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STELLASCOPE FOOD COMPANY LTD

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NAIROBI

**ESTABLISHMENT OF A SORGHUM MALTING
PLANT IN KENYA
A
FEASIBILITY STUDY REPORT**

FINAL REPORT

JANUARY, 1995

KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE

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ESTABLISHMENT OF A SORGHUM MALTING PLANT PROJECT IN KENYA
A
FEASIBILITY STUDY REPORT

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JANUARY, 1995.

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ACRONYMS

- BOD - Board of Directors
- CBS - Central Bureau of Statistics.
- CSIR - Council of Scientific and Industrial Research of South Africa
- CPA - Certified Public Accountant
- EADB - East African Development Bank
- GOK - Government of Kenya
- HND - Higher National Diploma
- IDB - Industrial Development Bank
- KWS - Kenya Wildlife Services
- KBL - Kenya Breweries Limited
- KeBS - Kenya Bureau of Standards
- KiBL - Kibuku Food Limited
- KIRDI - Kenya Industrial research and Development Institute
- MBA - Masters in Business Administration
- MoCI - Ministry of Commerce and Industry
- TBI - Transitional Beer Investment
- NCPB - National Cereals And Produce Board.
- PTA - Preferential Trade Area
- SAB - South African Breweries
- SA - South Africa
- UNIDO - United Nations Industrial Development Organization

UNITS OF MEASUREMENT

- Km** - Kilometer
- Cm** - Centimeter
- cp** - Centipoise
- m/m** - mass/mass ratio
- Kg** - Kilogram
- KSh** - Kenya shilling
- HL** - Hectolitre (100 litres)

CURRENCY CONVERSION RATE (October 1994)

US \$ = 40.00 KSh.

SA Rand = 12.00 KSh

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CHAPTER I

1.0 EXECUTIVE SUMMARY

1.1 PROJECT BACKGROUND AND BASIC IDEA

1.1.1 Project Background

The project involves the setting up of a malting plant to produce 2500 tonnes of sorghum malt per year.

The objective of the project is to produce a high quality malt that can be used by the local Sorghum beer breweries.

1.1.2 Project Promoter

The project is being promoted by Mr. H.B. Ng'weno of M/S Stellascope Food Company Limited of P.O. Box 20190, Nairobi, Kenya.

1.1.3 Project History

The history of the project date back to 1993 when the promoter made an inquiry on a Sorghum cloudy beer brewery. On enquiring, the investor was advised that there is a need to establish a malting plant as a sub-component of the brewery.

1.2 MARKETING ANALYSIS AND MARKETING STRATEGY

1.2.1 The market and Demand Analysis

The projects final products are targeted for the existing sorghum breweries (KiBL and UBL), the proposed Stellascope brewery and the traditional brewers of Busaa. The market of the sorghum malt is estimated at 1600 in 1996 and at 2390 in 1999.

1.2.2 Marketing Strategy:

The marketing strategy of the project will revolve around competitive pricing, promotion through visits of sorghum breweries and timely deliveries of orders. The malt shall be sold at a competitive price of US \$ 450 per tonne.

1.4 LOCATION AND SITE

1.4.1 Location

The project will be located in Busia town in Western Province of Kenya. Busia town lies on the Western part of the country close to the Kenya Uganda border.

1.4.2 Site

The project will be sited on a one hectare plot close to the sorghum brewery in Mundika centre which is about 8 Km South of Busia Town. The site is well served with all the necessary infrastructure facilities such as roads, water and electricity.

1.3 RAW MATERIALS AND SUPPLIES

1.3.1 Basic raw materials

The plant will utilise mainly unprocessed sorghum. A total of 3,125 tonnes of Sorghum grain will be used annually. Other raw material required for the project will be water, and gunny bags for packaging.

1.3.2 Utilities

The major utilities required are electricity, hot air and factory miscellaneous supplies.

1.5 ENGINEERING AND TECHNOLOGY

1.5.1 Production capacity and Programme

The plant will have an installed capacity to produce 2500 tonnes of sorghum malt per year when operating on two (2) shifts of 10 hours each for 312 days a year. Initially, the plant will produce at 75% capacity and gradually increase to 95% during the fourth year and maintain this production level in the successive years.

1.5.2 Technology

The traditional sorghum cloudy beer processing technology that exist in Eastern and South African region will be adopted for the project. In order to refine the technology to acceptable commercial level, technological refinement inputs will be obtained from South Africa, where efficacy of the technology has been industrially demonstrated.

1.5.3 Plant, Equipment and Machinery

The plant and machinery for the project which include steeping tanks, the malting blowers, trollies and hammer mill will be sourced locally. The total cost of the equipment is US\$ 453,000.

1.5.4 Building and Civil Works

The sorghum malting plant will have a floor area of 628 m². The total cost of the building and civil works is estimated at US\$ 50,000.

1.6 ORGANIZATION AND OVERHEAD COSTS

1.6.1 Organization Structure

The project will be managed by a Board of Directors which will be the policy making organ while the day-to-day plant operation will be under a General Manager.

The operations of the plant will be divided into 3 departments namely: Production, Accounts and supplies, and Personnel Department.

1.6.2 Organization Overhead Costs

With this organizational structure a total overhead cost of US\$ 188,000 will be incurred annually.

1.7 HUMAN RESOURCES

1.7.1 Labour and staff

The project will employ 43 persons categorised as follows:

(i)	Direct labour	-	25
(ii)	Management and staff	-	18

1.7.2 Human Resource Cost

The total labour and staff costs per year are estimated to be US\$ 89,300.

1.8 IMPLEMENTATION PLANNING AND BUDGETING

The implementation of the project will take one year and four months. A total of US\$ 101,000 pre-operational expenses will be incurred during this period.

1.9 FINANCIAL APPRAISAL

1.9.1 Investment

A total investment outlay of US\$ 1,066,000 is envisaged categorized as follows:

	US\$ ('000)
Land	3
Infrastructure	8
Design & Equipment	29
Building	50
Service Facilities	214
Transport Equipment	173
Plant, Machinery & Equipt	80
Other	20
Pre-production Capital Exp.	160
Contigencies	28
Working Capital	315
Total Investment	1,066

1.9.2 Financing Plan

The project will be financed as follows:

Source	Amount US\$	Interest % p.a.		Repayment (Yrs.)	Grace Period
		Local	Foreign		
Medium term loan	283	21%	12%	5	0
Short term loan	315	25%	12%	3	0
Equity	448	-	-	-	-
Total	1,066	-	-	-	-

1.9.3 Financial Analysis

(a) Payback Period

The pay back period of the project is 6 years.

(b) Simple rate of return

The return on investment for the project increases from -5.6% during year one to a maximum of 13.5% from year six. The Return on Equity and Return on Sales will also increase from -13.3% and 0% to 32.2% and 12.8% respectively over the same period.

(c) Net Present Value

Discounted at 18% the Net Present Value of the project is negative US\$ 61.

(d) Internal Rate of Return

The Internal Rate of Return of the project is 16% which is lower than the interest rate of short term loan which is 25% or interest on saving which is 19% p.a.

(e) Break-Even Point

The project has favourable BEP as from the fourth year which at 52% is lower than the planned capacity utilisation of 95%.

1.10 ECONOMIC EVALUATION

1.10.1 Economic Benefits

The project will employ 43 persons directly and over 1,000 persons indirectly. Substantial amount of income will also be generated through the project which would benefit the local farmers and businessmen. The Government will also gain substantially from the project in terms of tax earning which are estimated at US \$ 78,000 per annum.

1.10.2 Social Costs

The project will have very limited negative impact. The social risks that are to be borne as a result of the project are the adverse effects of using agricultural chemical inputs which if not properly applied might pollute water sources. These costs are however very minimal since the farmers will be properly advised by the agricultural officers on how to apply them.

1.10.3 Conclusion

The project does not meet some of the economic viability tests such as IRR and NPV nevertheless it is considered a worthwhile investment and very crucial to the operations of the proposed Sorghum Cloudy Beer Brewery and therefore should be implemented.

CHAPTER II

2.0 PROJECT BACKGROUND AND BASIC IDEA

2.1. THE PROJECT IDEA

This project is for setting up a sorghum malting plant in Western Kenya where most of the sorghum in the country is produced. The target is to produce 2500 tonnes of sorghum malt per year mainly for a proposed Sorghum Cloudy beer brewery plant and two other existing breweries in Nairobi.

2.2 PROJECT OBJECTIVE & STRATEGY

The establishment of this plant will service the sorghum cloudy beer industries who currently do not have a local source of sorghum malt and the proposed sorghum brewery to be established in Busia District. As of now, Kibuku Food Ltd. and Umoja Breweries Ltd. have combined demand of 1200 tonnes per year. The proposed brewery in Busia District will consume about 1100 tonnes per year while other small traditional brewers will consume about 200 tonnes per annum.

The strategy of the project is to produce malt of high quality in terms of its diastatic power 27-30% in order to reduce the use of external enzymes for production of wort. Its also expected that, the use of Sorghum malt will improve the flavour characteristics of the beer (as opposed to use of raw sorghum). With this strategy, the final beer product will appeal to the consumers and therefore tap the clientele who have been pushed out of the barley lager beer produced by KBL. The KBL lager beer has in the recent past become increasingly expensive for low and middle income earners.

2.3 INDUSTRIAL POLICY

The project is being initiated at a time when the government industrial development policies are geared towards encouraging the development of local breweries and utilization of local raw materials.

The government development plans stress on the importance of the Arid and Semi-arid Lands (ASAL) for increasing productivity of the arable land. This fragile and marginal ecosystems can only support unique cereals such as sorghum and millet. The exploitation of the cereals at industrial scale will therefore fulfil the objectives of increased production in these agro-ecological zones.

The government of Kenya has also promulgated a policy to stem rural-urban balance through the establishment of small and medium scale enterprises in rural towns. The location of this plant in Busia Town goes along way to meet this objective. The establishment of the plant will also have a trickle down effect on employment as well as income

generation and distribution to the local residents especially the small scale farmers and businessmen.

2.4 PROMOTER

The project promoter is Mr. Hilary Boniface Ng'weno who is promoting the project under the business name of M/S Stellascope Food Company Limited of P. O. Box 20190, Nairobi Kenya. Presently, the company has a total share holding of Ksh. 2,000 (US\$ 500) which is expected to be increased to Ksh.5,000,000 (US\$ 125,000).

The project will be financed through a joint venture between M/S Stellascope Food Co. Ltd and local investors on the one hand and Traditional Beer Investments of South Africa on the other hand. The local investors other than Mr. H. Ng'weno include but are not limited to Kibuku Food Ltd, Umoja Breweries Ltd. and individual investors.

Mr. Hilary B. Ng'weno, who is a professional Journalist, Author, Editor, Publisher and Video/Television Producer shall be the chairman of the Board of Directors which will be in charge of the management of the project. Untill recently, the promoter was the Editor in chief and Publisher of the Weekly Review and Rainbow magazines. He is currently the chairman of the Kenya Wildlife Service (KWS) and a member of the World Bank Council of African Advisors, the African Population Advisory Committee, the Technical Advisory Board of the African Long Term Perspective Studies, the Advisory Committee on Population (the Mac Arthur Foundation, Chicago U.S.A).

2.5 PROJECT HISTORY

The project dates back two years when Mr. Hilary Ng'weno made an enquiry on the establishment of sorghum Brewery. On consulting KIRDI on the brewery aspects, Mr. Ng'weno was advised that the objective of his brewery will be met best if he incorporates a sorghum malt plant as a sub-component of the brewery project.

In 1993, KIRDI took samples of the varieties of sorghum produced in Kenya for analysis and determination of their suitability for malting purposes. The results were positive showing that the sorghum samples had good germination performance, low mould infection and polyphenol content. It was also established that the diastatic power of the sorghum samples are reasonably high.

Following the encouraging results, Mr. Ng'weno approached UNIDO to finance a feasibility study on sorghum Brewery and sorghum malt plant. This study therefore arises from the aforesaid request.

2.6 COST OF PREPARATORY STUDIES

The costs of the preparatory studies of the project are categorized into two:-

(i) Pre-investment studies:-

These include opportunity study, raw material and market survey, feasibility study have been undertaken through funds born by a third part (UNIDO). A total of US\$ 10,400 have been spent on these studies.

(ii) Preparatory Investigations:-

These studies include land surveys, quantity surveys experts (consultants and Engineering) fees and other support studies will be borne as part of the implementation investment costs.

3.0 MARKET ANALYSIS AND MARKETING STRATEGY

3.1 THE MARKET DEMAND DATA

The sorghum malt from the proposed plant will be consumed by the two current sorghum breweries and the proposed sorghum brewery in Busia Town. There will also be some market for small quantities of the malt by way of traditional brewers.

The projection of the demand of the sorghum malt has taken into account the following parameters.

- (a) the proportion of malt that will be incorporated in the sorghum beer recipe.
- (b) production capacity of current sorghum breweries and the proposed brewery in Busia town.

3.1.1 Sorghum Breweries

(a) Umoja Brewery Ltd. (UBL)

The current production of Umoja Brewery is about 1 million litres per month. Using his current recipe, this translates into about 700 tonnes/year of sorghum malt assuming 40% replacement of sorghum grain with sorghum malt.

(b) Kibuku Food Ltd. (KiBL)

The plant produces 15,000 litres of cloudy beer per day or about 400,000 litres a month. The malt requirement of this company will be 300 tonnes a year.

(c) Stellascope Food Co. Ltd.

The proposed plant will be the main consumer of the sorghum malt from the proposed project. At an output of 1.8 million litres a year of sorghum cloudy beer, the project will require 1100 tonnes of malt per year, or 4 tonnes per day.

It should however be noted, that the breweries currently are not operating at full capacity due to limitations in the market arising from poor product characteristics and image. Once these constraints are overcome, it is estimated that the demand of sorghum malt from these two breweries will rise from three to five tonnes per day.

(d) Traditional Brewers

Alongside the commercial sorghum brewers, a "cottage" traditional brewers will be producing a similar product called 'Busaa' for ceremonies, traditional festivities. It is considered virtuous to produce a brew for such

occasions at 'cottage' level than use commercially produced products. The consumption of malt through this channel is estimated at 500 Kg per day on average.

3.1.2 Ratio of Sorghum Malt in the recipe

For purposes of quality of preservation (shelf-life) and also local taste inclinations, the proportion of sorghum malt in the recipe can vary from 28-40%. It's not possible to replace the other solid inputs by sorghum malt by 100%.

The maximum percentage of sorghum malt that can be incorporated (i.e 40 percent) in the beer has been assumed in the estimation of sorghum malt demand.

3.2 MARKET DEMAND PROJECTION

3.2.1 Demand Projection

Based on the above market data analysis, the market demand projections of sorghum malt is as given in the table below.

TABLE I - SORGHUM MALT DEMAND

Year	Consumers				Total
	Stellascoppe	Umoja (Malt in Tonnes)	Kibuku	Others ¹ *	
1996	550	700	250	100	1600
1997	660	750	300	150	1860
1998	825	750	300	200	2075
1999	990	750	400	250	2390
2001+	1100	750	400	250	2500

The demand of sorghum malt as projected in the table above indicate the actual malt that will be required by the identified product users. It is however anticipated that given the liberalization of the Kenyan economy, another sorghum-based brewery may be established in the country in the near future and this might expand the market demand of sorghum malt. Further, if the existing breweries overcome their quality constraints, they may need much more sorghum than calculated above. This would mean that demand may outstrip supply. Another sorghum malt may need to be established or the current one expanded.

¹ This refers to Traditional Sorghum Cloudy breweries

3.2.2 Competition

As of now there is no single plant that produces sorghum malt in the country with the exception of Umoja Breweries Ltd. which has a rudimentary facility which they use to produce about 100 Kg per day for its own use.

No market competition is therefore envisaged for the Sorghum malt market in the near future.

3.3 MARKETING STRATEGY

3.3.1 Strategic Plan

The strategic plan in the marketing of sorghum malt will comprise of the following:

- Ensuring that the produced and marketed sorghum malt is of the required quality
- Ensuring that delivery orders are made on timely basis
- Ensuring that enough stock are held to meet any unanticipated demand
- Competitive pricing policy.

3.3.2 Marketing Promotion

The market promotion of the sorghum malt will revolve around the sensitization of the target market breweries. The financial, product quality and flavour enhancement benefits of using sorghum malt in their brewing process will be explained to the target markets. This promotional mission will be undertaken by a sales executive who will visit the breweries on occasional basis to promote the product and solicit for orders.

3.3.3 Product Pricing

Pricing policy is a very pertinent issue in the marketing of any product. Since the use of sorghum malt reduces the consumption of external enzymes, the breweries will opt to use sorghum malt if among other things the use of malt will reduce their production costs. The ex-factory price of the sorghum malt has therefore been fixed at US\$ 0.45 per kilo or US\$ 450 per tonne which is considered competitive enough given the current price of external enzymes which is about US\$ 10.5 per litre.

3.4 MARKET Vs PLANT CAPACITY

The malting plant will have a capacity to produce 2500 tonnes per year (about 8 tons per day) when operating at 100% installed capacity, assuming a 312 days year and three 8 hour shifts per day. However, given the market demand

projections (Table I) the following production programme and plant capacity utilization is envisaged.

TABLE II: PRODUCTION PROGRAMME AND PLANT CAPACITY

Year	Projected Demand	% of Installed capacity utilized
1996	16000	65%
1997	1860	75%
1998	2075	85%
1999	2390	95%
2000+	2500	100%

The above production capacity levels will enable the plant to supply adequate sorghum malt for the breweries and maintain a stock in case of any demand upsurge.

CHAPTER IV

4.0 RAW MATERIAL AND SUPPLIES

4.1 MAJOR UNPROCESSED RAW MATERIALS

In the malting plant sorghum of 'Serena' and 'Seredo' varieties as well as indigenous dark colour sorghum will be the major raw materials. At 100% capacity utilisation, 2500 tonnes of sorghum malt will be produced. Since for every one (1) tonne of malt, 1.25 tonnes of sorghum grain are required it follows that 3,125 tonnes of raw sorghum will be required per year.

All the sorghum required for the project will be sourced in the Western region of the country which currently produces over 70% of the total national sorghum output (Tables III and IV).

TABLE III: SORGHUM PRODUCTION BY PROVINCE 1989 - 1991

PROVINCE	1989	1990 (Metric Tonnes)	1991
Nyanza	57,520	46,792	49,751
Western	16,980	18,445	22,360
Eastern	39,084	37,311	30,196
Coast	1,001	1,411	285
N/Eastern	340	874	890
R/Valley	6,490	5,242	4,353
Central	85	78	56
TOTAL	121,500	110,153	107,891

Source: Ministry of Agriculture - Provincial Annual Reports.

TABLE IV - SORGHUM PRODUCTION IN WESTERN KENYA 1989 - 1993

DISTRICT	1989	1990	1991	1992	1993
		(Metric Tonnes)			
Busia	12,920	13,136	7,861	7,112	10,556
Bungoma	620	1,070	978	894	772
Kakamega	3,440	4,240	2,119	3,095	2,739
Siaya	24,360	19,562	17,550	16,000	14,740
kisumu	9,872	9,082	9,899	7,533	4,075
S/Nyanza	22,789	17,312	18,086	23,477	18,862
Kisii	499	836	674	620	473
TOTAL	74,500	65,238	57,167	58,731	52,217

Source: Ministry of Agriculture - District Annual Reports

The required sorghum grain will be sourced from buying centres, established grain dealers, contracted farmers and the NCPB if need should arise.

4.1.2 Quality Characteristics of sorghum

The sorghum to be used in the malt plant should have the following characteristics:-

- high protease and b-glucanase activities and low rate of cyanogenesis.
- low gelatinization temperature of starch.
- soft endosperm and loosely packed starch granules.
- easily accessible protein bodies associated with starch,
- high amylase activity (diastatic power of between 27-30).
- low polyphenol and tannin content.
- low mould infection.
- high germination ability (not less than 80% as lower levels give low diastatic power).
- the sorghum should also be of reasonable grain size and uniform.

4.2 UTILITIES

4.2.1 Water

Water is an important input in operation of a malt plant. Other than its use for cleaning and general purpose, water is used in processing. For every one tonne of malt, 10 m³ of potable water is required. At 2500 tonnes of malt per year, the malt plant would require 25000 m³ of water. About 25% of this water requirement is for general purposes. The water required would be obtained from the Municipal water supply or a borehole if need arises. The water should be potable and have pH of 6-7.

4.2.2 Steam

For every one tonne of malt, 1.37 Kg of Steam is required. At 25000 tonnes of malt produced per year (100% capacity utilisation) 3425 Kg of steam would be required. This is equivalent to 266 million K cal. The steam requirement will be met from a diesel-run or wood fired boiler installed at the malt plant or .

4.2.3 Electrical Power

The power supply will be supplied from the national grid which have been stepped down to the voltage for industrial use. For every one tonne of malt, 234 Kw will be required. The annual requirement of power would be 480 Kwh. To guard

against power failures which may lead to interruptions in the malting, a standby generator will be installed.

4.2.4 Cold Air (Oxygen)

The production of malt is basically a germination process. This involves the metabolism of the stored nutrients (carbohydrates) in the grain for feeding the young plant. Adequate quantities of oxygen need be feed into the germinating grain in order to avoid putrefication and decomposition which are anaerobic processes. By means of blowers, supplies of air are blown through the false bottom which forms the malting beds. It is also necessary to turn the grain often to ensure that all the grain is exposed to the oxygen uniformly. The wet built temperature of air should not exceed 25 degrees centigrade.

4.2.5 Hot Air

Once the germination has reached the desired stage, its takes about 3-7 days depending on the variety of sorghum, the malting process must be stopped. At this stage, a current of hot air at about 50 degrees centigrade is blown through the false bottom of the malt plant. This removes the water available for the germination process, reducing it from 33% to about 10%. The malt is collected at 12% moisture and content packaged.

4.2.6 Packaging Material

The malt produced is packaged in gunny bag of 50 Kg each after it has been milled. It should be noted that the sorghum malt is not polished at all so as to have a high Free Amino Nitrogen (FAN) in the wort.

4.2.7 Miscellaneous Supplies

In the malt plant other miscellaneous supplies needed to run the plant include:

- (i) cleaning materials and consumables (detergents & brushes, brooms).
- (ii) packaging materials such as gunny bags.
- (iii) maintenance materials such as grease, oils and paints.
- (iv) stationery, charts and other office supplies.

4.3 RAW MATERIAL SUPPLIES PROGRAMME

The major raw material for the malt plant is raw sorghum grain which will obtained from the suppliers such as grain dealers, NCPB, or contracted farmers. The malting plant will have stores to hold upto 10 tonnes of raw sorghum grain for continued of production. The raw material will be replenished as and when it becomes desirable.

4.4 RAW MATERIAL AND SUPPLIES COSTS

The table below gives a summary of the costs of necessary raw material using 100% production capacity of the malt plant.

TABLE V: RAW MATERIALS AND SUPPLIES COST

<u>Raw Material</u>	Unit Cost (US \$)	Quantity	Total Costs
Sorghum	200.00	3,125 Tons	625
Water	0.25/m3	25,000 m3	6250
Electricity	0.09/KwH	608,000 Kw	54720
Fuel oil	0.45 lit.	20,000 lit.	9000
Gunny bags	1.00/ bag	32,000 bags	48000
Misc. supplies			<u>12500</u>
Total Raw Material costs			143595

CHAPTER V

5.0 LOCATION AND SITE

5.1 LOCATION

5.1.1 Location Selection Criteria

The sorghum malting plant will be located in Busia Town in the Western Province of Kenya. Busia Town is situated in the extreme edge of Kenya close to the Kenya-Uganda boarder.

Busia Town offers the best location for the project for several reasons:-

- (i) Raw materials: it lies close to the source of raw materials which will be sourced mainly from Busia District and the surrounding districts such as Siaya, Kisumu and Kakamega.
- (ii) Infrastructure: the town has the basic necessary infrastructure to support the project which includes the proposed sorghum brewing plant of which this project is a component. This would enable the malting plant to utilize the facilities that would be set-up under the sorghum brewery plant.
- (iii) Market:- about 45% of the malt produced by the plant would be sold to the proposed sorghum Brewery which will be just adjacent to the project.
- (iv) Social Capital:- the investor/promoter of the project hails from Busia and therefore the project is expected to benefit from the trust and support of the local populace towards the investor.
- (v) Government Policy:- the project would enjoy a number of investment incentives since it is located in a rural town.

5.1.2 Geography and Socio-economic Profile of Busia Town

In general, Busia District lies between latitude zero (0) degree and 0.45 North and longitude 34.25 East. Most parts of the district fall within the lake Victoria Basin and the altitude rises from 1130 m above sea level at the shores of L. Victoria to a maximum of about 1,500 m. The central part of the district is mostly peneplain which occasionally has a swampy drainage system.

Busia District receives between 1270 mm and 1790 mm of mean rainfall annually. About 50% of the annual rainfall falls during the long rains (March-May) and 25% during the short rains (August - October). The dry spells are from December through February. Temperatures in the district are almost homogeneous with annual maximum temperature ranging between 24 and 30 degrees centigrade. The annual mean minimum

temperatures vary between 14 and 18 centigrade. The potential evaporation is between 1,800 mm and 2,000 mm per year.

The District has a total population of 498,071 of which 8.5% resides in Busia Town. The population growth in the District is relatively high at 3.5% p.a.

Economically, the district is basically dependent on agriculture as the major economic activity. The major agricultural activities include, fishing, sorghum, maize, cassava and sugar cane cultivation. Agriculture presently employed an estimated 77% of the total 200,111 in the labour force bracket.

Busia district has most of the basic infrastructural facilities such as roads, water, health services, educational institutions, power supply and other social amenities. The District has a total of 791 Km of road network which is evenly distributed across the entire district. Most of these roads are all weather and therefore provide an easy transportation system. There are over 40 water supply facilities in the District, most of which are operated and maintained by the Ministry of Water Development. The District, especially Busia Town is well covered in terms of power supply. The town is connected to a 11 Kv power supply line.

The District also has 3 hospitals, 5 private health centres, 11 sub-Health centres and 17 dispensaries. In terms of educational institutions there are 37 Secondary Schools, 326 Primary Schools and 331 Pre-Primary Schools.

5.2 SITE

The plant will be constructed on a two (2) acre plot that is part of the 2.5 hectare parcel of land that has been earmarked for the establishment of a sorghum brewery complex in Mundika Market, about 8 Km South of Busia Town.

The site in Mundika Market lies close to the Kenya-Uganda highway (Map 2) and the plot belongs to the promoter of the project Mr. H. Ng'weno who is the Managing Director of Stellascope Food Company Ltd.

The site in Mundika has been selected for the project because:-

- of its terrain which is fairly flat and hence ideal for the project.
- the site plot is on free hold ownership and undeveloped and hence easier to acquire without any extra social costs e.g. displacement of people and/or compensation of the existing users.

- Mundika Market has been earmarked as the future district headquarters when they are relocated by the present location in Busia Town.

With all the above factors, the site is considered the most ideal for the sorghum malting plant.

5.3 ENVIRONMENTAL IMPACT ASSESSMENT

5.3.1 Direct Environmental Impact

The establishment of the malting plant in the area will have no immediate nor future impact on the environment. This is because the technology of sorghum malting does not involve the use of any chemical substances or unbiodegradable substance that are harmful to the environment. The waste effluent from the plant will mainly be composed of waste water without any chemical. The waste water so discharged from the plant will be treated and discharged to an oxidation pond to allow decomposition of biological materials after which it will be released into the river.

5.3.2 Indirect Environmental Impact

Some limited indirect negative environmental impact is expected from the project which will arise from the agricultural activities necessary to supply adequate sorghum raw material for the plant. It is anticipated that due to the farmers of agricultural inputs such as pesticides and fungicides, the same may find their way into open water sources and therefore cause pollution. This can however be mitigated by the use of bio-degradable fertilizers and fungicides. The ministry of Agriculture Field Extension Officers are expected to work closely with the Ministry of Environment officers in advising and assisting the local farmers on the appropriate use of chemical agricultural inputs. This would greatly minimise the risk of water pollution.

CHAPTER VI

6.0 ENGINEERING & TECHNOLOGY

6.1 PLANT PRODUCTION PROGRAMME

The sorghum malt plant is being set-up as a subsidiary project to the sorghum cloudy beer project. The production programme therefore is set in such a manner as to fit that of the brewery. Further more, the technology applied in the brewery, particularly the recipe, dictates the sorghum malt quantities and qualities required.

6.1.1 Production Data

Based on the malt market projection (section 3.3.2) and need to have a stock for at least one months market supply, the following production levels are envisaged in the first four years of the project.

TABLE V: PRODUCTION DATA

Year	Quantity Produced	% of Plant Capacity
1	1,750	75%
2	2,000	80%
3	2,125	85%
4+	2,400	95%

6.1.2 Preparation of Production Programme

The operations of the malt plant are phased out , in the initial stage, with those of the brewery. The trial runs for brewery are expected in November 1996, and therefore the malting plant should start operations by January 1997. This will ensure adequate supplies for the brewery trials runs.

The strategic stocks of raw materials should be accumulated in three months before the malt plant starts operations

Once the plant starts operations, its expected that it will be closed for at least 30 days annually for routine repair and maintenance. This will ensure that the machinery are kept in sound condition.

6.1.3 Plant Capacity

The plant will have an installed capacity to produce 8 tonnes of sorghum malt per day or 2500 tonnes per year. These production levels are based on an average of 26 working days per month or 312 days a year. The plant will operate two (2) 10 hour shifts a day.

The actual production capacity of the plant will increase from 75% during the 1st year to a maximum of 95% to be achieved by the fourth year as shown in Section 6.1.2 above.

Although there is no technologically minimum feasible capacity in malting, the plant in this project has been designed to meet the minimum requirements of the proposed sorghum brewery. The additional capacity is for meeting the market demand from the other sorghum beer brewers. Nevertheless, a plant of higher throughput, if the market existed, is desirable as the profit margin would be higher as a result of economies of scale.

6.2 TECHNOLOGY

6.2.1 Technology Selection and Acquisition

The technology for malting of sorghum has been practised in Kenya for a long period. However, this is the first time that it will be done at industrial scale. In the past, traditional beer brewers have tended to use finger millet malt in preference to sorghum malt for two-fold reasons:-

- finger millet is easier to malt.
- the enzymatic power of finger millet malt is higher as opposed to sorghum malt.

In this project, sorghum has been selected as the raw material for malting since it will be supplied to the sorghum cloudy beer and also because the finger millet is a smaller grain and hence cumbersome to handle.

At industrial scale, malting plants have mechanical equipment for turning the grain but this will be expensive for this project. The technology applied in this project will be manual in order to keep the investment costs low and take advantage of the cheap labour available in the location of the plant. The design of the plant will be acquired from South Africa under the joint venture arrangements and in collaboration with KIRDI and CSIR.

6.2.2 Manufacturing Process and Quality of Product

The manufacturing process of malt production is categorised into three major steps:

- raw material acquisition
- manufacturing process
- product quality characteristics.

(a) Raw Material acquisition

In order to get a product of high quality characteristics, it is important that one begins with good raw material. It is desirable that the sorghum raw material for the plant have the following characteristic:-

- clean (free from contaminants, chaff and debris)
- low polyphenol content (tannin)
- low mould infection
- free of aflatoxin
- low moisture content (maximum of 13%)
- high content of bio-degradable carbohydrates particularly starch.

The sorghum for the plant will be received from the local farmers, NCPB and grain traders. The project will have some storage facility for about 300 tonnes of sorghum grain.

(b) Manufacturing Process

The sorghum grain from the store after being sampled for germination ability which must be over 80% is processed as follows:-

- (i) the grain is steeped in tanks of about 7500 tonnes. The ratio of water to grain is 1:1 m/m. The grain is allowed to imbibe water to reach a moisture content of 35% wet weight basis. To accelerate the absorption of water by the grain, constant agitation is necessary and as an option compressed air may be used. The steep process takes about 12 hours.
- (ii) the steep water is separated from the wet grain by straining and the grain transferred into germination room/boxes.
- (iii) the grain is allowed to sprout on the germination boxes which are essentially concrete troughs with "false bottom" -a bottom which is perforated to allow for aeration of the grain.

The sprouting takes place under controlled condition of temperature and relative humidity, the wet bulb temperature need be below 25 degrees Centigrade. Constant uniform aeration is necessary as this provides the required oxygen potential for sprouting to take place otherwise the sprouting grain will 'die' leading to decomposition and putrefication of the material. The oxygen and air for the aeration of the grain will be supplied by means of blowers (fans) through the 'false bottom' concrete troughs. To access the grain to oxygen uniformly, the depth of the grain concrete troughs is at most half meter deep and constant turning of the grain is necessary.

- (iv) the sprouting grain is sampled time and again to assess the diastatic power and extent of sprouting. Once the diastatic power reaches 27-30, the sprouting is stopped by opening the germination boxes to ambient conditions and immediately depriving of the grain the moisture acquired during steeping.
- (v) hot air of about 50 degrees Centigrade is blown through the germination boxes and grain dried with constant turning until the grain reaches moisture content of 12%.
- (vi) the dry malt is then transferred to a milling section where it is size - reduced (hammermill or disc mill) and packed.

(c) Product Quality characteristics

The final product has to meet the following quality specifications:-

- (i) a diastatic power of 27-30.
- (ii) development of high degree free amino Nitrogen (FAN) as evidenced from radicle development.
- (iii) absence of cyanide.
- (iv) absence of aflatoxin.
- (v) moisture content of about 12% for ease of storage.

6.3 EQUIPMENT

The production and auxiliary equipment (with costs) that are necessary for the malt plant are outlined below:-

6.3.7 Production Equipment

Name	Capacity	No	Cost (US\$,000)
Grain cleaner		1	25.00
Steeping tanks	7500 l	2	40.00
Malt plant steel screen	2.5 tonnes	2	2.50
Fans (blowers)	10m	4	2.00
Strainer	0.5/hr	1	2.00
Trollies	0.5 tonn	7	4.00
Spades	5 Kg	10	0.03
Rakes	-	10	0.02
Hammer Mill	6 bags/hr		4.30
Total			79.85

6.3.2 Auxiliary Equipment:

Name	Capacity	No.	Cost (US\$ 000)
Boiler		1	187.00
Pellets		40	1.60
Trolleys		10	0.63
Lab. Equipment			25.00
Total			214.23

6.3.3 Transport Equipment

Name	Capacity	No.	Cost (US\$ 000)
Pick up	1 ton	1	26.20
Truck	8 ton	1	107.10
Saloon car	4 seater	1	25.20
Total			158.50

6.3.4 Office Equipment

Various office equipment			20.00
Total plant and machinery cost US\$			472.58

6.4 PLANT LAY-OUT

The plant will be sited in an area of two (2) acre with a built area of 628 m.sq.

The plant/machinery and equipment lay-out will be as sketched in appendix I.

6.5 BUILDING AND CIVIL WORKS

6.6.1 Site Preparation and Development

Before the project structures are put-up, the first civil engineering works to be undertaken would be the site preparation which basically involves site cleaning, fencing and levelling.

6.6.2 Building and Special Civil Works

In carrying out the design and the actual construction and civil works for the project the following requirements should be taken care of:-

- the siting of the building site should allow easy flow of traffic and future extension.

- as far as is practically possible, areas where dirt can collect i.e. horizontally level window sills, 90 degrees angles between wall and floor and gullies should be avoided.
- all floor in wet areas must permit complete draining to either suitable gullies and/or drain which are connected to the effluent disposal system.
- facilities in administrative block and the size thereof should be adequate for all work required.
- a borehole should be provided for to supply water in case of breakage in supply from the main water system.

The details for the building/civil works is as given below.

(i) Structure

The main structural elements of the building will be structural steel. This will allow fabrication to proceed whether the site work preparation and construction of the foundations are concurrently completed. This system is the quickest available for completing a simple building.

(ii) Foundations and floor slabs

Reinforced concrete.

(iii) Roof

Double spelter, fluted corrugated iron acrylic coloured.

(iv) Ceiling (where applicable)

Asbestos and fibre glass blanket.

(v) Partitions

Double spelter fluted corrugated iron acrylic coloured.

(vi) Walls

Brick work plastered and finished with epoxy paint.

(vii) Floor finish

Tiles in the grain areas.

(viii) Doors

Tongue and grooved timber internal and external personnel doors.

(viii) Doors - External

Galvanised and painted roller shutter doors.

(ix) Windows/Glazing

PVA or fibre glass sheets to same profile as side cladding.

(x) Floor drains and skirting

Open gullies.

(xi) Lighting

Lighting levels for the various process areas are as follows:

- Raw materials store - 250 watt
- Cleaning area - 500 Watt
- Steeping area - 800 Watt
- Germination area - 800 Watt
- Packing - 800 Watt
- Despatch store - 500 Watt

Lights will be switched individually in each area at the door way entrances.

Security lights will be provided outside by means of four lighting masts. Three phase and single phase power outlets will be provided in each of the process areas to serve mobile equipment.

(xii) Ventilation

Mechanical ventilation to the Factories Act requirements is to be provided as follows:

(xiii) Roads

All road works within the Malting site are to be of a standard offering satisfactory performance when subjected to heavy duty traffic. Storm water discharge will be by crossfall and surface run off. A final choice between concrete and mixed bitumen surfacing will be made in the light of material availability and costs at the time of construction.

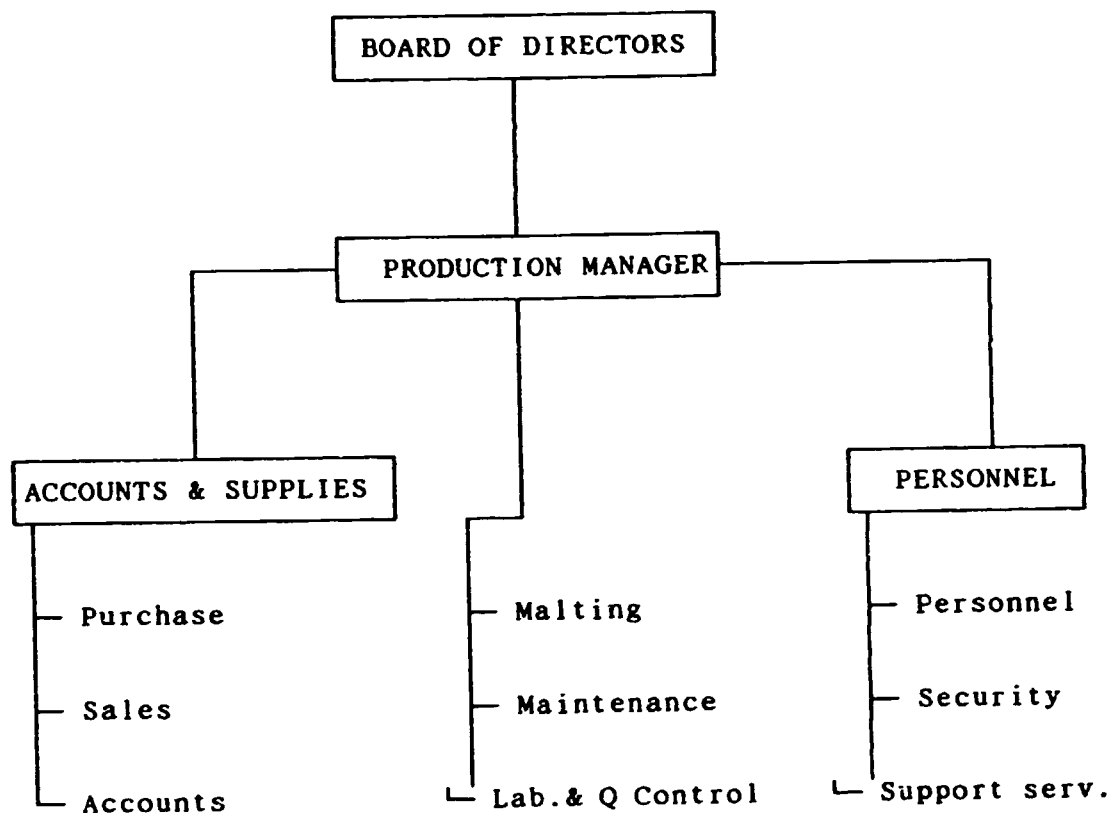
The total cost of the buildings, civil works and infrastructure development is estimated at US\$ 58,000

7.0 ORGANIZATION AND OVERHEADS

7.1 ORGANIZATIONAL STRUCTURE

The following organisational structure is proposed for the malting plant project.

CHART I ORGANISATIONAL STRUCTURE



7.1.1 Board of Directors

The BOD of the malting plant will be the same as that of the sorghum cloudy beer brewery. It will be the supreme policy making organ of the company. The BOD will be meeting at least once a month to deliberate on the operation issues of the company.

7.1.2 Production Manager (Production Department)

The Production Manager will be directly under the BOD and will oversee the overall functioning of the company. In addition, the Production Manager will also head the production department and hence will be in-charge of ensuring that the malt production programme are within the planned schedules.

7.1.3 Accounts and Supplies Dept.

The Accounts and Supplies Department will be headed by an Accountant and Supplies Officer who will be responsible for all the Company finances, purchases and sales.

7.1.4 Personnel Department

The Personnel Department will provide support services to the other departments. It will be responsible for recruitment, personnel administration, security and other personnel related matters of the plant.

7.2 ORGANIZATION OVERHEAD COSTS

The following overhead costs are anticipated.

TABLE VI: ORGANIZATIONAL OVERHEAD COSTS

Cost Item	GA	PD (US\$)	PvD	Total P.A
Adm. & Mktng.	3,000			3,000
Maintenance	-	-	25,000	25,000
Communication	10,000		-	10,000
Insurance	5,000	-	-	5,000
Training	-	-	8,000	8,000
Travel	-	-	6,000	6,000
Rents & Licences	1,000	-	-	1,000
Sub-Total	19,000	-	39,000	58,000
Deprec. of Mach. & Blding	-	130,000	-	130,000
Total	19,000	130,000	39,000	188,000

GA = General Administration PD = Personnel Department
PvD = Production Department

CHAPTER XIII

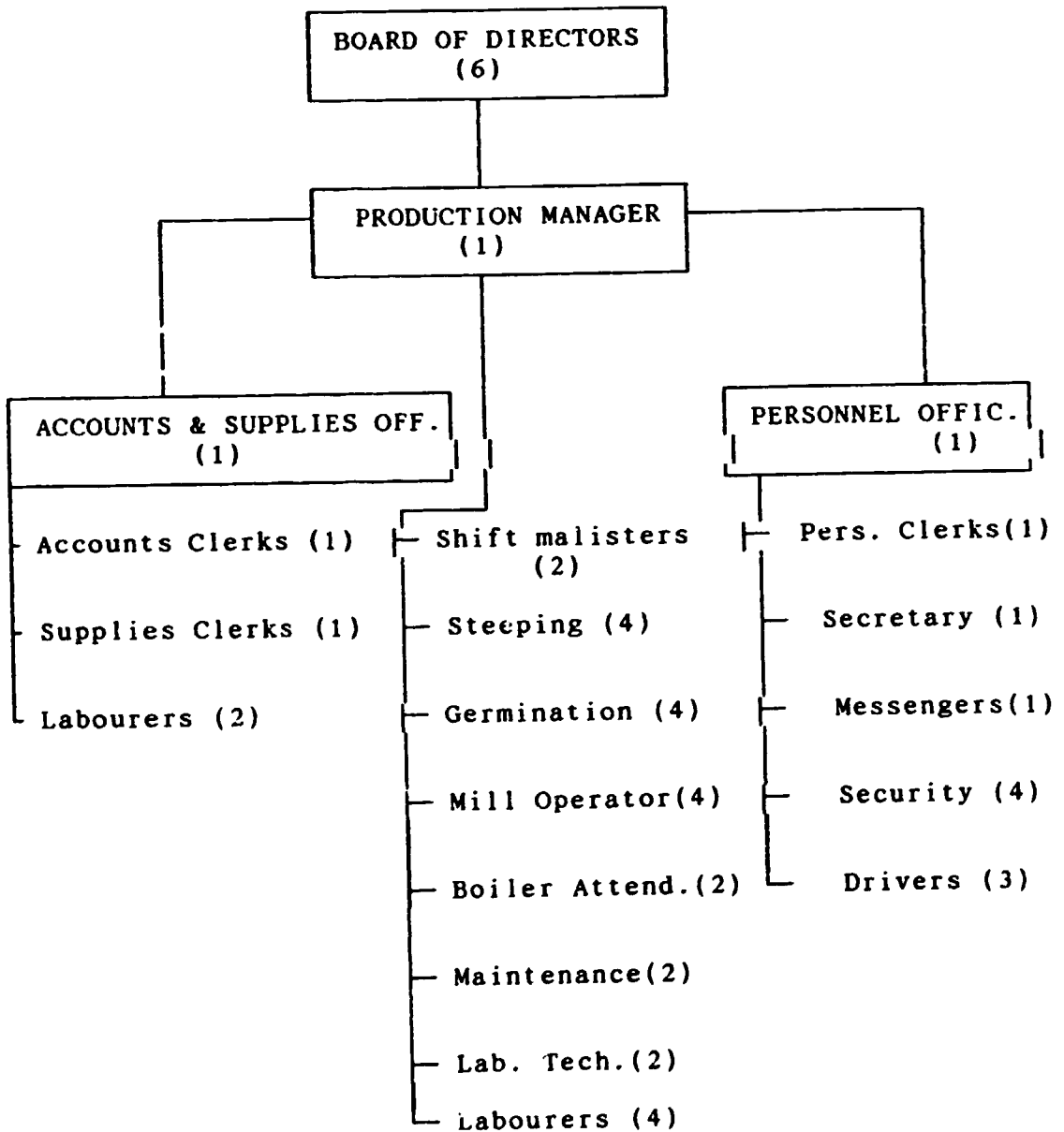
8.0 HUMAN RESOURCES

8.1 LABOUR REQUIREMENTS

8.1.1 Manpower/Labour Resources

The labour and manpower requirement for the operating of the malting plant is as given below.

CHART II - LABOUR REQUIREMENTS



8.1.2 Labour Qualification and Skills

(a) Production Department.

Category	Qualifications	Experience
Production Mgr.	Degree in Food Science with necessary experience in malting and Management	2-3 years
Shift Maltster	A diploma in food Science	2 year in a food industry
Steeping operator	At least Secondary School education	-
Germination operator	At least Secondary School education	-
Mill operator	At least Secondary School education	-
Boiler Attend.	At least Sec. education	-
Unskilled Labour	At least Primary education	-
Maintenance personnel	At least Certificate in relevant trades	-

(b) Accounts and Supplies Department.

Category	Qualification	Experience
Accountant	B.Com with A/C option or CPA II	2 years
Accounts Clerk	Certificate in Accounting	3 years
Supplies Clerk	Certificate in Stores and purchase	3 years
Labourers	At least Primary School education	-
Lab. Tech.	Diploma in Laboratory or Quality control	1 year

(c) Personnel Department.

Category	Qualification	Experience.
Personnel Officer	Degree in Social Sciences with at least a diploma in Human resource Mgt.	2 years
Personnel Clerks	Diploma in Business Adm. or Personnel Mgt.	2 years
Secretary	Relevant Secretarial qualifications	1 year
Security	At least Secondary education	Ex-armed forces or police
Drivers	Driving Trade test	3 years
Messengers	At least Secondary School education	-

8.1.3 Labour Manning Schedule and Labour Costs

TABLE VII: LABOUR MANNING SCHEDULE

Labour	Shift	No.	Cost/person per Mon.	Total P.A
Shift Maltster	I	1	375	4,500
	II	1	375	4,500
Steeper	I	2	175	4,200
	II	2	175	4,200
Germinator	I	2	175	4,200
	II	2	175	4,200
Mill Operator	I	2	175	4,200
	II	2	175	4,200
Maintenance	I	1	375	4,500
	II	1	375	4,500
Unskilled Labour	I	3	750	1,500
	II	3	750	1,500
Boilermen	I	1	175	2,100
	II	1	175	2,100
Lab. Techn.	I	1	375	4,500
	II	1	375	4,500
	III	1	375	4,500
Total		25		47,400

8.1.4 Staff Manning Table

TABLE VIII: STAFF MANNING SCHEDULE

Staff Category	Shift	No.	Cost/ per Mon/ person	Total P.A
Production Mgr.	-	1	625	7,500
Personnel Officer	-	1	500	6,000
Account/Supplies Officer	-	1	500	6,000
Per. Clerks	-	1	150	1,800
Secretary	-	1	350	4,200
Security	I	2	75	1,800
	II	2	75	1,800
Drivers	-	3	100	3,600
Accounts Clerk	-	1	250	3,000
Supplies Clerks		1	250	3,500
Labourers	-	4	62.5	3,000
Total		18		42,200

8.2 MANPOWER TRAINING

All the personnel associated with the project will receive some orientation training related to their discipline. The staff in the production department will further be attached in a sorghum malting plant in South Africa for hands on experience.

8.2.1 Overseas Attachment

The production manager, the maltsters, steeping and germinations operators will be attached to One-up company Ltd. of South Africa for a period of at least two weeks.

8.2.2 Local Training

- (a) Laboratory/Quality Control technicians will be attached to KeBs for one month.
- (b) Production Staff - one week on the job training during the trial run.

8.2.3 Training Costs

TABLE IX: TRAINING EXPENSES

Category	No.	Period	Overseas	Local	Total
Production	1	2 weeks	4,000	-	4,000
Shift Maltister	2	2 weeks	8,000	-	8,000
Lab. Techn.	2	2 weeks		400	400
Others	15	1 week	-	780	780
Total			12,000	11,780	13,180

CHAPTER IX

9.0 THE PROJECT IMPLEMENTATION AND BUDGETING

9.1 IMPLEMENTATION

The Sorghum Malting plant project will be implemented by all the concerned parties namely.

- (a) Project Promoter - M/S Stellascope Food Co. Ltd.
- (b) Other local investors - Busia professional group, (BUPA), Umoja Breweries Ltd, Kibuku Food Ltd. and others individual investors.
- (c) Joint venture (foreign) investors.
- (d) Technical consultants (KIRDI and CSIR).

9.1.1 Implementation Schedule

The implementation is anticipated to take a maximum of one year from the time the actual construction starts to the commencement of commercial production. Several of the activities in the implementation will run concurrently.

The major implementation activities to be undertaken and their time duration are given in the per-chart below.

ACTIVITY	PERIOD																		
	1994			1995			1996			1997									
	A	S	O	N	D	J	F	M	A	M	J	J	O	S	O	N	D	J	F
1. Feasibility Study	=====																		
2. Negotiations for Loans & Joint Venture						=====													
3. Signing of Joint Venture and bank loans										=====									
4. Preparation of Project Engineering details & Specifications										=====									
5. Tendering for Civil Works & Machinery											=====								
6. Building construction																			
7. Machinery Fabrication and Acquisition																			
8. Machinery Installation																			
9. Staff recruitment																			
10. Raw material Purchase																			
11. Trial run																			
12. Commissioning & Start up																			

9.2 COST ESTIMATE OF PROJECT IMPLEMENTATION

Item	Activity	Estimated Cost (local) US\$	Estimated Cost (Foreign) US\$	Total costs
1	Management of project implemen- tation	14,000	-	14,000
2	Arrangement of Supplies	3,000	-	3,000
3	Preliminary and capital issue expenses	4,000	-	4,000
4.	Detailed Eng.civil works design and Architectural fees	5,000	24,000	29,912
5.	Tendering documents	500	-	500
6.	Build up of Administration and labour	2,300	-	2300
7.	Training	1,180	12,000	13,180
	TOTAL	29,980	36,000	65,980

CHAPTER X

10.0 FINANCIAL APPRAISAL

10.1 FINANCIAL ANALYSIS

10.1.1 Total Investment

The total investment cost of the project is estimated at US\$ 986,000 as summarised below:

	Local (US\$'000)	Foreign (US\$'000)	Total US\$'000
Land	3	0	3
Infrastructure	8	0	8
Design & Engineering	5	24	3
Building	20	0	20
Service Equipment	189	25	214
Transport Equipt.	159	0	159
Plant, and Machin.	50	30	80
Other	<u>20</u>	<u>0</u>	<u>20</u>
Sub-total	<u>464</u>	<u>99</u>	<u>563</u>
Preprod. capital exp.	72	88	160
Contingencies	23	5	28
Total Initial fixed Investment	559	192	751
Working Capital	<u>315</u>	<u>0</u>	<u>315</u>
Total Investment	874	192	1,066

10.1.2 Project Financing

It is proposed that the project will be financed as follows:

Sources of Finance	Local (US\$'000)	Foreign (US\$'000)	Total (US\$'000)
Medium term loan	283	0	283
Short term loan	315	20	335
Equity	276	172	448
Total	874	192	1,066

A Medium term loan of US\$ 283,000 will be obtained from the long/medium term lending financial institutions e.g. P.T.A. Bank or local financial institution such as I.C.D.C and D.F.C.K. This loan will carry a maximum interest rate of 21% per annum and will be used mainly to finance the plant, machinery & Equipment component of the investment.

A short term loan of an equivalent of US\$ 335,000 will also be sought from local commercial banks to finance the working capital. Loan will be secured against the projects

fixed assets such as land and building. The loan will be obtained at an interest rate of 25% per annum.

The summary of the conditions of the loans is given below:

	Interest rate(%)	Repayment Period	Grace period	Year Received
Medium term loan	21	5	1	1
Short term loan	25	3	0	2

The equity capital requirement of US\$ 448,000 will be raised from both the local and foreign investors. The local equity will be US\$ 276,000 and this will be contributed by all the interested existing sorghum based breweries in Kenya notable among them being Umoja Breweries Ltd. The foreign equity contribution will be US\$ 192,000 and will be contributed by the interested South African investors.

The above financing plan will have the following debt/equity ratio.

	Amount (US\$'000)	Percentage Share	Rstio
Equity	448	42	1
Loans	718	58	1.4

The debt equity ratio is this 1:1.4. This low debt/equity ratio is acceptable to most financial institutions as it minimises on debt and the debt burden on the project.

10.2 PRODUCTION COSTS AND SALES REVENUE

The projects production costs and sales revenue for the first 4 years of the projects operation are detailed in Annex VII. During its 2nd year of operation the total production cost will be US\$ 763,000 as the plant will be operating at 75% capacity. This will increase to US\$ 903,000 after the fifth year when operating at 95% capacity. The total sales revenue will be marginal during the second year at US\$ 844,000 and rising to US\$ 1.125 million from the fifth year.

10.3 FINANCIAL STATEMENT

10.3.1 Net Income Statement

The projected Net Income Statement is depicted in ANNEX II. In the first and second years of operation the plant registers a Gross loss of US\$ 80,000 and US\$ 117,000 respectively. Thereafter the project makes appreciable Gross and Net profits yearly.

10.3.2 Pay-back Period

The pay-back period of the project is 7 years as depicted below:

Year	1	2	3	4	5	6	7
Ann. Net Cash flow	-692	-111	202	211	183	59	218
'Profit'	0	204	445	692	918	1,136	1,1540

10.3.3 Cash flow

Projected cash flow for a period of 15 years is depicted in Annex IV. The project registers a deficit in its accumulated cash balance third upto the sixth year. This is due to the immense capital investment on machinery and loan repayments.

10.3.4 Balance sheet

The balance sheet is as given in Annex V. In all the 15 years, the project has a balanced assets and liabilities position.

10.3.5 Simple Rate of Return

The project's Simple Rate of Return is as given below and detailed in Annex VI.

Period	1	2	3	4	5	6	7
ROI	-5.6	-4.3	2.7	11.9	12.8	13.5	13.5
ROE	-13.3	-10.3	6.4	28.3	30.5	32.2	32.2
ROS	0.0	-5.4	3.0	11.9	12.1	12.8	12.8

During the first 3 years, the project does not register impressive returns. However, from the 6th year onwards, on returns are positive and at acceptable levels.

10.3.6 Net Present Value

Discounted at 18% the net present value of the project is negative US\$ 61. This indicates that the profitability of the project is below the cut-off rate (18%) and hence not acceptable. However, considering that this project is mainly to provide critical inputs to the sorghum brewery, which is a highly profitable venture, the project cannot be dropped since the sorghum brewery will be able to subsidize it.

10.3.7 Internal Rate of Return

The Internal Rate of Return on the malting plant is 16%. This is much lower than the basic lending rates at 25% for the short term loan or the local Bank saving interest rate of 19% per annum. The IRR is only marginally higher than the lending rates in South Africa of 12.0% per annum. This makes the project unattractive but however due to the

reasons given on Net present Value, the project should not be dropped.

10.3.8 Break-even Analysis

The break-even point (BEP) which is calculated using the formula:

$$\text{B.E.P} = \frac{(\text{Fc} \times 100)}{\text{SR} - \text{VC}}$$

where FC = Fixed Cost; SR = Sales Revenue; VC = Variable Cost

is as shown below.

	Period (Yr)			
	2	4	6	8
Sales Revenue(SR)	844	1069	1125	1125
Variable Costs (VC)	571	722	760	760
Raw materials	471	596	628	628
Direct Labour	45	56	59	59
Utilities	55	70	73	73
Fixed Cost (FC)	918	290	194	194
Overheads	668	166	120	120
Depreciation	124	74	74	74
Interest	126	50	0	0
Sales Minus VC	273	347	365	365
B.E.P (%)	90	52	39	39

During year two when the plant is operating at 75%, the B.E.P is abnormally high at 90%. This however decreases to 39% as the utilization of the installed plant capacity increases to 95%.

10.4 APPRAISAL OF THE PROJECT

As shown in the analysis and the financial statements of the plan, the project does not qualify in some of the financial viability indicators specifically the internal rate of return, and Net Present Value. Even the B.E.P is not very impressive. As earlier noted however, this project is very basic and critical to the proposed Sorghum Cloudy Beer brewery. Since the sorghum brewery is making substantial profits and gives positive and acceptable financial indicators it is therefore possible to implement the project without any problem as there will be an element of subsidy from the brewery.

CHAPTER XI

11.0 ECONOMIC BENEFITS AND COSTS

The sorghum malting project will have numerous social and economic benefits to both the Kenyan economy as a whole and the committees living around the project location.

11.1 ECONOMIC BENEFITS

11.1.1 Employment generation

The project will generate direct employment for 43 persons and indirect employment for over 1,000 persons. The indirect employment will be generated as a result of the backward and forward linkages that the plant will have. The backward linkages will be on the local farmers who will be the suppliers of raw materials and the forward linkage will be in terms of the sorghum breweries to be established.

11.1.2 Income Distribution

At the moment, sorghum is traded but mainly as a subsistence crop. The project will create a major marketing outlet for sorghum grain. This will generate substantial income to the farmers.

11.1.3 Revenue to the Government

The project will generate a total of US\$ 79,000 as revenue annually to the exchequer. This will be paid as VAT and corporate tax.

11.1.4 Value Added

The project would also have a substantial economic benefit in terms of the Value Added on the local raw materials and other inputs. In a period of 15 years, the total Net National Value Added will be US \$ 996,000 as detailed in annex IX.

11.2 SOCIO-ECONOMIC COSTS

The project although having significant socio-economic benefits, it will also have some negative effects on the environment and the food requirements in the region which can be seen as socio-economic cost to the project.

11.2.1 Environmental Costs

Most of the areas where sorghum, the major raw material will be grown are fragile ecosystems. Use of mechanized farming systems will leave the soils open to soil erosion agents such as wind and run-offs. Also, if the farmers use more agricultural inputs e.g. fertilizers and herbicides, in an effort to increase their sorghum yield, these

chemicals if not properly managed will find their way to the water catchment areas and rivers and hence lead to water pollution.

11.2.2 Food Security Vs. Industrial use of Sorghum

Traditionally sorghum has been the staple food for a majority of the people in Western Kenya. The introduction of Industrial utilization of Sorghum will necessitate farmers to cultivate sorghum as a cash crop and thus threatening the local food security. Though this impact might be small, efforts will have to be undertaken to ensure that the locals produce enough sorghum for both their food and commercial purposes.

11.2.3 Foreign Exchange

The project will be a joint venture between local and foreign investors. The equity contributed by the foreign investors will contribute to increasing the foreign exchange reserve of the country. In addition, the setting up of the malting plant will save on foreign exchange that would be used for importing malt from say Nigeria or South Africa. Despite these long term benefits however, the project will have same negative foreign exchange impact on the Kenyan economy. Over a period of 15 years, a net foreign exchange outflow of US \$ 123,000 is expected against an inflow of only US \$ 20,000. The outflow of foreign exchange will mainly be due to importation of equipment, repayment of foreign loans, dividends and interest on the foreign loans (Annex IX)

11.3 CONCLUSION

Whereas this feasibility study has shown that the financial viability of the project is not very impressive as shown by the Internal Rate of Return and the Net Present Value, the project is however, technically feasible and socially acceptable. Considering the importance of the project to the proposed Sorghum cloudy Beer brewery project, it is recommended that the investors go ahead with the projects implementation.

ANNEX I - PROJECT SUMMARY

1. Project Title:	MALTING PLANT
3. Location	BUSIA
5. Total investment	US \$ 1,066
7. Internal Rate of Return	16%
9. Debt /Equity Ratio (Initial)	53

2. Sponso
4. Const period
6. Net Present Value
8. Payback Period
10. Retun on Equity

STELLASCOPE FOOD LTD.
12 MONTHS
(16) at Discount rate 18%
6 YEARS
30% at full operation

ANNEX II - NET INCOME STATEMENT

Item	Period >>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TOTAL SALES		0	844	956	1069	1125	1125	1125	1125	1125	1125	1125	1125	1125	1125	1125
DIRECT COST		0	570	646	722	760	760	760	760	760	760	760	760	760	760	760
Materials		0	471	533	596	628	628	628	628	628	628	628	628	628	628	628
Direct Labour		0	45	50	56	59	59	59	59	59	59	59	59	59	59	59
Utilities		0	55	62	70	73	73	73	73	73	73	73	73	73	73	73
GROSS MARGIN ON SALES		0	274	310	347	365	365	365	365	365	365	365	365	365	365	365
INDIRECT COSTS		0	69	69	69	69	69	69	69	69	69	69	69	69	69	69
Adm. & Marketing		0	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mnagement & Techn.		0	41	41	41	41	41	41	41	41	41	41	41	41	41	41
Other Overheads		0	25	25	25	25	25	25	25	25	25	25	25	25	25	25
DEPRECIATION		0	124	124	74	74	74	74	74	74	74	74	71	71	71	71
OPERATING PROFIT		0	80	117	204	222	222	222	222	222	222	222	225	225	225	225
INTEREST EXPENSES		59	126	88	50	12	0	0	0	0	0	0	0	0	0	0
GROSS PROFIT	(59)	(46)	29	154	210	222	222	222	222	222	222	222	225	225	225	225
INCOME TAX	0	0	0	27	74	78	78	78	78	78	78	78	79	79	79	79
NET PROFIT	(59)	(46)	29	127	137	144	144	144	144	144	144	144	146	146	146	146
DIVIDENDS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UNDISTRIBUTED PROFITS	(59)	(46)	29	127	137	144	144	144	144	144	144	144	146	146	146	146
ACCU. UND. PROFIT	(59)	(105)	(77)	50	187	331	475	620	764	908	1052	1199	1345	1491	1637	1637

ANNEX III - CASH FLOW

Item	Period >>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SOURCE OF CASH		751	519	241	277	296	296	296	296	296	296	296	296	296	296	296
EQUITY	441	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LOANS	303	315	0	0	0	0	0	0	0	222	222	222	225	225	225	225
OPERATING PROFIT	0	80	117	204	222	222	222	222	222	74	74	74	71	71	71	71
DEPRECIATION	0	124	124	74	74	74	74	74	74	74	74	74	71	71	71	71
USES OF CASH		751	498	289	278	86	293	78	98	78	317	98	108	79	258	79
INVESTMENT & REPL.	692	0	0	0	20	159	0	20	0	0	239	20	29	0	179	0
VAR. IN WORKING CAPITAL	0	315	39	39	19	(0)	0	0	0	0	0	0	0	0	0	0
DEBT SERVICE																
Interest	59	126	88	50	12	0	0	0	0	0	0	0	0	0	0	0
Repayment	0	57	162	162	62	57	0	0	0	0	0	0	0	0	0	0
TAXES	0	0	0	27	74	78	78	78	78	78	78	78	79	79	79	79
DIVIDENDS	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
EXCESS/DEFICIT	(0)	21	(48)	0	10	3	218	198	218	(21)	198	188	217	38	217	
CUMULATED CASH BALANCE	(0)	21	(27)	(27)	(18)	(15)	203	401	619	598	795	983	1,200	1,238	1,455	

ANNEX IV - WORKING CAPITAL ANALYSIS

Item	Work cap. (Days)	<< Period >>														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. CURRENT ASSETS																
1.1. ACCOUNT RECEIVABLE	45	0	105	120	134	141	141	141	141	141	141	141	141	141	141	141
1.2. INVENTORIES																
• Raw materials	120	0	157	178	199	209	209	209	209	209	209	209	209	209	209	209
• Work in Progress	7	0	12	14	15	16	16	16	16	16	16	16	16	16	16	16
• Finished Products	30	0	53	60	66	69	69	69	69	69	69	69	69	69	69	69
• Spares	120	0	3	3	3	3	3	3	3	3	3	3	3	3	3	3
1.3. CASH IN HAND	10	0	7	6	5	4	4	4	4	4	4	4	4	4	4	4
TOTAL CURRENT ASSETS		0	337	379	421	442	441	441	441	441	441	441	441	441	441	441
2. ACCOUNTS PAYABLE	15	0	22	25	28	29	29	29	29	29	29	29	29	29	29	29
3. NET WORKING CAPITAL		0	315	354	393	412	412	412	412	412	412	412	412	412	412	412
4. INCREASE/DECR. IN WORK. CAP.		0	315	39	39	19	(0)	0	0	0	0	0	0	0	0	0

ANNEX V - BALANCE SHEET

Item	Work cap. (Days)	<< Period >>														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. ASSETS																
1.1 CURRENT ASSETS																
Cash Balance		0	27	6	5	4	4	206	404	622	601	799	987	1,204	1,242	1,459
Account receivable	45	0	105	120	134	141	141	141	141	141	141	141	141	141	141	141
Inventory																
Raw material	120	0	157	178	199	204	209	209	209	209	209	209	209	209	209	209
Work in progress	7	0	12	14	15	16	16	16	16	16	16	16	16	16	16	16
Finished Goods	30	0	53	60	66	59	69	69	69	69	69	69	69	69	69	69
Spares	120	0	3	3	3	3	3	3	3	3	3	3	3	3	3	3
1.2. FIXED ASSETS																
Cum. investment		692	692	692	692	712	871	871	871	871	1,130	1,150	1,179	1,179	1,358	1,358
Cum. depreciation		0	124	248	322	395	469	543	616	690	763	837	908	979	1,049	1,120
Net fixed assets		692	568	444	370	317	402	328	275	201	367	313	271	200	309	238
TOTAL ASSETS		692	926	823	791	758	843	972	1,117	1,261	1,405	1,550	1,696	1,842	1,988	2,134
2. LIABILITIES																
2.1. CURRENT LIABILITIES																
Account payable	15	0	22	25	28	39	29	29	29	29	29	29	29	29	29	29
Short term loans		20	335	257	152	38	35	20	20	20	20	20	20	20	20	20
2.2. MEDIUM/LONG TERM LOANS																
		283	226	170	113	57	0	0	0	0	0	0	0	0	0	0
2.3. EQUITY																
		448	448	448	448	448	448	448	448	448	448	448	448	448	448	448
2.4. ACCUM. UND. PROFIT																
		0	(59)	(105)	(77)	50	187	331	475	620	764	908	1,052	1,199	1,345	1,491
2.5. UNDISTRIBUTED PROFIT																
		(59)	(46)	29	127	137	144	144	144	144	144	144	146	146	146	146
TOTAL LIABILITIES		692	926	823	791	758	843	972	1,117	1,261	1,405	1,550	1,696	1,842	1,988	2,134

ANNEX VI - RATIO ANALYSIS

Item	Period >>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Return on total investment		(5.6)	(4.3)	2.7	11.9	12.8	13.5	13.5	13.5	13.5	13.5	13.5	13.7	13.7	13.7	13.7
Return on Sales (%)		0	(5.4)	3	11.9	12.1	12.8	12.8	12.8	12.8	12.8	12.8	13	13	13	13
Return on Equity (%)		(13.3)	(10.3)	6.4	28.3	30.5	32.2	32.2	32.2	32.2	32.2	32.2	32.6	32.6	32.6	32.6
Debt Service Coverage		(11.6)	(0.6)	0.8	1	1.1	1	0	0	0	0	0	0	0	0	0
Investment turnover		0	1.5	2.2	2.9	3.0	2.8	3.4	4.1	5.6	3.1	3.6	4.1	5.6	3.6	4.7
Debt/Equity ratio		0.6	0.5	0.4	0.3	0.1	0	0	0	0	0	0	0	0	0	0
Investment per Employee	US \$ 25,000															

ANNEX VII - OPERATIONS ANALYSIS

Item	Period >>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. SALES ANALYSIS																
1.2. SORGHUM MALT																
Capacity utilisation (%)	0	75	85	95	100	100	100	100	100	100	100	100	100	100	100	100
Units Produced	0	1,875	2,125	2,375	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Unit price	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450
TOTAL SALES	0	544	956	1,069	1,125	1,125	1,125	1,125	1,125	1,125	1,125	1,125	1,125	1,125	1,125	1,125
2. MATERIALS																
2.1 SORGHUM																
Amount used per year	0	2,344	2,656	2,969	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125
Unit cost	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188
Total item Cost	0	439	498	557	586	586	586	586	586	586	586	586	586	586	586	586
2.2 GUNNY BAGS																
Amount used per year	0	31,256	35,424	39,591	41,675	41,675	41,675	41,675	41,675	41,675	41,675	41,675	41,675	41,675	41,675	41,675
Unit cost	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total item Cost	0	31	35	40	42	42	42	42	42	42	42	42	42	42	42	42
TOTAL MATERIAL COST	0	471	533	596	628	628	628	628	628	628	628	628	628	628	628	628
Operation Analysis (Cont'd)																
3. LABOUR																
3.1. DIRECT LABOUR																
3.1.1 Unskilled Labour (no.)																
Payrate per year	749	749	749	749	749	749	749	749	749	749	749	749	749	749	749	749
Unskd. Lab.costs/year	0	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
3.1.2 Semi skilled (No.)																
Payrate/year	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100
Semi skd. Lab. Cost	0	22	25	28	29	29	29	29	29	29	29	29	29	29	29	29
3.1.3. Skilled & tech. (no.)																
Payrate per year	4,493	4,493	4,493	4,493	4,493	4,493	4,493	4,493	4,493	4,493	4,493	4,493	4,493	4,493	4,493	4,493
Skilled la.costs/ye	0	20	23	26	27	27	27	27	27	27	27	27	27	27	27	27
TOTAL DIRECT LABOUR COSTS	0	35	50	56	59	59	59	59	59	59	59	59	59	59	59	59

Operation Analysis (Cont'd)

3.2 INDIRECT LABOUR														
3.2.1. Clerical/Admin. (no.)	0	15	15	15	15	15	15	15	15	15	15	15	15	15
Payrate/year	1,460	1,460	1,460	1,460	1,460	1,460	1,460	1,460	1,460	1,460	1,460	1,460	1,460	1,460
Cler./Adm.Costs/yr.	0	22	22	22	22	22	22	22	22	22	22	22	22	22
3.2.2 Management (no.)	0	3	3	3	3	3	3	3	3	3	3	3	3	3
Payrate/year	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500
Mgt. Staff Costs/yr	0	20	20	20	20	20	20	20	20	20	20	20	20	20
TOTAL INDIRECT LAB. COSTS	0	41	41	41	41	41	41	41	41	41	41	41	41	41
TOTAL PAYROLL	0	86	92	98	101	101	101	101	101	101	101	101	101	101
TOTAL NO. OF EMPLOYEES	0	36	38	41	42	42	42	42	42	42	42	42	42	42
4. UTILITIES														
4.1. ELECTRICITY ('000 kwh)	0	360	408	456	480	480	480	480	480	480	480	480	480	480
Unit Cost /'000	90	90	90	90	90	90	90	90	90	90	90	90	90	90
Electric. cost/year	0	32	37	41	43	43	43	43	43	43	43	43	43	43
4.2. LIQUID FUEL (ltr) ('00)	0	19	21	24	25	25	25	25	25	25	25	25	25	25
Unit cost /'000	450	450	450	450	450	450	450	450	450	450	450	450	450	450
Fuel cost/year ('00)	0	8	10	11	11	11	11	11	11	11	11	11	11	11
4.3. WATER ('000 Lt.)	0	18,750	21,250	23,750	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Unit cost /'000	250	250	250	250	250	250	250	250	250	250	250	250	250	250
Water cost/year ('0)	0	5	5	6	6	6	6	6	6	6	6	6	6	6
TOTAL UTILITIES	0	55	62	70	73	73	73	73	73	73	73	73	73	73
5. OTHER OVERHEADS														
Depreciation	0	124	124	74	74	74	74	74	74	74	74	71	71	71
Maintenance & Insur	0	16	16	16	16	16	16	16	16	16	16	16	16	16
Transport	0	4	4	4	4	4	4	4	4	4	4	4	4	4
Building rent	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. & special exp	0	5	5	5	5	5	5	5	5	5	5	5	5	5
Admin & Marketing e	0	3	3	3	3	3	3	3	3	3	3	3	3	3
TOTAL OVERHEADS COST	0	151	151	101	101	101	101	101	101	101	101	101	101	101
TOTAL COST OF OPERATIONS	0	763	839	865	903	903	903	903	903	903	903	900	900	900

ANNEX VIII - DEBT SERVICE

Item	Period >>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. LOCAL LOANS																
1.1. LONG TERM LOANS																
Repayment		0	57	57	57	57	57	0	0	0	0	0	0	0	0	0
Balance		283	226	170	113	57	0	0	0	0	0	0	0	0	0	0
Interest		59	48	36	24	12	0	0	0	0	0	0	0	0	0	0
1.2. SHORT TERM LOANS																
Repayment		0	0	105	105	105	0	0	0	0	0	0	0	0	0	0
Balance		0	315	210	105	0	0	0	0	0	0	0	0	0	0	0
Interest		0	79	53	26	0	0	0	0	0	0	0	0	0	0	0
LOCAL REPAYMENT		0	57	162	162	162	57	0	0	0	0	0	0	0	0	0
LOCAL BALANCE		283	541	380	218	57	0	0	0	0	0	0	0	0	0	0
LOCAL INTEREST		59	126	88	50	12	0	0	0	0	0	0	0	0	0	0
2. FOREIGN LOANS																
2.1. LONG TERM LOANS																
Repayment		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Balance		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.2. SHORT TERM LOANS																
Repayment		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Balance		20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Interest		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FOREIGN REPAYMENT		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FOREIGN BALANCE		20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
FOREIGN INTEREST		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL REPAYMENT		0	57	162	162	162	57	0	0	0	0	0	0	0	0	0
TOTAL BALANCE		303	561	400	238	77	20	20	20	20	20	20	20	20	20	20
TOTAL INTEREST		59	126	88	50	12	0	0	0	0	0	0	0	0	0	0

ANNEX IX - VALUE ADDED

Item	Period >>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
VALUE OF OUTPUT		0	844	956	1,069	1,125	1,125	1,125	1,125	1,125	1,125	1,125	1,125	1,125	1,125	1,125
VALUE OF MATERIAL INPUT		692	526	596	666	721	860	701	721	701	940	721	730	701	880	701
Investments		692	0	0	0	20	159	0	20	0	239	20	29	0	179	0
Imported		99	0	0	0	20	0	0	20	0	30	20	24	0	20	0
Domestic		593	0	0	0	0	159	0	0	0	219	0	5	0	159	0
Current Material Input		0	526	596	666	701	701	701	701	701	701	701	701	701	701	701
Imported		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Domestic		0	471	533	596	528	528	528	528	528	528	528	528	528	528	528
Utilities		0	55	62	70	73	73	73	73	73	73	73	73	73	73	73
NET DOMESTIC VALUE ADDED		(692)	318	361	403	404	265	424	404	424	185	404	395	424	245	1,036
NET NATIONAL VALUE ADDED		(692)	318	361	403	411	265	424	404	424	185	404	395	424	245	1,036
Wages		0	86	92	98	101	101	101	101	101	101	101	101	101	101	101
Social Surplus		(692)	232	269	305	303	164	323	303	323	84	303	294	323	144	935
DISCOUNTED AT 18%																
NET NAT. VALUE ADDED		(586)	328	219	203	177	98	133	108	96	35	65	54	49	24	87
Discounted Wages		0	62	56	50	44	37	32	27	23	19	16	14	12	10	8
Discounted Social Surpl		(586)	167	164	157	133	61	102	81	73	16	49	40	38	14	78

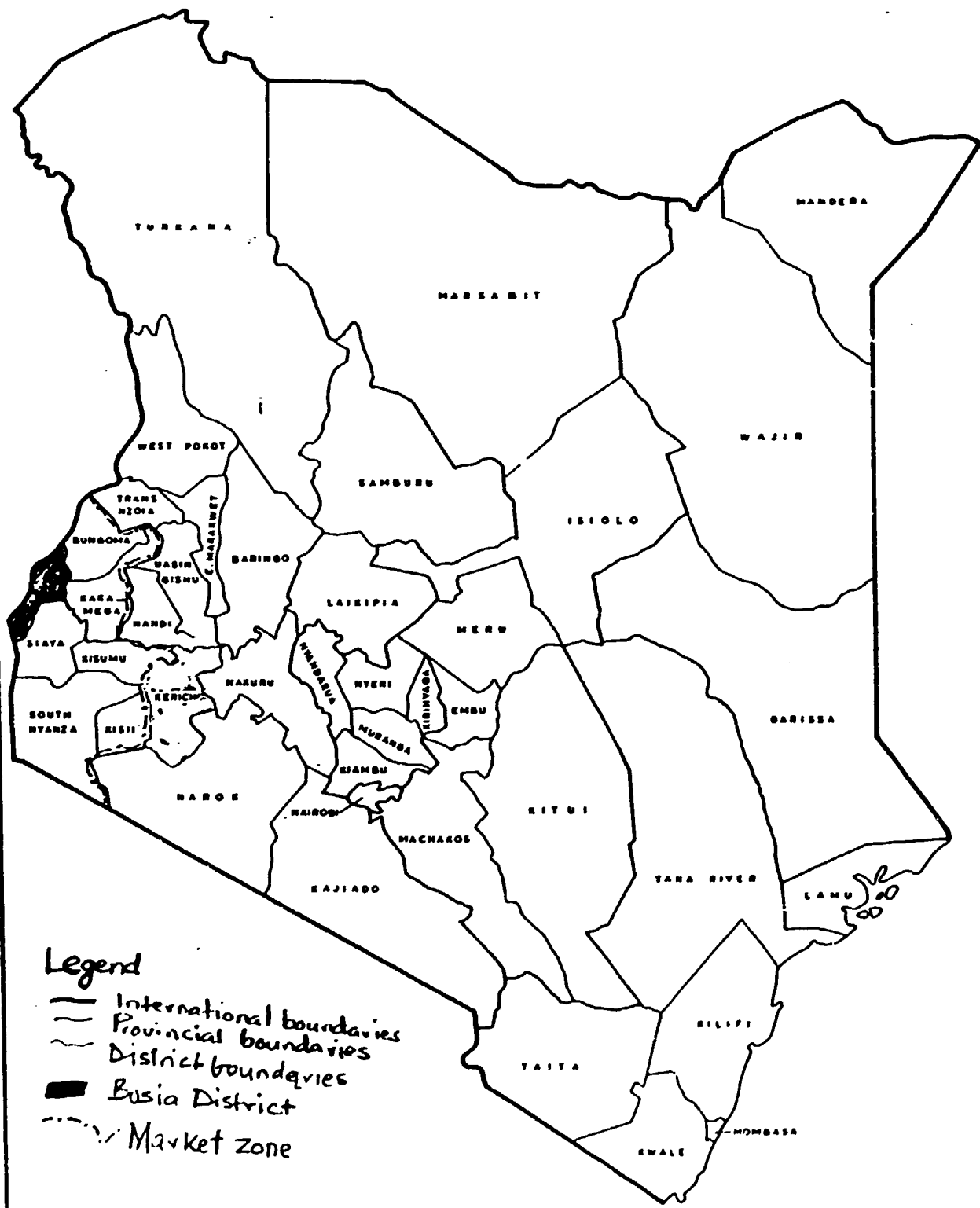
ABSOLUTE EFFICIENCY TEST PV (NNVA)
996

PV (Wages)
410

ANNEX X - FOREIGN EXCHANGE EFFECT

Item	Period >>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
FOREIGN EXCHANGE INFLOW		20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Foreign Equity		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Foreign Loan		20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FOREIGN EXCH. OUTFLOW		99	5	6	7	27	7	7	27	7	37	27	31	7	27	7
Imported Equipment		99	0	0	0	20	0	0	20	0	30	20	24	0	20	0
Imp. Materials, Utiliti		0	5	6	7	7	7	7	7	7	7	7	7	7	7	7
Repayment of Loans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Repatriated wages		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Devided repatriated		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest on Loans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NET FOREIGN EXCHANGE FLOW		(79)	(5)	(6)	(7)	(27)	(7)	(7)	(27)	(7)	(37)	(27)	(31)	(7)	(27)	(7)
NET FOREIGN EXCH. EFFECT		(79)	(5)	(6)	(7)	(27)	(7)	(7)	(27)	(7)	(37)	(27)	(31)	(7)	(27)	(7)
DISCOUNTED NET FOREIGN EXCHANGE FLOW		(67)	(4)	(4)	(3)	(12)	(3)	(2)	(7)	(2)	(7)	(4)	(4)	(1)	(3)	(1)
DISCOUNTED NET FOREIGN EXCHANGE EFFECT		(67)	(4)	(4)	(3)	(12)	(3)	(2)	(7)	(2)	(7)	(4)	(4)	(1)	(3)	(1)

MAP 1: LOCATION OF BUSIA IN KENYA



WESTERN KENYA

