

**16. PROFILE ON PRODUCTION OF BLACK  
AND GREEN TEA PROCESSING AND  
PACKING**

**TABLE OF CONTENTS**

	<b><u>PAGE</u></b>
I. SUMMARY	16-3
II. PRODUCT DESCRIPTION & APPLICATION	16-3
III. MARKET STUDY AND PLANT CAPACITY	16-4
A. MARKET STUDY	16-4
B. PLANT CAPACITY & PRODUCTION PROGRAMME	16-8
IV. MATERIALS AND INPUTS	16-9
A. RAW & AUXILIARY MATERIALS	16-9
B. UTILITIES	16-10
V. TECHNOLOGY & ENGINEERING	16-11
A. TECHNOLOGY	16-11
B. ENGINEERING	16-13
VI. MANPOWER & TRAINING REQUIREMENT	16-15
A. MANPOWER REQUIREMENT	16-15
B. TRAINING REQUIREMENT	16-15
VII. FINANCIAL ANALYSIS	16-17
A. TOTAL INITIAL INVESTMENT COST	16-17
B. PRODUCTION COST	16-18
C. FINANCIAL EVALUATION	16-19
D. ECONOMIC BENEFITS	16-20

## **I. SUMMARY**

This profile envisages the establishment of a plant for the processing and packing of black and green tea with a capacity of 100,000 kg per annum.

The present demand for the proposed product is estimated at 756.4 tonnes per annum. The demand is expected to reach at 1,434.73 tonnes by the year 2022.

The plant will create employment opportunities for 28 persons.

The total investment requirement is estimated at about Birr 5.36 million, out of which Birr 1.125 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 14 % and a net present value (NPV) of Birr 759,660, discounted at 8.5 %.

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

Tea is a shrub (*Camellia Sinensis*) cultivated from antiquity in China and now in countries like Japan, India, Kenya, Ethiopia, etc. and having lanceolate leaves and fragrant white flowers. Processed black or green tea is a product prepared and cured from the leaves, leaf buds and internodes of this plant for the market.

Tea in general and black and green tea as well are finding wide application both in urban and rural parts of Ethiopia. Tea is consumed both at home and at work places. As urbanization grows, particularly in cities and towns, tea is widely consumed at almost all meals, during break times, at conferences and seminars and at colleges and hospitals.

### III. MARKET STUDY AND PLANT CAPACITY

#### A. MARKET STUDY

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

The country's requirement for tea has been met through domestic production and imports. Table 3.1 shows the supply of the product from domestic production and imports during 1997-2006. During the period under reference, total supply averaged at 5308.68 tonnes, of which 4716.11 tonnes constituted domestic production and the remaining 592.57 tonnes imports. Thus, on the average, domestic production accounted for 88.8 per cent of the country's requirement for tea.

**Table 3.1**  
**SUPPLY OF BLACK AND GREEN TEA (TONNES)**

<b>Year</b>	<b>**Domestic Production</b>	<b>*Import</b>	<b>Total Supply</b>
1997	4693	44.77	4737.77
1998	5391	141.58	5532.58
1999	3608	991.66	4599.66
2000	3776	1451.00	5227.00
2001	3973	1361.40	5334.40
2002	3188	501.34	3689.34
2003	4976	355.39	5331.39
2004	5976	292.12	6268.12
2005	6864	193.85	7057.85
<b>Average</b>	<b>4716.11</b>	<b>592.57</b>	<b>5308.68</b>

*Source:* \*Customs Authority, External Trade Statistics, 1997-2005.

\*\* CSA, Statistical Abstract, 1997-2005.

Assuming supply was driven by demand, the average annual supply of black and green tea for the period under reference, which constitutes domestic production and imports, is considered as the effective domestic demand for the product for the year 2006. Since the consumption of tea is mainly associated with the urban population, the demand for the product is assumed to grow by 4% that corresponds to the annual growth rate of the urban population. The present domestic demand for black and green tea (i.e. for 2007) is, thus, estimated at 6077.91 tonnes. Assuming the average import shown in Table 3.1 represents the current demand for imported tea, the market share of the envisaged plant is estimated at 11.2% of the estimated current domestic demand for the product, i.e. 680.73 tonnes.

Although much of the domestic production is meant for domestic consumption, the country also exports black and green tea. The amount of black and green tea exported during 1997-2006 is depicted in Table 3.2. Varying from a minimum of 35.24 tonnes in 1999 to a maximum of 2193.02 tonnes in 2003, exports highly fluctuated during the period under reference. On the average, the country exported 707.15 tonnes of black and green tea during the reference period.

**Table 3.2**  
**EXPORTS OF BLACK AND GREEN TEA (TONNES)**

Year	Export
1997	253.32
1998	405.84
1999	35.24
2000	92.32
2001	75.46
2002	409.63
2003	2193.02
2004	1832.07
2005	1292.24
2006	482.36
<b>Average</b>	<b>707.15</b>

*Source: Customs Authority, External Trade Statistics, 1997-2006.*

Given the considerable fluctuations in the volume of exports of the product, the average annual export during the period under reference is considered as the effective export demand for black and green tea for the year 2006. Taking into account the remarkable growth in exports in to account, a growth rate of 7% is adopted in estimating the export demand for the product. The present export demand for the product (i.e., for 2007) is, therefore, estimated at 756.65 tonnes. Given the flourishing export sector, the envisaged plant is expected to achieve a volume of export equivalent to 10% of the estimated current export demand for the product, i.e. 75.67 tonnes. Thus, out of the 6834.56 tonnes total of present demand (domestic consumption + export) for the product, the total market share (domestic consumption + export) of the envisaged plant is estimated at 756.4 tonnes.

## **2. Projected Demand**

As stated above, a growth rate of 4% and 7%, respectively, is considered in projecting the domestic and export demand for black and green tea. The projected demand for the product is shown in Table 3.3.

**Table 3.3****PROJECTED DEMAND FOR BLACK AND GREEN TEA (TONNES)**

<b>Year</b>	<b>Projected Demand</b>
2007	756.40
2008	788.93
2009	822.91
2010	858.43
2011	895.55
2012	934.34
2013	974.90
2014	1017.30
2015	1061.64
2016	1108.01
2017	1156.50
2018	1207.23
2019	1260.29
2020	1315.82
2021	1373.92
2022	1434.73

**3. Pricing and Distribution**

Currently a 100 gm pack of domestically produced tea is retailed at Birr 3. Allowing 15 per cent for wholesale and retail margin, the envisaged plant is expected to sell its product at Birr 25.50 per kg.

The product can get its market outlet through the existing wholesale and retail network that includes department stores, merchandise shops and supermarkets.

## **B. PLANT CAPACITY AND PRODUCTION PROGRAMME**

### **1. Plant Capacity**

The market study for black and green tea indicates that the unsatisfied demand for the year 2007 is 756.40 tonnes, while this figure would grow to 1061.64 tonnes and 1315.82 tonnes by the year 2015 and 2020, respectively. It is proposed that processing of black and green tea will be started at small scale level, and gradually grow to higher capacity when the local and export markets get stronger.

Accordingly, a small scale processing and packing plant of 100 tonnes per annum capacity is proposed. The plant will operate single shift of 8 hours a day and for 300 days a year.

### **2. Production Programme**

The plant will start operation at low capacity to provide the possibility of skill development on the operation and maintenance of production equipment and establish adequate market outlets. Consequently, the plant will start operation at 65% of the plant capacity during the first year, and then gradually raise production to 75%, 85% and 100% during the second year, third year and fourth year and then after, respectively. Production build-up is shown in Table 3.4 below.

**Table 3.4**  
**PRODUCTION PROGRAMME**

<b>Year</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4 and above</b>
Capacity Utilization (%)	65	75	85	100
Production (tonne)	65	75	85	100

#### IV. MATERIALS AND INPUTS

##### A. RAW & AUXILIARY MATERIALS

Black and green tea are derived from the camellia sinensis evergreen plant. The green leaf is picked from the plant and is subject to process. Thus, the basic raw material of black and green tea processing is the green leaves derived from the plant.

Auxiliary materials required are pp sheets, packing boxes, labels, etc. Annual requirements of raw & auxiliary materials is given in Table 4.1 below.

**Table 4.1**  
**RAW AND AUXILIARY MATERIALS AND COST AT FULL CAPACITY**

Sr. No.	Description	Qty	Cost ('000 Birr)		
			LC	FC	TC
	<b><u>A. Raw Material</u></b>				
1	Green Leaves (tonnes)	500	750.0	-	750.0
	<b>Sub-total</b>		<b>750</b>	<b>-</b>	<b>750</b>
	<b><u>B. Auxiliary Materials</u></b>				
1	PP sheets	Reqd	30.0	-	30.0
2	Packing paper boxes, labels, etc.	Reqd	45.0	-	45.0
3	Cartons	Reqd	50.0	-	50.0
	<b>Sub -Total</b>		<b>125</b>		<b>125</b>
	<b>Total</b>		<b>875</b>		<b>875</b>

## B. UTILITIES

Utilities required are electricity, water and wood. Electricity is used to run production equipment, for lighting bulbs and power sockets. Water is used for drinking and general purposes. Wood is required for generating hot gas used to dry the green tea leaves. Annual requirement of utilities at full capacity production of the plant is given in Table 4.2 below.

**Table 4.2**

### **ANNUAL REQUIREMENT OF UTILITIES AND COST**

<b>Sr. No.</b>	<b>Description</b>	<b>Qty</b>	<b>Cost ('000 Birr)</b>
1	Electricity (kWh)	60,000	28.44
2	Water (m <sup>3</sup> )	500	5.0
3	Wood (m <sup>3</sup> )	150	100.00
	<b>Total</b>	<b>-</b>	<b>133.44</b>

## VI. TECHNOLOGY AND ENGINEERING

### A. TECHNOLOGY

#### 1. Production Process

There is a misperception that the different types of tea come from different tea plant. Black, Green and Oolong teas are all derived from the camellia sinensis evergreen plant.

The difference comes from how the plant is processed. The common processing unit operations are:

- a) WITHERING
- b) ROLLING
- c) OXIDATION
- d) DRYING OR FIRING

**a) Withering**

Newly picked leaves are thinly spread to dry during this process. Heated air is forced over the leaves if the climate is not suitable. The main goal of this process is to reduce the water content. By the end of this process, the leaves should be pliable enough to be rolled.

**b) Rolling**

From the withering racks, the leaves are now twisted and rolled so that the leaf cells are broken up. Sometimes shaking is done as well. Oils are released with this rolling process that give the tea its distinctive aroma. The leaves can be rolled with machinery or by hand. The juices that are released remain on the leaf; a chemical change will occur shortly.

**c) Oxidation**

This is the chemical process where oxygen is absorbed. This process began once the leaf membranes were broken during the rolling process. Oxidation causes the leaves to turn bright copper in color. This process is the main deciding factor whether we have green, Oolong or Black tea.

**d) Drying Or Firing**

In this stage the leaves are dried evenly and thoroughly without burning the leaves. Firing the leaves stops the oxidation process.

For the purpose of this study Oolong tea is not considered. However, the processes of producing Black and Green tea are considered separately.

**Black Tea Processing**

The Black tea process goes through the most stages described above. Once the leaves are picked, they are left to wither for about a day. After this the leaves are soft enough to be rolled into balls; oils from the leaves are brought to the surface. These aromatic oils aid in the oxidation process, which last for a number of hours until proper smell and color are achieved.

Next is firing. This is the process of moving the leaves through hot air chambers to stabilize the leaves and lock in the flavour. The dry heat stops the fermentation process by killing the active enzymes. During this firing, the leaves turn dark and lose all but about 2% of their moisture. If the firing is not done correctly, and the leaves are too dark, the result cup of tea will taste weak. The tea is now ready for packing. It is then dispatched into local and export market.

**Green Tea Processing**

The process for making green tea is the shortest. Withering is done first, but this step might be omitted. Rolling the leaves to break the membranes for oxidation is skipped, hence the oxidation process is also skipped. After withering the leaves are pan fired or fired to prevent oxidation from occurring. The last step is to roll the leaves and dry them one last time for its final shape. The green tea leaves usually remain green. The tea is now ready for packing and market.

## **2. Source of Technology**

Far East countries like India, China, Japan, etc are well known for processing different kinds of tea. India is particularly known for marketing tea to Africa. Tea processing equipment are widely produced and supplied by several Indian machinery manufacturers. Address of one such manufacturer and supplier is given below.

Tea Spares Enterprise

11, Clive Row, 3<sup>rd</sup> Floor, Kolkata 700001, India

Phone: 91-33 2242 2698

91-33 2242 3839

E-mail: [pramod@teaspares.com](mailto:pramod@teaspares.com)

Website: [www.teaspares.com](http://www.teaspares.com)

## **B. ENGINEERING**

### **1. Machinery and Equipment**

The list of machinery and equipment required for black and green tea processing is given in Table 5.1 below.

**Table 5.1****MACHINERY AND EQUIPMENT REQUIREMENT AND COST**

Sr. No.	Description	Qty	Cost ('000 Birr)		
			LC	FC	TC
1	Transportation equipment (for tea leaves)		-	750.0	750.0
2	Storage bins	20	-	40.0	40.0
3	Racks or troughs (for withering tea leaves)	20	-	40	40.0
4	Oven (for oxidation)	2	-	70	70.0
5	Frying pan (for green tea)	2	-	40	40.0
6	Hot gas generator (complete with burner, firing chamber, fan, hood and accessories)	Set	-	1750	1750.0
7	Packing machine (complete with tables and auxiliaries)	set	-	265.0	265.0
8	Tools & Accessories	Reqd	-	25.0	25.0
	<b>Sub-Total</b>			<b>2,980</b>	<b>2,980</b>
	Freight, Insurance, Customs, Bank charges, materials handling cost		120.0	-	120
	<b>Grand Total</b>		<b>120.0</b>	<b>2980</b>	<b>3100</b>

**2. Land, Building and Civil Works**

Black and green tea processing plant requires land area that would be used for constructing factory building, building for administration offices, general purpose buildings, warehouses for raw materials and finished products, pathways and land for future expansion. In view of these, the total land area requirement is estimated to be 5000 m<sup>2</sup>. Of this, 750 m<sup>2</sup> area will be used for constructing the various buildings indicated above. At the rate of Birr 1.0 per m<sup>2</sup> as lease value, and Birr 1500 per m<sup>2</sup> for building, the total investment on land, building and civil works will be Birr 1.525 million.

### **3. PROPOSED LOCATION**

Location of a plant is determined based on proximity to raw materials, availability of infrastructure and distance to potential market outlets. Moreover, consideration of fair distribution of projects among SNNPRS woredas is taken. Accordingly, Bitta and Benck woredas are identified, from which Bitta woreda is chosen. It is, therefore, suggested that the plant will be located in Bita genet town.

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

### **A. MANPOWER REQUIREMENT**

The envisaged plant requires skilled manpower to operate production equipment. Administration manpower is also required to carry out the managerial work of the plant. Details of manpower together with monthly wages and annual payments are shown in Table 6.1 below.

### **B. TRAINING REQUIREMENT**

Machinery operators, technicians and the technologist will have to be trained for a period of two weeks during erection and commissioning. A total of Birr 10,000 is ear marked to execute the training programme.

**Table 6.1**  
**MANPOWER REQUIREMENT AND LABOUR COST**

<b>Sr. No.</b>	<b>Job Title</b>	<b>Required No.</b>	<b>Monthly Salary (Birr)</b>	<b>Annual Wages (Birr)</b>
	<b><u>A. Administration</u></b>			
1	Plant manager	1	2,000	24,000
2	Secretary	1	600	7,200
3	Personnel officer	1	1,000	12,000
4	Salesman	1	800	9,600
5	Store man	1	800	9,600
6	Accountant	1	800	9,600
7	Clerk	1	400	4,800
8	Cashier	1	600	7,200
9	General services	3	250	9,000
	<b>Sub –total</b>	<b>11</b>		<b>93,000</b>
	<b><u>B. Production</u></b>			
1	Production supervisor	1	1,500	18,000
2	Technologist	1	1,200	14,400
3	Skilled workers	6	600	43,200
4	Laborer	4	250	12,000
5	Technician	2	600	14,400
6	Packers	3	400	14,400
	<b>Sub-total</b>	<b>17</b>		<b>116,400</b>
	Workers' benefit (25% BS)	-		52,350
	<b>Total</b>	<b>28</b>		<b>261,750</b>

## VII. FINANCIAL ANALYSIS

The financial analysis of the black and green tea processing and packing 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	8.5 %
Discount cash flow	8.5 %
Accounts receivable	30 days
Raw material local	30 days
Work in progress	5 days
Finished products	30 days
Cash in hand	10 days
Accounts payable	30 days

### A. TOTAL INITIAL INVESTMENT COST

The total investment cost of the project including working capital is estimated at Birr 5.36 million, of which 27 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	400.0
2	Building and Civil Work	1,125.0
3	Plant Machinery and Equipment	3,100.0
4	Office Furniture and Equipment	50.0
5	Vehicle	150.0
6	Pre-production Expenditure*	400.8
7	Working Capital	136.9
	<b>Total Investment cost</b>	<b>5,362.7</b>
	Foreign Share	27

\* *N.B Pre-production expenditure includes interest during construction ( Birr 300.81 thousand ) training (Birr 10 thousand ) and Birr 90 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 2.1 million (see Table 7.2). The material and utility cost accounts for 47.90 per cent, while repair and maintenance take 9.98 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	875.00	41.56
Utilities	133.44	6.34
Maintenance and repair	210	9.98
Labour direct	168.75	8.02
Administration Costs	93	4.42
Total Operating Costs	1,480.19	70.31
Depreciation	421.25	20.01
Cost of Finance	203.81	9.68
<b>Total Production Cost</b>	<b>2,105.25</b>	<b>100</b>

**C. FINANCIAL EVALUATION****1. Profitability**

According to the projected income statement, the project will start generating profit in the second 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 ) is estimated by using income statement projection.

$$\text{BE} = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable Cost}} = 28 \%$$

## 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 14 % and the net present value at 8.5 % discount rate is Birr 759,660.

## D. ECONOMIC BENEFITS

The project can create employment for 28 persons. In addition to supply of the domestic needs, the project will generate Birr 4.46 million in terms of tax revenue. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports.