70 . PROFILE ON NATURAL GUM PROCESSING

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I. SUMMARY

This profile envisages the establishment of a plant for the production of 1,000 tonnes of natural gum per annum.

The current demand for the proposed product is estimated at 2,620 tonnes per annum and it is projected to reach at 6,796 tonnes by the year 2014.

The project will create employment for 71 persons.

The total investment cost of the project is estimated at Birr 8.80 million, out of which Birr 3.5 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 23% and a net present value (NPV) of Birr 6.94 million, discounted at 10.5%.

II. PRODUCT DESCRIPTION AND APPLICATION

Natural gum is a product consisting essentially of a mixture of gum and resin usually obtained by making an incision on a plant and allowing the juice, which exudes to solidify. It can be collected from various trees and shrubs in tropical areas specially the acacia tree.

Gum Arabic (acacia gum) is the one believed to be abundantly available in the Benishangul-Gumuz region. It has tremendous export potential as long as attention is paid to quality and consistency of supply.

Gum Arabic is unique among the natural hydrocolloids because of its extremely high solubility in water. Most common gums cannot be dissolved in water at concentrations higher than about 5% because of their very high viscosities. Gum Arabic, however, can yield solutions of up to 50% concentration.

Its main food-related uses are in confectionery, soft and alcoholic beverages. Its non-food applications include pharmaceutical, cosmetic, lithographic and offset preparations. It was extensively used as an adhesive, but this use has almost entirely yielded to synthetics. Similarly, its uses as a sizing and finishing material in the textile industry have also mostly

given way to modern substitutes. However, small quantities continue to be used in papermaking. The gum is also used to a limited extent in polishes, contact insecticides and pesticides, photographic emulsions and pharmaceuticals.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

BGNRS has a potential for natural gum and incense production. The western lowlands of the region such as Guba, Kurmuk, Gizen and Oda-Godere woredas are highly endowed with gum and incense tree species. According to IPS study (2003), the region has a potential production of 629 tonnes and 277 tonnes of gum Arabic and resin, respectively. However, this potential is not fully exploited in the region.

The production of gum and resins in Ethiopia is mainly for export as the user industries are not developed in the country. Export of gum and resins during the period 1997-2002 is presented in Table 3.1.

Table 3.1

EXPORT OF GUMS & RESINS (TONNES)

Year	Exported Gums & Resins	Value ('000 Birr)
1977	2136.3	20,996.6
1998	1456.4	14,702.0
1999	1594.4	18,415.9
2000	2079.6	24,239.3
2001	2040.2	23,941.5
2002	2377.1	28,402.7
Total	11684.0	130,698.0
Average	1947.3	21,783.0

Source:- *Statistical Abstracts of Central Statistical Authority.*

Table 3.1 reveals that on the average Ethiopia has been exporting about 2000 tonnes of gums & resins annually to the international market. The export level which was about 1500 tonnes during 1998 and 1999 has grown to about 2165 tonnes on the average in the years 2000-2002. This indicates an annual average growth rate of about 10%.

To determine the present demand the average level of export during the period 2000-2002 was first calculated and found be 2,165 tonnes. Secondly, the average growth rate registered in these years was considered, which is 10%. If quality processed gums are supplied, there is wide export potential in the world market. In considering this potential, annual average growth rate of 10% is applied. According, the present (2004) demand is estimated to be 2,620 tonnes.

2. Projected Demand

To project the future demand, the method used to determine the present demand is applied. Accordingly, the projected demand at annual 10% growth rate ranges from 3,836 tonnes by the year 2008 to 6,796 tonnes by the year 2014 (see Table 3.2).

Table 3.2

PROJECTED DEMAND FOR GUM (TONNES)

Year	Projected Demand
2005	2882
2006	3170
2007	3487
2008	3836
2009	4220
2010	4641
2011	5106
2012	5616
2013	6178
2014	6796

3. Pricing and Distribution

The price of gums and resins in the past six years has increased from Birr 9,500/tonne to Birr 11,600/tonne. For the purpose of this project the average which is Birr 10,000/tonne is recommended. The product can be directly exported by the plant or can be sold to the existing known exporters.

B. PLANT CAPACITY AND PRODUCTION PROGRAMME

1. Plant Capacity

On the basis of market projection for the product, it is recommended to set up a cleaning and sorting facility for *Gum Arabic* having a capacity of 1000 tonnes per annum. Production capacity is based on a schedule of 300 working days per annum and a single shift of eight hours.

2. Production Programme

The envisaged production programme is given in Table 3.4 below. The schedule is worked out in consideration of the time required for gradual build-up in labour productivity. Accordingly, production starts at 90% of plant capacity in the first year of operation and reaches full-gear in the 3rd year of operation and thereafter (See Table 3.4).

Table 3.4

PRODUCTION PROGRAMME

Year	**1**	**2**	**3-10**
Capacity Utilization [%]	90	95	100
Production [tonne]	900	950	1000

IV. MATERIALS AND INPUTS

A. MATERIALS

The raw materials required for a 1,000 tonnes per year Hand Picked Selected (HPS) raw gum is indicated in Table 4.1 below. All of these raw materials are supposed to be obtained from local sources.

Table 4.1

ANNUAL MATERIALS REQUIREMENTS AND COST

Sr. No.	Description	Unit of Measure	Qty	Unit Price (Birr)	Total Cost ('000 (Birr)
1	Raw Gum Arabic	Tonnes	1100	5,500	6050
2	Jute bag, 50kg	pieces	200,000	4.0	800.00
	Grand Total				**6,850.0**

B. UTILITIES

Electricity and water are the two major utilities required by the plant. Table 4.2 below shows annual requirements and associated costs at full production capacity.

Table 4.2

ANNUAL UTILITY REQUIREMENT AND COSTS

Sr. No.	Description	Unit of Measure	Qty.	Unit Price (Birr)	Cost ('000 Birr)
1	Electricity	kWh	44400	0.335	14.652
2	Water	m^3	3000	2.5	7.500
	Grand Total				**22.152**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

Gum Arabic processing entails simple manual and mechanical operations namely; cleaning, sorting, grading and packing.

Primary cleaning and sorting is done by hand, usually by women, who sort excessively dark gum and remove pieces of bark and other foreign matter. Gum sorted in this way is kept in the warehouse as 'Selected' and 'Cleaned' gum, distinct from 'Natural' gum. Separation of mixtures of gum from different botanical sources (such as *A. senegal* and *A. seyal*) is not necessary because it is performed during collection.

The manually selected and cleaned gum is further re-cleaned, sorted and graded mechanically by using a system of conveyor belts and shaking- & sieving machines. The bags of manually cleaned gum are upturned onto an inclined moving belt, which takes the gum up to the shakers and sieves; a person is present at the start of the belt to remove any lumps that are very large. After separation of the dust and under-sized pieces by sieving, the remaining lumps of gum pass on a belt between lines of women who give them a final inspection - any remaining foreign mater (such as stones) or dark coloured pieces are removed by hand.

At the end of the conveyor belt, the gum is bagged and weighed ready for export in 100 kg sisal bags.

Natural gum cleaning and sorting operations do not pose any adverse impacts on the environment.

2. Source of Technology

A number of manufacturers in Asia could be communicated, which can supply relatively cheaper machinery and accessories for a natural gum cleaning and grading plant. The address of one is given below:

Osaw Agro Industries Pvt. Ltd.,
P.O.BAG No.5, OSAW COMPLEX, JAGADHRI ROAD, AMBALA CANTT - 133 001, (HARYANA), INDIA
Phone : ++ 91-171-2699547, 2699167, 2699354
Fax : ++ 91-171-2699018
E-mail : agrosaw@agrosaw.com
Web Site : <>http://www.agrosaw.com

B. ENGINEERING

1. Machinery And Equipment

Natural gum cleaning and grading is essentially based on manual operation, requiring few equipment. On this basis, the list of machinery and equipment required is given in Table 5.1 below required. The total cost of which is estimated at Birr 3.5 million, out of which Birr 2.5 million is in foreign currency.

Table 5.1
LIST OF MACHINERY AND EQUIPMENT

Sr. No.	Description	Qty (No.)
1	Trays, for hand picking	200
2	Conveyer belts, for manual sorting	3
3	Destoner	2
4	Sieving machine	2
5	Intermediate bin	1
6	Bagging machine	2
7	Auxiliary equipment	Set

2. Land, Building And Civil Works

Total land requirement of the project is estimated at 3,000m^2, out of which 1,500m^2 is a built-up area. The buildings and shades to be constructed are supposed to be simple in design as there is no heavy machinery involved. On the basis of this assumption, Cost of building construction is estimated at Birr 1.5 million. Total land lease cost, for a period of 70 years is estimated at Birr 420,000. 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 1.92 million.

3. Proposed Location

The western lowlands of the region like Guba, Kurmurk, Gizen and Oda-godere woredas are endowed with rich natural gum resources. Hence, the Assosa zone is believed to be the most optimal location for setting up a natural cleaning and grading plant.

VI. MANPOWER AND TRAINING REQUIREMENTS

A. MANPOWER REQUIREMENT

Table 6.1 below shows the list of manpower required and the estimated annual labour costs. Total manpower requirement, including skilled and unskilled labour, is 71 persons. The corresponding, total annual labour cost, including fringe benefits, is estimated at Birr 413,250.

Table 6.1

MANPOWER REQUIREMENT AND LABOR COST

Sr. No.	Description	Req. No.	Monthly Salary [Birr]	Annual Salary [Birr]
1.	General Manager	1	2000	24000
2.	Production & Technical Manager	1	1800	21600
3.	Finance & Administration Manager	1	1600	19200
4.	Commercial Manager	1	1600	19200
5.	Accountant	1	600	7200
6.	Sales Person	1	1200	14400
7.	Purchaser	1	500	6000
8.	Clerk	2	600	7200
9.	Secretary	1	500	6000
10.	Quality Control Manager	1	1600	19200
11.	Production Foreman	1	800	9600
12.	Chemist	2	1600	19200
13.	Operator	40	8000	96000
14.	Mechanic	1	700	8400
15.	Electrician	1	700	8400
16.	Unskilled labour	10	2000	24000
17.	Guard	2	400	4800
18.	Driver	3	1350	16200
	Total	**71**	**27550**	**330600**
	Worker's Benefit = 25% of Basic Salary		6887.5	82650
	Grand Total		**34437.5**	**413250**

B. TRAINING REQUIREMENT

Natural gum cleaning and grading is a very simple operation, which is also labour intensive. In view of this, a demonstration is sufficient which could be conducted on-site. The cost of a practical demonstration of this nature is estimated at Birr 50,000.

VII. FINANCIAL ANALYSIS

The financial analysis of the natural gum cleaning & grading project is based on the data presented in the previous chapters 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 the total plant and machinery
Accounts receivable	30 days
Raw material, local	90 days
Work in progress	2 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 8.80 million of which about 28% 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 ('000 BIRR)

Sr. No.	Cost Items	Foreign Currency	Local Currency	Total
1	Land	-	420.00	420.00
2.	Building and Civil Work	-	1,500.00	1,500.00
3.	Plant Machinery and Equipment	2,500.00	1,000.00	3,500.00
4.	Office Furniture and Equipment	-	150.00	150.00
5.	Vehicle	-	250.00	250.00
6.	Pre-production Expenditure*	-	1,477.80	1,477.80
	Total Investment cost	**2,500.00**	**4,797.80**	**7,297.80**
7	Working Capital	-	1,511.07	1,511.07
	Grand Total	**2,500.00**	**6,308.89**	**8,808.89**

B. PRODUCTION COST

The annual production cost at full operation capacity of the plant is estimated at Birr 8.32 million (see Table 7.2). The material and utility cost accounts for 84 per cent while repair and maintenance take 1.2 per cent of the production cost.

** Pre-production expenditure include interest during construction (Birr 977,800 thousand), training (Birr 50,000), and costs of registration, licensing and formation of the company including legal fees, commissioning expenses, etc.*

Table 7.2

ANNUAL PRODUCTION COST ('000 BIRR)

Items	Year			
	3	**4**	**7**	**10**
Raw Material and Inputs	6,165.00	6,510.64	6850.57	6,850.50
Labour direct	178.50	188.50	198.40	198.40
Utilities	19.94	21.05	22.15	22.15
Maintenance and repair	90.00	95.00	100.00	100.00
Labour overheads	74.40	78.60	82.70	82.70
Administration cost	119.00	125.70	132.30	132.30
Total Operating Costs	**6,646.86**	**7,019.52**	**7,386.33**	**7,386.33**
Depreciation	596.00	596.00	596.00	446.00
Cost of Finance	567.20	510.50	340.30	170.20
Total Production Cost	**7,810.05**	**8,125.99**	**8,321.72**	**8,001.56**

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 is estimated by using income statement projection.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable cost}} = 21\ \%$$

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 23 % and the net present value at 10.5% discount rate is Birr 6.94 million.

D. ECONOMIC BENEFITS

The project can create employment for 71 persons. In addition to supply of the domestic needs, the project will generate Birr 9.2 million in terms of tax revenue. Moreover, the Regional Government can collect employment, income tax and sales tax revenue.