67. PROFILE ON BEESWAX PROCESSING

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I. SUMMARY

This profile envisages the establishment of a plant for the production of 700 tonnes of beeswax per annum.

The current demand for proposed product is estimated at 1,321 tonnes and it is projected to reach 2,298 tonnes by the year 2019.

The plant will create employment opportunities for 16 persons.

The total investment requirement is estimated at Birr 4.11 million, out of which Birr 435,000 is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 29% and a net present value (NPV) of Birr 4.17 million, discounted at 10.5%.

II. PRODUCT DESCRIPTION AND APPLICATION

Beeswax is a tough wax produced by bees in the farm of tiny scales from glands on the ventral surface of the abdomen and used in building the combs in which the young are raised and pollen are stored. The beekeeper collects beeswax at the time of honey extraction and while also melting down old or damaged combs.

Beeswax is used commercially to make better quality candles, soap, skin care products, for coating of sweets and pills, furniture polish, it is applied on drawer runners to make them slide smoothly. Beeswax is also a component of modeling waxes. It is also put on thread to ease passing through of thread through tough materials during sewing.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

In Ethiopia, the most important users of beeswax are candle producers and "*TUAF*" producers. The Ethiopian Orthodox Church uses bees wax made *tuaf* every day. Moreover, most eastern Orthodox Churches in the world prefer beeswax candles because they burn clearly, with little or no wax dropping down the sides and little visible smoke.

Data on the domestic production of beeswax are not available since it is produced at small scale levels, mostly home made.

According to a survey made on private industries in Addis Ababa, candle producers demand about 223 tonnes, annually. However, an expert opinion confirms that about 75% of the demand is fulfilled.

Regarding demand for beeswax for the production of *tuaf*, there are an estimated 25,000 churches in the country under the Ethiopian Orthodox Church, consuming at least three pieces every day ensuring a wide domestic market. The demand for *tuaf* by every Ethiopian Orthodox Church is estimated at 1,000 pcs, annually. The total national demand is, therefore, estimated at 25,000,000 pcs or at an average 30 gm/piece of beeswaxes, 750 tonnes.

In addition to the domestic market, beeswax is one of the few exported items. Beeswax export is presented in Table 3.1.

Table 3.1

BEESWAX EXPORT IN TONNES

Year	Qty.	Cost '000 Birr
1994	313	5,514
1995	301	6,521
1996	330	7,987
1997	314	9,175
1998	995	10,514
1999	350	9,914
2000	217	5,549
2001	311	7,247
2002	285	6,006
2003	184	4,032

Source: *National Bank of Ethiopia (NBE).*

As can be seen from the table, an average 360 tonnes of beeswax has been exported between the years 1994-2003. Excluding the abnormal year 1988, the average annual export remains 289 tonnes. Statistically, the least square estimate of beeswax export in 1994-2003 (excluding 1990) depicts a constant function having non-significant slope with an equation:

$Y = -11.65t + 347.69 \qquad R^2 = 0.3472$

The export of beeswax is, therefore, estimated at 348 tonnes. The current effective demand for beeswax by the three segments is, therefore, 1,321 tonnes. However, current supply of the product is estimated to cover only 70% or 399 tonnes having a demand supply gap of 922 tonnes.

2. Projected Demand

The demand for beeswax is determined by candle manufacturing with the growth of overall economy. The international market for beeswax is wide enough as compared with the attained export. According to experts in the field, investment in the sector is believed to double the export figures in the coming ten years. The export market is also believed to be growing with development in infrastructure and facilitated environment to enter the international market. The demand for beeswax is, therefore, projected at 3.76% growth rate (the average growth rate achieved in 1990-1994). Projected demand for beeswax is presented in Table 3.2.

Table 3.2

PROJECTED DEMAND FOR BEESWAX (TONNES)

Year	Projected Demand	Existing Supply	Demand Gap
2005	1,371	400	971
2006	1,422	400	1,022
2007	1,476	400	1,076
2008	1,531	400	1,131
2009	1,589	400	1,189
2010	1,648	400	1,248
2011	1,710	400	1,310
2012	1,775	400	1,375
2013	1,842	400	1,442
2014	1,911	400	1,511
2015	1,983	400	1,583
2016	2,057	400	1,657
2017	2,134	400	1,734
2018	2,215	400	1,815
2019	2,298	400	1,898

3. Pricing and Distribution

The export price of beeswax during 1994 -2003 ranges from Birr 17.6 - 28.3 per kg. On the other hand in the local market, the product is sold in the range of Birr 10 to Birr 15. For the purpose of financial analysis, an average factory-gate price of Birr 13.54 per kg is adopted for the envisaged project. Distribution of the product is recommended to be directed to consumers with out involving intermediaries.

B. PLANT CAPACITY & PRODUCTION PROGRAMME

1. Plant Capacity

Based on the demand projection indicated, the proposed plant will have a capacity to produce 700 tonnes of beeswax per annum. The plant is envisaged to operate in one shift of 8 hours per day and for 264 days per year. However, it is also possible to work in two shifts based on actual market conditions.

2. Production Programme

The fact that beeswax processing is familiar process in our country, it may take only a short time to develop the skills and knowhow. However, it is recommended to start at relatively lower capacity to get enough time to penetrate existing local market and prepare for export. The production build-up programme is, hence, made to start at relatively lower (80%) and then gradually rise to full capacity in the 3rd year of operation. The detailed production programme is given in Table 3.3 below.

Table 3.3

PRODUCTION PROGRAM ME

Year of Production	1st Year	2nd Year	3rd Year
Production in %	80%	90%	100%
Beeswax	560	630	700

IV. MATERIALS AND INPUTS

A. MATERIALS

The raw materials required to prepare commercial beeswax is mainly raw beeswax and some chemicals. The detailed breakdown of material requirement at full operation capacity of the plant is given in Table 4.1.

Table 4.1

LIST OF RAW MATERIALS AND COSTS

Sr. No.	Description	Unit of Measure	Qty	Costs in Birr		
				LC	FC	Total
1	Honey comb (raw beeswax)	tone	750	7,467,000	-	7,467,000
2	Sulphuric acid	tone	17		17,000	17,000
3	Different sanitary articles	kg	15,000		45,000	45,000
4	Drum containers	pcs	28,400		142,000	142,000
5	Leaflets	met	28,500		4,275	4,275
6	Glue	kg	300		2,250	2,250
7	Others				33,000	33,000
	Grand Total			**7,467,000**	**243,525**	**7,710,525**

B. UTILITIES

The plant will use electrical energy and water as main utilities. An estimated annual utility consumption along with corresponding cost is indicated in Table 4.2.

Table 4.2

UTILITY CONSUMPTION OF THE PLANT AT FULL CAPACITY AND COST

Utility	Unit of Measure	Consumption	Unit Cost	Total
Electricity	kWh	15,750	0.4736	7,460.00
Water	m^3	1,080	1.67	1,810.00
Grand Total				**9,270.00**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

During beeswax processing, dark honeycombs should first be soaked in water to remove non-wax components (honey, pollen, …etc). Otherwise, while melting the wax emulsion is formed in the water reducing wax quality. Soft water is required for this purpose as hard water contains cations of some metals contributing to the emulsion formation. As wax contains uncombined fatty acids that react the metals of which the equipment is made and change the wax colouring (eg: iron colours wax in brown, zink-in dark-blue, copper - in green), that facilitates emulsion formation and deteriorates wax quality. So it is necessary to use technological equipment produced from non-corrosive materials, enamelled metals, aluminium, wood or ceramics. Water enulgated in wax is removed by

long settling of melted wax. Water and not-containing wax components will fall out and the wax quality will be improved.

While melting raw wax materials again wax may store some insoluble admixtures. The coarse ones are removed by another melting in soft water and by settling of melted wax. The length of settling depends on the degree of wax pollution and its temperature. Very small admixtures that are commonly kept in wax by the forces of absorption and electrostatics are removed by adding of sulphuric and hydrochloric acids to melted wax (5,0 - 30,0 cm^3 per 10 kg of wax). Wax is carefully mixed with the acid and kept to mature in melted state. Sometimes, it is washed repeatedly in a cold boiled water until dark wax gains yellow colouring.

Beeswax withstands the atmospheric influence and does not need any special storage facilities. Wax is not liable to damage of moth that is common in raw wax materials. It retains its properties, content and quality under long storage and heating

2. Source of Technology

The machinery required to process beeswax is available as unit or separately that performs heating, separating the wax from others and storing or transferring to other transitional containers. All necessary machinery and the technology is to be imported from abroad. As a potential supplier of machines and the technology, the following companies are recommended.

Beeswax processing equipment
Honey & Bee Division
Shots Inc 4418 Josephine Lane
Robbinsdale MN 55422, USA

Bees for Development
Troy, Monmouth, NP5 4AB
Tel +44(0)6007 13648

Fax +44(0)6007 16167

Web WWW.planbee.org.uk

B. ENGINEERING

1. Machinery and Equipment

The list of machinery and equipment required by the envisaged plant is given in Table 5.1. The total cost of plant machinery and equipment is estimated at Birr 435,000, of which Birr 362,500 is required in foreign currency.

Table 5.1

LIST OF MACHINERY AND EQUIPMENT

Sr. No.	Machine / Equipment Description	Qty
1	Wax processor (melting oven, separator & storage)	1
2	Wax moulding tanks	2
3	Stainless steel tanks	3

2. Land, Building and Civil Works

The required area for both building and open space for the plant is estimated to be 400m^2, out of which 300 m^2 will be a built-up area. The total cost of building and civil works at the rate of Birr 1,500 per m^2 is estimated at Birr 600,000. The total cost of land lease for a period of 70 years land holding at the rate of Birr 2.50/m^2 per year is estimated to be Birr 70,000. Thus, the total investment cost for land, building ad civil works assuming that the total land lease cost will be paid in advance is estimated at 670,000.

3. Proposed Location

Based on the availability of the basic raw material for the production of beeswax Metekel or Assosa zones are recommended to be the location of the envisaged plant.

VI. MANPOWER AND TRAINING REQUIREMENT

A. MANPOWER REQUIREMENT

The plant will require about 16 workers at the beginning of the plant operation. The breakdown of manpower allocation and corresponding labour cost is indicated in Table 6.1.

Table 6.1

MANPOWER REQUIREMENT AND ANNUAL LABOUR COST (IN BIRR)

Sr. No.	Position Description	Req. No.	Monthly Salary	Annual Salary
1	Plant manager	1	1,500	18,000
2	Finance & Admin manager	1	1,000	12,000
3	Accountant & cashiesr	1	800	9,600
4	Production & Techn Dept.	1	1,000	12,000
5	Operators	4	1,600	19,200
6	Prod. & Tech. helpers	3	900	10,800
7	Commercial Dept Mgr	1	1,000	12,000
8	Sells & Purchase Officer	1	500	6,000
9	Store keeper	1	400	4,800
10	Driver	2	500	6,000
	Sub-total			**110,400**
11	Workers benefit (25 % of basic salary)			27,600
	Grand Total	**16**	**8,700**	**104,400**

B. TRAINING REQUIREMENT

Beeswax processing is not such a new and complicated process. However, it is recommendable to train the Production and Technical Manager on how to use modern machines to produce quality beeswax especially for the export market. The trained person will conversely train other workers of the factory. The training will be given by the machinery supplier during erection and commissioning period for about two weeks on-site. This training may cost the plant about Birr 52,000.

VII. FINANCIAL ANALYSIS

The financial analysis of beeswax project is based on the data provided in the previous chatpers and the following assumptions:-

Construction period	2 years
Source of finance	30% equity
	70% loan
Tax holidays	6 years
Bank interest	10.5%
Discounted cash flow	10.5%
Repair and maintenance	5 % of Plant machinery and equipment
Accounts receivable	30 days
Raw material (local)	30 days
Raw materials (import)	90 days
work in progress	2 days
Finished products	30 days
Cash at 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 4.12 million, out of which about 14% 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	-	70.00	70.00
2	Building and Civil Work	-	600.00	600.00
3	Plant Machinery and Equipment	362.50	72.50	435.00
4	Office Furniture and Equipment	-	100.00	100.00
5	Vehicle	-	250.00	250.00
6	Pre-production Expenditure*	-	354.00	354.00
	Total Investment Cost	**362.50**	**1,446.50**	**1,809.00**
7	Working Capital	207.69	2,100.01	2,307.70
	Grand Total	**570.19**	**3,546.51**	**4,116.70**

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* Pre-*production expenditure include interest during construction (Birr 229,000), training (Birr 52,000) and cost 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 8.12 million (see Table 7.2). The material and utility cost accounts for 87.7 per cent while repair and maintenance take 0.27 per cent of the production cost.

Table 7.2

ANNUAL PRODUCTION COST

('000 BIRR)

Items	Year			
	3	**4**	**7**	**10**
Raw Material and Inputs	6,173.00	6,935.80	7,110.50	7,110.50
Labour Direct	53.00	59.60	66.20	66.20
Utilities	7.40	8.30	9.30	9.30
Maintenance and repair	18.00	20.20	22.50	22.50
Labour overheads	22.10	24.80	27.60	27.60
Administration cost	35.40	39.70	44.20	44.20
Total operating costs	**6,308.90**	**7,088.50**	**7,880.30**	**7,880.30**
Depreciation	159.50	159.50	159.50	84.50
Cost of Finance	132.80	119.50	79.70	39.80
Total Production Cost	**6,601.20**	**7,367.60**	**8,119.50**	**8,004.60**

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.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales-Variable Cost}} = 12\ \%$$

3. Pay-Back Period

The investment cost and income statement projection are used to project the pay-back period. The project will fully recover the initial investment and working capital within 5 years time.

4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 29 % and the net present value at 10.5% discount rate is Birr 4.17 million.

D. ECONOMIC BENEFITS

The project can create employment opportunities for 16 persons. In addition to supply of the domestic needs, the project will generate Birr 3.16 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 exporting its products.