

**14. RUBBER TREE PLANTATION  
& RUBBER PROCESSING**

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## **I. SUMMARY**

This profile envisages the establishment of Rubber Tree Plantation and Rubber gum plant with a production capacity of 412.5 tonnes per annum.

The present demand for the proposed product is estimated at about 3000 tonnes per annum. The demand is expected to reach at 5,154 tonnes by the year 2010.

The plant will create employment opportunities for 45 persons.

The total investment requirement is estimated at Birr 5.24 million, out of which Birr 1.2 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 56 % and a net present value (NPV) of Birr 19.4 million, discounted at 8.5 %.

## **II. PROJECT DESCRIPTION AND APPLICATION**

Rubber tree (*Hevea brasiliensis*) is not commercially grown in Ethiopia. The tree is the main source of raw material for tyre manufacturing industry.

According to FAO report (1993) in order to meet the growing needs of tyre and other rubber products in Ethiopia and to avoid dependency on the imported raw materials of rubber sheets, the-then Addis Tyre Share Company or the current Matador-Addis: had made various efforts to develop commercial rubber plantation. It was in year 1991 that a FAO rubber consultant and Addis Tyre Share Company visited Toli Kobo's matured rubber trees in Illubabor where they made some observations and collected certain data. In that area 117 trees were planted in a spacing of 5m x 5m square between plants. The report indicates that there was no sign of leaf diseases or deficiency symptoms. The planting was carried out to identify the adaptability of the crop under Ethiopian Agro-ecologic conditions. About 8,000 fresh seeds of rubber tree were collected and planted in rubber nurseries in year 1991. In September and October 1991 over 20,000 seeds were collected and germinated at 3 nurseries for the Rubber Planting Project of Addis Tyre Share Company. A two hectare planting was done during 1990 at Butaji near Gumaro in Illubabor zone. Rubber Plantation was established on 10 hectares of land at Addis Berhan and rubber nurseries were developed at Addis Berhan, Biffu, Shonga and Kikar. The Toli Kobo old rubber trees, which were the sources of fresh rubber seeds were identified to be identical to RRIM501 and RRIM600 clones, which were developed by a breeding programme of Rubber Research of Malaya. These two clones were recommended for large scale planting in Malaya and they are still among the most popular clones in most of the rubber tree growing countries of the world.

Rubber tree is a source of latex important for manufacturing various rubber materials. The fresh latex consists of a colloidal suspension of rubber particles in an aqueous serum. The content of rubber hydrocarbon varies from 25-40 per cent, with average of about 30 per cent.

Currently, 70 per cent of the total rubber consumption is in the manufacture of tyres and tubes and other items associated with automotive transport. It has been estimated

that 50,000 different products are made from rubber directly or indirectly. About 6 per cent of the world's rubber is used for footwear, boots, shoes, soles and heels and 4 per cent for wire and cable insulation.

### **III. MARKET STUDY, FARM AND PROCESSING PLANT CAPACITY**

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

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

The bulk of demand for natural rubber in Ethiopia derives from the requirements of tyre manufacturing. Some amount of rubber is also imported for shoe-sole manufacturing and for processing into various items like automotive parts.

The only tyre manufacturing plant in Ethiopia is Matador-Addis, which used to be known as Addis Tyre S.C before the joint venture arrangement with Slovak Matador. The current capacity of the factory is 240,000 tyres annually; which, according to information released by the General Director of the factory to the newspaper “Fortune” on October 17, 2004, will increase to 280,000 pieces after the initial expansion in the year 2005 and 500,000 pieces in the year 2000. The factory reckons that local demand is about 600,000 to 700,000 tyres a year. Imported tyres like Dunlop, Pirelli, Bridgestone and Kumho currently meet 40% of the local market demand.

Information obtained from Matador-Addis indicates that the annual natural rubber consumption of the factory is presently 2,826 tonnes. This amount represents about 75% of the rubber consumption of the factory; the balance, i.e. 25% being synthetic rubber. In order to meet its natural rubber requirement through local sourcing Matador-Addis is implementing a rubber plantation project at Bebeke in SNNPR. As the project is not completed, all rubber needed for tyre manufacturing is still sourced from abroad.

Although tyre production is the dominant activity of Matador-Addis, inner tubes and general rubber goods like door mats, automotive accessories and out-soles are also produced.

Other importers of rubber are shoe factories, particularly the Black Nile Shoe Factory and the Ethiopian Canvas & Shoe Factory, for the manufacture of rubber soles. Although these factories import about 600 tonnes of rubber in combination, natural rubber constitutes about 25%, i.e., 150 tonnes out of the total; the balance being comprised of synthetic and reclaimed rubber of aggregating the requirements deriving from tyre and shoe production as well as other less significant consumers, the present market size is estimated at 3,000 tonnes per annum.

As an alternative approach to estimate the present demand, the historical import data was also looked into. Table 3.1 shows that though fluctuations are observed, there is an overall growth trend in annual rubber importation. The average import volume of the most recent 3 years in the data set (2000-2003) was 3,055 tonnes, which is close to the earlier estimate of 3,000 tonnes.

**Table 3.1**  
**IMPORT OF NATURAL RUBBER**

<b>Year</b>	<b>Import (Tonnes)</b>
1994	2920
1995	2877
1996	2831
1997	1905
1998	4053
1999	1537
2000	2384
2001	4477
2002	1247
2003	3442

**Source:** *Customs Authority, External Trade Statistics, Annual Issues.*

A third alternative approach employed by the study to estimate the present demand was referring to the CSA publication “Results of Survey of Manufacturing and Electricity Industries”, which is published annually. Among the available data in the publication are quantity of major raw materials consumed by reporting enterprises. The figures pertaining to rubber are given in Table 3.2. It should, however, be noted that both natural and synthetic rubber are included in the data.

**Table 3.2**  
**QUANTITY OF NATURAL & SYNTHETIC RUBBER CONSUMED BY**  
**REPORTING ENTERPRISES**

<b>Year</b>	<b>Consumption (Tonnes)</b>
1993	2536
1994	2692
1995	2727
1996	1915
1997	4105
1998	4330
1999	3153
2000	3554
2001	3872
2002	3300

**Source:-** *CSA, Survey of the Manufacturing and Electricity Industries, Annual Issues.*

Scrutiny to Table 3.2 reveals that rubber consumption as raw material by user industries is higher than the estimate arrived at through the first and second approach. This is to be expected as synthetic rubber is also included in the later data. The average consumption during the most recent five years was 3,641 tonnes. The difference with the earlier estimate of 3,000 tonnes, i.e., 641 tonnes could thus be accounted for by synthetic rubber.

## 2. Projected Demand

A multitude of interrelated factors influence the size of the rubber market in a country. The most important among these are:-

- Growth of the national economy, reflected in growth in GDP and other national economic indicators,
- Growth of the vehicular (car) population,
- Growth of footwear and other rubber consumer industries, and
- Expansion of road transport infrastructure, facilities and services.

Having considered all the above factors, it is deemed prudent to project future demand for natural rubber with a 7% annual growth rate; and, the forecast, as shown in Table 3.3, ranges from 3,210 tonnes in the year 2005 to 7735 tonnes by the year 2018.

**Table 3.3**  
**PROJECTED DEMAND FOR NATURAL RUBBER**

<b>Year</b>	<b>Demand (Tonnes)</b>
2004	3000
2005	3210
2006	3438
2007	3675
2008	3932
2009	4207
2010	4502
2011	4817
2012	5154
2013	5515
2014	5901
2015	6314
2016	6756
2017	7229
2018	7735

## 3. Price and Distribution

Natural rubber producing countries with relatively high share in the world market and from which Matador-Addis Tyre Factory makes most of its imports of the commodity are: Malaysia, India and Singapor. Although the price varies from time to time, currently the C.I.F price falls in the range of 6,000-12,000 Birr/tonne, depending upon the country of origin.

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

### **1. Farm and Processing Plant Capacity**

The proposed rubber tree plantation farm will have a production capacity of 412,500 kg of rubber gum from 250 ha. of land per annum. The processing plant will be established with the intension of processing only the farm produce, i.e., 412,500 kg rubber gum/ annum.

### **2. Farm and Processing Plant Production Programme**

The envisaged rubber tree plantation farm establishment will begin with 50 per cent capacity and will reach at full capacity in the second year. It is assumed that the processing plant will be established after six year, the time for the young plant to reach into tapping stage. Because of raw material (latex) the plant will begin with 45 per cent capacity and will grow to 75 per cent and 100 per cent capacity in the second year and third year, respectively.

## **IV. FARM AND PROCESSING PLANT MATERIALS, AND UTILITIES**

### **A. FARM AND PROCESSING PLANT MATERIALS**

The main farm and processing plant materials and inputs required for the plantation and processing plant are depicted in Table 4.1. According to Table 4.1 seed, poly bags, fertilizers, pesticides and mixed soil are the major farm materials and agricultural inputs for rubber tree plantation, while latex and auxiliary materials like anticoagulants and coagulating chemicals are required for the processing plant.

The total cost for materials and inputs is estimated to be Birr 0.4 million, out of which 76.0 per cent and 24.0 per cent is required in local and foreign currency, respectively.

**Table 4.1**  
**FARM AND PROCESSING PLANT MATERIALS REQUIREMENT,**  
**AND COSTS**

<b>Sr. No.</b>	<b>Description</b>	<b>Cost ('000 Birr)</b>		
		<b>Local</b>	<b>Foreign</b>	<b>Total</b>
1	Seeds	3	40	43
2	Bud woods	3	20	23
3	Poly bags	50	-	50
4	Fertilizers	60	-	60
5	Pesticides	83	-	83
6	Mixed soil	10	-	10
7	Auxiliary materials	40	-	40
8	Other	29	29	58
	<b>Grand Total</b>	<b>278</b>	<b>89</b>	<b>367</b>

## B. UTILITIES

Fuel, lubricant, electricity, water, office supplies and telephone will be the main utilities requires for the establishment of the rubber tree farm and for processing rubber sheet. The types of utilities required for the proposed project and the corresponding costs are shown in Table 4.2. According to Table 4.2, the total cost both for the farm and processing plant is expected to be Birr 0.3 million.

**Table 4.2**  
**UTILITIES REQUIREMENT AND COST**

Sr. No.	Description	Qty ('000)	Cost ('000 Birr
1	Fuel (lt)	53	132.5
2	Lubricant (lt/kg)	5.3	13.25
3	Electricity (kWh)	90	43
4	Water (m <sup>3</sup> )	38	76
5	Office supplies	-	14
6	Telephone	-	15
	<b>Total</b>		<b>293.75</b>

## V. FARM AND PROCESSING PLANT TECHNOLOGY AND ENGINEERING

### A. FARM AND PROCESSING PLANT TECHNOLOGY

#### 1. Farming Technology

Rubber tree plantation arm establishment is expected to be presumed by appropriate site selection and preparation. This will be followed by procurement and importation of seeds with high genetic potentials to give a high quality planting materials. Once the nursery site is selected, nursery operations such as clearing, ploughing, seed bed preparation, etc will be undertaken upto transplanting seedlings to field nursery. The subsequent operations include bud wood multiplication nursery, establishment, planting holes preparation, field budding, poly bag budding, thinning, bud wood nursery maintains, weeding, mulching, watering, fertilizer application, bud grafting, pruning and insect pest and disease management.

#### 2. Processing Technology

The manufacture of ribbed smoked sheets grades essentially involves the following steps.

These are collection and preservation of latex, reception and bulking, coagulation, processing, into wet sheets, drying and smoking, grading and weightings, finally bale pressing, wrapping.

#### 3. Source of Technology

The farm and processing machinery and equipment could be supplied by various companies in the country or imported from outside.



## B. ENGINEERING

The types of farm and processing plant machinery and equipment required for the project are depicted in Table 5.1. The total cost for machinery and equipment is assumed to be Birr 1.6 million, where 58.4 per cent and 41.6 per cent will be local and foreign currency respectively.

**Table 5.1**  
**FARM AND PROCESSING PLANT MACHINERY AND**  
**EQUIPMENT AND COST**

Sr. No.	Description	Unit of Measure	Qty.	Cost ('000 Birr)		
				Local	Foreign	Total
1	Vehicle (pickup double cabin)	No.	1	400	-	400.00
2	Nursery and field equipment	-	-	15	15	30.00
3	Generator	No.	2	120	-	120.00
4	Office Equipment	-	-	15	15	30
5	Sprayer	No.	10	2.5	-	2.5
6	Tractor (MF375-4WD - 78MP)	No.	1	59.3	154.40	213.7
7	Trailer (4 tonne)	No.	1	94	-	94.0
8	Transportation tank	No.	2	24.2	68.6	92.8
9	Pump 5-6 HP	No.	1	10	-	10.0
10	Water storage tank	No.	1	11.5	-	11.5
11	Sheeting battery	No.	1	57	144	201
12	Coagulating tank	No.	7	76.7	192.25	268.95
13	Bulking tank	No.	2	27.4	68.6	96.0
14	Factory utensils	No.	1	2.4	6.8	9.2
15	Platform scale	No.	1	3.5	-	3.5
16	Spring balance	No.	2	0.8	-	0.8
17	Baling press	No.	2	2.00	-	2.00
18	Baling box	No.	20	10.00	-	10.00
	<b>Grand Total</b>			<b>931.3</b>	<b>664.65</b>	<b>1595.95</b>

## 2. Land Development, Building and Civil Works

Cost of land development for 250 ha. of rubber tree plantation and nursery sites is estimated to be Birr 0.9 million. The costs for access roads and farm road construction are estimated at Birr 0.38 million.

The total area required for rubber tree plantation and processing plant, including open area for future expansion and for constructing stores residential houses, processing plant, etc. is estimated to be 300 ha. and 2000 m<sup>2</sup>, respectively and its cost of construction is estimated at Birr 1.4 million, at a unit cost of Birr 700 per meter square. Rural land lease cost in BGRS ranges from Birr 15 to Birr 30 per hectare. Accordingly, the total cost of land lease, at the rate of Birr 30 per ha and for 70 years of land holding, is estimated at Birr 630,000. Accordingly the total investment on land, building and civil works, assuming that the total land lease cost will be paid in advance is estimated at Birr 2.41 million.

### 3. Proposed Location

The location for the envisaged project is proposed to be in Tongo special woreda of the Bensihangul-gumuz region.

## VI. MANPOWER AND TRAINING REQUIREMENT

### A. MANPOWER REQUIREMENT

The envisaged project requires 45 labour force. The labour requirement for the farm and processing plant and the corresponding cost are shown in Table 6.1. As can be seen from the table, the total cost for permanent and casual labour is estimated at Birr 0.40 million.

**Table 6.1**  
**MANPOWER REQUIREMENT AND ANNUAL LABOUR COST ('000 BIRR)**

Sr. No.	Description	Req. No.	Monthly Salary (Birr)	Annual Salary (Birr)
1	Manager	1	1850	22.2
2	Assistant manager	1	1500	18.00
3	Agronomist	1	1250	15.00
4	Administrator	1	980	11.76
5	Field assistant	1	750	9
6	Plant protectionist	1	1250	15.00
7	Cashier/ secretary	1	600	7.2
8	Store keeper	1	600	7.2
9	Clerk typist	1	400	4.8
10	Accountant clerk	1	600	7.2
11	Driver	1	500	6.00
12	Tractor operator	1	400	4.80
13	Assistant tractor operator	1	200	2.4
14	Generator operator	1	400	4.8
15	Field guards	10	2000	24.00
16	Janitor	1	200	2.4
17	Office guards	4	800	9.6
18	Factory supervisor	1	600	7.2
19	Rubber sheet processing section	8	1600	19.2
20	Engine driver	1	350	4.2
21	Smoking section	2	400	4.8
22	Grading and peeling	4	800	9.6
23	<b>Sub -total</b>			<b>216.36</b>
	Allowance (25%)			54.09
24	Tapping and collection of latex and stimulation			270.45
	<b>Total</b>	<b>45</b>		<b>270.45</b>
	<b>Grand Total</b>			<b>91.8</b>

## **B. TRAINING REQUIREMENT**

Although there is no a need for special training, the personel working on processing plant machine will be trained at the spot by the machinery suppliers. The total cost for training is assumed to be Birr ten thousand.

## **VII. FINANCIAL ANALYSIS**

The financial analysis of the Rubber Tree Plantation and Rubber Processing project is based on the data presented in the previous chapters and the following assumptions:-

Construction period	1 years
Source of finance	30 % equity 70 % loan
Tax holidays	3 years
Bank interest	7.5 %
Discounted cashflow	8.5 %
Repair and maintenance	3 % of the total plant and machinery
Accounts receivable	30 days
Raw material, local	30 days
Raw materials, import	90 days
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 initial investment cost of the project including working capital is estimated at 5.24 million, of which 13.36 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**

<b>Sr. No.</b>	<b>Cost Items</b>	<b>Total ('000 BIRR)</b>
1	Land lease value	630
2	Site preparation and development	1238
2.	Building and Civil Work	1400
3.	Farm & Plant Machinery and Equipment	1166
4.	Office Furniture and Equipment	30
5.	Vehicle	400
6.	Pre-production Expenditure*	315
7	Working Capital	69.7
	<b>Total Investment cost</b>	<b>5249.3</b>
	<b>Foreign share</b>	<b>13.36</b>

## **B. PRODUCTION COST**

The annual production cost at full operation capacity of the project is estimated at Birr 1.76 million (see Table 7.2). The material and utility cost accounts for 20.8 per cent while repair and maintenance take 6.9 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	367	20.8
Utilities	294	16.7
Maintenance and repair	109	6.9
Labour direct	216	12.3
Factory overheads	54	3.1
Administration Cost	50	2.8
<b>Total Operating Costs</b>	<b>1090</b>	<b>61.9</b>
Depreciation	366	21.79
Cost of Finance	304	17.3
<b>Total Production Cost</b>	<b>1,760.8</b>	<b>100</b>

\* N.B Pre-production expenditure includes interest during construction (Birr 300 thousand), training (Birr 10 thousand), and ( Birr 5 thousand) costs of registration, licensing and formation of the company including legal fees, commissioning expenses, etc.

## 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 lifetime 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 2 ) is estimated by using income statement projection.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable cost}} = 17\%$$

### 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 2 years.

### 4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 56 % and the net present value at 8.5% discount rate is Birr 19.4 million.

## D. ECONOMIC BENEFITS

The project can create employment for 45 persons. In addition to supply of the domestic needs, the project will generate Birr 1 million per annum in terms of tax revenue when it starts to operate at full capacity. Moreover, the Regional Government can collect employment, income tax and sales tax revenue. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports.