

Sector	Agro & Food Processing
Sub - sector	Agro Processing
Profile No.	AF-13
Project Title	Banana Fiber Extraction and Processing up to Textile

Project Description

The use of "Banana" fiber for textile and other purpose as natural material is a new concept for India. However, considerable research work has been done by textile research organizations including BITRA, CITRA, KVIC(Khadi Village Industry Corporation) and NRCB (National Research Centre for Banana-Trichy) and it has been found that banana fiber can be a very promising source of natural fiber in the coming period. It may be noted that this fiber is already used successfully in Philippines since decades and hence it is also known popularly as "**Manila Hemp**". The other name of this fiber is "Abaca", it belongs to musa sapientum species.

The proposed project envisages setting up of a facility for Banana fiber extraction from waste banana stem, cleaning, grading and converting it up to finished ready made garment. Presently, waste banana stems pose problem of disposal and are available almost free of cost in Central and South Gujarat.

Product Application

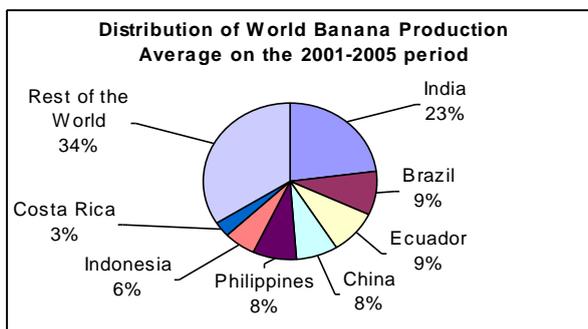
Banana fiber is a multiple celled structure. The lumens are large in relation to the wall thickness. Cross markings are rare and fiber tips pointed and flat, ribbon like individual fiber diameter range from 14 to 50 microns and the length from 0.25 cm to 1.3 cm, showing the large oval to round lumen.

Banana fiber is a natural fiber with high strength, which can be blended easily with cotton fiber or other synthetic fibers to produce blended fabric & textiles. It is mainly used by cottage industry in Southern India at present. Banana Fiber also finds use in high quality security/ currency paper, packing cloth for agriculture produce, ships towing ropes, wet drilling cables etc.

Market and Growth Drivers

World Banana production in the year 2004 was estimated at about 70 million tons. The world contribution for the banana production is as given in the figure below.

Philippines and Japan are the countries using banana fiber on large scale for commercial production of variety of textile items. Philippines is also exporting huge quantity of ready made garments made from this fiber to Japan, Singapore, Taiwan and all far East Asian countries.



Demand for textile and ready made garment is continuously increasing in India with increasing population, rise in per capita income and spending power. However, the use of Banana fiber in commercial production is still to gear up in India, and is currently only limited for consumption by cottage industry. Banana fiber offers excellent potential in terms of its eco-friendly nature and properties as compared to other natural and man-made fibers.

India also occupies the largest area under Banana cultivation in the world covering approx. 11% of world area of Banana. Banana fiber can partially replace the consumption of Cotton and Jute fiber in India. It has excellent potential for export to Far-east Asian and South Asian countries like Singapore, Taiwan, Japan, Thailand, Sri Lanka and Malaysia.

Growth drivers

- Increasing demand of eco-friendly clothing in developed countries like Europe, USA and Canada and rise in per capita requirement of textile / garments.
- Preference of eco friendly fabric over synthetic fabric in hot and humid tropical and sub tropical climates natural which would help in boosting the demand for Banana fiber.
- Provisions under the multi-fiber agreement in the new WTO regime, is likely to boost the use of natural fibers in global textile industries for various applications.
- The real cost involved in the production of Banana Fibre comes from waste stem collection and fiber extraction which is negligible in comparison with the other natural fibers like cotton, jute and hemp. This cost competitiveness will fuel growth of this product.

Why Gujarat?

- Gujarat ranks sixth in the area cultivation of banana in the country with the average cultivation area of around 46,500 hectares in last three years. Banana stem waste is the basic raw material required for this project and Gujarat has sufficient availability of the same to cater to the need.

YEARWISE BANANA CULTIVATION AREA IN GUJARAT

Sr. No.	Year	Banana farming in Hectares
1.	2002-03	35187
2.	2003-04	42909
3.	2004-05	46347
4.	2005-06(E)	50000
<i>Source: Directorate of Horticulture, Gujarat (E) estimated area</i>		

- Gujarat has well developed cotton textile industry hence this will find ready market for blending. Banana fiber is a natural fiber with considerable strength and can be used for various other purposes like preparing ropes for well drilling, tug pulling in ports and other applications.
- Gujarat is having textile research institute like ATIRA which have already done work on similar technology development for Jute. Indigenous Banana fiber extraction and processing

know how can be made available from National Research Center for Banana Tiruchirappalli - Tamil Nadu.

- Gujarat has ready availability of Technical manpower for fiber processing and textile industry.

Technology / Process

There are two methods for extraction of Banana fiber, namely Bacnis method and Loenit method.

- In the Bacnis method, Banana Fiber is produced from waste stalk of Banana plant. The outer sheath is tightly covered layers of fiber. The fiber is located primarily adjacent to the outer surface of the sheath and can be peeled-off readily in ribbons of strips of 5 to 8 cm wide and 2 -4 mm thick, the entire length of sheath. This stripping process is known as tuxying the strips being called tuxies. Two methods of tuxying are employed in Philippines. In the first method-called Bacnis method, the trunks are pulled apart and the sheath separated according to their position in stalk. They are then flattened and the fiber is stripped from the stem by cutting the pulpy portion and pulling away the tuxy.
- In Loenit method, the tuxies are pulled off the stalk from one sheath at a time. In either of these methods tuxies are tied into bundles of 23 to 27 kg and brought to the stripping knife for cleaning. In this process tuxies are pulled under a knife blade, which is pressed tightly against the tuxy in order to scrape away the plant tissue between the fibers. The clean fiber is then air dried and made up into bundles for subsequent grading and bailing.
- In addition to hand stripping, machines are used where the trunks from which the dark outer sheaths have been removed, are cut into sections of 120 to 180 cm in length. The sections are then crushed between rolls and the pulpy tissues are scraped away, one half the length at a time, by two large revolving drums, the rim of which are fitted with scrapping blade which scrape the sheath while it is pressed against a bed plate, oven dried, graded and baled.

Raw Material

The basic raw material for the proposed unit is Banana pseudo stems and chemicals for fibre processing. The following table summarizes Gujarat's Banana production of last 5 years.

Banana Production - Gujarat

Sr. No	Year	Area (Hectares)	Production (MT)
1	2001-02	33139	1154330
2	2002-03	35187	1403077
3	2003-04	42909	1760901
4	2004-05	43647	1979257
5	2005-06	49234	2498776

Source: Directorate of Agriculture, Government of Gujarat

Area under banana cultivation in India, in the year 2004 was around 6 lakh hectares. Taking into account 3000 plants density per hectare, the pseudostem would account for fibre extraction of 1500 million stems in nearly 18 months, of which around 2.5kg clean dried fibre is extracted per stem. The fibre content in the wild varieties is said to be more.

Suggested Plant Capacity and Project Cost

- Capacity of the unit is proposed to be approximate 30 MTPD or 9000 MTPA fiber and products. This is a medium scale unit for such project. This capacity is suggested based on possible availability of raw-material and optimum size of project investment.
- Capital cost of project is estimated at INR 90 million (US \$ 2 million).

Estimated Project cost & Means of finance

Sr. No.	Cost of project	INR in Million
1	Land and Land development	4.00
2	Building & Civil works	10.00
3	Plant & Machinery	45.00
4	Misc. Fixed Assets	6.00
5	Preliminary & Pre-operative incl. technology	5.50
6	Provision for contingencies	3.38
	Total Fixed Assets	73.88
7	Margin Money for working capital	16.12
	Total	90.00
	Means of Finance	
8	Promoters contribution	30.00
9	Term loan	60.00
	Total	90.00

As indicated above, the proposed project will require an approx 10000 sq. mt of land with an proposed built up area of 1500 sq. mt. The unit is proposed to have an installed capacity of 9000 TPA. The total fixed cost of the project is estimated at INR 73.88 and INR 16.12 million is the working capital margin which adds up to a block capital cost of INR 90 million. The unit being proposed to cater to domestic as well as to International demand is suggested to have a Debt equity ratio of 2:1. Thus, the estimated term loan amounts to INR 60 million and Equity at INR 30 million.

Plant and Machinery

The proposed project would require the following major equipments as basic and necessary plant and machinery:

List of Plant and Machinery

Sr. No.	Particulars	Quantity	Supplier
1	Cutting and slitting equipments	5	Rashtriya Engineering Works, Delhi
2	Roll crusher for Fiber separation	3	Rashtriya Engineering Works, Delhi
3	Open vats	6	Rashtriya Engineering Works, Delhi

Sr. No.	Particulars	Quantity	Supplier
4	Hot air drying chambers	2	Ashitex Mech, Tamilnadu
5	Weighing Scale / balance	4	Omega Electronic Scale Co Ltd, Mumbai
6	Hot air generator	1	Aerotherm India P.Ltd, Ahmedabad
7	HT /LT Electrification and 60 KVA DG set for running critical process machineries	Lot	Kirloskar Electricals Ltd, Mumbai

Utilities

Depending upon the level of mechanization inducted in this project there will be need of utility such as Power, Steam and Water. In the proposed project size also there will variation as per the technology selection and level of automation desired as well as level of processing undertaken by the unit. The investment in utilities will be approx 30% of the project estimate for such kind of project.

The unit will require power of 100HP. Water requirement will be 30 KL per day and the unit will have agro waste fired mini boiler with 500 Kg steam per hour.

Man Power required

The proposed integrated unit would entail partial mechanisation to achieve consistent productivity and quality. The estimated manpower required for the unit is 70 people which will include 5 persons in the support staff, 30 in fibre extraction, cleaning and grading, 15 people for spinning fibre into yarn, and 20 for fabric weaving and processing the fabric into finished product that is garment.

The suggested project can be developed as a composite manufacturing unit or cottage industry, by splitting into various sections.

Suggested Location

Considering the project requirement of raw materials the suggested locations are Kaira, Vadodara, Bharuch, Narmada, Surat, Valsad or Panchmahal. This would also help in reducing the cost of production to a certain extent. The unit would require power (150 HP) and water (30000 Liters).

Project Time Line

The proposed project will have project time line of 4 to 5 months in obtaining necessary permissions and approvals from concerned authorities and the project can be implemented in a period of 10-12 months.

Financial Indicators

Based on the profitability projections worked out for the proposed project, key financial indicators are as summarized below:

Key Financial Indicators

Sr. No.	Financial Ratios	1 st Year	2 nd Year	3 rd Year
A	Break-Even Point in % capacity	33.93	32.37	32.13
B	Debt-service Coverage Ratio	1.85	2.19	2.80

Sr. No.	Financial Ratios	1 st Year	2 nd Year	3 rd Year
C	Average DSCR	2.28		
D	Return on Investment (ROI)	24.33	27.76	33.70
E	IRR	47%		

As perceived from the project cost and means of finance table, the suggested Debt Equity Ratio for the proposed project is 2:1. The IRR (Internal Rate of Return) for the proposed unit is approx. 47% projected for a period of 10 years.

Clearance Required

- The proposed unit will have to register their manufacturing capacity with Industrial Entrepreneur's Memorandum (IEM), Secretariat of Industrial Approvals, Ministry of Industries and Government of India, as it will have plant and machinery investment of more than INR 10 million.
- As medium scale unit it will require permission also from Textile ministry for spinning, weaving and processing sections of the unit.

Agencies to be Contacted

Industrial Extension Bureau

Mott MacDonald India

Gujarat Agro Industries Corporation Ltd