43. PROFILE ON SESAME OIL

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I. SUMMARY

This profile envisages the establishment of a plant for the production of 1,200 tonnes of sesame oil per annum.

The present demand for the proposed product is estimated at 1,212 tonnes per annum and it is projected to reach at 1,753 tonnes by the year 2014.

The plant will create employment opportunities for 83 persons.

The total investment requirement is estimated at Birr 16.23 million, out of which Birr 6.5 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 17% and a net present value (NPV) of Birr 6.09 million, discounted at 10.5%.

II. PRODUCT DESCRIPTION AND APPLICATION

Sesame oil is a pale yellow bland semi-drying, fatty oil obtained from sesame seed. Oil has a particularly good fatty acid distribution being high in the relatively stable unsaturated acids, oleic and linoleic, 35-49% and 37-48%, respectively.

Refined sesame oil is an exceptionally good edible oil is used directly as a bland salad oil and for cooking purposes. It compares very favourably in these uses with olvie oil and this often leads to sesame oil being used as an adulterant of olive oil rather than straight forward substitution.

Because of its high stability compared with other vegetable oils, sesame oil also has some specific end-uses in the pharmaceuticals industry, which employs the oil as a vehicle for

medicaments which are required to be administered subcutaneous or intramuscularly. It may also be used in the preparation of liniments, plasters, ointments and special soaps & small quantity in perfumery as a fixative.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

Edible oil is mainly produced from cotton seed, rape seed, lint seed, nigger seed, sesame seed, palm and vegetables. In Ethiopia, the first two types are dominant in the market followed by lint and nigger seed. Vegetable and palm oil are imported products while sesame oil is not easily available in the market. Sesame is one of the major export earning oil seeds. Due to the highest price offer in the international market as against the depressed price of domestic edible oil, the manufacturing of edible oil is mainly processed from cotton seed and rape seed, which have lesser prices against sesame and other oil seeds.

Edible oil is part of every day food expenditure in urban areas as well as in most of the rural areas. Sesame oil is also used as an input for industrial production of pharmaceuticals, soap and cosmetics. However, in Ethiopia it is used mainly as edible oil.

The supply of edible oil is met through domestic production and import. The import of edible oil is made through commercial means as well as part of humanitarian aid. Aid packages including edible oil were tendered for sale to the public destabilizing domestic edible oil market and forcing most oil mills to close down. After a government intervention, the domestic market for edible oil is somewhat reviving. The domestic production and import of edible oil is presented in Table 3.1.

Table 3.1

EDIBLE OIL SUPPLY (IN TONNES)

Year	Domestic Supply	Import	Total
1999	6,879	39,645	46,224
2000	6,637	16,816	23,453
2001	8,329	22,934	31,263
2002	7,993	12,283	29,276

As can be seen from Table 3.1, three-fourth of the total supply is covered by imported products. The average edible oil supply during the period 1999-2002 was 121,216 tonnes. The supply of imported sesame oil from the total was 0.14%. The current effective demand for sesame oil, taking the domestic supply into consideration, is assumed to be 1% or 1,212 tonnes.

2. Projected Demand

The demand for edible oils is directly related with the growth in population and income. The demand for sesame oils, as a relatively expensive type of edible oil, is more dependent on income than population. In addition to the income factor, raising the awareness of consumers for a differentiated sesame oil as against the common cotton seed and rape seed oil is vital. By distinguishing the types of edible oil through aggressive advertisement, it is possible to attract and supply a new segment of the market.

Thus, the demand for sesame oil is projected based on the annual rate of 3.76% growth in real gross demotic production attained during the period 1999-2002. The projected demand for sesame oil is presented in Table 3.2.

Table 3.2

PROJECTED DEMAND FOR SESAME OIL

Year	Demand (Tonnes)
2005	1258
2006	1305
2007	1354
2008	1405
2009	1458
2010	1513
2011	1570
2012	1628
2013	1690
2014	1753

3. Pricing and Distribution

The price for one liter edible oil at Addis Ababa is Birr 12.50 for locally produced oil and Birr 13 for the imported oil. Taking the marketing costs required for distribution and transportation into consideration, Birr 10.80 per liter is considered for the envisaged product.

The packing materials and distribution system are most determing factors in the highly competitive edible oil market. The product will reach consumers through retails shops who will receive the product using van delivery with an appropriate size and package.

B. PLANT CAPACITY AND PRODUCTION PROGRAMME

1. Plant Capacity

Based on the unsatisfied demand of vegetable oil and availability of the major raw material i.e. sesame seed, the envisaged edible oil plant will have a production capacity of 1200 tonnes/ annum, in three shifts of 8 hours per day and 300 working days per year. The plant will also produce 1,800 tonnes of oil cake per annum that can be used for animal feed.

2. Production Programme

Considering a period for production skill development and market penetration, the capacity utilization rate is set at 75%, 80%, 95% in the first, second and third year of operation, respectively. The plant will operate at full capacity in the fourth year and thenafter.

IV. RAW MATERIALS AND INPUTS

A. RAW MATERIALS

The main raw material required by the sesame oil plant is the oil bearing sesame seed. The region, especially in the eastern part, has very high potential for this seed. The auxiliary raw materials necessary for refining the oil and packing are phosphoric acid, bleaching earth, caustic soda, barrel, plastic (PET) bottles and jute bag. All raw materials except phosphoric acid are locally available. Annual requirements and cost of raw materials are depicted on Table 4.1.

Table 4.1

ANNUAL REQUIREMENT OF RAW AND AUXILIARY MATERIALS AND COST

Sr. No.	Description	Consumption	Total Cost '000		
			L.C	F.C	Total
1.	Sesame seed	3300 tonne	9,900	-	9,900
2.	Caustic Soda	10 tonne	65	-	65
3.	Bleaching earth	50 tonne	90	-	90
4.	Phosphoric acid	10 tonne	-	120	120
5.	*Barrel (2001t)	60 tonne	-	36	36
6.	Plastic container 1 lt	1,000,000 pcs	500	-	500
7.	Jute sack (75kg oil cake)	24,000 pcs	168	-	168
	Grand Total		**10,723**	**156**	**10879**

* Barrels are recyclable with 5% loss.

B. UTILITIES

Utilities required for the envisaged oil mill include: electricity, water and fuel oil. Annual requirement and their costs at full operation capacity of the mill is depicted on Table 4.2.

The total cost of utilities is estimated at Birr 1.203 million, annually.

Table 4.2

ANNUAL UTILITIES REQUIREMENT AND COST

Sr. No.	Description	Quantity	Unit Price (Birr)	Total Price (Birr)
1.	Electricity (kWh)	1,080,000	0.474	511,920
2.	Water (m^3)	58,000	2	116,000
3.	Furnace oil (lt)	250,000	2.30	575,000
	Grand Total			**1,202,920**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

There are two extraction technologies, one is mechanical pressing and the other is solvent extraction. The most important factor in the choice of the processing plant, and the processing sequence, is the seed to be worked, its yield, capacity and the quality of products to be achieved. The minimum capacity recommended for solvent extraction process is 150-200 t /day feed stock. In addition to the above restriction, mechanical presses has the advantage of reduced capital cost, no danger of fire from combustible solvent, simpler process control and smaller number of skilled staff over solvent extraction process. Therefore, screw press expeltion is recommended for the envisaged plant.

The seed requires to undergo a thorough cleaning process to remove sand, stalk, plant debris and any foreign matters by rotary or table sieves, usually with air aspiration by fans, and cyclones for dust removal from the air. Then, the seed have to be prepared for efficient oil recovery. The stages involved in pre-treatment are:

a) Size reduction of the seeds by breaking them, usually in fluted roller mills;
b) Flaking of the seed particles in roller mills with smooth roller surfaces (0.2 - 0.3 mm);
c) Conditioning the seed by adjusting their moisture content and temperature, while keeping the seed hot (say 90-95^{0}C) for periods that vary widely (30-60 minutes). Then, extraction by using high pressure screw press follows.

The crude oil obtained from the press requires to undergo refining processes to produce a bland tasting, light coloured oil without odour or flavour. To obtain fully refined oil from crude oil, the following steps are necessary: degumming, neutralizing, bleaching, winterizing and deodorizing. The refined oil is, then, packed and marketed. The main waste material from oil manufacture is water and much attention should be given to the water treatment to avoid its adverse effect in the environment. Biological treatment by

aerating, activated sludge system, addition of flocculating agent and filtration are used before the effluent is discharged.

2. Source of Technology

The machinery and equipment for the oil mill can be acquired from a Chinese company named:

Shangha; Small Enterprise Trade Development Service Center Int. Coop.
Division Shangha, 200032
Fax (008621) 64220814.

B. ENGINEERING

1. Machinery and Equipment

Machinery and equipment required by the proposed project are shown in Table 5.1. The total cost of machinery and equipment is estimated to be Birr 6.5 million, out of which Birr 5.2 million is required in foreign currency.

Table 5.1

LIST OF MACHINERY AND EQUIPMENT

Description	Quantity
Seed cleaning unit	1
Dust blower	1
Cyclones	2
Hammer mill	1
Screw conveyors	3
Bucket elevator	2
Roller crusher	1
Screw press	1
Weighing scale	2
holding tanks	3
Pumps	5
Neutralizer	1
Bleacher	1
Vacuum pump	1
Condenses	1
Deodorizer	1
Water treatment plant	1
Boiler house	1
Filling sealing machine	1

2. Land, Building and Civil Works

The oil mill requires a total land area of 6,000 m^2 and at a rate of Birr 1.5 per square meter, the land lease value for 70 years will be Birr 630,000. The area to be covered by plant building, administrative and auxiliary buildings, and the facilities will be about 3500 m^2. Assuming building construction cost of Birr 1500 per m^2, the estimated cost of

buildings and associated civil works will be Birr 5,250,000. Therefore, the total cost of land, buildings and civil work is estimated to be Birr 5,880,000.

3. Proposed Location

Plant location is a compromise between the availability of markets, raw materials, labour, energy and water. To avoid bulk raw materials transportation, the plant is proposed to be located at kemashi zone, where most of the woredas can grow sesame. The plant can also get market for the oil cake as animal feed in the nearby.

VI. MANPOWER AND TRAINING REQUIREMENTS

A. MANPOWER REQUIREMENT

Manpower requirement of the plant is 83 persons, of which 48 are direct production workers and 35 are administrative and supervisory staff. Details of manpower requirement and estimate of annual expenses for salaries is presented in Table 6.1.

B. TRAINING REQUIREMENT

Workers directly related to production; supervisors, foreman, operators, mechanics and electricians need to be given on-the-job training for one month by qualified personnel of machinery supplier. The training cost is estimated at Birr 50,000.

Table 6.1

MANPOWER REQUIREMENT AND ANNUAL LABOUR COST, (BIRR)

Sr. No.	Description	Req. No.	Monthly Salary	Annual Salary
1	General manager	1	2500	30,000
2	Executive secretary	1	900	10,800
3	Finance and Adm. manager	1	2000	24,000
4	Production and technic manager	1	2000	24,000
5	Commercial manager	1	2000	24,000
6	Production head	1	1500	18,000
7	Technic had	1	1500	18,000
8	Production supervisor	3	1200	43,200
9	Operators	24	600	172,800
10	Labourers	12	250	36,000
11	Mechanic	3	600	21,600
12	Electrician	3	600	21,600
13	Personnel	1	1100	13,200
14	General service head	1	1100	13,000
15	Accountant	2	1200	28,800
16	Cashier	1	500	6,000
17	Time keeper	3	400	14,400
18	Boiler operator	3	600	21,600
19	Purchaser	1	900	10,800
20	Sales officer	1	1100	13,200
21	Store keeper	2	600	14,400
22	Chemist	3	1200	43,200
23	Guard	6	300	21,600
24	Messenger	2	300	7,200
25	Cleaner	2	300	7,200
26	Driver	3	400	14,400
	Sub-total	**83**	**-**	**673,000**
	Workers Benefit (25% of basic salary)			168,250
	Grand total	**83**	**-**	**841,250**

II. FINANCIAL ANALYSIS

The financial analysis of sesane oil project is based on the data provided in the previous chatpers and the following assumptions:-

Construction period	2 years
Source of finance	30% equity
	70% loan
Tax holidays	4 years
Bank interest	10.5%
Discounted cash flow	10.5%
Land value	Based on estimated lease rate of the region (Birr 1.5/m^2)
Repair and maintenance	5 % of Plant machinery and equipment
Accounts receivable	30 days
Raw material (local)	30 days
Raw material (import)	90 days
Work in progress	2 days
Finished products	30 days
Cash at hand	5 days
Accounts payable	30 days

A. TOTAL INITIAL INVESTMENT COST

The total initial investment cost of the project including working capital is estimated at Birr 16.23 million, out of which about 32% will be required in foreign currency. Details are indicated in Table 7.1.

Table 7.1

INITIAL INVESTMENT COST ('000 BIRR)

Sr. No.	Cost Items	Foreign Currency	Local Currency	Total
1	Land	-	630.0	630.0
2	Building and Civil Work	-	5,250.0	5,250.0
3	Plant Machinery and Equipment	5,200.0	700.0	6,500.0
4	Office Furniture and Equipment	-	75.0	75.0
5	Vehicle	-	175.0	175.0
6	Pre-production Expenditure*		**2,069.6**	**2,069.6**
	Total Investment Cost	**5,200.0**	**9499.6**	**14699.6**
7	Working Capital	56.79	1478.21	1535.0
	Grand Total	**5256.79**	**10977.81**	**16234.6**

B. PRODUCTION COST

The annual production cost at full operation capacity of the plant is estimated at Birr 15.38 million (see Table 7.2). The material and utility cost accounts for 76 per cent while repair and maintenance take 0.84 per cent of the production cost.

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* *Pre-production expenditure include interest during construction (Birr 1.9 million), training (Birr 50,000) and cost of registration, licensing and formation of the company including legal fees, commissioning expenses, etc.*

Table 7.2

ANNUAL PRODUCTION COST

('000 BIRR)

Items	Year			
	3	**4**	**7**	**10**
Raw Material and Inputs	8159.3	8701.7	10,879.0	10,879.0
Labour Direct	302.9	323.0	403.8	403.8
Utilities	902.2	962.2	1202.9	1202.9
Maintenance and repair	97.5	104.0	130.0	130.0
Factory overheads	126.2	134.6	168.3	168.3
Administration Overheads	201.9	215.3	269.2	269.2
Total operating costs	**9789.9**	**10,440.7**	**13053.2**	**13053.2**
Depreciation	1641.5	1641.5	1641.5	271.5
Cost of Finance	1142.5	1028.2	685.5	342.7
Total Production Cost	**12573.8**	**13110.4**	**15381.5**	**13667.4**

C. FINANCIAL EVALUATION

1. Profitability

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

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

2. Break-even Analysis

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

$$BE = \frac{\text{Fixed Cost}}{\text{Sales-Variable Cost}} = 46\ \%$$

3. Pay-Back Period

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

4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 17% and the net present value at 10.5% discount rate is Birr 6.09.

D. ECONOMIC BENEFITS

The project can create employment opportunities for 83 persons. In addition to supply of the domestic needs, the project will generate Birr 10.17 in terms of tax revenue. 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.