200. PROFILE ON PRODUCTION OF MORINGA OLEIFERA OIL

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I. SUMMARY

This profile envisages the establishment of a plant for the production of Moringa oleifera oil with a capacity of 279 tonnes per annum.

The present demand for the proposed product is estimated at 3,500 tonnes per annum. The demand is expected to reach at 8,207 tonnes by the year 2017.

The plant will create employment opportunities for 43 persons.

The total investment requirement is estimated at Birr 3.79 million, out of which Birr 1.8 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 17 % and a net present value (NPV) of Birr 1.64 million discounted at 8.5%.

II. PRODUCT DESCRIPTION AND APPLICATION

Moringa oleifera seed is harvested from its tree and contains 38.4% crude protein and 35 to 40% tatty oil. Moringa oleifera oil is non-drying oil with high oleic acid and used for cooking and soap manufacture, as a cosmetic base and to provide illumination.

Other uses of moringa oleifera oil are for their antibiotic and anti-inflammatory propertied to treat arthritis, rheumatism, cramp, sexually transmitted disease & bills.

The expeller cake, which is produced by pressing the seed to extract oil, is used as fertilizer, coagulant (natural cationic polyelectrolyte) and animal toddler. The cake contains about 58.9% crude protein.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

Moringa oleifera is a fast growing, aesthetically pleasing small tree adapted to arid, sandy conditions. The species is characterized by its long, drumstick shaped pods that contain its seeds. Within the first year of growth, moringa has been known to grow up to 4 meters and can bear fruit within the same first year. Depending on the purpose and quantity desired, moringa can be grown in a nursery as a community project or on a smaller scale at the family level.

Moringa oleifera oil has a number of applications including;

- Edible oil,
- Oils for cosmetics and soap,
- Oilcake as animal feed, fertiliser and solid fuel, and
- Moringa Leaf Powder as a food and nutrition supplement.

The edible oil is equivalent in every way to Olive oil with similar health benefits and will be produced at a price much less than Olive oil and therefore more affordable for the local population.

Cosmetic oils are used in skin care, massage preparations and pure natural soap is also made from Moringa oleifera oil. The left over cake have a value as a fertilizer or solid fuel.

However, in Etrhiopia as the cosmetics manufacturing industry is not well developed it is assumed that at present Moringa oleifera oil will be only used as edible oil.

The country's requirement for the product has been met through domestic production and import. Table 3.1 shows supply of edible oil both through import and local production.

Table 3.1
SUPPLY OF EDIBLE OIL (TONNES)

Year	Domestic	% Share	Import	Total
2000	6579	8.50	70,789	77,368
2001	6,637	21.12	24,785	31,422
2002	8,329	19.59	34,196	42,525
2003	7,993	26.40	22,283	30,276
2004	8,027	6.18	121,812	129,839
2005	6,931	7.79	82,014	88,945
AVERAGE	**7,416**	**15**	**59,313**	**66,729**

Source: *Customs Authority CSA, Statistical Abstract.*

As can be seen from Table 3.1, during the time under reference imports and domestic production averaged 59,313 and 7,416 tonnes respectively, while average supply stands at 66,729 tonnes. Thus on the average, about 15% of country's requirement for edible oil was supplied through domestic production.

It is assumed that the average supply during the period of analyses approximates current (2007) demand for edible oil. Moreover, in order to be conservative it is assumed that the market share of Moringa oleifera oil is assumed to be only 7% of the total demand for edible oil i.e. 4,671 tonnes.

2. Projected Demand

The demand projection is estimated on a hypothetical assumption that edible oil consumption should grow with the growth of urban population. Hence, a 4% growth rate is used to forecast the demand as depicted in Table 3.2.

Table 3.2

PROJECTED DEMAND MORINGA OLEIFERA OIL

Year	Projected Demand
2008	4858
2009	5052
2010	5254
2011	5464
2012	5683
2013	5910
2014	6147
2015	6393
2016	6648
2017	6914
2018	7191
2019	7478
2020	7778

3. Pricing and Distribution

The price for one liter edible oil is Birr 12. Assuming margin for wholesalers and retailers, Birr 7 per liter is recommended the envisaged product.

The product will can be distributed through retails shops who will receive the product using van delivery with an appropriate size and package.

B. PLANT CAPACITY AND PRODUCTION PREGRAMME

1. Plant Capacity

The annual production capacity of the envisaged plant is 1,500 tonnes of refined edible oil and 2,447 tonnes of expeller cake, based on 300 working days and 3 shifts per day.

2. Production Programme

Considering the gradual development of processing skill and marketing, the rate of capacity utilization during the 1st and 2nd year of production will be 70 and 90% respectively. Full capacity will be attained in the third year then after. Table 3.3 shows the production program of the proposed project.

Table 3.3

PRODUCTION PROGRAM (Tonnes)

Sr. No.	Product	Production Year		
		1	2	3-10
1	Moringa Oleifera Oil	1050	1350	1500
2	Expeller Cake	1712.9	2202.3	2,447
3	Capacity Utilization Rate (%)	70	90	100

IV MATERIAL AND INPUTS

A. RAW AND AUXILIARY MATERIALS

The principal raw and auxiliary materials are moringa oleifera seed and packing materials such ass drums (200kg capacity) for oil and pp bags for expeller cake. The total annual requirement of raw and auxiliary and cost of these materials is indicated in Table 4.1.

Table 4.1

ANNUAL RAW AND AUXILIARY MATERIALS REQUIREMENT & COST

Sr. No.	Materials	Unit	Qty.	Cost (1000 Birr)		
				LC	FC	TOTAL
1	Moringa Oleifera	Tonne	660	3,947	-	9868
2	Caustic Soda	Kg	2,400	36	-	36
3	Bleaching Earth	Kg	5,280	-	60	60
4	PP bags (50kg)	Kg	5,448	100.33	-	100.33
5	Replacement of Drums - (2%) 2%	Pcs	20	18	-	18
	Total			**10,020.33**	**60**	**10,080.33**

B. UTILITIES

Electricity, furnace oil and water are utilities of the proposed project. Table 4.2 indicates the annual utility requirement and cost at full capacity. Process water shall be supplied by submersible pumps installed by the project.

Table 4.2

ANNUAL UTILITIES REQUIREMENT & COST

Sr. No.	Utility	Unit	Qty	Cost (1000 Birr)
1	Electricity	kWh	670,000	317.58
2	Furnace oil	Tonne	120,000	649.2
3	Water	m^3	2,000	20
	Total			**986.78**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Process Description

Edible oil processing can be classified in two groups of manufacturing stages: crude and refined oil production.

Moringa oleifera seeds first enter into cleaning unity where vibratory screens and pneumatic cleaners are involved. The cleaned seed then passes through conditioning process. The cooked and conditioned seed will be pressed to produce crude oil which shall be screened and filtered before entering the refinery unity.

In the refinery there exists three major operations: neutralization, bleaching and deodorization. In the neutralizer the free fatty acid content of crude oil shall be lowered by adding caustic soda. The colour of oil shall be controlled in the bleacher using bleaching earth. Finally, the odors are removed by the deodorization process. The final refined oil is then dispatched for sales.

2. Source of Technology

Different machinery manufacturers and suppliers can be requested for their offer. For example the following company may be interested to supply parts or the whole plant, in turn-key basis.

Dayal Impex
Website: http://www.indiamart.com/oilexpellerspare.

B. ENGINEERING

1. Machinery and Equipment

The list of machinery and equipment is indicated in Table 5.1. The total cost of machinery is estimated at Birr 17,014,900, of which Birr 14,179,000 is required in foreign currency.

Table 5.1

LIST OF MACHINERY & EQUIPMENT

Sr. No.	Description	Qty. (No.)
1	Vibratory Screen	1
2	Expeller Press	1
3	Filter / press	1
4	Storage Tank	2
5	Neutralizer & Bleacher	1
6	Lye Tank	1
7	Deodorizer	1
8	Boiler	1
9	Cooling Tower	1
10	Submersible Pump	1
11	Water Reserve oir	

2. Land, Building and Civil Works

The total area of the project is about 1,500 m^2 of which 1,500 m^2 is a built-up area. The cost of buildings is estimated at Birr 2,2250,000. The lease value of land is Birr 400,000 at a rate of 1 Birr per m^2 for 80 years.

3. Proposed Location

Selam Bere town is the best location to establish the envisaged plant, for its proximity to raw material sources.

VI. MANPOWER AND TRAINING REQUIREMENT

A. MANPOWER REQUIREMENT

The list of manpower and the labour cost are indicated in Table 6.1. The total annual cost of labour is estimated at Birr 417,000.

B. TRAINING REQUIREMENT

Training shall be carried out during plant erection by the experts of machinery suppliers. The total cost of training is estimated at Birr 30,000

Table 6.1

MANPOWER REQUIREMENT & LABOUR COST

Sr. No.	Manpower	Req. No.	Monthly Salary (Birr)	Annual Salary (Birr)
1	General Manager	1	3,000	36,000
2	Sales Officers	2	2,500	30,000
3	Accountant	1	2,000	2,400
4	Production Head	1	2,000	2,400
5	Operators	12	8,400	100,800
6	Laborers	20	6,000	72,000
7	Guards	3	900	10,800
8	Lab. Technicians	3	3,000	36,000
Sub-total		**43**	**27,800**	**333,600**
Benefit (25%BS)			6950	83,400
Total			**34,750**	**417,000**

VII. FINANCIAL ANALYSIS

The financial analysis of the moringa oleifera 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	5 years
Bank interest	8%
Discount cash flow	8.5%
Accounts receivable	30 days
Raw material local	30days
Work in progress	5 days
Finished products	30 days
Cash in hand	1 days
Accounts payable	30 days

A. TOTAL INITIAL INVESTMENT COST

The total investment cost of the project including working capital is estimated at Birr 3.79 million, of which 31 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	120.0
2	Building and Civil Work	750.0
3	Plant Machinery and Equipment	1,800.0
4	Office Furniture and Equipment	100.0
5	Vehicle	250.0
6	Pre-production Expenditure*	331.7
7	Working Capital	443.0
	Total Investment cost	**3,794.7**
	Foreign Share	31

** N.B Pre-production expenditure includes interest during construction (Birr 181.70 thousand) training (Birr 15 thousand) and Birr 135 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 2.96 million (see Table 7.2). The material and utility cost accounts for 73.37 per cent, while repair and maintenance take 3.83 per cent of the production cost.

Table 7.2

ANNUAL PRODUCTION COST AT FULL CAPACITY ('000 BIRR)

Items	Cost	%
Raw Material and Inputs	2,011.13	67.80
Utilities	165.5	5.58
Maintenance and repair	113.65	3.83
Labour direct	97.92	3.30
Factory overheads	40.8	1.38
Administration Costs	65.28	2.20
Total Operating Costs	2,494.28	84.08
Depreciation	313.5	10.57
Cost of Finance	158.7	5.35
Total Production Cost	**2,966.48**	**100**

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 3) is estimated by using income statement projection.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable Cost}} = 61\ \%$$

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 17 % and the net present value at 8.5% discount rate is Birr 1.64 million.

D. ECONOMIC BENEFITS

The project can create employment for 43 persons. In addition to supply of the domestic needs, the project will generate Birr 998,110 in terms of tax revenue.