

**CASTOR BEAN FARM &  
PROCESSING PLANT**

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## **I. SUMMARY**

This profile envisages the establishment of a castor bean farm & a plant for the production of Castor Oil with a capacity of 270 tonnes per annum.

The present demand for the proposed product is estimated at 1,000 tonnes per annum. The demand is expected to reach at 1.34 thousand tonnes by the year 2010.

The plant will create employment opportunities for 33 persons.

The total investment requirement is estimated at Birr 27.16 million, out of which Birr 11.84 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 19.08 million, discounted at 8.5 %.

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

Castor is originated in Africa and grows wild in East and North Africa, the Yemen and the Near and Middle East. It was cultivated in ancient Egypt as long as 400 B.C.

Castor requires a warm climate and is killed by frost . At least 140 - 180 growing season is required before the first killing frost. It can be grown over a wide altitude range in the tropics and with both low and medium rainfall. Heavy rainfall and water logging should be avoided. At sustained temperatures above 100<sup>0</sup>F seed may fail to set. The best soils for its cultivation are rich well-drained sandy or clayey loams.

Upto the beginning of the 20<sup>th</sup> Century, the main use of castor was to extract castor oil to use it in the machine manufacturing, mainly as a purgative. Now the bulk of crop is utilized in industry. It is water resistant and is used for waiting fabrics and their protective coverings. It is used in the manufacture of high - grade lubricants, soap and printing inks, on textile dyeing and for preserving leather. The dehydrated oil is an excellent drying agent which compares favourably with tung oil and is used in paints and varnishes. The hydrogenated oil is used in the manufacture of waxes, plastics, carbon paper, candles and crayons. They are also used for plastics, ointments and cosmetics.

### III. MARKET STUDY, FARM & PLANT CAPACITY

#### A. MARKET STUDY

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

Although castor oil is an industrial raw material or intermediate input, there are no industries in Ethiopia which make use of it. Therefore, it has no market potential locally at present, and there is no indication that it will be demanded in meaningful quantity in the near future. Import statistics too show that negligible amount of it is imported annually, the average over the last five years being about 3.8 tonnes.

**Table 3.1**  
**IMPORT OF CASTOR OIL (1994 - 2003)**

Year	Imports (Tonne)
1994	0.175
1995	0.072
1996	-
1997	-
1998	-
1999	4.3
2000	4.2
2001	0.4
2002	7.1
2003	2.9

*Source: Customs Authority, External Trade Statistics, Annual Issue.*

Internationally, however, castor oil is widely used as an emollient and skin softener for treatment of gastrointestinal problems, lacerations and other skin disorders. It is also found in many skin care products.

India is the leading producer and exporter of castor oil in the world, followed by China and Brazil. The present annual world trade in castor oil is estimated from 800,000 tonnes to one million tonnes per annum. The major importers of castor oil in the world market are European Union, US and Japan. The world demand for castor oil is estimated to grow at the rate of 5 to 7% per annum.

Since the domestic market is virtually non-existent, and the price is higher than any other vegetable oil, the general recommendation for a country like Ethiopia is to export whatever is produced. Presently, it is possible to export about 1,000 tonnes through contacts and agents.

##### 2. Projected Demand

The European market for castor oil is an expanding one. Therefore, the supply can be increased at a rate of 5%, given to the past trends.

**Table 3.2**  
**PROJECTED DEMAND FOR CATOR OIL**

<b>Year</b>	<b>Projected Demand (Thousand Tonnes)</b>
2004	1
2005	1.05
2006	1.10
2007	1.15
2008	1.21
2009	1.28
2010	1.34
2011	1.41
2012	1.48
2013	1.55
2014	1.63
2015	1.71
2016	1.80
2017	1.88
2018	1.98

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

Currently, a kilogramme of castor oil fetches a price of 11.6 USD in the European market. The equivalent converted price of about Birr 100 /kg could be used as a reference price to assess the financial feasibility of the envisaged project.

Distribution of the product should be arranged through contacts with agents having deep and extensive experience of the market.

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

### **1. Farm and Plant Capacity**

The castor farm is expected to produce 5,000 qts. of castor bean from 500 ha. of land per annum. The productivity of the farm is assumed to be 10 qts. per hectare in each production season. The whole produce will be processed for castor oil extraction. The processing plant will be with 270 thousand liters of castor oil producing capacity per annum.

## 2. Production Programme

The proposed castor bean farm and castor oil processing plant will begin with 50 per cent capacity of production at their initial stages and will reach to their full capacity in the second year.

## IV. FARM AND PLANT MATERIALS AND INPUTS, AND UTILITIES

### A. FARM AND PLANT MATERIALS AND INPUTS

Materials and inputs required for castor bean farm and castor oil production and the corresponding costs are indicated in Table 4.1. As can be seen from the table, the total cost for materials and inputs will be about Birr 8.8 million.

**Table 4.1**  
**FARM AND PLANT MATERIALS AND INPUTS, AND**  
**CORRESPONDING COST ('000 BIRR)**

Sr. No.	Description	Qty.	Cost Birr
1	Seeds (qt)	50	12.5
2	Fertilizer ( qt )	7,500	2,250
3	Chemicals	-	100
4	Sacks ( No)	7,500	225
5	Oil container	-	650
	<b>Total Cost</b>		<b>3,237.5</b>

### B. UTILITES

Electricity, water, fuel, lubricant, telephone and office supplies are the main utilities required by the envisaged castor farm and castor oil processing plant. The types of utilities required and their corresponding cost are shown in Table 4.2. According to Table 4.2, the total cost of fuel and lubricant for transporting products, inputs and other materials and running the generator and electrical appliances are estimated at Birr 0.44 million . The cost for electricity, water, telephone and office supplies are expected to be Birr 0.4 million, Birr 0.14 million, Birr 0.02 million and Birr 0.04 million, respectively. Generally, the total cost of utilities is estimated to be Birr one million.

**Table 4.2**  
**UTILITIES REQUIREMENT AND COST '000 BIRR**

Sr. No.	Description	Qty (000)	Cost
1	Fuel (lt)	158	395
2	Lubricant ( lt/kg)	15.8	39.5
3	Electricity (kWh)	769.956	364.805
4	Telephone	-	20
5	Office supplies	-	36
	<b>Total</b>		<b>855.305</b>

## **V. FARM OPERATION AND OIL PROCESSING TECHNOLOGY AND ENGINEERING**

### **A. FARM OPERATION AND OIL PROCESSING TECHNOLOGY**

#### **1. Farm Operation and Oil Production Process**

Like other crops, castor bean production will presume with land development. The land development part includes surveying and design; land clearing, leveling and irrigation system and access and farm roads construction. Usually land development is followed by land preparation activities such as ploughing, disking and harrowing. After fine seed bed preparation, sowing with fertilizer application will be undertaken.

In castor bean production, preharvest managements like cultivation for weed control and soil fertility improvement, irrigation water application, insect pest and disease control are the main activities to be carried out, timely. These operations are expected to be undertaken manually using different farm implements

Post - harvest management is the final stage of castor bean production. It comprises harvesting, threshing, packing, loading / unloading, transporting, storing and marketing or processing of the produce. Processing of castor bean for castor oil extraction includes cleaning, conditioning, pressing, cleaning and storage . At the first step castor beans are cleaned in shaking screens of various sizes and then are fed to multiple stage steam heated cookers in order to be conditioned. After being conditioned, the seeds are taken to the expeller as needed. The expeller breaks up the seeds and subjects them to pressure. Thus, removing oil which is expelled from the machine and can be stored in drums.

## 2. Source of Technology

The machinery and equipment required by the farm and processing plant could be supplied by Ries Engineering, Nazareth Tractor Assembly Plant, Hagbes, etc. In addition, technologies such as fertilizers, chemicals, etc. could be availed by Governmental and Non - governmental inputs supplying organizations.

### B. ENGINEERING

#### 1. Farm and Plant Machinery and Equipment

The required farm and plant machinery and equipment are listed in Table 5.1. The total cost for machinery and equipment is estimated to be Birr 14.54 million , out of which 8 per cent and 92 per cent will be local and foreign currency, respectively.

**Table 5.1**  
**FARM AND PLANT MACHINERY AND EQUIPMENT REQUIREMENT,**  
**AND COST ('000 BIRR)**

<b>Sr. No.</b>	<b>Description</b>	<b>Qty. (No.)</b>	<b>Local Currency</b>	<b>Foreign Currency</b>	<b>Total</b>
1	Tractor 110 HP -125 HP	2	-	540	540
2	Disk Plough(5-6 farrw)	2	-	120	120
3	Disk Harrow 3 set type	2	-	180	180
4	Rigger	2	-	80	80
5	Trailer	2	180	-	180
6	Sprayers ( manual)	20	-	20	20
7	Generator	1	30	125	155
8	Workshop (set )	1	-	50	50
9	Tools (set)	1	-	12.5	12.5
10	Truck	2	-	1600	1600
11	Vehicle -pickup	1	-	200	200
12	Processing plant equipment	-	-	-	500
12.1	Cooker	-	-	500	500
12.2	Expeller	-	-	2000	2000
12.3	Filter press seed cleaner	-	-	1500	1500
12.4	Other	-	-	1500	1500
12.5	Office furniture	-	900	-	900
	<b>Grand total</b>		<b>1110</b>	<b>13428</b>	<b>14538</b>



## **2. Land, Building and Civil works**

### **2.1 Land**

The total land required for castor bean farm and castor oil production plant will be about 1000 hectares. The land is expected to be allocated for castor bean production, future expansion and processing plant, residential houses, offices, stores, workshop and access road construction. Rural land lease rate in BGRS ranges from Birr 15 to Birr 30 per hectare. Accordingly, the total land lease, at the rate of Birr 30 per hectare and for 70 years of land holding, is estimated at Birr 2.1 Million.

### **2.2 Buildings**

Building areas of the farm includes stores , offices, canteens and workshop is estimated to be 8000 m<sup>2</sup> and its total construction cost will be about Birr 5.6 million at the unit cost of Birr 700 per m<sup>2</sup>.

### **2.3 Civil Works**

Surveying, clearing and leveling of farm land and main canal and farm road, including hydraulic structures constructions will be among the civil work activities to be carried out for castor bean and castor oil production. The total cost is estimated at Birr 1.8 million.

Accordingly, assuming that the total land lease cost will be paid in advance, the total investment on land, building and civil works is estimated at Birr 9.5 million.

## **3. Proposed Location**

The location of the project is expected in Assosa zone where water and land is abundant.

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

### **A. MANPOWER REQUIREMENT**

The cost for permanent and casual labour required for the envisaged castor bean farm and castor oil production is indicated in Table 6.1. As can be seen from the table, the total cost for permanent and casual labour is estimated at Birr 1.86 million, out of which Birr 0.31 million is for permanent and Birr 1.55 million for casual labour.

### **B. TRAINING REQUIREMENT**

On-the-job training will be given by the machinery supplier to castor oil production manager and processing plant operators for one month during erection & commissioning period. The total training cost is estimated at Birr 15 thousand.

**Table 6.1**  
**MANPOWER REQUIREMENT AND ANNUAL LABOUR COST**

Sr. No.	Description	Req. No.	Monthly Salary (Birr)	Annual Salary ('000 Birr)
1	Manager	1	2250	27
2.	Secretary/ Cashier	1	700	8.4
3	Irrigation Agronomist	1	2000	24
4	Plant Protectionist	1	2000	24
5	Sales Purchaser	1	800	9.6
6	Accountant	1	700	8.4
7	Warehouse Specialist	1	1850	22.2
8	Processing plant Operator	4	1600	19.2
9	Processing plant Manager	1	1200	14.4
10	Production Sales-person	1	1000	12.0
11	Tractor Operator	2	800	9.6
12	Ass. Tractor Operator	2	600	7.2
13	Mechanic	1	500	6.00
14	Ass. Mechanic	1	600	7.2
15	Drivers	3	1500	18.0
16	Ass. Drivers	2	600	7.2
17	Generator Operator	1	300	3.6
18	Store Keeper	2	500	6.00
19	Office girl /boy	2	400	4.8
20	Guards	4	800	9.60
	<b>Sub - total</b>	<b>33</b>		<b>248.4</b>
	Employee benefits 25%			62
	<b>Total</b>			<b>310.5</b>
	Casual labour			1550
	<b>Grand total</b>			<b>1860</b>

## VII. FINANCIAL ANALYSIS

The financial analysis of the Castor Bean farm & Castor Oil processing 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	6 years
Bank interest	7.5 %
Discounted cashflow	8.5 %

Repair and maintenance	3 % of the total farm & plant and machinery & equipment
Accounts receivable	30 days
Raw material, local	30 days
Raw materials, import	90 days
Work in progress	1 days
Finished products	30 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 27.17 million, of which 48.37 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	2,100
2	Sale preparation & Dev't	1,800
3	Building and Civil Work	5,600
4	Farm & Plant Machinery and Equipment	11,838
5	Office Furniture and Equipment	900
6	Vehicle	1,800
7	Pre-production Expenditure*	1,572.7
8	Working Capital	1,554.4
	<b>Total Investment cost</b>	<b>27,165.08</b>
	<b>Foreign share</b>	<b>48.37</b>

#### B. FARM OPERATION AND OIL PROCESSING COSTS

The annual operation and processing cost at full operation capacity of the project is estimated at Birr 14.2 million (see Table 7.2). The material and utility cost accounts for 61.4 per cent while depreciation and financial costs take 23.79 per cent of the operation and processing cost.

\* N.B Pre-production expenditure includes interest during construction (Birr 1552.7 thousand), training (Birr15 thousand), and ( Birr 5 thousand) costs of registration, licensing and formation of the company including legal fees, commissioning expenses, etc.

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

<b>Items</b>	<b>Cost</b>	<b>%</b>
Raw Material and Inputs	8,775	61.4
Utilities	995	6.9
Maintenance and repair	138	0.97
Labour direct	636	4.4
Farm & factory overheads	311	2.1
Administration Cost	25	0.2
<b>Total Operating Costs</b>	<b>10,879</b>	<b>76.20</b>
Depreciation	2,112	14.79
Cost of Finance	1,285	9
<b>Total Production Cost</b>	<b>14,227</b>	<b>100.0</b>

**C. FINANCIAL EVALUATION****1. Profitability**

According to the projected income statement, the project will start generating profit in the 2<sup>nd</sup> 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 operate at full capacity ( year 3) is estimated by using income statement projection.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable cost}} = 51 \%$$

**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 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 19.08 million.

#### **D. ECONOMIC BENEFITS**

The project can create employment for 33 persons. In addition to supply of the domestic needs, the project will generate Birr 1.3 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.