

**42. PROFILE ON THE PRODUCTION OF
ESSENTIAL OIL**

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I. SUMMARY

This profile envisages the establishment of a plant for the production of essential oil with a capacity of 15,000 kg per annum. Essential oil is used as odorants, flavorants, and pharmaceutical ingredients.

The demand for Essential oil is entirely met through import. The present (2012) demand for essential oil is estimated at 1,820 tons. The demand for essential oil is projected to reach 3,660 tons and 7,363 tons by the year 2017 and 2022, respectively.

The principal raw material required by the envisaged plant is rose petal which is locally available.

The total investment cost of the project including working capital is estimated at Birr 43.14 million. From the total investment cost the highest share (Birr 31.39 million or 72.76%) is accounted by initial working capital followed by fixed investment cost (Birr 8.40 million or 19.48 %) and pre operation cost (Birr 3.34 million or 7.75 %). From the total investment cost Birr 4.30 million or 9.99% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 25.04% and a net present value (NPV) of Birr 42.42 million, discounted at 10%.

The project can create employment for 18 persons. The project will generate Birr 21.40 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 as well as by exporting to the world market. The project will also create backward linkage with floriculture sector and forward linkage with the pharmaceuticals; food processing and cosmetics sub sectors and also generate income for the Government in terms of payroll tax.

II. PRODUCT DESCRIPTION AND APPLICATION

Essential oil is an aromatic volatile substance (named after the French 'essence', not the English 'essential') extracted by distillation or expression from blossoms, seeds, fruits, fruit peels, leaves, stems, barks, wood, roots, and plant secretions. The resulting oil should have nothing added either during or after this process.

Essential oils are found in hundreds of products but are generally used as odorants, flavorants, and pharmaceutical ingredients. As odorants, they are used in perfumes and other cosmetics, soaps, detergents, and other products ranging from animal feed to insecticides. As flavorants, they are present in a wide variety of foods, including soft drinks, baked products, ice creams, candy, confectionary, meat, and even pickle. As pharmaceutical ingredients, essential oils are used in dental products such as toothpaste, aromatherapy and phytotherapy products, and a large number of medicines.

Among the myriads of essential oils, rose oil is considered in this profile since it has wide application and the resource i.e. rose can be produced in the outskirts of the Metropolis. Rose oil, meaning either rose otto (attar of rose, attar of roses) or rose absolute, is the essential oil extracted from the petals of various types of rose. Even with their high price and the advent of organic synthesis, rose oils are still perhaps the most widely used essential oil in perfumery.

Rose oil is used in perfumes to lend beauty and depth. A drop or two in a massage, facial or bath oil is luxurious and soothing. The oil is used in skin creams, powders and lotions. Aromatherapy benefits: romantic, supportive, gently uplifting

Rose oil soothes and harmonizes the mind and helps with depression, anger, grief, fear, nervous tension and stress and at the same time addresses sexuality, self-nurturing, self-esteem and dealing with emotional problems. It is most helpful for poor circulation and heart problems, which would include heart palpitations, arrhythmia as well as high blood pressure and is also used to boost the liver and gall bladder. For the respiratory system rose oil assists in cases of asthma, coughs and hay fever, and in the digestive system for liver congestion and nausea.

Rose otto oil has a clearing, cleansing, regulating and purifying effect on the female sex organs and can be used for regulating and balancing hormones, irregular menstruation, functional infertility, leucorrhoea, menorrhagia, uterine bleeding and other uterine disorders, while having a general toning effect on the uterus.

On the skin, it is most effective for moisturizing and hydrating the skin, while having a general stimulant and antiseptic action, which is good for all skin types, but especially so for dry, mature and irritated skin. It is used to repair broken capillaries, inflammation as well as skin redness and is useful in eczema and herpes. Rose water can be used for conjunctivitis.

Rose oil gives a feeling of well-being and happiness, it helps a nervous mind, can be helpful for the respiratory tract, for digestive problems, for menstrual problems and in skin care.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

Essential oils are widely used in the cosmetics, pharmaceuticals confectionery, and beverage industries. The country's demand for essential oils is met through import. The Ethiopian Revenues and Customs Authority data on the import of the product classifies based on their plant source as well as their application. The list of classification based on the plant source and application is as given below.

- Essential oils of orange,
- Essential oils of lemon,
- Essential oils of bergamot ,
- Essential oils of citrus fruit,
- Essential oils of jasmine,
- Essential oils of rose,

- Essential oils of pepper mint,
- Essential oils of lavender or lavandin,
- Essential oils of mints,
- Concentrates of essential oils of a kind used in medicament,
- Concentrates of essential oils in fats,
- Essential oils of a kind used in non alcoholic drinks or in preparation of flavor food,
- Essential oils of a kind used in alcoholic drinks industries,
- Essential oils of a kind used in sandal manufacture,
- Essential oils of a kind used in mosquito repellent jelly manufacture, and
- Other mixtures of odoriferous substances.

A summary on the imported volume and value of the different types of essential oils is given in Table 3.1.

TABLE 3.1
IMPORT OF ESSENTIAL OILS

| Year | Qty (Tons) | Value (`000 Birr) |
|-------------|-------------------|---------------------------|
| 2000 | 375.8 | 37,280 |
| 2001 | 534.3 | 45,337 |
| 2002 | 577.6 | 54,475 |
| 2003 | 632.4 | 66,853 |
| 2004 | 728.6 | 83,047 |
| 2005 | 929.4 | 109,789 |
| 2006 | 1,106.8 | 128,849 |
| 2007 | 1,026.4 | 144,976 |
| 2008 | 1,420.5 | 226,651 |
| 2009 | 1,428.6 | 326,291 |
| 2010 | 1,530.6 | 485,658 |
| 2011 | 1,596.5 | 510,146 |

Source: - Ethiopian Revenues and Customs Authority.

Table 3.1 reveals that the quantity imported in the past 12 years has been consistently rising. The imported quantity which was 375.8 tons in the year 2000 has reached to 1,596.5 tons by the year 2011. The total increment in the past twelve years is more than fourfold, which is equal to an annual average growth rate of 14%. To estimate the present demand the historical growth rate of 14% has been applied by taking the imported quantity of 2011. Accordingly, present demand is estimated at 1,820 tons.

2. Demand Projection

The demand for the various types of essential oils will increase mainly with the expansion and establishment of the food, soft drinks, alcoholic drinks, pharmaceuticals and cosmetics industry and various chemical industries. Due to the favorable climate created for foreign and local investors a number of food, beverage, pharmaceutical, chemical and cosmetics manufacturing projects are on pipe line for establishment. Considering the past demand growth of the product and the conducive environment created for investment an annual growth rate of 15% , which is almost equal to the historical trend, is applied to forecast the future demand (see Table 3.2).

Table 3.2

FORECASTED DEMAND FOR ESSENTIAL OILS (TONS)

| Year | Forecasted Demand |
|-------------|--------------------------|
| 2013 | 2,093 |
| 2014 | 2,407 |
| 2015 | 2,768 |
| 2016 | 3,183 |
| 2017 | 3,660 |
| 2018 | 4,210 |
| 2019 | 4,841 |
| 2020 | 5,567 |
| 2021 | 6,402 |
| 2022 | 7,363 |
| 2023 | 8,467 |

3. Pricing and Distribution

The prices of essential oils vary considerably according to the type of plant source, contents and concentration of the product. Assuming the envisaged plant to process essential of rose, which is available in the vicinity of Addis Ababa and based on the current international price of the product the factory gate price is set at Birr 22,500 per kilo gram

The product can be sold directly to the user industries mainly food, cosmetic and soft drinks plants. For small quantity purchasers that may be found at dispersed places agents can be appointed to handle the sales activity.

B. PLANT CAPACITY AND PRODUCTION PROGRAM

1. Plant Capacity

Before defining viable economic size of the proposed project, certain important aspects have to be decided before hand. First of all we have to decide which distillation process should be used and which botanical herb(s) should be cultivated for essential oil extraction and over what area. Steam distillation is the recommended process and rose is the selected botanical herb for extraction since it is available in the outskirts of the metropolis.

The annual production capacity of the envisaged plant is 15,000 kg of rose oil in three shifts operation based on 300 working days.

2. Production program

Considering the gradual development of processing skill and marketing of the product, the rate of capacity utilization during the 1st and 2nd year of production will be 75% and 85%, respectively. Full capacity will be attained in the third year and then after. The production program is indicated in Table 3.3.

Table 3.3
PRODUCTION PROGRAM

| Sr.No. | Description | Production Year | | |
|--------|-------------------------------|-----------------|-------|------|
| | | 1 | 2 | 3-10 |
| 1 | Rose oil (tons) | 11.25 | 12.75 | 15 |
| 2 | Capacity utilization rate (%) | 75 | 85 | 100 |

IV. RAW MATERIAL AND INPUTS

A. RAW AND AUXILIARY MATERIALS

Rose oil petals are collected from the floriculture farm found in the outskirts of Addis Ababa. The basic raw material is rose petal. From 1,000kg of rose petal, 1kg rose oil is extracted. The auxiliary materials required by the envisaged project are plastic drums of 30 kg capacity. The total annual cost of material and input is estimated at Birr 60.075 million. Table 4.1 indicates the detail of annual raw material requirements and its cost at full capacity production.

Table 4.1
RAW AND AUXILIARY MATERIAL REQUIREMENT AND COST

| Sr.No. | Raw Material | UOM | Qty. | Cost ('000 Birr) |
|--------|--------------------------------|------|--------|------------------|
| 1 | Rose petal | Tons | 15,000 | 60,000 |
| 2 | Plastic drums (30 kg capacity) | Pcs | 500 | 75 |
| | Total | | | 60,075 |

B. UTILITIES

Electricity, furnace oil and water are essential utilities required by the project. Table 4.2 indicates the annual utilities cost and consumption of the proposed steam distillation unit. The total annual utility cost is estimated to be Birr 260,554.

Table 4.2
ANNUAL UTILITIES REQUIREMENT & COST

| Sr.No. | Description | UOM | Qty. | Cost ('000 Birr) |
|---------------|--------------------|----------------|-------------|-----------------------------|
| 1 | Electricity | kWh | 5,000 | 2,890 |
| 2 | Furnace oil | Lt | 15,300 | 227,664 |
| 3 | Water | M ³ | 3,000 | 30,000 |
| | Total | | | 260,554 |

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Process Description

Most commonly, the essence is extracted from the plant using a technique called 'distillation'. Since plants contain such a small amount of this precious oil, several hundred kilograms of plant material may be needed to produce a single ounce. There are four methods of essential oil extraction i.e. steam distillation, cold pressing or compression, solvent extraction, and carbon dioxide extraction.

➤ **Steam Distillation**

Steam distillation is the most common method of extracting essential oils. Many old-time distillers favor this method for most oils, and say that none of the newer methods produces better quality oils. Steam distillation is done in a 'still'. Fresh or sometimes dried, botanical material is placed in the plant chamber of the still and pressurized steam is generated in a separate chamber and circulated through the plant material. The heat of the steam forces the tiny intercellular pockets that hold the essential oils to open and release them. The temperature of the steam must be high enough to open the pouches, yet not so high that it destroys the plants or burns the essential oils. As the steam is released, the tiny droplets of essential oil, evaporate and together with the steam molecules, travel through a tube into the still's condensation chamber. As the steam cools, it condenses into water. The essential oil forms a film on the surface of the water. To separate the essential oil from the water, the film is then decanted or skimmed off the top. The remaining water, a byproduct of distillation, is called floral water, distillate, or hydrosol. It retains many of the therapeutic properties of the plant, making it valuable in skin care for facial mists and toners. In certain situations, floral water may be preferable to pure essential oil; such as when treating a sensitive individual or a child, or when a more diluted treatment is required.

➤ **Cold Pressing or Cold Compression**

Another method of extracting essential oils is cold pressed expression, or scarification. It is used to obtain citrus fruit oils such as bergamot, grapefruit, lemon, lime, mandarin, orange, and tangerine oils. In this process, fruit rolls over a trough with sharp projections that penetrate the peel. This pierces the tiny pouches containing the essential oil. Then the whole fruit is pressed to squeeze the juice from the pulp and to release the essential oil from the pouches. The essential oil rises to the surface of the juice and is separated from the juice by centrifugation.

➤ **Solvent Extraction**

Another method of extraction used on delicate plants is solvent extraction, which yields a higher amount of essential oil at a lower cost. In this process, a chemical solvent such as 'hexane' is used to saturate the plant material and pull out the aromatic compounds. This renders a substance

called 'concrete'. The concrete can be dissolved in alcohol to remove solvent. When the alcohol evaporates, an 'absolute' remains. Although solvent extraction is a cost-efficient process, it has certain disadvantages. Residues of the solvent may remain in the absolute and they can cause side effects. While absolutes or concretes may be fine for fragrances or perfumes, they are not desirable for skin care applications.

➤ **Carbon Dioxide Extraction**

Supercritical carbon dioxide extraction uses carbon dioxide under extremely high pressure to extract essential oils. Plants are placed in a stainless steel tank and, as carbon dioxide is injected into the tank, pressure inside the tank builds. Under high pressure, the carbon dioxide turns into a liquid and acts as a solvent to extract the essential oils from the plants. When the pressure is decreased, the carbon dioxide returns to a gaseous state, leaving no residues behind. Many carbon dioxide extractions are fresher, cleaner, and crisper aromas than steam-distilled essential oils, and they smell more similar to the living plants. Scientific studies show that carbon dioxide extraction produces essential oils that are very potent and have great therapeutic benefits. This extraction method uses lower temperatures than steam distillation, making it more gentle on the plants. It produces higher yields and makes some materials, especially gums and resins, easier to handle. Many essential oils that cannot be extracted by steam distillation are obtainable with carbon dioxide extraction.

➤ **Selected Production Process**

Steam distillation is the preferred method for rose oil produced in large quantities. The steam produced in a boiler is introduced into a vessel which contains the leaves and water. The leaves are located on a grid placed at a certain distance above the level of the water which fills the bottom of the vessel. The water is vaporized indirectly by steam flowing in a pipe coil submerged by the water. The water vapor plus the distilled oil coming from the evaporator vessel is recovered in a separate water cooled condenser. The mixture flowing out of the condenser is separated by decantation in a Florentine flask. The oil floats at the top and is easily separated. The distilled water still contains some soluble parts of the oil and therefore is sent back to the evaporator.

2. Environmental Impact Assessment

The essential oil production plant uses steam for extraction of essential oil and does not use any chemical. Therefore, the plant does not have any adverse environmental impact.

B. ENGINEERING

1. Machinery and Equipment

The total cost of the turn-key plant is estimated at Birr 5,742,200, of which Birr 4,306,650 is required in foreign currency. The list of machinery & equipment is indicated in Table 5.1.

Table 5.1
LIST OF MACHINERY

| Sr.No. | Description | Qty. |
|---------------|----------------------|-------------|
| 1 | Still(Extractor) | 6 |
| 2 | Condenser | 3 |
| 3 | Florentine flask | 3 |
| 4 | De ionizing plant | 1 |
| 5 | Steam boiler | 1 |
| 6 | Pump (condensate) | 1 |
| 7 | Pump (cooling water) | 1 |
| 8 | Cooling tower | 1 |
| 9 | Submersible pump | 1 |

2. Land, Building and Civil Work

The total area of the project is 500 m², of which 300 m² is a built-up area. The cost of building is estimated at Birr 1,500,000.

According to the Federal Legislation on the Lease Holding of Urban Land (Proclamation No 721/2004) in principle, urban land permit by lease is on auction or negotiation basis, however, the time and condition of applying the proclamation shall be determined by the concerned regional or city government depending on the level of development.

The legislation has also set the maximum on lease period and the payment of lease prices. The lease period ranges from 99 years for education, cultural research health, sport, NGO , religious and residential area to 80 years for industry and 70 years for trade while the lease payment period ranges from 10 years to 60 years based on the towns grade and type of investment.

Moreover, advance payment of lease based on the type of investment ranges from 5% to 10%.The lease price is payable after the grace period annually. For those that pay the entire amount of the lease will receive 0.5% discount from the total lease value and those that pay in installments will be charged interest based on the prevailing interest rate of banks. Moreover, based on the type of investment, two to seven years grace period shall also be provided.

However, the Federal Legislation on the Lease Holding of Urban Land apart from setting the maximum has conferred on regional and city governments the power to issue regulations on the exact terms based on the development level of each region.

In Addis Ababa, the City's Land Administration and Development Authority is directly responsible in dealing with matters concerning land. However, regarding the manufacturing sector, industrial zone preparation is one of the strategic intervention measures adopted by the City Administration for the promotion of the sector and all manufacturing projects are assumed to be located in the developed industrial zones.

Regarding land allocation of industrial zones if the land requirement of the project is below 5000 m², the land lease request is evaluated and decided upon by the Industrial Zone Development and Coordination Committee of the City's Investment Authority. However, if the land request is above 5,000 m² , the request is evaluated by the City's Investment Authority and passed with

recommendation to the Land Development and Administration Authority for decision, while the lease price is the same for both cases.

Moreover, the Addis Ababa City Administration has recently adopted a new land lease floor price for plots in the city. The new prices will be used as a benchmark for plots that are going to be auctioned by the city government or transferred under the new “Urban Lands Lease Holding Proclamation.”

The new regulation classified the city into three zones. The first Zone is Central Market District Zone, which is classified in five levels and the floor land lease price ranges from Birr 1,686 to Birr 894 per m². The rate for Central Market District Zone will be applicable in most areas of the city that are considered to be main business areas that entertain high level of business activities. The second zone, Transitional Zone, will also have five levels and the floor land lease price ranges from Birr 1,035 to Birr 555 per m². This zone includes places that are surrounding the city and are occupied by mainly residential units and industries. The last and the third zone, Expansion Zone, is classified into four levels and covers areas that are considered to be in the outskirts of the city, where the city is expected to expand in the future. The floor land lease price in the Expansion Zone ranges from Birr 355 to Birr 191 per m² (see Table 5.2).

Table 5.2**NEW LAND LEASE FLOOR PRICE FOR PLOTS IN ADDIS ABABA**

| Zone | Level | Floor Price/m² |
|-------------------------|-----------------|----------------------------------|
| Central Market District | 1 st | 1686 |
| | 2 nd | 1535 |
| | 3 rd | 1323 |
| | 4 th | 1085 |
| | 5 th | 894 |
| Transitional zone | 1 st | 1035 |
| | 2 nd | 935 |
| | 3 rd | 809 |
| | 4 th | 685 |
| | 5 th | 555 |
| Expansion zone | 1 st | 355 |
| | 2 nd | 299 |
| | 3 rd | 217 |
| | 4 th | 191 |

Accordingly, in order to estimate the land lease cost of the project profiles it is assumed that all new manufacturing projects will be located in industrial zones located in expansion zones. Therefore, for the profile a land lease rate of Birr 266 per m² which is equivalent to the average floor price of plots located in expansion zone is adopted.

On the other hand, some of the investment incentives arranged by the Addis Ababa City Administration on lease payment for industrial projects are granting longer grace period and extending the lease payment period. The criteria are creation of job opportunity, foreign exchange saving, investment capital and land utilization tendency etc. Accordingly, Table 5.3 shows incentives for lease payment.

Table 5.3**INCENTIVES FOR LEASE PAYMENT OF INDUSTRIAL PROJECTS**

| Scored Point | Grace Period | Payment Completion Period | Down Payment |
|---------------------|---------------------|----------------------------------|---------------------|
| Above 75% | 5 Years | 30 Years | 10% |
| From 50 - 75% | 5 Years | 28 Years | 10% |
| From 25 - 49% | 4 Years | 25 Years | 10% |

For the purpose of this project profile, the average i.e. five years grace period, 28 years payment completion period and 10% down payment is used. The land lease period for industry is 60 years.

Accordingly, the total land lease cost at a rate of Birr 266 per m² is estimated at Birr 133,000 of which 10% or Birr 13,300 will be paid in advance. The remaining Birr 119,700 will be paid in equal installments with in 28 years i.e. Birr 4,275 annually.

VI. HUMANRESOURCE AND TRAINING REQUIREMENT

A. HUMANRESOURCE REQUIREMENT

The list of human resource and cost are indicated in Table 6.1. The total annual cost of human resource is estimated at Birr 346,500.

Table 6.1
HUMANRESOURCE REQUIREMENT & LABOR COST

| Sr.No. | Manpower | Req.No. | Monthly Salary (Birr) | Annual Salary (Birr) |
|---------------|-------------------------------|----------------|------------------------------|-----------------------------|
| 1 | General manager | 1 | 5,000 | 60,000 |
| 2 | Secretary | 1 | 1,200 | 14,400 |
| 3 | Accountant | 1 | 2,500 | 30,000 |
| 4 | Production and technical head | 1 | 3,000 | 36,000 |
| 5 | Mechanic | 1 | 1,500 | 18,000 |
| 6 | Quality control | 1 | 1,500 | 18,000 |
| 7 | Operators | 6 | 5,400 | 64,800 |
| 8 | Ass. Operators | 3 | 1,800 | 21,600 |
| 9 | Guards | 3 | 1,200 | 14,400 |
| | Sub- total | 18 | 23,100 | 277,200 |
| | Benefits (25% BS) | | 5,775 | 69,300 |
| | Total | | 28,875 | 346,500 |

B. TRAINING REQUIREMENT

On-the-job training is carried out during plant erection and commissioning by the experts of machinery suppliers and Wondo -genet University. The cost of training is estimated at Birr 50,000.

VII. FINANCIAL ANALYSIS

The financial analysis of the essential 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 and 70% loan |
| Tax holidays | 5 years |
| Bank interest | 10% |
| Discount cash flow | 10% |
| Accounts receivable | 30 days |
| Raw material local | 30 days |
| Work in progress | 5 days |
| Finished products | 30 days |
| Cash in hand | 5 days |
| Accounts payable | 30 days |

Repair and maintenance 5% of machinery cost

A. TOTAL INITIAL INVESTMENT COST

The total investment cost of the project including working capital is estimated at Birr 43.14 million (see Table 7.1). From the total investment cost the highest share (Birr 31.39 million or 72.76%) is accounted by initial working capital followed by fixed investment cost (Birr 8.40 million or 19.48 %) and pre operation cost (Birr 3.34 million or 7.75 %). From the total investment cost Birr 4.30 million or 9.99% is required in foreign currency.

Table 7.1

INITIAL INVESTMENT COST ('000 Birr)

| Sr. No. | Cost Items | Local Cost | Foreign Cost | Total Cost | % Share |
|----------------|--------------------------------|-------------------|---------------------|-------------------|----------------|
| 1 | Fixed investment | | | | |
| 1.1 | Land Lease | 13.30 | | 13.30 | 0.03 |
| 1.2 | Building and civil work | 1,500.00 | | 1,500.00 | 3.48 |
| 1.3 | Machinery and equipment | 1,434.55 | 4,307.65 | 5,742.20 | 13.31 |
| 1.4 | Vehicles | 900.00 | | 900.00 | 2.09 |
| 1.5 | Office furniture and equipment | 250.00 | | 250 | 0.58 |
| | Sub -total | 4,097.85 | 4,307.65 | 8,405.50 | 19.48 |
| 2 | Pre operating cost * | | | | |
| 2.1 | Pre operating cost | 522.27 | | 522.27 | 1.21 |
| 2.2 | Interest during construction | 2,822.26 | | 2,822.26 | 6.54 |
| | Sub- total | 3,344.53 | | 3,344.53 | 7.75 |
| 3 | Working capital ** | 31,390.17 | | 31,390.17 | 72.76 |
| | Grand Total | 38,832.54 | 4,307.65 | 43,140.19 | 100 |

* *N.B Pre operating cost include project implementation cost such as installation, startup, commissioning, project engineering, project management etc and capitalized interest during construction.*

** *The total working capital required at full capacity operation is Birr 41.83 million. However, only the initial working capital of Birr 31.39 million during the first year of production is assumed to be funded through external sources. During the remaining years the working capital requirement will be financed by funds to be generated internally (for detail working capital requirement see Appendix 7.A.1).*

B. PRODUCTION COST

The annual production cost at full operation capacity is estimated at Birr 326.33 million (see Table 7.2). The cost of raw material and utility account for 98.25% of the production cost. The other major components of the production cost are financial cost and depreciation, which account for 0.83% and 0.47 %, respectively. The remaining 0.45% is the share of labor, repair and maintenance, labor overhead and administration cost. For detail production cost see Appendix 7.A.2.

Table 7.2

ANNUAL PRODUCTION COST AT FULL CAPACITY (YEAR THREE)

| Items | Cost (in 000 Birr) | % |
|------------------------------------|-------------------------------|--------------|
| Raw Material and Inputs | 60,075.00 | 18.41 |
| Utilities | 260,554.00 | 79.84 |
| Maintenance and repair | 172.00 | 0.05 |
| Labor direct | 277.00 | 0.08 |
| Labor overheads | 69.00 | 0.02 |
| Administration Costs | 200.00 | 0.06 |
| Land lease cost | - | - |
| Cost of marketing and distribution | 750.00 | 0.23 |
| Total Operating Costs | 322,097.00 | 98.70 |
| Depreciation | 1,517.89 | 0.47 |
| Cost of Finance | 2,716.42 | 0.83 |
| Total Production Cost | 326,331.31 | 100 |

C. FINANCIAL EVALUATION

1. Profitability

Based on the projected profit and loss statement, the project will generate a profit through out its operation life. Annual net profit after tax will grow from Birr 9.84 million to Birr 10.72 million during the life of the project. Moreover, at the end of the project life the accumulated net cash flow amounts to Birr 108.79 million. For profit and loss statement and cash flow projection see Appendix 7.A.3 and 7.A.4, respectively.

2. Ratios

In financial analysis financial ratios and efficiency ratios are used as an index or yardstick for evaluating the financial position of a firm. It is also an indicator for the strength and weakness of the firm or a project. Using the year-end balance sheet figures and other relevant data, the most important ratios such as return on sales which is computed by dividing net income by revenue, return on assets (operating income divided by assets), return on equity (net profit divided by equity) and return on total investment (net profit plus interest divided by total investment) has been carried out over the period of the project life and all the results are found to be satisfactory.

3. Break-even Analysis

The break-even analysis establishes a relationship between operation costs and revenues. It indicates the level at which costs and revenue are in equilibrium. To this end, the break-even point for capacity utilization and sales value estimated by using income statement projection are computed as follows.

$$\text{Break -Even Sales Value} = \frac{\text{Fixed Cost} + \text{Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 47,385,270$$

$$\text{Break -Even Capacity utilization} = \frac{\text{Break -even Sales Value}}{\text{Sales revenue}} \times 100 = 14 \%$$

4. Pay-back Period

The pay -back period, also called pay- off period is defined as the period required for recovering the original investment outlay through the accumulated net cash flows earned by the project.

Accordingly, based on the projected cash flow it is estimated that the project's initial investment will be fully recovered within 5 years.

5. Internal Rate of Return

The internal rate of return (IRR) is the annualized effective compounded return rate that can be earned on the invested capital, i.e., the yield on the investment. Put another way, the internal rate of return for an investment is the discount rate that makes the net present value of the investment's income stream total to zero. It is an indicator of the efficiency or quality of an investment. A project is a good investment proposition if its IRR is greater than the rate of return that could be earned by alternate investments or putting the money in a bank account. Accordingly, the IRR of this project is computed to be 25.04% indicating the viability of the project.

6. Net Present Value

Net present value (NPV) is defined as the total present (discounted) value of a time series of cash flows. NPV aggregates cash flows that occur during different periods of time during the life of a project in to a common measuring unit i.e. present value. It is a standard method for using the time value of money to appraise long-term projects. NPV is an indicator of how much value an investment or project adds to the capital invested. In principle, a project is accepted if the NPV is non-negative. Accordingly, the net present value of the project at 10% discount rate is found to be Birr 42.42 million which is acceptable. For detail discounted cash flow see Appendix 7.A.5.

D. ECONOMIC AND SOCIAL BENEFITS

The project can create employment for 18 persons. The project will generate Birr 28.85 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 and exporting to the world market. The project will also create backward linkage with the floriculture sector and forward linkage with the pharmaceuticals; food processing and cosmetics sub sectors and also generate income for the Government in terms of payroll tax.

Appendix 7.A
FINANCIAL ANALYSES SUPPORTING TABLES

Appendix 7.A.2
PRODUCTION COST (in 000 Birr)

| Item | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 | Year 11 |
|------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Raw Material and Inputs | 45,056 | 51,064 | 60,075 | 60,075 | 60,075 | 60,075 | 60,075 | 60,075 | 60,075 | 60,075 |
| Utilities | 195,416 | 221,471 | 260,554 | 260,554 | 260,554 | 260,554 | 260,554 | 260,554 | 260,554 | 260,554 |
| Maintenance and repair | 129 | 146 | 172 | 172 | 172 | 172 | 172 | 172 | 172 | 172 |
| Labour direct | 208 | 235 | 277 | 277 | 277 | 277 | 277 | 277 | 277 | 277 |
| Labour overheads | 52 | 59 | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 |
| Administration Costs | 150 | 170 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| Land lease cost | 0 | 0 | 0 | 0 | 4 | 4 | 4 | 4 | 4 | 4 |
| Cost of marketing and distribution | 750 | 750 | 750 | 750 | 750 | 750 | 750 | 750 | 750 | 750 |
| Total Operating Costs | 241,760 | 273,895 | 322,097 | 322,097 | 322,101 | 322,101 | 322,101 | 322,101 | 322,101 | 322,101 |
| Depreciation | 1,518 | 1,518 | 1,518 | 1,518 | 1,518 | 85 | 85 | 85 | 85 | 85 |
| Cost of Finance | 0 | 3,104 | 2,716 | 2,328 | 1,940 | 1,552 | 1,164 | 776 | 388 | 0 |
| Total Production Cost | 243,278 | 278,517 | 326,331 | 325,943 | 325,559 | 323,739 | 323,350 | 322,962 | 322,574 | 322,186 |

Appendix 7.A.3
INCOME STATEMENT (in 000 Birr)

| Item | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 | Year 11 |
|---------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Sales revenue | 253,125 | 286,875 | 337,500 | 337,500 | 337,500 | 337,500 | 337,500 | 337,500 | 337,500 | 337,500 |
| Less variable costs | 241,010 | 273,145 | 321,347 | 321,347 | 321,347 | 321,347 | 321,347 | 321,347 | 321,347 | 321,347 |
| VARIABLE MARGIN | 12,115 | 13,730 | 16,153 | 16,153 | 16,153 | 16,153 | 16,153 | 16,153 | 16,153 | 16,153 |
| in % of sales revenue | 4.79 | 4.79 | 4.79 | 4.79 | 4.79 | 4.79 | 4.79 | 4.79 | 4.79 | 4.79 |
| Less fixed costs | 2,268 | 2,268 | 2,268 | 2,268 | 2,272 | 839 | 839 | 839 | 839 | 839 |
| OPERATIONAL MARGIN | 9,847 | 11,462 | 13,885 | 13,885 | 13,881 | 15,314 | 15,314 | 15,314 | 15,314 | 15,314 |
| in % of sales revenue | 3.89 | 4.00 | 4.11 | 4.11 | 4.11 | 4.54 | 4.54 | 4.54 | 4.54 | 4.54 |
| Financial costs | | 3,104 | 2,716 | 2,328 | 1,940 | 1,552 | 1,164 | 776 | 388 | 0 |
| GROSS PROFIT | 9,847 | 8,358 | 11,169 | 11,557 | 11,941 | 13,761 | 14,150 | 14,538 | 14,926 | 15,314 |
| in % of sales revenue | 3.89 | 2.91 | 3.31 | 3.42 | 3.54 | 4.08 | 4.19 | 4.31 | 4.42 | 4.54 |
| Income (corporate) tax | 0 | 0 | 0 | 3,467 | 3,582 | 4,128 | 4,245 | 4,361 | 4,478 | 4,594 |
| NET PROFIT | 9,847 | 8,358 | 11,169 | 8,090 | 8,358 | 9,633 | 9,905 | 10,176 | 10,448 | 10,720 |
| in % of sales revenue | 3.89 | 2.91 | 3.31 | 2.40 | 2.48 | 2.85 | 2.93 | 3.02 | 3.10 | 3.18 |

Appendix 7.A.4
CASH FLOW FOR FINANCIAL MANAGEMENT (in 000 Birr)

| Item | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 | Year 11 | Scrap |
|---------------------------------|--------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| TOTAL CASH INFLOW | 8,928 | 287,365 | 286,879 | 337,506 | 337,500 | 337,500 | 337,500 | 337,500 | 337,500 | 337,500 | 337,500 | 45,569 |
| Inflow funds | 8,928 | 34,240 | 4 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inflow operation | 0 | 253,125 | 286,875 | 337,500 | 337,500 | 337,500 | 337,500 | 337,500 | 337,500 | 337,500 | 337,500 | 0 |
| Other income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 45,569 |
| TOTAL CASH OUTFLOW | 8,928 | 276,001 | 285,061 | 334,965 | 331,773 | 331,505 | 331,663 | 331,391 | 331,119 | 330,848 | 326,695 | 0 |
| Increase in fixed assets | 8,928 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Increase in current assets | 0 | 31,418 | 4,181 | 6,271 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Operating costs | 0 | 241,010 | 273,145 | 321,347 | 321,347 | 321,351 | 321,351 | 321,351 | 321,351 | 321,351 | 321,351 | 0 |
| Marketing and Distribution cost | 0 | 750 | 750 | 750 | 750 | 750 | 750 | 750 | 750 | 750 | 750 | 0 |
| Income tax | 0 | 0 | 0 | 0 | 3,467 | 3,582 | 4,128 | 4,245 | 4,361 | 4,478 | 4,594 | 0 |
| Financial costs | 0 | 2,822 | 3,104 | 2,716 | 2,328 | 1,940 | 1,552 | 1,164 | 776 | 388 | 0 | 0 |
| Loan repayment | 0 | 0 | 3,881 | 3,881 | 3,881 | 3,881 | 3,881 | 3,881 | 3,881 | 3,881 | 0 | 0 |
| SURPLUS (DEFICIT) | 0 | 11,365 | 1,818 | 2,540 | 5,727 | 5,995 | 5,837 | 6,109 | 6,381 | 6,652 | 10,805 | 45,569 |
| CUMULATIVE CASH BALANCE | 0 | 11,365 | 13,183 | 15,723 | 21,450 | 27,445 | 33,283 | 39,392 | 45,773 | 52,425 | 63,230 | 108,798 |

Appendix 7.A.5
DISCOUNTED CASH FLOW (in 000 Birr)

| Item | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 | Year 11 | Scrap |
|---------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| TOTAL CASH INFLOW | 0 | 253,125 | 286,875 | 337,500 | 337,500 | 337,500 | 337,500 | 337,500 | 337,500 | 337,500 | 337,500 | 45,569 |
| Inflow operation | 0 | 253,125 | 286,875 | 337,500 | 337,500 | 337,500 | 337,500 | 337,500 | 337,500 | 337,500 | 337,500 | 0 |
| Other income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 45,569 |
| TOTAL CASH OUTFLOW | 40,318 | 245,937 | 280,160 | 322,097 | 325,564 | 325,683 | 326,230 | 326,346 | 326,463 | 326,579 | 326,695 | 0 |
| Increase in fixed assets | 8,928 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Increase in net working capital | 31,390 | 4,177 | 6,266 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Operating costs | 0 | 241,010 | 273,145 | 321,347 | 321,347 | 321,351 | 321,351 | 321,351 | 321,351 | 321,351 | 321,351 | 0 |
| Marketing and Distribution cost | 0 | 750 | 750 | 750 | 750 | 750 | 750 | 750 | 750 | 750 | 750 | 0 |
| Income (corporate) tax | | 0 | 0 | 0 | 3,467 | 3,582 | 4,128 | 4,245 | 4,361 | 4,478 | 4,594 | 0 |
| NET CASH FLOW | -40,318 | 7,188 | 6,715 | 15,403 | 11,936 | 11,817 | 11,270 | 11,154 | 11,037 | 10,921 | 10,805 | 45,569 |
| CUMULATIVE NET CASH FLOW | -40,318 | -33,130 | -26,416 | -11,013 | 923 | 12,739 | 24,010 | 35,164 | 46,201 | 57,122 | 67,927 | 113,495 |
| Net present value | -40,318 | 6,534 | 5,549 | 11,573 | 8,152 | 7,337 | 6,362 | 5,724 | 5,149 | 4,632 | 4,166 | 17,569 |
| Cumulative net present value | -40,318 | -33,784 | -28,234 | -16,662 | -8,510 | -1,173 | 5,189 | 10,913 | 16,062 | 20,693 | 24,859 | 42,428 |

NET PRESENT VALUE 42,428
INTERNAL RATE OF RETURN 25.04%
NORMAL PAYBACK 5 years