64. 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 26,000 kg per annum.

The present demand for the proposed product is estimated at 756.7 tonnes per annum. The demand is expected to reach at 1,612 tonnes by the year 2010.

The plant will create employment opportunities for 25 persons.

The total investment requirement is estimated at Birr 2.65 million, out of which Birr 1.5 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 16.4% and a net present value (NPV) of Birr 1.4 million, discounted at 8.5 %.

II. PRODUCT DESCRIPTION AND APPLICATION

Essential oils are any of several chemicals that form the odoriferous essences of a number of plants. Essential oils come from the flowers, fruits, leaves, roots, seeds, and bark of many plants. They are volatile liquids, mostly insoluble in water, but freely soluble in alcohol, ether, vegetable and mineral oils. They are usually not oily to the touch.

Essential oils are used to import flavour and delicate aroma to coffee, tea, wine, and distilled liquors. They are the basic ingredients in the manufacture of perfumes, and are also used in medicine, either for their flavouring qualities or for their pain-relieving and physiological value.

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 beverages industries. The country's demand for essential oils is met through imports. Based on their applications, imports of essential oil are classified into four categories. These include essential oils imported for flavouring food, manufacturing non-alcoholic beverages, manufacturing alcoholic beverages and other uses. Table 3.1 depicts the amount of essential oils imported during 1989 – 2003. Total imports averaged at 654,250 kg during the period. Data on average imports by application (end-use) reveal that 35,607; 545,796; 48,558 and 24,290 kg of essential oils were imported, respectively, for flavouring food, non-alcoholic beverages, alcoholic beverages and other uses. On the average, the overwhelming proportion (83%) of the essential oils imported during the period under reference was used by the non-alcoholic beverages industry.

Table 3.1

IMPORTS OF ESSENTIAL OIL (KG)

Year	Imports By End Use				Total
	Flavouring Food	Manufacturing Non-Alcoholic Beverages	Manufacturing Alcoholic Beverages	Other Uses	
1989	297	4321	19107	5519	29244
1990	5728	125	7432	605	13890
1991	4528	4584419	23744	14774	4627465
1992	43316	22400	3384	491	69591
1993	354	71821	3089	863	76081
1994	2606	1071508	4690	6212	1085016
1995	2882	235642	72095	72461	383080
1996	129472	215975	4500	76696	426643
1997	207651	4601	5604	99833	363689
1998	129738	88779	120559	63658	402734
1999	1140	264350	8739	7811	282040
2000	6323	269855	92471	2249	366298
2001	1510	353601	169073	1005	525189
2002	888	478130	90599	7735	577352
2003	2267	521414	103280	4479	631440
Average	**35607**	**545796**	**48558**	**24290**	**654250**

Source: *Customs Authority, External Trade Statistics, various years.*

In estimating the demand for essential oil the supply data, which constitutes only imports is considered as a proxy for demand. Exponential smoothing method is, then, applied to the import data to estimate the demand for the product (Table 3.2).

The Exponential Smoothing Model is given by:

$Y''_{t+k} = L_1+kT_1$

Where,

L_1 = alpha*Y1+(1-alpha) (L_1-1+T_{1-1})
T_1=beta (L_1-L_1)+(1-bata)T_{1-1}

Where

Y''_{1+k} stands for forecasted value,

L_t indicates the long-term level or base value for the time-series data, i.e. the level term,

T_t indicates the expected increase or decrease per year, i.e. the trend term,

k stands for the number of time periods we want to forecast,

t represents time, and

alpha and beta are smoothing parameters.

Table 3.2
EXPONENTIALLY SMOOTHED FORECAST OF THE DEMAND FOR ESSENTIAL OIL (IN KG) (BASED ON IMPORT DATA)

Alpha = 0.2
Beta = 0.3

Year	Import (kg)	Level Term	Trend Term	Forecast	Abs.% Error	MAD
1989	29244	29244.00	0.00	NA	NA	NA
1990	13890	23102.40	-3684.96	29244.00	-1.11	15354.00
1991	4627465	1862636.46	1102246.45	19463.44	1.00	4608047.56
1992	69591	1806766.15	407376.39	2964882.92	-41.60	2895291.92
1993	76081	1358963.93	-105758.38	2214142.55	-28.10	2138061.55
1994	1085016	1185902.13	-146112.83	1253159.55	-0.15	2414188.76
1995	383080	777105.58	-303723.06	1039789.30	-1.71	3013897.44
1996	426643	454686.71	-314940.55	473382.52	-0.11	2615359.92
1997	363689	210923.30	-272234.27	139746.63	0.56	2545376.92
1998	402734	124307.02	-160863.47	-61310.97	1.15	2647205.76
1999	282040	90882.13	-84400.32	-36556.45	1.13	2705460.01
2000	366298	150408.28	1955.56	6481.80	0.98	2628350.65
2001	525189	301493.91	91433.60	152363.84	0.71	2631598.33
2002	577352	466697.30	135695.48	392927.51	0.32	2653153.69
2003	631440	614011.67	142666.81	602392.78	0.05	2654640.67
2004				756678.48		

On the basis of the smoothed data, the demand for essential oil for the year 2004 is estimated at 756,678 kg.

2. Projected Demand

On the basis of the exponentially smoothed forecast of the demand for essential oils reported in Table 3.2, the projected demand for the product is depicted in Table 3.3.

Table 3.3
PROJECTED DEMAND FOR ESSENTIAL OIL

Year	Demand (kg)
2005	899345
2006	1042012
2007	1184679
2008	1327346
2009	1470013
2010	1612680
2011	6355347
2012	1898014
2013	2040681
2014	2183348
2015	2326015
2016	2468682
2063	2611349
2018	2754016
2019	2896683
2020	3039350
2021	3182063
2022	3324684
2023	3467351
2024	3610018
2025	3752685

3. Pricing and Distribution

The prices of essential oils vary considerably according to the contents and concentration of the product. The CIF price of the product ranged between Birr 59 and 99 per kg in year 2003. Considering the lower range price of Birr 59 per kg and allowing 30% for import duty and other clearing expenses, the factory-gate price for the envisaged plant is estimated at Birr 76.70 per kg.

The envisaged plant can distribute its product directly to users or appoint an agent.

B. PLANT CAPACITY AND PRODUCTION PROGRAMME

1. Plant Capacity

According to the market study, the demand for essential oil is very high if it is deemed to replace 10% of the import. So that the only constraint for determining capacity is the availability of raw material and minimum economies of scale. The plant is sized for distilling 425 kg of leaves per hour yielding 26,000 kg of different kinds of oil on the assumption of 250 working days per year, three shifts per day of eight hours each.

2. Production Programme

The plant starts operating at 70% of its capacity with 10% of progressive increment every year reaching full capacity in the fourth year and thenafter by considering the technological skill development, market penetration problem and also the period needed for plantation.

IV. MATERIALS AND INPUTS

A. RAW MATERIALS

The envisaged project is planed to extract essential oils from different leaves mainly from lemon grass, geranium and eucalyptus since these leaves can grow in the region and are produced by the same process and consequently by the same or similar equipment. So, the basic raw material is leaves of the above plants. The plant needs 2,550,000 kg leaves of the above mix. The total cost of raw materials is estimated to be Birr 960,500 including packing material for finished product. Plastic or glass bottles can be used as a packing material.

B. UTILITIES

The utilities required by the plant are water, fuel oil and electricity. The consumption rate of the above utilities is estimated to be 18,000 m^3 of water 50,000 lt of fuel oil and 140,000 kWh of electricity. The total cost of utilities is estimated to be Birr 252,000.

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

The selected process is the steam distillation, which is the preffered method for all essential oils 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 vapourized indirectly by steam flowing in a pipe coil submerged by the

water. The water vapour 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 distilled water is separated by the upper oil layer and as it still contains some soluble parts of the oil sent back to the evaporator vessel to recover the soluble alcohols by means of a second distillation.

2. Source Of Technology

The machinery and equipment required by essential oil extraction plant can be obtained from the following supplier.

B/R instrument corporation,
Email: br service @brinstrument.com,
phone: 410.820 8800,
Fax: 410 820 8141,

B. ENGINEERING

1. Machinery & Equipment

The total cost of machinery and equipment is estimated to be Birr 1.5 million, out of which Birr 1.2 million is required in foreign currency. The plant needs one pick-up for transportation of raw material and finished product as well as for office work. The total cost is estimated to be Birr 150,000. The machinery and equipment required by the envisaged plant are listed in Table 5.1 below.

Table 5.1

LIST OF MACHINERY AND EQUIPMENT

Sr. No.	Description	Qty.
1	Evaporators	2
2	Water cooled condenser	2
3	Florentine flask	2
4	Steam boiler	1
5	Pump	2

2. Land, Building and Civil Works

The plant needs a total land area of 750 m^2, out of which 500 m^2 is built-up area. Assuming construction cost of Birr 1,200 per m^2, the total cost of construction is

estimated to be Birr 600,000. The land lease value, at a rate of Birr 1.2 per m^2 and for 70 years of land holding period is estimated to be Birr 63,000. 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 Birr 663,000 including land for plantation.

3. Proposed Location

Any zone with enough plantations to satisfy the capacity of the plant without requiring excessively long transportation is suitable for locating the plant. The operating site should be near a source of water and not far from lodging possibilities for the operating personnel. So, the plant is proposed to be located as Assosa or Kemashi zone.

VI. MANPOWER AND TRAINING REQUIREMENT

A. MANPOWER REQUIREMENT

A total of 32 manpower is required by the plant. The detailed list of manpower and their monthly salary is indicated in Table 6.1 below. The total cost of manpower is estimated to be Birr 260,250 including benefit.

Table 6.1
MANPOWER REQUIREMENT AND ANNUAL LABOUR COST

Sr. No.	Description	Req. No.	Monthly salary	Annual salary
1	General manager	1	1500	18,000
2	Executive secretary	1	600	7,200
3	Production supervisor	3	750	27,000
4	Operator technician	6	450	32,400
5	Electrician	1	450	5,400
6	Junior operators	6	300	21,600
7	Accountant	1	750	9,000
8	Store keeper	1	450	5,400
9	Sales person	1	750	9,000
10	Guard	4	200	9,600
	Sub-total	**25**		**144,600**
	Employees benefit			36,150
	Grand total			**180,750**

B. TRAINING REQUIREMENT

Operators, production supervisors and chemists need training on process, quality and maintenance for about one month by the competent expert of machinery supplier during erection and commissioning period. The total cost of training is estimated to be Birr 20,000.

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 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	5 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 2.65 million, of which 45.4 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	63
2.	Building and Civil Work	600
3.	Plant Machinery and Equipment	1,500
4.	Office Furniture and Equipment	60
5.	Vehicle	150
6.	Pre-production Expenditure*	635.3
7	Working Capital	97.8
	Total Investment cost	**2,646.1**
	Foreign share	**45.4%**

* *N.B Pre-production expenditure includes interest during construction (Birr 140.3 thousand), training (Birr 30 thousand), and (Birr 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 of the plant is estimated at Birr 1.8 million (see Table 7.2). The material and utility cost accounts for 67.5 per cent while depreciation and financial costs take 20 per cent of the production cost.

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

Items	Cost	%
Raw Material and Inputs	960.5	53.5
Utilities	252.0	14
Maintenance and repair	23.7	1.3
Labour direct	144.6	8.1
Factory overheads *	36.2	2.0
Administration Cost **	20.0	1.1
Total Operating Costs	**1,437.0**	**80.0**
Depreciation	226.2	12.6
Cost of Finance	132.6	7.4
Total Production Cost	**1,795.7**	**100.0**

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.

**Factory overhead cost includes salaries and wages of supervisors, insurance of factory workers, social costs on salaries of direct labour, etc.*

*** Administrative cost includes salaries and wages, insurance, social costs, materials and services used by administrative staff etc.*

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.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable cost}} = 66\ \%$$

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 6 years.

4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 16.4 % and the net present value at 8.5% discount rate is Birr 1.4 million.

D. ECONOMIC BENEFITS

The project can create employment for 25 persons. In addition to supply of the domestic needs, the project will generate Birr 65 thousands 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.