25. PROFILE ON PAPRIKA OLEORESIN

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I. SUMMARY

This profile envisages the establishment of a plant for the production of 125 tonnes of oleoresin paprika per annum.

The present demand for the proposed product is estimated at 10,000 tonnes and it is projected to reach 13,116 tonnes by the year 2014.

The plant will create employment opportunities for 35 persons.

The total investment requirement is estimated at Birr 22.83 million, out of which Birr10 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 26% and a net present value (NPV) of Birr 21.54 million, discounted at 10.5%.

II. PRODUCT DESCRIPTION AND APPLICATION

Oleoresin extracted from red pepper is a natural food colourant used to obtain a deep red colour in any food that has a liquid/fat phase. It is derived from the liquid extract of the fruit of genus *Capsicum Annum L*, (also from its variant, Paprika) by extraction with hexane or super critical carbon dioxide. The oleoresin is a slightly viscous, homogenous red liquid with good flow properties at room temperature.

As compared to essential oils, oleoresins provide a more complete flavour profile than essential oils.

The oleoresin obtained this way is used in snack seasonings, sausage products, cheeses, soups and other foods where characteristic paprika colouring and flavouring are desired.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply And Present Demand

Oleoresin is a naturally occurring mixture of a resin and an essential oil extracted from certain plants. It provides hot, bitting, Pungent taste and aromatic flavour. Its popular application includes: spice blends, snack foods, sauces and dressings, cheeses and flavour oils.

Commercially manufactured spice in Ethiopia were supplied by the Ethiopian Spice Extraction Factory which was established in 1971 to extract oleoresin paprika from red peppers. Although the factory has the capacity to extract from ginger, capsicum and turmeric, over 85% of its business is for paprika. All of the extracted spices are exported to overseas for food colouring and flavouring to Europe, North America and Japan. There is also another spice extraction plant established recently at Addis Ababa. Ethiopian spice export is presented in Table 3.1. As can be seen from the table, Ethiopia has been exporting on average about 300 tonnes of spices annually, during the period 1999-2002.

Table 3.1

EXPORTED SPICE (TONNES)

Year	Export
1999	393
2000	944
2001	396
2002	261
Average	**299**

***Source**: Export Trade Statistics.*

In the past decade, world trade in spices has leaped to an estimated 500,000 tonnes of spices & herbs valued at 1.5 billion US dollars, annually. India which is the major supplier of the product to the global market supplies almost half of the global demand.

During the past two years 243,202 tonnes & 264,566 tonnes of spices were supplied by India to the world market. The two years average amounts to 253,884 tonnes of which 2% was spice oils and oleoresin. Thus India sharing 50% of the total supply, the global demand for oleoresin is estimated at 10,000 tonnes.

2. Projected Demand

The world demand for oleoresins and spices is increasing. The demand for spices in general is determined by the demand for food since spices are essential food additives. As a major supplier of spices, India's supply to the world market has shown 2.75% growth rate annually. In the projection of oleoresin demand, this growth rate is considered and the projected demand for oleoresins is presented in Table 3.2.

Table 3.2

PROJECTED DEMAND FOR OLEORESIN (TONNES)

Year	Project Demand
2005	10,275
2006	10,558
2007	10,848
2008	11,146
2009	11,453
2010	11,768
2011	12.091
2012	12,424
2013	12,765
2014	13,116

3. Pricing and Distribution

The current price for spice oils and oleoresins is 17.07 US dollar per kg. The average price of Indian spice oils and oleoresins during the period 2001 – 2004 was also 17.05 US dollars per kg. On the other hand, the Ethiopian Spice Extraction Factory used to sell

USD 45-50 per kg depending on the quality of the colour and concentration. Recently, however, the price has fallen to USD 28 per kg. Therefore, 20 USD per kg or Birr 160 per kg is considered as a factory-get price for the envisaged project.

B. PLANT CAPACITY AND PRODUCTION PROGRAMME

1. Plant Capacity

Considering high capital costs associated with extraction plants and constraints with raw material supply, it is recommended to set up a plant with an annual capacity of 125 tonnes of oleoresin paprika. The relatively high projected demand means that the market can support a number of such plants. Production capacity is based on a schedule of 300 working days per annum and a single shift of eight hours per day.

2. Production Programme

The envisaged production programme is given in Table 3.4 below. The schedule is worked out in consideration of the time required for gradual build-up in labour productivity and fine-tuning of machinery. Production will start at 75% of plant capacity in the first year of operation and reache full-gear in the 3rd year of operation and thenafter.

Table 3.4
PRODUCTION PROGRAMME

Year	**1**	**2**	**3-10**
Capacity Utilization [%]	75	85	100
Production [tonnes]	93.75	106.25	125

IV. MATERIALS AND INPUTS

A. MATERIALS

The raw materials required for the production of 125 tonnes of oleoresin paprika is indicated in Table 4.1 below. Carbon dioxide, is supposed to be produced on-site. All of these raw materials are to be obtained from local sources.

Table 4.1

ANNUAL RAW MATERIALS REQUIREMENT AND COST

Sr. No.	Description	Unit of Measure	Qty.	Unit Price (Birr)	Total Cost
1	Capsicum Annum L,	tonne	1250	7000	12,500.00
2	Drum, 25kg	No.	5000	20.00	100.00
	Grand Total				**12,600.00**

B. UTILITIES

Electricity and water are the two major utilities required by the plant. Table 4.2 below shows annual requirement and associated cost at full production capacity.

Table 4.2

ANNUAL UTILITY REQUIREMENT AND COST

Sr. No.	Description	Unit of Measure	Qty.	Unit Price (Birr)	Total Cost
1	Electricity	kWh	135367	0.49	66.33
2	Water	m^3	1500	3.00	4.50
	Grand Total				**70.83**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

The extraction process used here is the Super Critical Fluid Extraction (SCFE) method, which makes use of carbon dioxide as solvent. This technology is state-of-the-art and globally proven; moreover, it is environmentally friendly as compared to the conventional method which is based on hexane- an organic solvent. The market price for the product obtained through this process is much higher as compared to the product obtained from the conventional method, as the former do not contain any chemical residues and the purity level is very high.

The manufacturing process involves the following operations:

- The dry raw material is at first reduced in size by pin mills, hammer mills and sized in the grinding section;

- The raw material is ground through a process known as Cryogenic Grinding in which temperature of the material is lowered to its embrittlement point, using liquid CO_2;

- Liquid carbon dioxide from the plant storage tank is transferred to the day tank of 2000 liters capacity at 60 bar pressure through a reciprocating pump;

- The liquid CO_2 from the day tank is chilled in a chiller and pumped through a reciprocating pump at 550 bar pressure;

- The liquid carbon dioxide coming out of the pump is heated upto the required temperature of extraction at 60-70 degree centigrade and is admitted into the extractor; ground pepper is loaded into the extractor through a removable basket

with perforated disks at the bottom and top to allow the liquid / gaseous CO_2 to pass through the ground pepper;

- Super critical CO_2 absorbs the food materials to be extracted and oils and oleoresins flow out of the extractor;

- Before it enters the separators, the pressure is dropped to a certain level wherein the oleoresins portion is separated in the first separator; on further drop in pressure, the essential oils are separated in the second separator;

- The residual CO_2 coming out of the second separator is condensed in the condenser and returns back to the day tank for recycling. This process continues till the essential oils and oleoresins are extracted completely.

2. Source of Technology

The manufacturing technology and machinery for the production of oleoresin from pepper can be obtained from renowned suppliers in Europe and Asia. The following supplier can be contacted to this effect:

M V Industries Pvt. Ltd.,
Raja S C Mullick Road, Bademasur
Calcutta 86, India.

B. ENGINEERING

1. Machinery And Equipment

The list of machinery and equipment required for the manufacture of oleoresins is given in Table 5.1. The total cost of machinery and equipment for the envisaged annual output is estimated at Birr 10 million, out of which Birr 6 million is required in foreign currency.

Table 5.1

LIST OF MACHINERY AND EQUIPMENT

Sr. No.	Description	Qty. No.
1	Destoner	1
2	Huller	1
3	Pulverizer	1
4	Extractor	1
5	Separator	1
6	Circulation pump	Set
7	Pre-heater	Set
8	Measuring & controlling system	Set
9	CO_2 plant & tanks	1
10	Condenser	1
11	Cooling unit	1
12	Compressor	Set
13	Lab equipment	Set
14	Auxiliary equipment	Set

2. Land, Building and Civil Works

Total land requirement of the project is estimated at 4,000m^2, out of which 1,500m^2 is built-up area. Cost of building construction, at a unit cost of Birr 1,500 per m^2, is estimated at Birr 2.25 million. Total land lease cost, for a period of 70 years and at a lease rate of Birr 2 per m^2, is estimated at Birr 560,000. The total land lease cost is assumed to be paid in advance.

3. Proposed Location

It is highly recommended that the production of oleoresin paprika should be integrated with a commercial paprika plantation. The major problem that local producers of this product face is acute shortage of red pepper, as this item is highly demanded by households.

The Region's major irrigable area, amounting to about 2,780 hectares, is located in Assosa zone. It is, therefore, believed that commercial paprika plantations could be

established there. Hence, the most optimal location for oleoresin plant is Assosa zone. Assosa town could be a place of choice in view of its relatively better infrastructure.

VI. MANPOWER AND TRAINING REQUIREMENTS

A. MANPOWER REQUIREMENT

Total manpower requirement, including skilled and unskilled labour, is 35 persons. Corresponding total annual labour cost, including fringe benefits, is estimated at Birr 334,500. Table 6.1 shows the list of manpower required and the estimated annual labour cost.

Table 6.1
MANPOWER REQUIREMENT AND ANNUAL LABOR COST

Sr. No.	Description	Req. No.	Monthly Salary [Birr]	Annual Salary [Birr]
1.	General Manager	1	2000	24000
2.	Production & Technical Manager	1	1800	21600
3.	Finance & Administration Manager	1	1600	19200
4.	Commercial Manager	1	1600	19200
5.	Accountant	1	600	7200
6.	Sales person	1	600	7200
7.	Purchaser	1	500	6000
8.	Clerk	3	900	10800
9.	Secretary	2	1000	12000
10.	Quality Control Manager	1	1600	19200
11.	Production Foreman	3	2400	28800
12.	Chemist	2	1600	19200
13.	Operator	4	2000	24000
14.	Mechanic	1	700	8400
15.	Electrician	1	700	8400
16.	Unskilled labour	6	1200	14400
17.	Guard	3	600	7200
18.	Diver	2	900	10800
	Total	**35**	**22300**	**267600**
	Worker's Benefit = 25% of Basic Salary		5575	66900
	Grand Total		**27875**	**334500**

B. TRAINING REQUIREMENT

An on-site training programme can be arranged for key production, maintenance and quality control personnel in consultation with the machinery and technology supplier. The training can be best carried out during commissioning and performance testing of the factory. Cost of an on-site training of this nature is estimated at Birr 100,000.

VII. FINANCIAL ANALYSIS

The financial analysis of paprika oleoresin project is based on the data presented in the previous chapters and the following assumptions:-

Construction period	2 years
Source of finance	30 % equity
	70 % loan
Tax holidays	6 years
Bank interest	10.5%
Discounted cashflow	10.5%
Repair and maintenance	5 % of the total plant and machinery
Accounts receivable	30 days
Raw material, local	180 days
Work in progress	2 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 Birr 22.83 million, out of which about 26% 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	-	560.00	560.00
2.	Building and Civil Work	-	2,250.00	2,250.00
3.	Plant Machinery and Equipment	6,000.00	4,000.00	10,000.00
4.	Office Furniture and Equipment	-	150.00	150.00
5.	Vehicle	-	300.00	300.00
6.	Pre-production Expenditure	-	2,571.20	2,571.20
	Total Investment cost	**6,000.00**	**9,831.20**	**15,831.20**
7	Working Capital	-	6,998.91	6998.91
	Grand Total	**6,000.00**	**16,830.09**	**22,830.09**

B. PRODUCTION COST

The annual production cost at full operation capacity of the plant is estimated at Birr 15.11 million (see Table 7.2). The material and utility cost accounts for 84 per cent, while repair and maintenance take 1.32 per cent of the production cost.

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* *Pre-production expenditure include interest during construction (Birr 2.12 million), training, (Birr 100,000) and costs 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	9375.1	10668.8	12600.0	12600.0
Labour direct	120.4	137.0	160.6	160.6
Utilities	53.1	60.4	70.8	70.8
Maintenance and repair	150.00	170.7	200.00	200.00
Labour overheads	50.2	57.1	66.9	66.9
Administration Overheads	80.3	91.3	107.00	107.00
Total Operating Costs	**9829.1**	**11183.3**	**13105.4**	**13105.4**
Depreciation	1270.5	1270.5	1270.5	1120.5
Cost of Finance	1230.4	1107.4	738.2	369.1
Total Production Cost	**12,329.98**	**13561.2**	**15114.2**	**14595.1**

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 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.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable cost}} = 18\ \%$$

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 cashflow statement, the calculated IRR of the project is 26 % and the net present value at 10.5% discount rate is Birr 21.54 million.

D. ECONOMIC BENEFITS

The project can create employment for 35 persons. In addition to supply of the domestic needs, the project will generate Birr 16.72 million 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 earning effect to the country by increasing the current export level.