

## **51. PROFILE ON PRODUCTION OF CASTOR OIL**

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## **I. SUMMARY**

This profile envisages the establishment of a plant for the production of castor oil with a capacity of 1,000 tonnes per annum.

The present demand for the proposed product is estimated at 1,250 tonnes per annum. The demand is expected to reach at 2,947 tonnes by the year 2017 .

The plant will create employment opportunities for 27 persons.

The total investment requirement is estimated at Birr 6.66 million, out of which Birr 4.09 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 29 % and a net present value (NPV) of Birr 5.82 million, discounted at 8.5 %.

## **II. PRODUCT DESCRIPTION AND APPLICATION**

Castor oil is processed from castor beans. It has a distinct feature and a peculiar composition that makes it very versatile when is used as a raw material. It has got applications in hydraulic fluids, paints and varnishes, surfactant and in the production of synthetic fibers and dibasic acids.

### III. MARKET STUDY AND PLANT CAPACITY

#### A. MARKET STUDY

##### 1. Past Supply and Present Demand

Castor oil has got wide application in hydraulic fluids, paints and vanishes, surfactant in the production of synthetic fibres, pharmaceuticals, cosmetics and dibasic acids. Although it is an industrial raw material or intermediate input, the user industries in Ethiopia are at low stage of development currently. However, due to the conducive conditions created for investment a number of projects in the chemical sector are coming up recently in various parts of the country. Therefore, its demand is expected to grow with the growth of the manufacturing sector.

On the other hand, castor oil has a very wide demand in the international market especially in countries where the user industries are developed. The market in Europe alone ranges from 500,000 to 750,000 tonnes.

As there are no plants that produce castor oil in the country, the limited amount that is required by the existing users is totally met through import (see Table 3.1).

**Table 3.1**  
**IMPORT OF CASTOR OIL**

<b>Year</b>	<b>Volume (Tonnes)</b>
1999	6.63
2000	8.45
2001	0.80
2002	12.08
2003	6.40
2004	5.83
2005	8.63

*Source :- Compiled from Customs Authority.*

As could be seen from Table 3.1 the imported quantity during the past seven years ranges from 5.8 tonnes to 12.08 tonnes, except an exceptional figure for the year 2001 which is 0.8 tonnes. The annual average over the last seven years is about 7 tonnes

Since the domestic market is not attractive, currently the general recommendation for a county like Ethiopia is to export a substantial amount of what is produced. As mentioned earlier, there is no problem of demand in the international market. Hence, Ethiopia can capture at least 1% of the European market which ranges from 5,000-7,500 tonnes per annum. However, for the purpose of this new project only 25% of the potential market, which is at minimum 1,250 tonnes, is estimated as the present effective demand.

## 2. Projected Demand

Due to the development of the castor oil user industries in Europe, the export market is very wide. Therefore, the supply to the export market can be increased at a rate of 10% annually. The demand projection made based on this assumption is presented in Table 3.2.

**Table 3.2**  
**POTENTIAL DEMAND FOR CASTOR OIL**

<b>Year</b>	<b>Quantity (Tonnes)</b>
2008	1,375
2009	1,512
2010	1,664
2011	1,830
2012	2,013
2013	2,214
2014	2,436
2015	2,679
2016	2,947

### **3. Pricing and Distribution**

By considering the imported price of castor oil and subtracting costs of duty and transportation, a factory gate price of Birr 9,000 per tonne is recommended.

The factory can get its market outlet through foreign agents or directly selling to bulk end users in the international market.

## **B. PLANT CAPACITY AND PRODUCTION PROGRAMME**

### **1. Plant Capacity**

Based on the market study shown above, the potential demand of castor oil for the year 2008 will be 1375 tonnes, and this demand is projected to grow to 2679 tonnes by the year 2015. For the purpose of this project, a plant capacity of 1,000 tonnes of castor oil is proposed. The plant will operate single shift of 8 hours a day and for 300 days a year. Production can be increased by operating the plant double shift for 16 hours a day or three shift for 24 hours a day, if the market warrant.

### **2. Production Programme**

Considering the time required for market penetration and skill development, the plant is assumed to start production at 75% of its capacity in the first year, at 85% in the second year, and finally reach at 100% in the third year and then after. Table 3.3 shows production build-up programme.

**Table 3.3**  
**PRODUCTION PROGRAMME**

<b>Year</b>	<b>1</b>	<b>2</b>	<b>3 and then after</b>
Capacity utilization %	75	85	100
1. Castor oil (tonne)	700	850	1,000
2. Expeller cake (tonne)	1,087.5	1,232.5	1,450
<b>Total</b>	<b>1,787.50</b>	<b>2,082.50</b>	<b>2,450</b>

#### **IV. MATERIALS AND INPUTS**

##### **A. RAW AND AUXILIARY MATERIALS**

The major raw material for producing castor oil is castor bean. This raw material can be obtained partially from SNNP region, and the rest can be procured from neighbouring regional states of the country.

Castor oil plant requires auxiliary materials such as sacks, metallic drums, and other inputs. These materials can be procured both from local and foreign markets. Table 4.1 presents the details of raw and auxiliary materials including related annual expenditure.

**Table 4.1**  
**ANNUAL REQUIREMENTS OF RAW AND AUXILIARY MATERIALS AND**  
**COST (AT FULL CAPACITY)**

Sr. No.	Description	Qty	Unit Price (Birr)	Cost ('000 Birr)
	<b><u>A. Raw Material</u></b>			
1	Castor bean (tonnes)	3,000	1,850	5,550.00
	<b><u>B. Auxiliary Materials</u></b>			
1	Sacks (pcs)	Req	-	80
2	Drums (metallic)	Req	-	350
3	Other inputs	Req	-	37
	<b>Total</b>		-	<b>6,017.00</b>

Castor beans contain, on the average, 45% oil. The finest grade of oil is reserved for medicinal purposes. The lower grades are used in the manufacture of transparent soaps, flypaper, and type writer ink, and as a motor lubricant.

## **B. UTILITIES**

Inputs to the plant include electricity, water, and fuel oil for generation of steam. Electricity is used to provide motive power to production equipment. Water is required as an input to steam generating equipment (boiler), for human consumption and general purposes. Annual requirement of utilities at full production capacity is given in Table 4.2.

**Table 4.2**  
**ANNUAL REQUIREMENT OF UTILITIES**

<b>Sr. No.</b>	<b>Description</b>	<b>Qty</b>	<b>Cost ('000 Birr)</b>
1	Electricity (120kw)	288,000	135.36
2	Water (m <sup>3</sup> )	2,500	25.00
3	Fuel oil (litres)	20,000	108.2
4	Grease, lubricants, oils	Req	10.0
	<b>Total</b>	-	<b>278.56</b>

## **V. TECHNOLOGY AND ENGINEERING**

### **A. TECHNOLOGY**

#### **1. Process Description**

The major operations involved in the production of castor oil are cleaning of the raw material, conditioning, pressing, cleaning and storage.

At the first step castor beans are properly cleaned in shaking screens of various sizes and then are fed to multiple stage steam heated cookers in order to be conditioned.

After conditioning operation the seeds are taken to the expeller (or Press) as needed. The expeller breaks up to seed and subject it to pressure, thereby removing oil which is expelled from the machine and can be stored in drums.

The expelled oil should be left to settle for a couple of days, so that the sediments will fall down to the bottom and the oil can be decanted. The oil is finally pumped to the filter for further clarification. The oil discharged from the filter is taken to storage or packing facilities.

Castor oil production can produce both solid and liquid waste that can be easily handled with out causing any negative impact on environment. As the envisaged plant is a small scale one, the waste generated is relatively small in quantity.

## **2. Source of Technology**

The technology of castor oil production involves the use of simple and conventional equipment such as oil press and cooker. Such production equipment can be supplied by countries in Europe, Asia and the Far East.

Address of technology supplier in India is given below.

NOVA Engineering

P.O.Box chittilapilly, Trichur-680551,

Kerela, INDIA

Telephone: 0091-487-2306170, 2306435

Fax: 91-487-2308890,

Cell: 9447481890, 9895077644

E-mail: [novaengg@rediffmail.com](mailto:novaengg@rediffmail.com)

Website: [www.novaind.net](http://www.novaind.net)

## **B. ENGINEERING**

### **1. Machinery and Equipment**

The machinery and equipment required for the envisaged castor oil plant is given in Table 5.1 below.

**Table 5.1**  
**MACHINERY AND EQUIPMENT REQUIREMENT AND COST**

Sr. No.	Description	Qty (No.)	Cost ('000 Birr)		
			LC	FC	TC
1	Cooker	1	-	500	500
2	Expeller (complete unit)	1	-	2,000	2,000
3	Filter Press (with seed cleaner)	1	-	750	750
4	Boiler	1 set	-	200	200
5	Drum washer and filter	1	-	200	200
6	Laboratory equipment	Req	-	20	20
7	Weighting scale	1	20	-	-
8	Tanks (setting, decanting)	Req	50	-	-
9	Other accessories	Req	-	100	100
	FOB price		70	3,770	3,770
	Bank charge, insurance, customs, handling charges, etc.		-	250	
	<b>CIF Landed Cost</b>		<b>70</b>	<b>4,020</b>	<b>4,090</b>

## 2. Land, Building and Civil Works

Land area required for the plant is 1,000 m<sup>2</sup>. Built-up area for factory and administrative buildings, and others for general purpose will be 500 m<sup>2</sup>. At a land lease value of Birr 1.0 per m<sup>2</sup>, the total land lease value will be Birr 80,000. At a unit (per m<sup>2</sup>) building cost of Birr 1,500, the total cost of buildings, including cost of site preparation and development will be Birr 750,000. Thus, the total cost of land, buildings and civil works will be Birr 830,000.

### **3. Proposed Location**

Location of a plant is determined on the basis of proximity to raw materials, availability of infrastructure and its distance from potential market outlets. Moreover, consideration is given to fair distribution of projects among SNNPRS woredas. Accordingly, five woredas, namely; Damot Gale, Damot Woyde, Abadebretshay, Amaro special woreda and Shashogo are identified. Of this, Shashogo woreda is selected. It is, therefore, proposed to establish the envisaged plant in Bonnossa town.

## **VI. MANPOWER AND TRAINING REQUIREMENT**

### **A. MANPOWER REQUIREMENT**

The plant requires manpower both for production and administrative work. The details of manpower requirement including monthly salary and annual expenditure is shown Table 6.1.

### **B. TRAINING REQUIREMENT**

Oil milling technology is widely known in the country as there are several oil mills in the country. However, it would be advantageous for the new plant to given two weeks on-job training for the workers. The training programme can be conducted in one of well established edible oil mills in the country. An estimated of Birr 50,000 would be adequate to execute the training programme.

**Table 6.1**  
**MANPOWER REQUIREMENT**

(Birr)

<b>Sr. No.</b>	<b>Job title</b>	<b>Req. (No.)</b>	<b>Monthly Salary</b>	<b>Annual Expenditure</b>
	<b><u>A. Administration</u></b>			
1	Plant manager	1	2,000	2,4000
2	Secretary	1	600	7,200
3	Accountant	1	700	8,400
4	Personnel	1	700	8,400
5	Sales man	1	600	7,200
6	Store man	1	450	5,400
7	Clerk	1	250	3,000
8	General services (Guards, messengers, cleaners)	5	200	12,000
	<b>Sub-total</b>	<b>12</b>		<b>75,600</b>
	<b><u>B. Production</u></b>			
1	Production supervisor	1	1,200	14,400
2	Operators	6	600	43,200
3	Unskilled labor	3	180	6,480
4	Chemist	1	700	8,400
5	Technician	4	450	21,600
	<b>Sub-total</b>	<b>15</b>	<b>-</b>	<b>94,080</b>
	Workers' benefit (25% BS)	-	-	43,420
	<b>Total</b>	<b>27</b>	<b>-</b>	<b>212,100</b>

## VII. FINANCIAL ANALYSIS

The financial analysis of the castor 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	3 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 6.66 million, of which 17 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	80.0
2	Building and Civil Work	750.0
3	Plant Machinery and Equipment	4,070.0
4	Office Furniture and Equipment	125.0
5	Vehicle	450.0
6	Pre-production Expenditure*	576.3
7	Working Capital	609.8
	<b>Total Investment cost</b>	<b>6,661.1</b>
	Foreign Share	17

\* *N.B Pre-production expenditure includes interest during construction ( Birr 328.81 thousand ) training (Birr 50 thousand ) and Birr 197.5 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 7.49 million (see Table 7.2). The material and utility cost accounts for 83.97 per cent, while repair and maintenance take 2.33 per cent of the production cost.

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

<b>Items</b>	<b>Cost</b>	<b>%</b>
Raw Material and Inputs	6,017.50	80.25
Utilities	278.56	3.71
Maintenance and repair	175	2.33
Labour direct	136.5	1.82
Administration Costs	75.6	1.01
Total Operating Costs	6,683.16	89.13
Depreciation	596.5	7.96
Cost of Finance	218.6	2.92
<b>Total Production Cost</b>	<b>7,498.26</b>	<b>100</b>

**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.

$$\text{BE} = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable Cost}} = 29 \%$$

## 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 4 years.

## 4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 29 % and the net present value at 8.5 % discount rate is Birr 5.82 million.

## D. ECONOMIC BENEFITS

The project can create employment for 27 persons. In addition to supply of the domestic needs, the project will generate Birr 2.64 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.