33. COTTON SEED OIL

TABLE OF CONTENTS

		PAGE
I.	SUMMARY	33-3
II.	PRODUCT DESCRIPTION & APPLICATION	33-3
III.	MARKET STUDY AND PLANT CAPACITY	33-3
	A. MARKET STUDY	33-3
	B. PLANT CAPACITY & PRODUCTION PROGRAMME	33-5
IV.	RAW MATERIALS AND INPUTS	33-5
	A. RAW MATERIALS	33-5
	B. UTILITIES	33-6
V.	TECHNOLOGY & ENGINEERING	33-6
	A. TECHNOLOGY	33-6
	B. ENGINEERING	33-7
VI.	MANPOWER & TRAINING REQUIREMENT	33-9
	A. MANPOWER REQUIREMENT	33-9
	B. TRAINING REQUIREMENT	33-11
VII.	FINANCIAL ANLYSIS	33-11
	A. TOTAL INITIAL INVESTMENT COST	33-11
	B. PRODUCTION COST	33-12
	C. FINANCIAL EVALUATION	33-13
	D. ECONOMIC BENEFITS	33-13

I. SUMMARY

This profile envisages the establishment of a plant for the production of Cotton Seed Oil with a capacity of 4,472,372 liters per annum.

The present demand for the proposed product is estimated at 53,400 tonnes per annum. The demand is expected to reach at 86,000 tonnes by the year 2010.

The plant will create employment opportunities for 103 persons.

The total investment requirement is estimated at Birr 48.05 million, out of which Birr 33 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 36% and a net present value (NPV) of Birr 70.39 million, discounted at 8.5 %.

II. PRODUCT DESCRIPTION AND APPLICATION

The edible oil from cotton seed contains a high proportion of unsaturated fatty acids. Crude cotton seed oil is a very dark coloured oil with a pronounced odour and flavour, but after refining to remove gossypol and related pigments along with free fatty acids, a light yellow coloured oil is produced. Fully refined and deodorized cotton seed oil is virtually used as a salad and cooking oil and when dehydrated, for the production of margarine and shortening. The cake and meal are used for cattle feed.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present demand

Cotton seed is one of the varieties of oil rich seeds used for cooking and food manufacturing. As compared with animal fats, most vegetable oils are considered more desirable dietary ingredients. Nigger seed, sesame seed and linseed are export oil seeds having more value in the international market as compared with the local edible oil market. Therefore, most edible oil mills in Ethiopia use cotton seed and rape seed as their raw material.

Although edible oil mills constitute one of the largest small scale industry sectors, the major share of the market is covered by imported edible oil. The supply of edible oil in Ethiopia is presented in Table 3.1. As can be seen from the table, the latest official statistics available for the domestic supply reveals that in 1999 – 2003 an average 7,400 tonnes of edible oil has been supplied to the market. On the other hand, the 1999 – 2004 average annual imported edible oil was 47,790 tonnes. Thus, the edible oil market is dominated by imported products, the local supply covering less than 15%.

Table 3.1
SUPPLY OF EDIBLE OIL IN TONNES

Year	Imported	Local	Total
1999	3,9645	6,579	46,224
2000	24,899	6,637	31,536
2001	33,083	8,329	41,412
2003	19,757	7,993	27,750
2004	121,567	N.A	-
Average	**47,790**	**-**	**-**

NB: *NA not available*

Source : *1) External Trade Statistics.*
2) Statistical Abstract, CSA.

Considering the average import figure for the period 1999 – 2002 and average domestic supply, the current effective demand is conservatively estimated at 53,400 tonnes.

2. Projected Demand

The demand for edible oil is directly related with food consumption or growth in standard of living and population. Food consumption of families increases with growth in income. Since in poorest countries like Ethiopia most of the people are undernourished due to the lowest level of per capita income, the growth in income for families will result in growth in consumption of edible oil and food. Thus, the demand for edible oil is projected with a slight modification of GDP growth rate attained in 2004 or 10 %. The projected demand for edible oil is presented in Table 3.2.

Table 3.2
PROJECTED DEMAND FOR EDIBLE OIL (Tonnes)

Year	Projected Demand
2006	58,740
2007	64,614
2008	71,075
2009	78,183
2010	86,001
2011	94,601
2012	104,061
2013	114,468
2014	125,914
2015	138,506

3. Pricing and Distribution

The retail price of domestic edible oil per liter at Addis Ababa is Birr 12. The recommended price for the envisaged project is Birr 7. Since edible oil should be available in the nearest retail shop for households; to the consumer's convenience, intensive distribution through delivery to the retailers as well as its own shops in selected centers is recommended.

B. PLANT CAPACITY AND PRODUCTION PROGRAMME

1. Plant Capacity

Based on the market study, minimum economies of scale and availability of raw material (cotton seed), the envisaged plant is proposed to have a capacity of 4,128 tonnes (4,472,372 lt) of refined oil per annum. The plant will also produce 11,000 tonnes of meal to be sold for animal feed.

2. Production Programme

The plant will start its operation at a capacity of 75% in the first year, 90% in the second year and 100% in the third year and thenafter due to the problems in market penetration and skill development. The plant will operate 250 days per year, under three shifts of 8 hours each, a day.

IV. MATERIALS AND INPUTS

A. RAW MATERIALS

The major raw materials required by the oil mills are cotton seed, caustic soda, phosphoric acid and bleaching earth. Table 4.1 below depicts the annual requirement of raw materials and their cost. The basic raw material i.e. cotton seed requirement is calculated on the basis of 25% extraction rate and 5% wastage and impurities. Accordingly, the total annual cost of raw materials is estimated to be Birr 6.684 million.

Table 4.1
ANNUAL RAW MATERIAL REQUIREMENT AND COST

Sr. No.	Description	Qty.	Cost ('000)		
			LC	FC	TC
1	Cotton seed (Tonnes)	16,512	4,954	-	4,954
2	Caustic soda	18	108	-	108
3	Phosphoric acid	18	-	72	72
4	Bleaching earth	90	180	-	180
	* Packing material	3727		745.4	745.4
	Grand Total		**5,242**	**817.4**	**6,059.4**

** The drums used as packing material for the finished product are recyclable with 10% damage, annually. So the annual cost of packing material is with 10% loss of the total demand i.e. 22,362 drums.*

B. UTILITIES

The utilities required by the envisaged plant are water, electricity and steam. The annual consumption of electricity is estimated at 2.7 million kWh, for water 150,000 m^3 & for steam 30,000 tonnes. Steam is obtained from burning hulls from seed in multi-purpose boiler except the initial requirement for steam generation until hulls are available. Fuel oil of 100,000 lts is used for this purpose. The total annual cost for utilities is estimated at Birr 1, 879,800.

V TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

The seed obtained from the cotton gins are usually in a sufficiently dry state to be treated at once but any damp seeds should be dried by exposure to sun or on steam heated surfaces.

For the expression of the oil, the cotton seed is made to pass through a cleaning unit with a rotary or table vibrating screens of different mesh size and aspirator which sort out and suck the impurities.

The screen is equipped with powerful magnet to separate magnetic substances from the seed.

After cleaning, the cotton seed is first decorticated. This is a process of coarse cutting of seeds (ideally in halves) and of separating of the hulls from the kernels. The decorticated seeds are rolled into thin flakes between heavy smooth iron rolls of a roller mill. This allows an easy flow of the oil while pressing. Then, it passes to the cooking and conditioning operation to coagulate the proteins, adjust moisture content. Further, rupture the oil cells by thermal energy and decrease the viscosity of the oil contained in the seed to allow optimum oil yield.

Here, there are two well-known technologies to be used for the extraction of oil from the seed, i.e., mechanical presses and solvent extraction. But, solvent extraction will be attractive if the capacity is high (150-200 lt /day) and for oil seeds with high oil content like ground nut and sesame seed. It also need higher investment but the yield of oil is high. For the envisaged project, continuous screw presses (expellers) is chosen.

After conditioning the material is directly fed into the screw presses. The screw extracts the oil which then passes by the lining bars. The oil passes through successive clarification and refining operations like degumming, neutralizing, Bleaching, winterizing, and deodorizing. The refined oil is packed and marketed. The cake is dried and packed to be marketed for animal feed.

2. Source of Technology

The machinery and equipment required for cotton seed oil processing can be supplied by the following companies.

1. Plot No2 Dhormajvan Industrial Estate
   Gokuldham Main Road
   Rajkot - 360004, Gujarat
   India
   Phone: +91281 2368564
   Mobile No. +91 98242 17600
   Fax: + 91 281 2366010

2. MI.D.C, Ambad
   Nashil - 422010, maharashtra
   India
   Phone: +91 253 2381993, +91 253 2381 994
   Fax: +91 253 5601441

B. ENGINEERING

1. Machinery & Equipment

Machinery and equipment required for processing 25,000 tonnes of cotton seed oil are listed in Table 5.1. The total cost of machinery and equipment is estimated to be Birr 33 million, out of which Birr 26.4 million is required in foreign currency. In addition to this, the plant needs one truck to transport raw material and finished product and two pick ups for office work. The total cost of machinery and equipment including vehicle is estimated to be Birr 33.75 million.

Table 5.1
LIST OF MACHINERIES AND EQUIPMENT

Sr. No.	Description	Qty.
1	Screw conveyor	5
2	Seed silo	2
3	Air system for separator	1
4	Decorticator	2
5	Hull beater	2
6	Shaker separator with permanent magnet	1
7	Meat and husk separator	1
8	Screw expeller	1
9	Bucket elevator	3
10	Cake storage silo	1
11	Crude oil setting tank	1
12	Pump	6
13	Filter press	2
14	Filtered oil storage tank	1
15	Caustic soda dosing tank	1
16	Phosphoric acid dosing tank	1
17	Neutralizer / bleacher	1
18	Vacuum pump	2
19	Condenser	1
20	Deodorizer	1
21	Refined oil storage tank	1
22	Weighing scale	2
23	Air compressor	2
24	Boiler unit	1
25	Laboratory equipment	lump sum
26	Filling and packing unit	1
27	Cake handling unit	1
28	Winterizer	1
29	Drum washer and filler	1

2. Land, Building and Civil Works

The envisaged plant requires a total land of about 10,000 m^2, out of which 6,500 m^2 is built up area. Assuming the land lease rate of Birr 1.5 per m^2 per annum and for 70 years of land holding, the total land value will be Birr 1,050,000. The total construction cost by taking a rate of Birr 1500 per m^2 is estimated at Birr 9,750,000. Therefore, the total cost of land building and civil works assuming that the total land lease cost will be paid in advance is estimated to be Birr 10,800,000.

3. Proposed Location

Plant location is a compromise between the availability of market, raw materials, labour, energy and water. The plant should be near or at the Ginnery in order to avoid bulk transportation of raw material. The proposed location for the envisaged plant is at Assosa or kemashi zone where most of the irrigable land is found.

VI. MANPOWER AND TRAINING REQUIREMENT

A. MANPOWER REQUIREMENT

The project needs a total of 103 manpower, out of which 47 are direct labour. The detailed list of manpower and their montly and annual salary is indicated in Table 6.1. The total cost of manpower is estimated at Birr 954,000.

Table 6.1
MANPOWER REQUIREMENT AND ANNUAL LABOUR COST

Sr. No.	Description	Req. No.	Monthly Salary, Birr	Annual Salary, Birr
1	General manager	1	2500	30,000
2	Executive secretary	1	750	9,000
3	Production and technic manager	1	2000	24,000
4	Commercial manager	1	1800	21,600
5	Administrative and finance manager	1	1800	21,600
6	Production head	1	1500	18,000
7	Technic head	1	1500	18,000
8	Accountant	3	900	32,400
9	Junior accountant	2	600	14,400
10	Salesperson	2	900	21,600
11	Purchaser	2	900	21,600
12	General service head	1	1200	14,400
13	Personnel	1	1200	14,400
14	Time keeper	3	300	10,800
15	Cashier	2	450	10,800
16	Shift leader	3	900	32,400
17	Operators	15	600	135,000
18	Ass. operators	9	450	48,600
19	Daily labourers	20	300	72,000
20	Electricians	3	600	21,600
21	Ass. Electricians	3	450	16,200
22	Mechanics	3	600	21,600
23	Ass. mechanics	3	450	16,200
24	Chemist	3	900	32,400
25	Junior chemist	3	600	21,600
26	Tool keeper	2	300	7,200
27	Store keeper	2	450	10,800
28	Driver	3	450	16,200
29	Guard	8	300	28,800
	Sub-total	**103**		**763,200**
	Employs benefit (25% of basic salary)			190,800
	Grand Total			**954,000**

B. TRAINING REQUIREMENT

Training of selected key employees has vital importance. The production and technic division head, the maintenance head and the quality control head are recommended to be trained by machinery supplier experts abroad for a period of one month on raw material and product testing, process technology, production management, machine operation and maintenance. The other workers related to production, maintenance and quality control also be given on-the-job training for about two weeks during erection and commissioning period. The total cost of training is estimated to be Birr 100,000.

VII. FINANCIAL ANALYSIS

The financial analysis of the Cotton Seed Oil project is based on the data presented in the previous chapters and the following assumptions:-

Construction period	1 years
Source of finance	30 % equity
	70 % loan
Tax holidays	3 years
Bank interest	7.5 %
Discounted cashflow	8.5 %
Repair and maintenance	3 % of the total plant and machinery
Accounts receivable	30 days
Raw material, local	30 days
Raw materials, import	90 days
Work in progress	2 days
Finished products	15 days
Cash in hand	5 days
Accounts payable	30 days

A. TOTAL INITIAL INVESTMENT COST

The total initial investment cost of the project including working capital is estimated at 48.05 million, of which 53 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 ('000 BIRR)
1	Land lease value	1,050
2.	Building and Civil Work	9,750
3.	Plant Machinery and Equipment	33,000
4.	Office Furniture and Equipment	50
5.	Vehicle	750
6.	Pre-production Expenditure*	2,672.25
7	Working Capital	779.73
	Total Investment cost	**48,051.98**
	Foreign share	**53%**

B. PRODUCTION COST

The annual production cost at full operation capacity of the plant is estimated at Birr 16.69 million (see Table 7.2). The material and utility cost accounts for 47.56 per cent while depreciation and financial costs take 38.59 per cent of the production cost.

Table 7.2
ANNUAL PRODUCTION COST AT FULL CAPACITY ('000 BIRR)

Items	Cost	%
Raw Material and Inputs	6,059.4	36.30
Utilities	1,879.8	11.26
Maintenance and repair	1,338.0	8.02
Labour direct	763.2	4.57
Factory overheads	190.8	1.14
Administration Cost	20	0.12
Total Operating Costs	**10,231.20**	**61.29**
Depreciation	4,016.0	24.06
Cost of Finance	2,426.1	14.53
Total Production Cost	**16,693.25**	**100.0**

* *N.B Pre-production expenditure includes interest during construction (Birr2,567.25 thousand), training (Birr100 thousand), and (Birr 5 thousand) costs of registration, licensing and formation of the company including legal fees, commissioning expenses, etc.*

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 lifetime 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 operates at full capacity (year 3) is estimated by using income statement projection.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable cost}} = 19\%$$

3. Pay-Back 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 3 years.

4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 36% and the net present value at 8.5% discount rate is Birr 70.39 million.

D. ECONOMIC BENEFITS

The project can create employment for 103 persons. In addition to supply of the domestic needs, the project will generate Birr 4.7 million per annum in terms of tax revenue when it starts to operate at full capacity. Moreover, the Regional Government can collect employment, income tax and sales tax revenue. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports.