTRATIVE MAP



M.2

TABLE A.1 **Monthly Rainfall During 1988-1992 (Rainfall in mm)**

Month	Long Term Mean Monthly	1988	1989	1990	1991	1992
January	47.44	75.6	2.0	58.8	90.7	10.1
February	62.04	69.6	61.1	118.5	46.5	14.5
March	162.2	175.7	187.3	285.7	105.6	71.7
April	207.18	342.5	163.1	301.3	152.1	76.7
May	165.7	86.0	204.2	174.3	191.9	172.1
June	79.1	129.7	68.7	47.1	81.3	72.1
July	97.1	163.3	90.5	86.4	88.4	56.9
August	84.02	118.9	74.1	135.8	25.9	65.6
September	118.7	235.2	88.1	68.9	99.4	101.8
October	115.4	64.6	138.7	132.2	124.9	116.6
November	70.5	83.5	85.0	104.9	24.2	55.1
December	60.4	86.5	124.4	70.8	20.3	67.0
Mean Monthly Rainfall	105.9	135.9	107.3	132.1	87.6	73.4

Source: Meteorological Department, Bungoma, 1993

Maximum and Minimum, Monthly Mean Temperatures From 1990-1992.

Month	1990		1991		1992	
	Max	Min	Max	Min	Max	Min
January	30.6	14.2	29.6	15.5	31.9	16.9
February	27.7	14.3	30.0	15.4	28.5	20.2
March	21.1	15.6	30.1	15.8	31.1	16.9
April	26.8	15.7	26.3	16.4	28.8	16.9
May	27.8	15.4	27.2	17.0	27.7	16.6
June	26.9	13.6	26.2	16.9	26.6	15.8
July	26.7	14.2	25.1	16.7	27.0	15.8
August	27.4	13.4	26.9	16.9	27.2	16.4
September	27.7	14.9	28.8	15.5	28.2	15.8
October	28.1	15.8	27.3	16.2	28.1	15.8
November	28.2	16.3	26.1	15.9	26.8	16.5
December	27.6	15.2	28.2	16.8	28.4	16.6

Source: Meteorological Dept., Bungoma.

A.2

Mean Monthly Rainfall(mm)

Month	Long Term Monthly Mean	1988	1989	1990	1991	1992
January	76.1	157.6	16.9	116.2	129.3	26.6
February	100.6	55.4	83.3	173.6	87.6	85.1
March	160.6	193.4	202.7	192.1	203.0	45.2
April	299.9	502.6	227.1	227.5	196.4	346.5
May	271.3	260.7	242.7	169.4	469.3	207.0
June	148.8	130.6	165.1	74.4	95.2	427.0
July	155.9	293.6	114.7	87.4	92.9	162.2
August	238.6	415.8	253.3	429.9	210.2	179.8
September	166.5	290.1	172.8	130.0	118.6	133.2
October	172.2	186.8	216.3	119.3	247.9	154.0
November	134.7	124.8	125.0	178.4	112.0	96.0
December	81.2	24.6	158.5	53.9	85.2	70.7
Annual Total	2006.4	2163.6	1978.4	1952.1	2047.6	1933.3

Source: Meteological Station, Kakamega, 1993

Note: The Mean Annual Rainfall total for 5 years is 2,109 mm. The Long Term Monthly Mean Rainfall above was calculated for a period of 10 years from between 1983-1992.

Mean Monthly Temperatures (Centrigrade)

Month	Long Term Monthly Mean	Mean Monthly Temperatures 1988	1989	1990	1991	1992
January	21.0	21.0	20.2	21.1	20.7	21.9
February	21.5	21.3	21.2	20.9	21.5	21.5
March	21.9	21.3	21.2	20.7	22.0	22.9
April	21.0	21.0	20.4	18.7	21.0	21.3
May	20.5	20.6	20.0	20.4	20.5	21.3
June	19.9	19.8	18.3	19.1	20.1	20.0
July	19.2	18.3	19.3	18.7	19.1	19.0
August	19.6	19.8	19.6	18.7	19.1	20.6
September	19.9	19.7	19.7	19.5	19.9	26.6
October	20.4	20.7	20.5	19.7	19.7	26.6
November	20.5	20.4	20.9	20.1	20.3	27.1
December	20.6	20.7	20.3	19.9	20.4	26.8
Mean Annual	20.5	20.4	20.1	19.8	20.4	23.0

Source: Meteorological Station, Kakamega 1993.

NB: The Mean Annual Temperature for 5 years is 20.5 degrees centigrade while the Long Term Monthly Mean Temperatures were calculated for a period of 13 years, i.e from 1980-1992.

TABLE NO. 5

VARIETY SELECTION FOR FOOD CROPS

CROP	SEASON	VARIETY	REMARKS
Maize	Main rains	pioneer Hybrid, 614, 625	Hybrids require high cultivation standards. *1
	short rains	Dry land composite Katumani, composite B	Unlikely to succeed often. *1
Sorghum	main rains	white 1291	*1
	short rains	serena	*1,2
Beans	main rains	Roko	
		canadian wonder,	Also late rains.
		quarentino	*3
			*1
	short rains	mwezi moja	*1
		mex 142 GLP 1004, GLP 2	
			Former drought - resistant. *3
Soya Beans	main rains	Belgium Congo	*1
		Hill, 18741	*3
	short rains	Black Hawk, Hill	*1

SOURCES

* 1. Farm Management Division, Ministry of Agriculture.

* 2. District agricultural officers, Kakamega, Bungoma

* 3. Grain legume project of the National Horticultural Research Station Thika.

TABLE No. 6: ESTIMATED YIELDS FOR IMPROVED FOOD CROPPING

Crop	Season 1/	Period to harvest (days)	Well distributed rainfall required (mm)	Lower limit of optimum yield (kg/ha)
Maize	Main rains	150 to 180	550 to 750	5,000
	Short rains	85 to 95	240 to 430	2,500
Finger millet	Main rains	100 to 160	500 to 900	2,500
Sorghum	Main rains	160 to 180	400 to 800	5,600
	Short rains	75 to 95	220 to 480	4,000
Cowpeas	Main rains	120 to 150	250 to 500	2,200
	Short rains	70 to 90	200 to 400	1,500
Green gram	Short rains	75 to 90	200 to 400	1,500
Beans (eg Canadian Wonder)	Main rains	120 to 150	250 to 450	1,600
	Short rains	70 to 80	230 to 430	1,500
Groundnut	Short rains	90 to 120	280 to 550	1,800
Pigeon peas	Both seasons	180 to 260	500 to 800	2,300
Soyabean	Main rains	130 to 150	400 to 750	2,500
	Short rains	110 to 130	350 to 680	2,500
Simsim	Short rains	90 to 120	300 to 500	1,000

1/ The short rainy season has rather unreliable rainfall, and cropping is not as certain as during the main rains.

Source: Ministry of Agriculture, Farm Management Division.

TABLE 7 Fruit and Other Tree Species

Citrus:	Washington Navel on Rough Lemon stock; more work with other scions and stocks is required (eg Valencia orange and varieties of lemon, lime, grapefruit and tangerine).
Mango:	Baribo and Ngowe have been grown. Mangoes were seen to be growing well and there are many other varieties to try.
Pineapple:	The advice of the growers near Thika and the National Horticultural Research Station would be sought.
Vegetables:	Some named varieties are commonly grown, eg Drumhead and Sugarloaf cabbages and Money Maker and Marglobe tomatoes.
Bananas:	Local preferences are pre-eminently important for bananas and other fruit and the project can only provide improved planting material of local varieties.
Woodland lots:	For building of fencing poles, fuel and charcoal making, the trees shown in Table 2 are recommended.

TABLE NO 8: Recommended tree species

Tree	Species	Remarks (from 'A Guide to Species Selection for Tropical and Sub-tropical Plantations', Webb et al CFI 1980)
Eucalyptus (perhaps the best group for	E. camaldulensis	Drought-resistant but affected by termites. Stands seasonally waterlogged soils. 15-25 m^3/ha/year.
	E. grandis	Very productive species 24-70 m^3/ha/year.
	E. maculata	Prefers deep soils, fire-resistant. 21-35 m^3/ha/year.
	E. paniculata	Tolerates shallow soils. 9-18 m^3/ha/year.
	E. saligna	Commonly grown, needs free-draining and moist soils. 20-38 m^3/ha/year.
	E. tereticornis	Free-draining soils, resistant to termintes. 12-25 m^3/ha/year.
Grevillea	G. robusta	Free-draining and rather deep soils, fuel and charcoal. 5-10 m^3m/ha/year.
Cassia	C. siamea	Prefers well-drained deep soils, very tough, coppices, building poles as well as fuel and charcoal, resistant to termites. 11-30 m^3/ha/year.

APV

DTD

Below follows a summary of the technical data on basis of which the dairy plant has been designed.

Main Capacity of the Plant

Input

Milk reception (3.2% fat):	30,000 l/day

Output

Pasteurised skim milk filled into plastic pouches	1,500 l/day
Pasteurised milkfilled into plastic pouches	23,400 l/day
Mala (cultured milk) filled into plastic pouches	4,500 l/day
Butter in cups	300 kg/day
Buttermilk filled into plastic pouches	300 l/day

Basic Data

Working days

The plant is estimated to be operating 7 days/week 365 days/year.

Milk reception 7 days/week, total 365 days/year.

Power supply

Voltage: 3 x 380/220V, 4 wire

Frequency: 50 cycles

Climatic conditions

Wet bulb temperature: max. 25°C

Max. ambient temperature: 40°C

Min. ambient temperature: + 1°C

Altitude

The site is situated at an altitude of less than 500 m above sea level.

Water supply

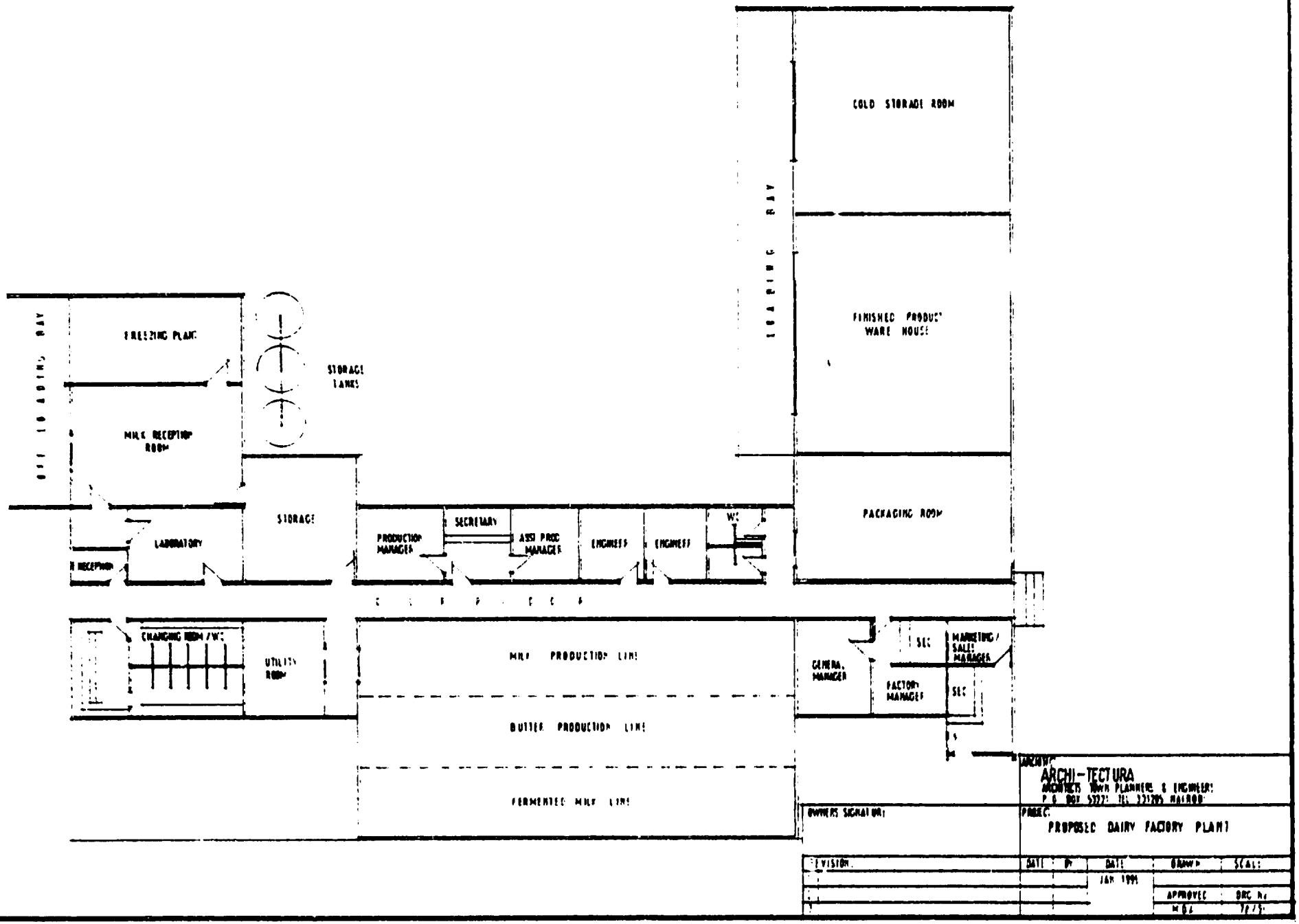
It has been assumed that the raw water temperature is 20°C and of a quality corresponding to The World Health Organization's International Standard for Drinking Water.

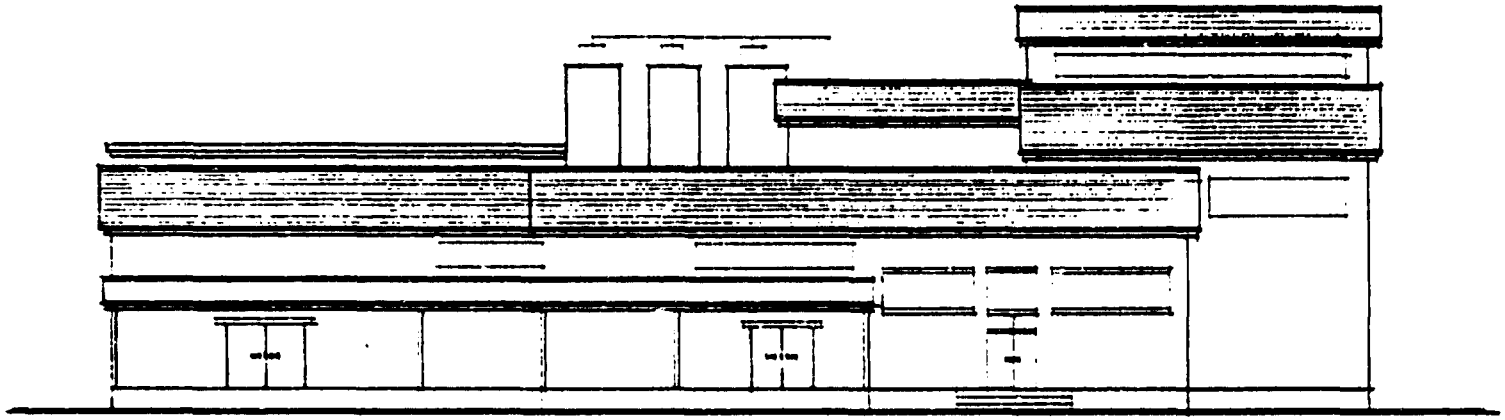
E.03 Degree of Automation

The plant is generally based on manual operation which means that the product flow is diverted to the various tanks, processing machines and filling machines by means of manually operated cocks, valves and swing bends.

The individual machines and processing lines of the plant operate to a great extent automatically, controlled and regulated by means of thermostats, pressostats, etc.

For further information, we refer to "List of Machinery", Chapter G.


COLD STORAGE ROOM
LOADING BAY
FINISHED PRODUCT WARE HOUSE
FREEZING PLANT
STORAGE TANKS
MILK RECEPTION ROOM
STORAGE
PACKAGING ROOM
LABORATORY
PRODUCTION MANAGER
SECRETARY
ASST PROD MANAGER
ENGINEER
ENGINEER
WC
CHANGING ROOM / WC
UTILITY ROOM
MILK PRODUCTION LINE
BUTTER PRODUCTION LINE
FERMENTED MILK LINE
GENERAL MANAGER
FACTORY MANAGER
SEC
SEC
MARKETING / SALES MANAGER
OWNERS SIGNATURE
ARCHI-TECTURA
PROPOSED DAIRY FACTORY PLANT
REVISION
DATE
BY
DATE
DRAWN
SCALE
JAN 1994
APPROVED
DRG No



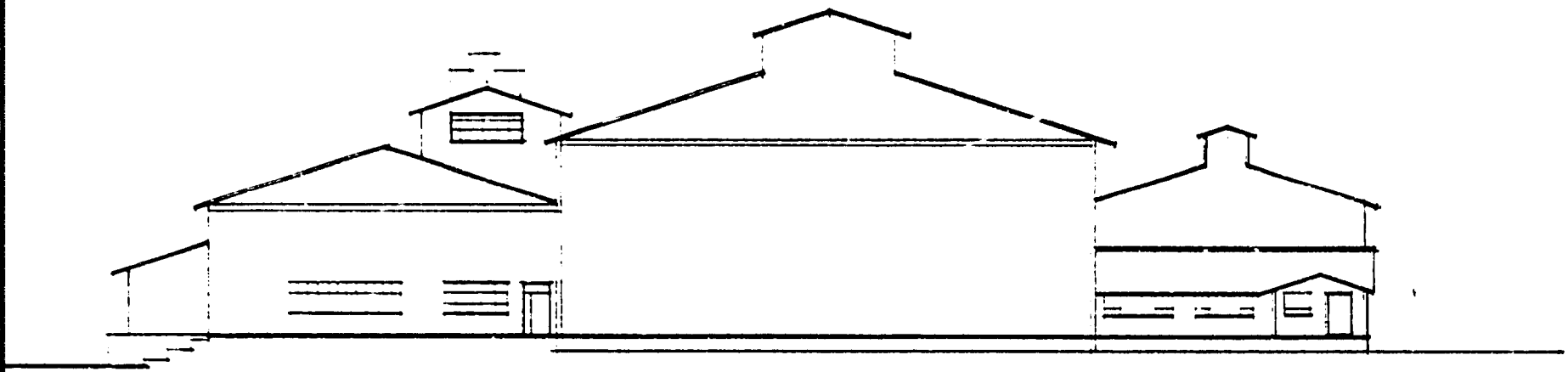
ELEVATION

ARCHITECT
ARCHI - TECTURA
ARCHITECTS TOWN PLANNERS & ENGINEERS
P O BOX 51721 TEL 331205 NAIROBI

OWNERS SIGNATURE

PROJECT
PROPOSED DAIRY FACTORY PLANT.

REVISIONS	DATE	BY	DATE	DRAWN	SCALE
1			JAN 1995		
2				APPROVED	DRG No.
3				M.O.A.	18/95



ELEVATION

ARCHITECT
ARCHI-TECTURA
ARCHITECTS TOWN PLANNERS & ENGINEERS
P.O. BOX 53171 TEL 331205 NAIROBI

OWNERS SIGNATURE

PROJECT
PROPOSED DAIRY FACTORY PLANT.

REVISIONS	DATE	BY	DATE	DRAWN	SCALE
1			JULY. 1995		
2				APPROVED	DRG No.
3				M.O.A	8/15

9

28 June 1994

TERMS OF REFERENCE FOR A FEASIBILITY STUDY FOR ROYAL FOOD INDUSTRIES ON MILK AND MILK PRODUCTS FACTORY PROJECT -WEBUYE-

A. GENERAL

To outline in detail, the Kenya Government's economic, industrial, financial, social policies that would affect this project and how they enhance its viability.

T, analyze the sectors that would benefit from this project's investment.

B. AGRICULTURE

To study and investigate in detail all factors that affect the location of the project. In particular to study;

Weather patterns in the target area including Kakamega, Bungoma and Uasin gishu districts.

Analyze the soil structure in the target farming area and its suitability for the planting of dairy animal grasses and availability of animal feeds for high yield of milk.

Look at and study disease control and other pest control measures.

The availability of land in target area for factory complex and the availability of prospective contract farmers to provide milk on a continuous basis.

Establish yields small scale farmer.

Establish high season and low season for alternative plants for production.

Analyze the output versus value of competing cash crops in the area and project a probable price structure (per kilo/litre).

C. INFRASTRUCTURE

- Survey on the transportation system in the area and government plans for improvement.

- Analyze the alternative ways and costs of receiving milk from outlying farmers, contracted by the factory, if this is necessary- The availability and costs of

infrastructure - Telephone Systems, electricity and water connections.

- Roads linking to major highways.

- Civil engineering works at the factory.

D. FACTORY

1.

- Develop the production programme.

- The required technology and its acquisition together with the attendant costs.

- Sources of Machinery and Equipment./whether new or used.

- Obtain plant design and engineering layout from experts.

- How raw materials will be acquired and processed.

- Auxiliary materials if any.

- Factory supplies to be acquired.

- Spare parts for the machinery and Equipment and availability after installation.

2. For the above supplies, quantities and quality of supplies.

   - availability schedules

   - unit costs to be developed

   - storage of raw materials,products under process finished goods.

   - delivery schedules.

E. ENVIRONMENTAL IMPACT

- Identifying the processes required at the plant

- The size of the factory and emission rates.

- Types of wastes to be generated if any

- Receptors of waste water and their costs

- Disposal of solid waste generated at the factory and the associated costs.

- The good housekeeping efforts to be developed

- Future process changes and how they can be incorporated.

F. FACTORY ADMINISTRATION

- Organisation structure of the factory
- Human resources utilization and costs associated to be projected.
- Selection of staff and workers.
- Procurement of supplies etc.
- Turnkey project (alternative analysis)

G. MARKETING MANAGEMENT AND RESEARCH.

1. Market analysis

-Product development
-Pricing structure and constraints
-Promotional Avenues

2. Distributional Channels

-Projected sales of products
-Target markets and strategies to reach them
-Direct or indirect sales
-The actual size and costs associated with marketing of the products
-Harmonizing the markets-Domestic,PTA,overseas, with the factory out put to achieve optimum operating profits.

-Constraints in the International markets
- Troughs, quotas, local content laws,
- Exchange controls, transportation.
- Taxes and food laws.

H. FINANCE:

Financial Statements:

-Internal Rate of Return.
-Payback period.
-Break-even analysis (BEP).
-Sensitivity analysis.
-Cost Benefit analysis.
-The Debt/Equity Ratios.

I. CONCLUSIONS

-The major advantages of the plant.
-The chances of reaching implementation stage.

J. OTHERS

- Look for project financier

(1c)

Prepared by:-

T.S. ISENYE
TOTAL INFORMATION SYSTEMS AGENCY
(Management and project consultants.)
P.O. BOX 57844
NAIROBI
"1994."

(18)

- Prepare draft study report in 3 copies, one to be sent to project sponsor and two (2) to UNIDO HQ for comments. The report should indicate all elements referred to above.

- Prepare final study report in 8 copies based on comments received from project sponsor and UNIDO HQ. One copy each of the final report to send to Ministry of Industry, UNIDO office in Nairobi and 3 copies each to the project sponsor and UNIDO HQ.

- In collaboration with the project sponsor discuss and present report to potential investors, financing institutions and other relevant parties.

Duration:	2 months
Date required:	As soon as possible
Duty Station	Nairobi, Kenya
Purpose of project	To assist the proprietor of Royal Food Industries in the identification, formulation and promotion of milk and milk products project.

3 x 2 = 6
1 ✓ 8
1 ✓
1

3 - UNIDO HQ
1 - MOI
1 - UNDP
1

MILK RECEPTION

TION

RAW MILK STORAGE

BULK RECEPTION

CAN WASHING

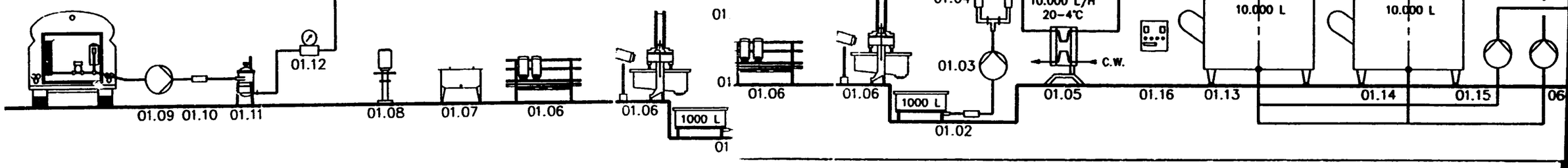
CAN RECEPT

IING

CAN RECEPTION

MILK COOLING

SECTION 1



MARKET MILK PRODUCT

MILK PRODUCTION

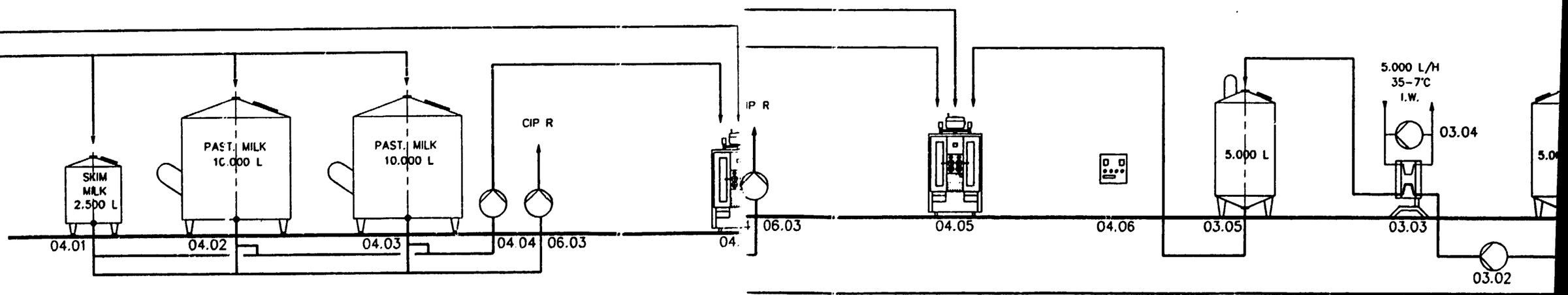
STORAGE

FILLING

FILLING

SECTION 2

MALA RIPENING/COOLING



BUTTER PRODUCTION

DUCTION

BUTTERMILK HEAT

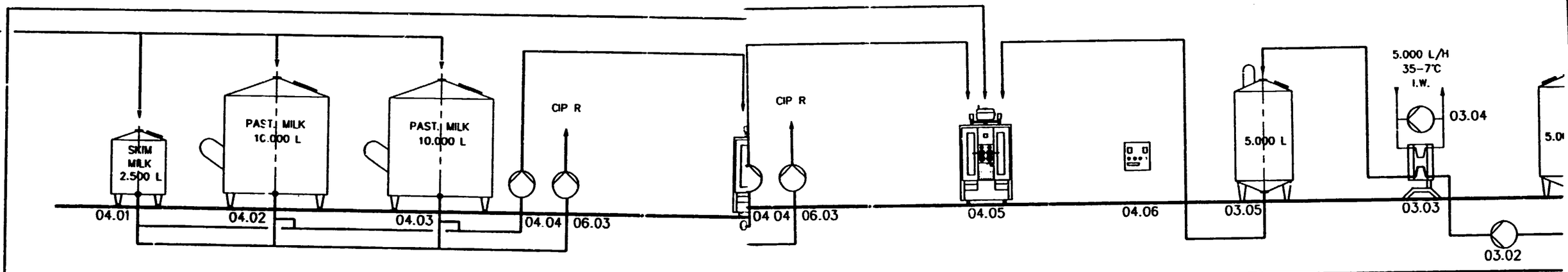
FILLING & PACKING

STORAGE

FILLIN

FILLING

MALA
RIPENING/COOLING



BUTTERMILK
HEAT
TREATMENT
AND STORAGE

BUTTER PRODUCTION

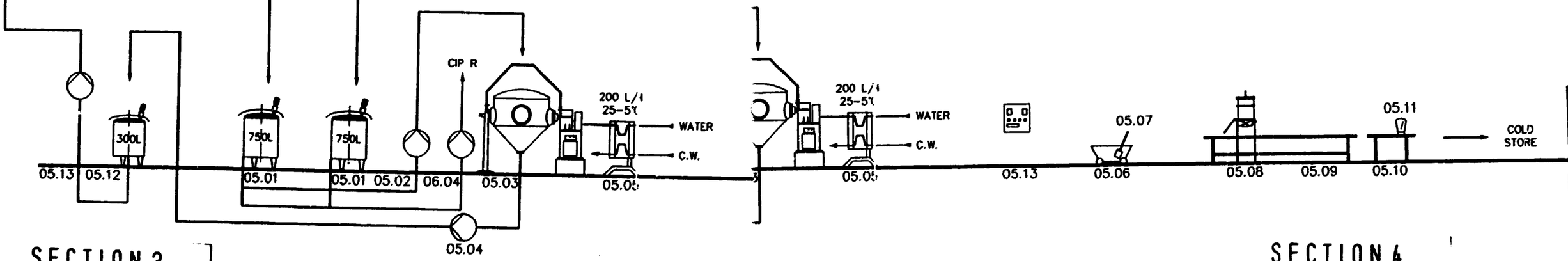
RODUCTION

CREAM RIPENING
AND STORAGE

CHURNING

RNING

FILLING & PACKING



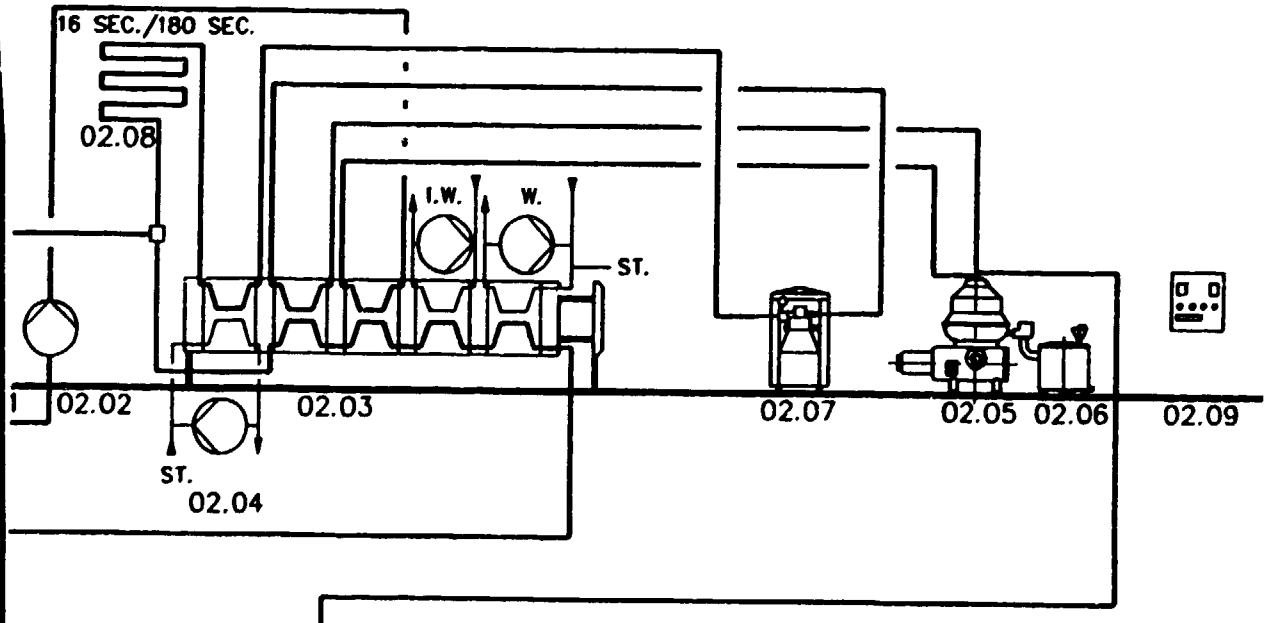
SECTION 3

SECTION 4

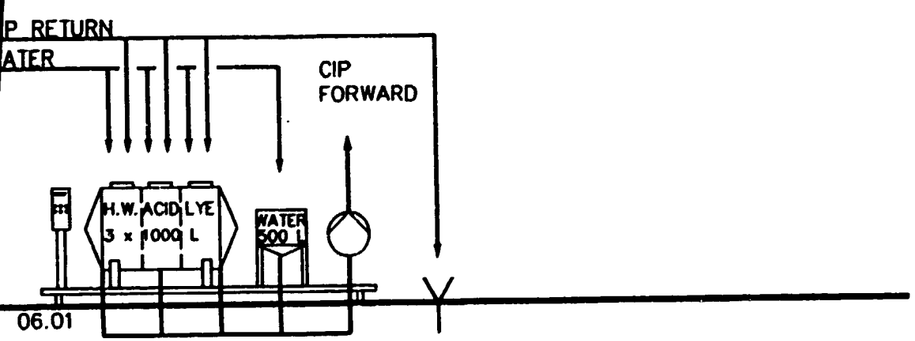
MILK TREATMENT PLANT

4-50-65-74/90-4/35°C
5.000 L/H

SECTION 1



CIP PLANT



SECTION 2

Client:

Project:

Subject:

APV
(Danish
2 Europ
Tel.: +4
This dra
utilized,

Client: ROYAL FOOD INDUSTRIES, NAIROBI, KENYA

Project: NEW DAIRY PLANT

Subject: FLOW SHEET

Drg. No:	10
Job No:	31–50406.01
Date:	22.12.94
Scale:	–
Drawn:	BIK
Approv.:	PHL

APV DTD
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APV
DTD