235. PROFILE ON PRODUCTION OF LINSEED OIL

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I. SUMMARY

This profile envisages the establishment of a plant for the production of linseed oil with a capacity of 240 tones per annum.

The present demand for the proposed product is estimated at 300 tones per annum. The demand is expected to reach 537 tones by the year 2017.

The plant will create employment opportunities for 38 persons.

The total investment requirement is estimated at about Birr 5.99 million, out of which Birr 2.85 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 19 % and a net present value (NPV) of Birr 2.44 million discounted at 8.5 %.

II. PRODUCT DESCRIPTION AND APPLICATION

Linseed oil is golden-yellow or amber of brown drying oil with peculiar odor and bland taste. The oil polymerizes on exposure to air. Soluble in ether, turpentine etc; and slightly soluble in alcohol. The drying property is due to the linoleic ad linolemic groups.

Linseed oil is principally used, being a drying oil, in the point and varnish industry and also in the manufacture of linoleum, oilcloth, printing and lithographic inks and soft soaps. Locally it is also used for cooking. It is also employed in the preparation of lubricants, greases and polishes.

Raw linseed oil is used in pharmaceuticals as emollient, demulcent, expectorant and diuretic.

The expeller cake is harmless and is a palatable of protein rich (30%) livestock feed it is hot pressed. The poisonous effect of linseed is due to the presence of a cyanogenetic glycoside, phaselounation (linamarin). Cattle poisoning is caused by the hydrocyanic acid or prussic acid which is released by the activity of the enzyme linase on finamarin. Hot pressed linseed cake is harmless as the linamarin traction is not hydrolyzed to HCN owing to the denaturizing of the enzyme linase during cooking.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

Supply of linseed oil Ethiopia is in both from local production and import. However, the data for domestic production of oil is not available by type of the oil seed. Hence the imported quantity is used to indicate the unsatisfied demand for linseed oil (Table 3.1)

Table 3.1

IMPORT OF LINSEED OIL (TON)

Year	Edible	Non Edible
1997	973.2	637.4
1998	6,112.9	-
1999	4,986.2	156.3
2000	4,406.8	459.9
2001	5,678.3	501.7
2002	817.1	-
2003	3,714.8	1,191.1
2004	5,833.8	14.7
2005	9,965.9	37.2
2006	7,097.0	0.2

Table 3.1 reveals that Ethiopia imports a substantial amount of linseed oil (edible and non edible) annually to meet the unsatisfied demand. Import of edible linseed oil during the period 1998-2001 has ranged from about 4,407 tons to 6113 tons. The imported quantity during 2002 has sharply declined to 817 but increased to about 3,715 tons and 5,834 tons during 2003 and 2004. A substantial increase has been registered during year 2005 and 2006. During these two recent periods the yearly average import was 8,531 tons. Since the general trend of import was increasing the average of the recent two years import, which is 8,531, is taken to fairly estimate the current demand for edible linseed oil.

With regard to non-edible linseed oil the import data is highly erratic. In some years the imported quantity is very high while in other it is nil or very low. For, example during the years 1997,2001 and 2003 the imported quantity is 637 tons, 502 tons and 1,191 tons respectively.

On the other hand there was no import during 1998, 2002, and 2006. In the remaining three years from the data set the imported quantity ranged between 15 tons to 156 tons. In the absence of a trend in the data the average of the past 10 years is assumed to reflect the current effective demand for non-edible linseed oil. Accordingly current demand is estimated at 300 tons.

2. Demand Projection

Demand for edible linseed oil is mainly influenced by population growth and income. On the other hand the demand for non-edible oil is influenced by the user industries mainly the chemical industries such as paint, varnish, printing ink etc. Considering the above factors a 4% and 6% annual growth rate is applied to project future unsatisfied demand for edible linseed oil and non edible linseed oil respectively (see Table 3.2).

Table 3.2

PROJECTED UNSATISFIED DEMAND FOR LINSEED OIL (TON)

Year	Edible	Non Edible
2008	8,872	318
2009	9,227	337
2010	9,596	357
2011	9,980	379
2012	10,379	401
2013	10,794	425
2014	11,226	451
2015	11,675	478
2016	12,142	507
2017	12,628	537

3. Pricing and Distribution

Based on the current producers average price Birr 7,418 per ton is proposed for financial analysis. Non edible oil can be sold directly to the end users since their number is small. For the edible oil agents have to be appointed to reach the various consumers of the product.

B. PLANT CAPACITY AND PRODUCTION PROGRAM

1. Plant Capacity

The annual production capacity of the proposed plant is 240 tones of linseed oil, based on 300 working days per annum. The press section and refinery are operated in single shift and three shifts, respectively.

2. Production Program

Table 3.3 indicates the production program of the project. At the initial stage of the production period, the plant requires some years to penetrate the market. Therefore, in the first and second year of production, the capacity utilization rate will be 70% and 90% respectively. In the third year and then after, full capacity production can be attained.

Table 3.3

PRODUCTION PROGRAM

Sr No.	Description	Production Year		
		1	2	3-10
1	Linseed oil (ton)	167	216	240
2	Expeller cake (ton)	357	459	510
3	Capacity Utilization Rate (%)	70	90	100

IV. RAW MATERIAL AND INPUTS

A. RAW AND AUXILIARY MATERIALS

The major raw materials of the proposed project are linseed, caustic soda, bleaching earth and common salt. Usually, vegetable oil is packed in 200 litter barrels for distribution to retailers. Table 4.1 shows the annual requirement and cost of these materials at full capacity production.

Table 4.1

RAW AND AUXILIARY MATERIALS

REQUIREMENT AND COST

Sr. No.	Materials	Unit	Qty.	Cost (1000 Birr)		
				LC	FC	Total
1	Linseed	Ton	750	2,625	-	2,625
2	Caustic Soda	Kg	2400	14.4	-	14.4
3	Bleaching earth	Kg	5280	-	10.56	10.56
4	Common salt	Kg	5448	4.36		4.36
5	Replacement of Drums (200 lt)- 2%	Pcs	20	2.4	-	2.4
	Total			**2,646.16**	**10.56**	**2656.72**

B. UTILITY

Electricity, furnace oil and water are utilities of the proposed project. Table 4.2 indicates the annual utility requirement and cost at full capacity. Process water shall be supplied by submersible pumps installed by the project.

Table 4.2

ANNUAL UTILITY REQUIREMENT & COST

	Utility	Unit	Qty	Cost (1000 Birr)
1	Electricity	Kwh	750.000	355.5
2	Furnace oil	kg	49,187	266.1
3	Water	M^3	17,511	8.76*
	Total			**630.36**

** Only water for drinking and food preparation shall be form municipality water.*

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Process Description

Edible oil processing in broadly grouped in two consecutive processes crude and refined oil production Impunities of raw linseed are separated by vibratory screens, pneumatic cleaners and magnets. The cleaned oilseed in then conditioned in a cooker with steam. The cooked meat is then pressed to produce crude oil which shall be screened and filtered before entering the refinery unit.

In the refinery, there exist three consecutive operations: neutralization, bleaching and decortications. In the neutralization process, the free tatty acid (FFA) content of crude oil shall be lowered by caustic soda. The colour of oil will be adjusted in the bleacher with bleaching earth. Finally, the constituents of oil which are responsible for the odour are removed by the deodorization process. The final refined oil is then packed in barrels and then dispatched for sales.

2. Source of Technology

Several manufactures suppliers and manufactures can be requested for their offer. The following company could be one of the candidates.

Henan Times Trading Com. Ltd
Tel. 0086-371-9013776
Fax. 0086-371-3812887
E-mail shang5@371.net

B. ENGINEERING

1. Machinery and Equipment

The list of machinery and equipment is indicated in Table 5.1. The total cost of machinery is estimated at Birr 2,851,200 of which Birr 2,376,000 is in foreign currency.

Table 5.1

LIST OF MACHINERY & EQUIPMENT

Sr. No.	Description	No
1	Vibratory cleaner	1
2	Crusher	1
3	Cooker	1
4	Settling tank	2
5	Hot water tank	1
6	Alkali Treatment tank	1
7	Filter press	1
8	Holding tank	1
10	Neutralization and Bleaching Tank	1
11	Deodorization tank	1
12	Cooling tower	1
13	Submersible pump	1
14	Boiler	1 unit
15	Crude and refined oil tank	2
16	Reservoir	1

2. Land, Building and Civil Works

The total area of the project is 5000 m^2 of which, the built-up area is 1200 m^2. The cost of building is estimated at Birr 1,800.000. The lease value of land is about Birr 400,000 at a rate of 1 Birr per m^2 per year for 80 years.

3. Location and Site

Gimbicho town is the best location for the envisaged project, for its proximity to major raw material source.

VI. MANPOWER AND TRAINING REQUIREMENT

A. MANPOWER REQUIREMENT

The list of manpower and annual labour cost are indicated in Table 6.1. The total cost of labour is estimated at Birr 441.000.

Table 6.1

MANPOWER REQUIREMENT & COST

Sr. No.	Manpower	No	Monthly Salary (Birr)	Annual Salary (Birr)
1	General Manager	1	3000	36,000
2	Secretary	1	800	9,600
3	Sales Officer	1	1500	18,000
4	Accountant	1	2000	24,000
5	Production Head	1	2000	24,000
6	Operators	12	8400	108,800
7	Laborers	16	6400	76,800
8	Laboratory Technician	3	4500	13,500
9	Guards	2	800	9,600
Subtotal		**38**	**29,400**	**352,800**
Benefit (25% BS)			7,350	88,200
Total			**36,750**	**441,000**

B. TRAINING REQUIREMENT

On – the- Job training shall be carried out during plant erection and commissioning by experts of machinery supplier. The total cost of training is estimated at Birr 20,000

VII. FINANCIAL ANALYSIS

The financial analysis of the linseed oil project is based on the data presented in the previous chapters and the following assumptions:-

Construction period	1 year
Source of finance	30 % equity
	70 % loan
Tax holidays	5 years
Bank interest	8.5 %
Discount cash flow	8.5 %
Accounts receivable	30 days
Raw material local	30 days
Work in progress	2 days
Finished products	30 days
Cash in hand	10 days
Accounts payable	30 days

A. TOTAL INITIAL INVESTMENT COST

The total investment cost of the project including working capital is estimated at Birr 5.99 million, of which 24 per cent will be required in foreign currency.

The major breakdown of the total initial investment cost is shown in Table 7.1.

Table 7.1

INITIAL INVESTMENT COST

Sr. No.	Cost Items	Total Cost ('000 Birr)
1	Land lease value	400
2	Building and Civil Work	1,800.00
3	Plant Machinery and Equipment	2,851.20
4	Office Furniture and Equipment	75
5	Pre-production Expenditure*	339.61
6	Working Capital	531.38
	Total Investment cost	**5,997.2**
	Foreign Share	24

** N.B Pre-production expenditure includes interest during construction (Birr 264.61 thousand) training (Birr 20 thousand) and Birr 55 thousand costs of registration, licensing and formation of the company including legal fees, commissioning expenses, etc.*

B. PRODUCTION COST

The annual production cost at full operation capacity is estimated at Birr 4.45 million (see Table 7.2). The material and utility cost accounts for 73.83 per cent, while repair and maintenance take 1.80 per cent of the production cost.

Table 7.2

ANNUAL PRODUCTION COST AT FULL CAPACITY ('000 BIRR)

Items	Cost	%
Raw Material and Inputs	2,656.72	59.67
Utilities	630.36	14.16
Maintenance and repair	80	1.80
Labour direct	211.68	4.75
Factory overheads	88.2	1.98
Administration Costs	141.12	3.17
Total Operating Costs	3,808.08	85.54
Depreciation	397.62	8.93
Cost of Finance	246.29	5.53
Total Production Cost	**4,451.99**	**100**

C. FINANCIAL EVALUATION

1. Profitability

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

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

2. Break-even Analysis

The break-even point of the project including cost of finance when it starts to operate at full capacity (year) is estimated by using income statement projection.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable Cost}} = 27\ \%$$

3. Payback Period

The investment cost and income statement projection are used to project the pay-back period. The project's initial investment will be fully recovered within 5 years.

4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 19 % and the net present value at 8.5 % discount rate is Birr 2.44 million.

D. ECONOMIC BENEFITS

The project can create employment for 38 persons. In addition to supply of the domestic needs, the project will generate Birr 2.05 million in terms of tax revenue. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports.