

## **2. PROFILE ON BEES WAX PROCESSING**

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## **I. SUMMARY**

This profile envisages the establishment of a plant for the production of bee wax with a capacity of 800 tonnes per annum.

The present demand for the proposed product is estimated at 1223 tonnes per annum. The demand is expected to reach 2,543 tonnes by the year 2019.

The plant will create employment opportunities for 10 persons.

The total investment requirement is estimated at about Birr 3.54 million, out of which Birr 100,000 is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 19.92 % and a net present value (NPV) of Birr 1.68 million discounted at 8.5%.

## **II. PRODUCT DESCRIPTION AND APPLICATION**

Bees wax is a tough wax produced by bees in the form 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 and honey are stored. The beekeeper collects bees wax at the time of honey extraction and while also melting down old or damaged combs.

Bees wax is used commercially to make fine candles, cosmetics and pharmaceuticals including bone wax (cosmetics and pharmaceuticals account for 60% of total consumption), in polishing materials (particularly shoe polish), as a component of modeling waxes, and in a variety of other products. It is commonly used during the assembly of pool tables to fill the screw holes and the seams between the slates. Bees wax candles are preferred in most Eastern Orthodox churches because they burn cleanly, with little or no wax dripping down the sides and little visible smoke. Bees wax is also prescribed as the material (or at least a significant part of the material) for the Paschal

candle ("Easter Candle") and is recommended for other candles used in the liturgy of the Roman Catholic Church.

It is also used as a coating for cheese to protect the food as it ages. While some cheese makers have replaced it with plastic, many still use bees wax in order to avoid any unpleasant flavors that may result from plastic. As a food additive, bees wax is known as E901 (glazing agent).

The burning characteristics of bees wax candles differ from those of paraffin. A bees wax candle flame has a "warmer," more yellow color than that of paraffin, and the color of the flame may vary depending on the season in which the wax was harvested.

Bees wax is also an ingredient in moustache wax, as well as dreadlock wax, and was used in the manufacturing of the cylinders used by the earliest phonographs.

### **III. MARKET STUDY AND PLANT CAPACITY**

#### **A. MARKET STUDY**

##### **1. Past Supply and Present Demand**

Bees wax is used as an ingredient for a wide variety of consumer and industrial products. In Ethiopia, the most important users of bees wax 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 bees wax candles because they burn clearly, with little or no wax dropping down the sides and little visible smoke.

Data on the domestic production of bees wax 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 bees wax 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 bees waxes, 750 tonnes.

In addition to the domestic market, bees wax is one of the few exported items. The Ethiopian bees wax is exported to different countries around the globe. Japan, the United States and Greece are major importers of Ethiopian bees wax. Total volume and value of bees wax export is presented in Table 3.1.

**Table 3.1**  
**BEES WAX EXPORT IN TONNES**

<b>Year</b>	<b>Qty.</b>	<b>Cost '000 Birr</b>
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
2004	305	8366
2005	292	10881
2006	265	10486

*Source: External Trade Statistics*

As can be seen from Table 3.1, export of bees wax was some what erratic without any trend. For example, the quantity of bees wax exported during the period 1994 - 1997 ranges from 301 tonnes to 314 tonnes. In the year 1998 the exported quantity climbed to 995 tonnes. Between the years 1999 – 2006, the average quantity exported was about 266 tonnes.

However, the above export figures indicate that there is already an established foreign market for Ethiopian bees wax. Moreover, opinions found from traders reveals that there is a wide market for bees wax in the international market. The problem is not unavailability of demand but how to collect much of the bees wax that is wasted in most remote parts of the country.

Accordingly, it can be safely concluded that at present, there is foreign market at least which accommodates 250 tonnes of Ethiopian Bees wax. This can be taken as the present effective export demand.

Accordingly, the current effective demand for bees wax by the three segments is, therefore, 1,223 tonnes. However, current supply of the product is estimated to cover only 30% or 367 tonnes having a demand supply gap of 856 tonnes.

## **2. Projected Demand**

The demand for bees wax is determined by candle manufacturing with the growth of overall economy. The international market for bees wax 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. However, in order to be conservative the demand for bees wax is assumed to grow at a rate of 5% per annum. Projected demand for bees wax is presented in Table 3.2.

**Table 3.2**

**PROJECTED DEMAND FOR BEES WAX (TONNES)**

<b>Year</b>	<b>Projected Demand</b>	<b>Existing Supply</b>	<b>Demand Gap</b>
2005	1,284	400	884
2006	1,348	400	948
2007	1,416	400	1,016
2008	1,487	400	1,087
2009	1,561	400	1,161
2010	1,639	400	1,239
2011	1,721	400	1,321
2012	1,807	400	1,407
2013	1,897	400	1,497
2014	1,992	400	1,592
2015	2,092	400	1,692
2016	2,196	400	1,796
2017	2,306	400	1,906
2018	2,421	400	2,021
2019	2,543	400	2,143

### **3. Pricing and Distribution**

The export price of bees wax ranges from Birr 17.6 - 28.3 per kg. For the purpose of financial analysis, an average factory-gate price of Birr 17.6 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 800 tonnes of bees wax 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 bees wax processing is familiar process in our country, it may take only a short time to develop the skills and know how. 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 3<sup>rd</sup> year of operation. The detailed production programme is given in Table 3.3 below.

**Table 3.3**

### **PRODUCTION PROGRAMME**

<b>Year of Production</b>	<b>1<sup>st</sup> Year</b>	<b>2<sup>nd</sup> Year</b>	<b>3<sup>rd</sup> Year</b>
Production in %	80%	90%	100%
Bees wax	640	720	800

## IV. MATERIALS AND INPUTS

### A. MATERIALS

The raw materials required to prepare commercial bees wax is mainly raw bees wax and some chemicals. The detailed breakdown of material requirement at full operation capacity of the plant is given in Table 4.1. The total cost of raw materials is estimated at Birr 13.1 million.

**Table 4.1****LIST OF RAW MATERIALS AND COSTS**

Sr. No.	Description	Unit of Measure	Qty	Costs in Birr('000)		
				LC	FC	Total
1	raw bees wax	tonne	860	12,900	-	12,900
2	Sulphuric acid	tonne	20	200	-	200
	<b>Grand Total</b>			<b>13,100</b>	<b>-</b>	<b>13,100</b>

**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. The total annual cost of utilities is estimated at Birr 13,400.

**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 <sup>3</sup>	1,080	5.50	5,940
<b>Grand Total</b>				<b>13,400</b>

**V. TECHNOLOGY AND ENGINEERING****A. TECHNOLOGY**

## **1. Production Process**

During bees wax 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 emulgated 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<sup>3</sup> 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 cold boiled water until dark wax gains yellow colouring.

Bees wax 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 bees wax 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 technology is to be imported from abroad. As a potential supplier of machinery and the technology, the following companies are recommended.

1. Bees wax processing equipment

Honey & Bee Division

Shots Inc 4418 Josephine Lane

Robbinsdale MN 55422, USA

2. Bees for Development

Troy, Monmouth, NP5 4AB

Tel: +44(0)6007 13648

Fax: +44(0)6007 16167

Web [WWW.planbee.org.uk](http://WWW.planbee.org.uk)

3. Maxant Industries, Inc.

P.O. Box 454

28 Harvard Rd.

Ayer, Ma. 01432 U.S.A

978 772-0576

fax 978 772-6365

Email: <mailto:sales@maxantindustries.com>

**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 100,000, of which Birr 80,000 is required in foreign currency.

**Table 5.1**  
**LIST OF REQUIRED 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<sup>2</sup>, out of which 200 m<sup>2</sup> will be a built-up area. The building will be constructed with EGA sheet roof, HCB wall and cement screed floor finish. The total cost of building and civil works at the rate of Birr 2,300 per m<sup>2</sup> is estimated at Birr 460,000. The total cost of land lease for a period of 80 years land holding at the rate of Birr0.1 /m<sup>2</sup> per year is estimated to be Birr 3,200. Thus, the total investment cost for land, building and civil works assuming that the total land lease cost will be paid in advance is estimated at Birr 463,200.

## **3. Proposed Location**

Based on the availability of the basic raw material for the production of bees wax, Bonga Zuria Woreda, Bonga town is recommended to be the location of the envisaged plant.

## **VI. MANPOWER AND TRAINING REQUIREMENT**

### **A. MANPOWER REQUIREMENT**

The plant will require about 10 workers at the beginning of the plant operation. The breakdown of manpower allocation and corresponding labour cost is indicated in Table 6.1. The total cost of manpower is estimated at Birr 62,250.

**Table 6.1**

**MANPOWER REQUIREMENT AND ANNUAL LABOUR COST (IN BIRR)**

<b>Sr. No.</b>	<b>Position Description</b>	<b>Req. No.</b>	<b>Monthly Salary</b>	<b>Annual Salary</b>
1	Production supervisor	1	800	9,600
2	cashier	1	500	5,000
3	Operators	3	1200	14,400
4	Sells & Purchase Officer	1	500	6,000
5	Store keeper	1	350	4,200
6	Driver	1	300	3,600
7	Guard	2	500	6,000
	<b>Sub-total</b>	<b>10</b>		<b>49,000</b>
	Workers benefit ( 25 % of basic salary)			12,450
	<b>Grand Total</b>			<b>62,250</b>

## **B. TRAINING REQUIREMENT**

Bees wax processing is not such a new and complicated process and does not need any special training arrangement.

## **VII. FINANCIAL ANALYSIS**

The financial analysis of the bee wax 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	3 years
Bank interest	8%
Discount cash flow	8.5%
Accounts receivable	30 days
Raw material local	30days
Work in progress	3 days
Finished products	30 days
Cash in hand	5 days
Accounts payable	30 days

## **A. TOTAL INITIAL INVESTMENT COST**

The total investment cost of the project including working capital is estimated at Birr 3.54 million. 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	3.2
2	Building and Civil Work	460.0
3	Plant Machinery and Equipment	100.0
4	Office Furniture and Equipment	125.0
5	Vehicle	200.0
6	Pre-production Expenditure*	246.7
7	Working Capital	2,403.5
	<b>Total Investment cost</b>	<b>3,538.4</b>
	Foreign Share	-

\* *N.B Pre-production expenditure includes interest during construction ( Birr 96.66 thousand ) and Birr 150 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 13.48 million (see Table 7.2). The material and utility cost accounts for 97.27 per cent, while repair and maintenance take 0.15 per cent of the production cost.

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

<b>Items</b>	<b>Cost</b>	<b>%</b>
Raw Material and Inputs	13,100.00	97.17
Utilities	13.4	0.10
Maintenance and repair	20	0.15
Labour direct	37.35	0.28
Factory overheads	12.45	0.09
Administration Costs	24.9	0.18
Total Operating Costs	13,208.10	97.97
Depreciation	115.5	0.86
Cost of Finance	157.53	1.17
<b>Total Production Cost</b>	<b>13,481.13</b>	<b>100</b>

**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.

$$\text{BE} = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable Cost}} = 29 \%$$

**3. Payback 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 19.92 % and the net present value at 8.5% discount rate is Birr 1.68 million.

#### **D. ECONOMIC BENEFITS**

The project can create employment for 10 persons. In addition to supply of the domestic needs, the project will generate Birr 1.53 million in terms of tax revenue. The establishment of such factory will have a foreign exchange earning potential through exporting its products.