TECHNO ECONOMIC FEASIBILITY REPORT

COIR POLYMER COMPOSITE BOARD

Submitted to

COIR BOARD

Ministry of MSME

Govt. of India

CSIR-North East Institute of Science & Technology : Jorhat

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TECHNO ECONOMIC FEASIBILITY REPORT

COIR POLYMER COMPOSITE BOARD – PREPARED FROM COIR FIBRE NON-OVEN FELT & VARIOUS TYPES OF RESINS

SUMMARY

Reinforcement with natural fibre in composites has recently gained attention due to low cost, easy availability, low density, acceptable specific properties, ease of separation, enhanced energy recovery, C02 neutrality, biodegradability and recyclable in nature. The Coir Polymer Composite Board has a great demand in market which is now-a –days gaining popularity as wood substitute for using as wall tiles, partition board, ceiling etc.

The Coir Polymer Composite Board Production Unit under North East Indian conditions is very much technically feasible and economically viable as has been worked out in the feasibility report. The Coir Polymer Composite Board Production Unit will be economically feasible in the major coconut producing districts in Assam& Tripura**.** However, the Coir Polymer Composite Board Production plant to be established localities where continuous power supply, communication facility and marketing facilities are available. It is found that in town areas like **Nalbari, Barpeta, Tezpur, Nagaon, Guwahati** in the state of Assam and **Agartala** in the state of Tripura, the Coir Polymer Composite Board Production Unit should be established.

Plant Capacity :

The production basis for a Coir Polymer Composite Board Production Unit would be as follows :

Working hour per day	: 8 hours
Production capacity	: 80 (2'×2' size) per day
Working Days in a year	: 300 days
Capacity utilization	: 75%, 80%, 85% during first, second & third year & 90% from fourth year onwards.
Annual Production	: 24000 (2'×2' size) piece

The major highlight of the feasibility report :

1. The Capital requirement : Rs.24.64 lakh
2. Promoter contribution : Rs.4.928 lakh
3. Annual Sales (Turnover) : Rs.30.00 lakh
4. Annual Operating expenses (fixed + variable) : Rs.19.95 lakh
5. Annual Gross profit (pre-tax) : Rs.10.05 lakh
6. Annual Gross profit Ratio : 33.51%
7. Break Even Point : 30.84%
8. Rate of return on investment : 22.55%
9. Number of person employed : 6 persons per day

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11. INTRODUCTION

11.1 General

The coconut palm indeed is a traditional plantation crop grown in India over the past 3000 years with longest mythological and historical record. In spite of the great antiquity attached to coconut crop in the country, organized efforts to develop the crop were made only about a century back and actual systematic efforts for development of coconut palm as a commercial crop begun in 1940s.

Coir is a unique natural fibre with diverse applications of great economic importance extracted from husks of Coconut. India is the largest coir producer in the world accounting for more than 80 per cent of the total world production of coir fibre. The coir sector in India is very diverse and involves households, co-operatives, NGOs, manufacturers and exporters.

Over a past few decades composites, plastics, ceramics have been the dominant engineering materials. The areas of applications of composite materials have grown rapidly and have even found new markets. Modern day composite materials consist of many materials in day to day use and also being used in sophisticated applications while composites have already proven their worth as weight saving materials the current challenge is to make them durable in tough conditions to replace other materials and also to make them cost effective. This has resulted in development of many new techniques currently being used in the industry. The composite industry has begun to recognize the various applications in industry mainly in the transportation sector. New polymer resin matrix materials and high performance fibres of glass, carbon and aramid which have been introduced recently have resulted in steady expansion in uses and volume of composites. This increase has resulted in obvious reduction of cost. High performance FRP are also found in many diverse applications such as composite armouring design to resist the impact of explosions, wind mill blades, industrial shafts, and fuel cylinders for natural gas vehicles paper making rollers and even support beams of bridges. Existing structures that have to be retrofitted to make them seismic resistant or to repair damage caused by seismic activity are also done with help of composite materials. While the use of composites is a clear choice in many applications but the selection of materials will depend on the factors such as working life, lifetime requirements complexity of product shape, no of items to be In recent years, due to the growth of population & industry, the forest areas of our country are also decreasing day by day. However a huge amount of plant raw materials are also being consumed by the different forest based industries like paper, plywood, veneer etc. and as a result, there is a considerable shortage of plant

raw material to feed such industries. Considering the gradual decreasing in forest areas of our country, the government has prohibited order for felling of tress from the forests both for industrial and private use. Therefore, the demand of wood as building construction materials has also increased proportionately. The time has come to develop a suitable wood substitute product to cop up the growing demand of wood based building construction material. While the use of composites is a clear choice in many applications but the selection of materials will depend on the factors such as working life, lifetime requirements complexity of product shape, no of items to be produced , savings in terms of cost and the experience and skill of designer to trap the optimum skill of the composites.

Natural fibre composites mostly consists fibres of jute, cotton, hemp and non conventional fibres such as coir and many empty fruit bunches. Natural fibre thermoplastic composites are attractive as they are cheaper, stiffer, paintable, rot-resistant and also can be given the look of wood in addition to all this they have more life- cycle. Natural fibre composites are attractive to industry because of their low density and ecological advantages over conventional composites Natural fibres are lingo cellulosic in nature. These composites are gaining importance due to their non-carcinogenic and bio-degradable nature. Natural fibre composites are very cost effective material especially in building and construction purpose packaging, automobile and railway coach interiors and storage devices. These can be potential candidates for replacement of high cost glass fibre for low load bearing applications.
Coir is a natural fibre extracted from the husk of Coconut fruit. The husk consists of Coir fibre and a corky tissue called pith. It is a fibre abundantly available in India the second highest in the world after Philippines. It consists of water, fibres and small amounts of soluble solids. Because of the high lignin content coir is more durable when compared to other natural fibres. With increasing emphasis on fuel efficiency, natural fibres such as coir based composites enjoying wider applications in automobiles and railway coaches & buses for public transport system. There exist an excellent opportunity in fabricating coir based composites towards a wide array of applications in building and construction such boards and blocks as reconstituted wood, flooring tiles etc. Value added novel applications of natural fibres and coir based composites would not go in a long way in improving the quality of life of people engaged in coir cultivation, but would also ensure international market for cheaper substitution. Natural fibres have the advantages of low density, low cost and biodegradability. However, the main disadvantages of natural fibres and matrix and the relative high moisture sorption. Therefore, chemical treatments are considered in modifying the fibre surface properties.

11.2 Brief of the technologies

CSIR-North East Institute of Science & Technology, Jorhat with the support from Central Coir Research Institute, Kalavoor the research center of Coir Board has successfully developed a technology for Coir Polymer Composite Board to be used as building materials. There is also possibility to set up industries based on this technology which may generate employment opportunity. It will also save wood materials from the forest.

The Coir fibre reinforced composite material for building and furnishing materials like wall tiles, partition panels, ceiling boards, table top, sport goods and other advanced materials.

The competitive advantages of the Coir Composite Polymer Board is as follows :

- Light weight, cheap, renewable and unique reinforcements for advanced bio-composite
- High strength and damage tolerant composite material
- Possibility of using polymeric waste materials as matrix
- Use of polymeric waste material will reduce disposal problem enhancing environmental safeguard
- Good looking appearance for decorative purposes
- Possibility of using of coir fibre based precursor for making advanced Silicon carbide ceramic composite is being explored presently

11.3 About the North Eastern Region

North Eastern region of India comprising the eight states of Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura is endowed with vast natural resources and has enormous potential of development. The economic structure of north-east India is similar to the general economic structure of India as a whole. But because of its topography as well as social and political conditions it has a relatively backward economy.

The climatic condition in the region varies from temperate to sub-tropical and tropical. The agro-climatic conditions of the region, varied soil types and abundant rainfall are favourable for cultivation of horticultural crops especially plantation crops. Coconut is one of the most popular crop grown for a long time especially in Assam state and in recent times in others N.E. states. The area and production which were 11,000 hectares and 60 million nuts, respectively, during 1985–86, have now increased to 40,000 hectares and about 178 million nuts, in the North Eastern Region. The cultivation which was confined to Assam, Tripura and to some extent in Manipur, has now spread to states like Nagaland, Mizoram, Arunachal Pradesh and Meghalaya due to efforts made by Coconut Development Board.

The state of Assam is having 20710 ha area under Coconut & with a total production of 1756.13 lakhs of nuts every year. In the State, farmers of Nagaon, Nalbari, Kamrup (R), Morigaon districts and the Bajali sub-division in Barpeta district are the major producers of coconut. Farmers in some areas of Lakhimpur and Dhemaji districts also produce the crop. Lion’s share of the coconut produced in the State is consumed by its own people, while a portion is exported to the neighbouring states of Manipur, Mizoram, Meghalaya and West Bengal. Some portions are also exported to Bihar and Jharkhand.

Taking advantage of the sufficient number of coconut production, there is great scope to set up Coir based industries in the states of Assam & Tripura in this North East Region of India. The prospect of the coir industry is very high as Assam produces a total of 176 million coconuts every year. The state produces 8 thousand 480 nuts per hectare per year against the national average of 8 thousand 303. According to experts, 80 tones of fiber could be extracted from 1 million coconuts. Hence, Assam can produce 17 thousand 561 metric tones of fiber per year. Traditional items like durable ropes and twines, mats & matting along with technology based products including Carpets are being produced, using coir.

Taking advantage of the coir produced, it is possible to set up Coir Polymer Composite Board production unit in North East India.

11.4 Aim of the feasibility study

The development of coir industry has all along been in areas where there is a concentration of coconut trees and availability of coconut husk. Historically, the coir industry started and flourished in Kerala which has a long coast line, lakes, lagoons and backwaters providing natural conditions required for retting. However, with the expansion of coconut cultivation, coir industry has picked up in the States of Tamil Nadu, Karnataka, Andhra Pradesh, Orissa, West Bengal, Assam, Tripura, Pondicherry and the Union Territories of Lakshadweep and Andaman & Nicobar Islands through the efforts of Coir Board. The coir fibre industry is particularly located in Southern states of India, mainly the coastal region of Kerala State, produces 60% of the total world supply of white coir fibre. There is scope for development of coir industry in the coconut growing North Eastern States of India. Hence, the present study was undertaken to find out the feasibility of establishing Coir Industries in North Eastern States of India with respect to availability of raw materials (coconut husks), operational cost etc.

The main aims of the techno-economic feasibility study for a developed technology are –

- Technical evaluation of the know-how/technology developed by an R&D institution.
- To broadly specify the plant and machinery and other facilities required.
- Assessment of demand of the product to be produced.
- The likely investment required.
- Financial analysis of the proposed technology/venture to broadly determine whether the project is economically viable.
- Commercial analysis of the project to evolve sound marketing plan and organizational structure for the proposed venture.
- To make projected financial analysis for submission to the financial institutions and bank seeking long term and short term borrowings respectively.

12. DEMAND, PRODUCTION AND SUPPLY

12.1 Demand of the product

The world-wide demand of coir products have increased tremendously. The major portion of demand is primarily met by India & Srilanka. Although Srilanka is gaining on the global coir product export share, India, who has witnessed rapid growth in coir product export since the early 1990s, still holds 80% of the global coir product market. India produces many different coir products (mats, matting, geotextiles, rugs, carpet, rubberized coir), and export them to more than 43 countries around the world. The global coir product market seems to be promising, with exports of variety of different products to many different countries. Besides, the export market, India itself is a huge consumer of coir products. Therefore, the utilization of coir husks (fiber) of North East India is the need of time for socio-economic development of this region.

Reinforcement with natural fibre in composites has recently gained attention due to low cost, easy availability, low density, acceptable specific properties, ease of separation, enhanced energy recovery, C02 neutrality, biodegradability and recyclable in nature. The Coir Polymer Composite Board has a great demand in market which is now-a –days gaining popularity as wood substitute for using as wall tiles, partition board, ceiling etc.

12.2 Production & Supply

Assam produces 1756.13 lakh of coconut per year. It is estimated that 80 tones of fiber could be extracted from 1 million coconuts. Hence, Assam can produce 14 thousand 80 metric tones of coir fiber per year.

However, at present there is no Coir Polymer Composite Board Production Unit in the North Eastern states. Hence, considering the enormous scope of supplying Coir Polymer Composite Board from this part of the country, a few industries with for producing Coir Polymer Composite Board can be established.

13. PLANT LOCATION AND INFRASTRUCTURAL FACILITIES

13.1 Plant Location

For the selection of a suitable location for setting up of Coir Polymer Composite Board Production Unit, following prerequisites are to be considered.

(i) Availability of infrastructural facilities *viz.* raw materials and transport.
(ii) Locally available raw materials (Coir fibre) utilization.
(iii) Communication and transport facilities.
(iv) Availability of necessary technical personnel, skilled & unskilled manpower.

The source of coir fibre is the Coconut plant. It is observed from the survey, collection of data from various sources that Coconut is mostly grown in Assam (20710 ha) and Tripura (5900 ha) amongst the North Eastern States of India. Therefore, any entrepreneur wish to set up Coir Industry should be in Assam or in Tripura.

Assam & Tripura together produces 1890.55 lakhs of nuts per year. The Major coconut producing districts in Assam are – Barpeta, Nagaon, Sonitpur, Golaghat, Kamrup & Nalbari. However, the Coir Polymer Composite Board Production plant to be established localities where continuous power supply, communication facility and marketing facilities are available. Therefore, it is suggested that in town areas like **Nalbari, Barpeta, Tezpur, Nagaon, Guwahati** in the state of Assam and **Agartala** in the state of Tripura, the Coir Polymer Composite Board Production Unit should be established.

13.2 Infrastructural Facilities

Infrastructural facilities required for Coir Polymer Composite Board Production Unit are a building of 8m × 12m, machineries like Fibre Cutting Machine, Hot Compression Machine, Edge Trimming Machine and Dies. The proposed building will be sufficient enough for the installation of all machineries and storing raw materials & finished product. The land requirement for construction of building for Coir Polymer Composite Board Production Unit is 2000 sq.m.

13.3 Plant Layout

The machineries for Coir Polymer Composite Board Production Unit are to be installed in the 8m× 12m building. The machineries are to be purchased from standard manufacturer and installed. The plant should be with systematically layout of major equipments for easy accessibility to the operator, there should be sufficient space between two adjacent equipments for free movement of working personnel.

14. MANUFACTURING PROCESS

4.1. General :

A composite material is made by combining two or more materials to give a unique combination of properties, one of which is made up of stiff, long fibres and the other, a binder or 'matrix' which holds the fibres in place. Composites should not be regarded simple as a combination of two materials. In the broader significance; the combination has its own distinctive properties. In terms of strength to resistance to heat or some other desirable quality, it is better than either of the components alone or radically different from either of them. Most composites consist of a bulk material (matrix) and a reinforcement of some kind, added primarily to increase the strength and stiffness of the matrix.

4.2. Manufacturing Process :

The manufacturing process for production of Coir Polymer Composite Board requires mainly coir fibre and a matrix or binding material (may be polyethylene, natural rosin, cellulose acetate binder, polyvenyl acetate, polyvenyl alcohol etc). Thermosetting polymers are resins which change irreversibly under the influence of heat into an infusible and insoluble material by the formation of covalently cross-linked stable networks. Important thermosetting resins are unsaturated polyesters, epoxy resins, alkyds, vinyl esters and alkyl resins, amino plastics, urethanes, silicones etc. Approximately 1kg gm of coir fibre should be taken and mixed with 200gm of

polyethylene. These should be then mixed such a way that the polyethylene cut pieces are uniformly distributed all around the fibre mass. These should be put into the wooden mould of size 2' × 2' and then hot pressed at 80^0C for 20 min and at 150 kg/cm^2 pressure. A releasing agent should be spreaded in both side of the fibre mass before hot pressing. After that, pressure should be released from the hot press and boards were kept for sometimes in open air for conditioning. The physical strength properties of the boards should be re-ascertained before sending to markets.

4.3. Quality Control Analysis :

Physical strength properties like thickness of boards, density, braking load, bending stress capacity, moisture content, water absorption capacity, swelling due to surface absorption etc. are to be maintained in optimum condition. The matrices materials (Resin) in composites are required to fulfill the following functions:

a) To bind together the fires by virtue of its cohesive and adhesive characteristics

b) To protect them from environments and handling.

c) To disperse the fibers and maintain the desired fiber orientation and spacing.

d) To transfer stresses to the fibers by adhesion and/or friction across the fiber-matrix interface when the composite is under load, and thus to avoid any catastrophic propagation of cracks and subsequent failure of composites.

e) To be chemically and thermally compatible with the reinforcing fibers.

f) To be compatible with the manufacturing methods which are available to fabricate the desired composite components.

4.4. Pollution and abatement :

The proposed plant for production of Coir Polymer Composite Board does not produce harmful effluents. Therefore, no environmental pollution will arise from the proposed industry. Considering the environmental problem caused by various industries of our country, it may be suggested that the use of formaldehyde free binding material for manufacturing of building construction material like particle board/Coir composite board, may be found potential in coming years. The natural rosin and cellulose acetate binder have certain advantages, as they are eco-friendly and does not create any pollution during the manufacturing of the boards.

The use of waste polyethylene bag cuttings for making composite board from coir fibre has certain added advantages as it not only helps in enhancing the physical strength properties but also helps in keeping the environment clean.

15. ORGANIZATION AND MANAGEMENT

15.1 Functional areas envisaged

The proposed Coir Polymer Composite Board Production Unit is to be maintained & look after by the owner/entrepreneur. The operation and management of Coir Polymer Composite Board Production Unit can be run with a very simple organizational structure with the following functional areas :

(i) Production (Weaving)
(ii) Administration, sales/purchase and accounts &
(iii) Quality Control.

5.2 Functional responsibilities

The recommended that only six workers are needed per day to execute the above functional areas with following responsibilities :

(i) **Production :** One person may be directly involved in the activities related to the cleaning, cooking washing & drying of coir fibre. Another two persons are to be engaged with blending, mixing, conditioning of the coir-resin mixture. Two persons are required for hot pressing & finishing the product.

(ii) **Administration, Sales/Purchase and accounts** : The owner/entrepreneur will responsible for purchase of coir fibre, marketing of coir polymer composite board, calculating operational cost, fixing of prices for sales & purchase and maintaining accounts. Formulation of a workable & profitable program for purchase of raw materials & sales of coir mats/matting will look after by the Supervisor (entrepreneur). However, one labour may be engaged in packing, loading and other related works in marketing of Coir Polymer Composite Boards.

(iii) **Quality Control** : The supervisor and workers have to be well trained before starting the Coir Polymer Production Unit about the operation and functions of various machineries. He also should have the idea about the quality parameters of the composite board.

16. PROJECT PHASING AND ACTIVITY SCHEDULE

16.1 Project phasing

A poorly designed traditional planning and control methods fail to cope up with the changing realities of modern business. Now the management have started using more effective planning and control techniques when a complex set of activities are involved.

A time span of 24 weeks time is envisaged to complete the project implementation i.e. training, purchase of machineries, market survey & collection of raw materials.

16.2 Activity Schedule

The detail scheduling of each activity and effective project control systems are essential to completion of the project according to the project implementation schedule. The activity schedule for producing coir polymer composite board involves the following primary activities:

(i) Process Review
(ii) Sanction of finances
(iii) Site development & construction of building
(iv) Purchase & Installation of machineries
(v) Engagement of Manpower like Supervisor & labour
(vi) Training

(vii) Raw material specification finalization
(viii) Purchase/collection of raw materials
(ix) Production of Coir Polymer Composite Board
(x) Storing & marketing of product

17. CAPITAL REQUIREMENT AND COSTS

17.1 Fixed capital

For the purpose of techno-economic study fixed costs are taken as those which are required before the commencement of commercial production. This includes fixed assets towards land and buildings, plant & machinery, miscellaneous fixed assets, know-how and engineering/training fees, capitalized and pre-operative expenses etc. The fixed investment for purchase & operation of Coir Polymer Composite Board Production Unit is estimated as Rs.24.64 lakh. To cover the expenditure during project implementation period of 24 weeks, the establishment salaries, travelling expenses, postage and telephones, printing & stationeries expenses are considered under the pre-operative head. In this case, the Pre-operative cost is calculated as Rs.0.20 lakh & Margin Money for Working Capital is estimated at Rs.1.90 lakh (**Table-IV**). The detail cost break of individual components is presented in **Table I & Figure I**.

17.2 Working capital

Working Capital provided for the inventory of new materials & utilities, salaries and wages, stock of finished goods, bills receivable & other items. Considerable care is exercised in estimating the working capital since it is a non-depreciable capital on which a return must be earned. The details of working capital (Cost of production) have been calculated as Rs.19.95 lakh and shown in **Table-II, Table- III & Figure-II.**

17.3 Scheme of finance

The proposed project *i.e.* Coir Polymer Composite Board Production Unit is to be managed by private entrepreneurs, requirement of funds are proposed to be drawn through a bankable project, capital subsidy from Coir Board, Govt. of India under suitable scheme. **Table-V** presents the Bank Loan along with loan repayment schedule for five years.

18. OPERATING REQUIREMENT AND COSTS

This is deals with the operating costs viz. fixed and variable costs after commencement of production. The breakdown of the production cost is given in **Table II**.

18.1 Variable costs

The variable costs which are directly related to the quantum of production, include raw materials, utilities, packing costs, maintenance cost etc. The total variable cost is presented in **Table-II**.

18.2 Fixed costs

The salary and wages of all the personnel to be employed is calculated as Rs.4.50 lakh per year and shown in **Table-III**.

19. FINANCIAL ANALYSIS

The primary objective of the financial analysis is to determine the suggested program and policies that form the very basis of the proposed venture would yield a reasonable return on investment. The assessment is presented in the following format.

(i) Fixation of price of Coir Polymer Composite Board
(ii) Profitability Analysis
(iii) Cash Flow Analysis
(iv) Balance sheet presentation
(v) Appraisal of the proposed venture

19.1 Fixation of product price

Demand of Coir Polymer Composite Board is well established and gaining popularity in the country. From the available information the current price of Coir Polymer Composite Board in NE states is varies from Rs.125-250/- per Board (2' × 2') depending upon the design & quality of finished boards. However, for the purpose of feasibility study and financial analysis of the proposed project the minimum price of Rs.125/- per square meter has been considered.

19.2 Profitability analysis

From the recommended selling price and generated cost data the profitability has been worked out. While estimating profitability, sales and administrative expenses, financial expenses *i.e.* interest payable to financial institutions and banks have been duly considered. Considering the geographical locations & Socio-economic conditions in NE states, it is calculated that only 75% of the capacity of the plant is utilized in first year, 80% in second year, 85% in third year and 90% from fourth year onwards. The details of profitability analysis are presented in **Table-VI**. In short it can be seen that the proposed Coir Polymer Composite Board Production Unit of an entrepreneur can generate the Gross Operating Profit and Net Profits for ten production years as per the following table:

Years	Gross Operating Profit (Rs. in lakh)	Net Profit (Rs. in lakh)
I year	6.420	6.400
II Year	7.147	7.127
III Year	7.874	7.854
IV Year	8.600	8.580
V Year	8.600	8.580
VI Year	8.600	8.580
VII Year	8.600	8.580
VIII Year	8.600	8.580
IX Year	8.600	8.580
X Year	8.600	8.580

19.3 Cash flow analysis

The data presented in **Table VII** is very critical for the purpose of financial analysis. The data highlight the quantum of cash flow from the proposed Coir Polymer Composite Board Production Unit for the ten productive years. This would in turn bring the debt paying power of the proposed entrepreneur. For the purpose of financial analysis, the repayment of loan (Rs.19.712 lakh), commences from the first year of production. It is expected to be cleared by the end of fifth year in 5 installments with interest. **Table-V** shows repayment schedule of loans and the interest payable to the financial institution at the rate of 12%. It is observed from the Cash Flow Analysis that an amount of Rs.77.231 lakh cash also has been accumulated for any expansion or diversification of business utilizing coir fibre during a period of ten years after clearing all the loans by fifth year.

19.4 Balance Sheet

The projected balance sheet for the ten productive years showing the assets and liabilities of the proposed venture (Coir Polymer Composite Board Production Unit) has been shown in **Table-VIII.**

19.5 Appraisal

Setting up of industries in NE states owing to its varied socio-cultural differences, geographical unevenness & other socio-economic condition is sometimes become complex. To overcome such risks it is very much essential to judge a project by various means after working out a detail techno-economic feasibility report. Most of the projects are financed from multiple sources, internal funds, loans, grants etc. The loan and associated interest and other charges will be repaid principally from the operating cash flow which the capital project is expected subsequently to generate. Thus the risk are shared by both the parties *i.e.* lender & financial institution. There are some reliable means of judging a project and they are duly considered here.

19.6 Break Even Point :

The Break Even Point analysis is primarily intended to indicate the proposed plant operating level at which accounting sales covers the accounting costs and the unit run at no loss basis. Any increase in production from break event level will definitely yield profit whereas it will run at loss if the production level is below the break even. The secondary objective is to examine the relationship between profit and quantum of production. **Table-IX** represented the detail Break Even Point Analysis and **Figure-III** represented the BEP graphically. In this particular Coir Polymer Composite Board Production Unit in NE States, the break even point occurs at **30.84%** production level.

20. CONCLUSION AND RECOMMENDATION

India accounts for more than two-thirds of the world production of coir and coir products. It is an important cottage industry contributing significantly to the economy of the major coconut growing States and Union Territories, i.e., Kerala, Tamilnadu,

Andhra Pradesh, Karnataka, Maharashtra, Goa, Orissa, Assam, Andaman & Nicobar, Lakshadweep, Pondicherry, etc.

However, despite the huge potential to grow up this industry in NE region, especially in Assam, due to lack of awareness, scattered nature of coconut plantations, the growth of the coir industry is negligible or very poor. The state of Assam is having 20710 ha area under Coconut & with a total production of 1756.13 lakhs of nuts every year. Assam can produce 17 thousand 561 metric tones of fiber per year. Due to lack of infrastructure facility, lack of awareness & poor economic condition the full utilization of the coconut husk has not been achieved.

The Coir Polymer Composite Board Production Unit under North East Indian conditions is very much technically feasible and economically viable as has been worked out in the feasibility report. The Coir Polymer Composite Board Production Unit will be economically feasible in the major coconut producing districts in Assam, which are – Barpeta, Nagaon, Sonitpur, Golaghat, Kamrup & Nalbari**.** However, the Coir Polymer Composite Board Production plant to be established localities where continuous power supply, communication facility and marketing facilities are available. Therefore, it is suggested that in town areas like **Nalbari, Barpeta, Tezpur, Nagaon, Guwahati** in the state of Assam and **Agartala** in the state of Tripura, the Coir Polymer Composite Board Production Unit should be established.

Therefore, it is recommended that interested entrepreneurs may come forward to take up the technology (Coir Polymer Composite Board Production Unit) for self employment and socio-economic development of this region. Cooperation is also required from different sectors to provide necessary facilities *i.e.* financial, technical etc. to help the interested entrepreneurs for speedy & successful implementation of the project.

ECONOMIC FEASIBILITY STUDY

Title of the Project : **COIR POLYMER COMPOSITE BOARD**

Basis of calculation :
Number of Working Days = 300 days
Debt Equity Ratio = 4 : 1

Plant Capacity
Product (Coir Polymer Composite Board) = 80 piece per day
(Size 2' x 2')

TABLE- I

PROJECT CAPITAL COST

Sl. NO.	PARTICULARS	CAPACITY	UNIT	QTY	COST(Rs)
A	**LAND (2000 sq.M)**				340000.00
B	**BUILDING (8M x 12M)**	96	cu.M	1	768000.00
C	**MACHINERY**				1146000.00
	Fibre Cutting Machine, Hot Compression Machine, Edge Trimming Machine, Dies				
D	**PRE-OPERATIVE EXPENSES**				20000.00
E	**MARGIN MONEY FOR WORKING CAPITAL**				190000.00
				GRAND TOTAL	**2464000.00**

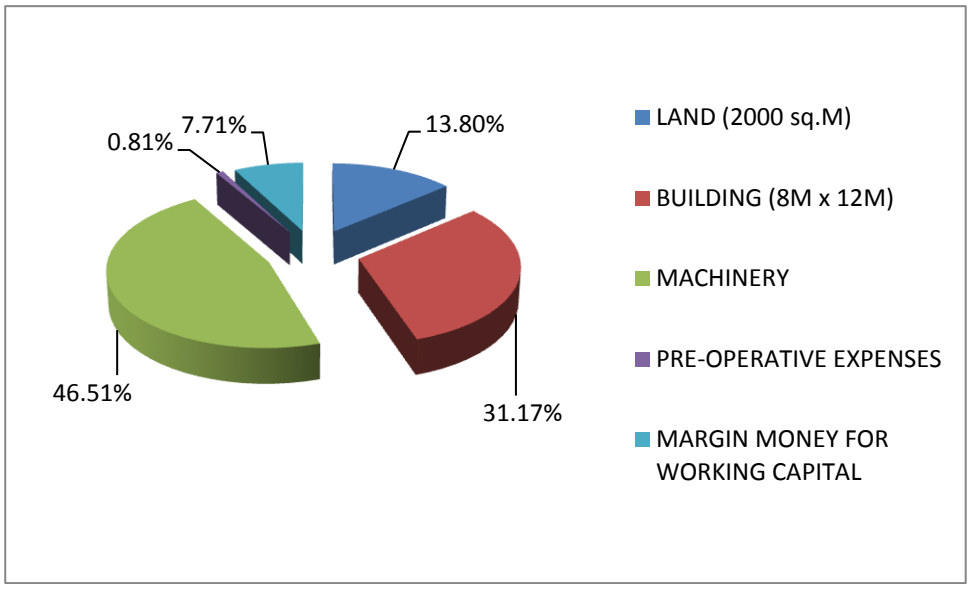

Figure-I : Diagrammatic Representation of Project Capital Cost

TABLE - II

COST OF PRODUCTION

Sl. No.	Item	Requirement		Price (Rs)		Amount per Annum	
1	Raw Material Cost						
	Coir Fibre	1.0	Kg per board	22.00	per Kg		528000.00
	Resin	0.2	Kg per board	50.00	per Kg		240000.00
	Raw Material Cost					Rs.	768000.00
2	Manpower Cost	1800	Man days	250.00	per day	Rs.	450000.00
3	Utility						
	Electricity	22000.00 per month				Rs.	264000.00
	Water	Nominal					
	Utility Cost						264000.00
4	Maintenance & Repair	5%	of Machinery			Rs.	57300.00
5	Depreciation	10%	of Machinery			Rs.	114600.00
		5%	of Building			Rs.	38400.00
	Depreciation Cost					Rs.	153000.00
6	Interest on Bank Loan	12%	of Bank Loan			Rs.	236500.00
7	Miscellaneous Expenditure	1%	of Raw material Cost			Rs.	7680.00
8	Marketing Cost	3%	of (1 to 7)			Rs.	58094.40
				TOTAL COST OF PRODUCTION		Rs.	**1994574.40**

SALES REALIZATION

Sl. No.	Item	Quantity		Selling Price (Rs)		Amount per Annum	
1	Composite Board	80	piece/day	125.00	per piece	Rs.	3000000.00
					TOTAL SALES REALIZATION	Rs.	**3000000.00**

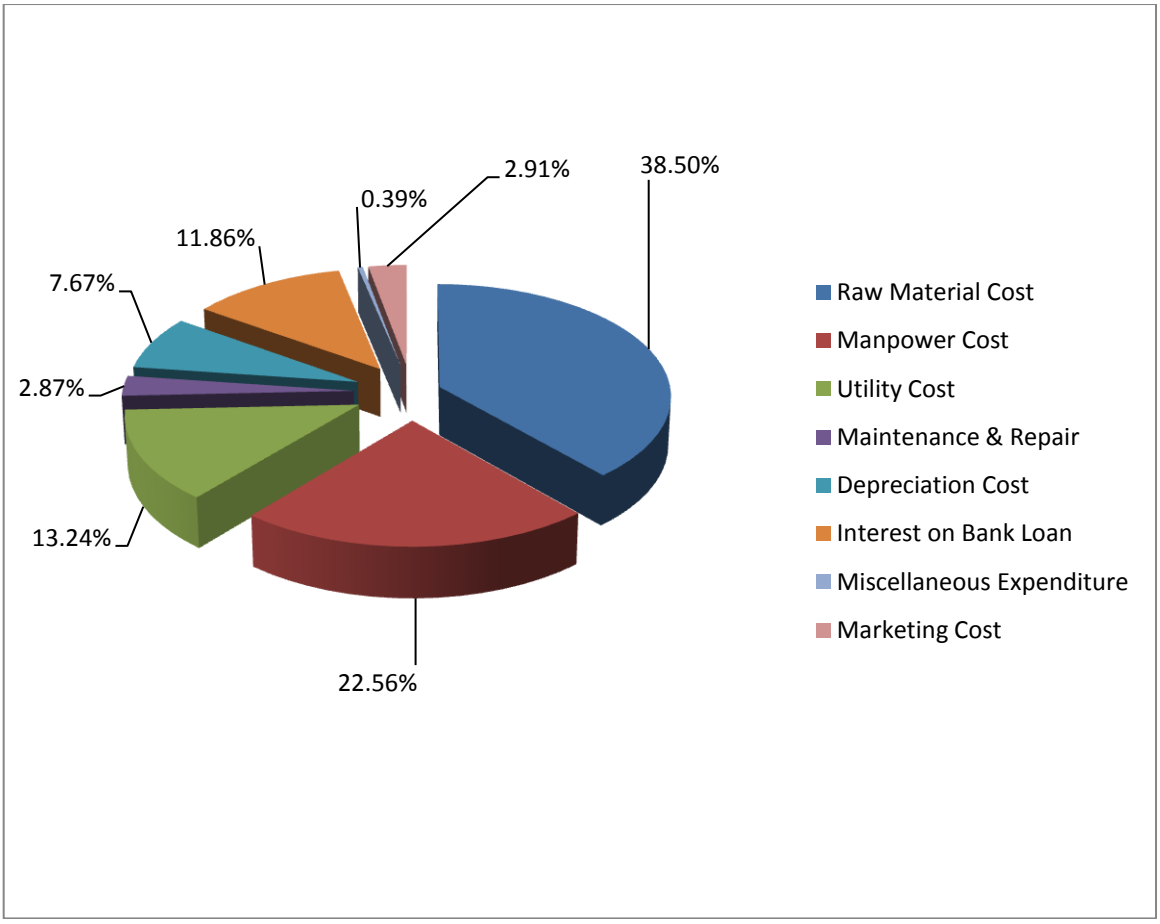

Figure-II : Diagrammatic Representation of Working Capital

TABLE - III

COST OF MANPOWER

Sl. No.	Type	Quantity	Wage in Rs.	No. of Days		Amount in Rupees
1	Labour	6	250.00	300	Days	450000.00
				TOTAL YEARLY COST		**450000.00**

TABLE - IV

MARGIN MONEY FOR WORKING CAPITAL

Sl. No.	Particulars	No. of Months		Amount in Rupees
1	Raw Materials	1	Month	64000.00
2	Manpower Cost	1	Month	37500.00
3	Utility	1	Month	22000.00
4	Maintenance & Repair	1	Month	4775.00
5	Depreciation Cost	1	Month	12750.00
6	Interest on Bank Loan	2	Month	39416.67
7	Miscellaneous Expenditure	1	Month	640.00
8	Marketing Cost	1	Month	4841.20
			TOTAL	**185923.00**
			SAY	**190000.00**

TABLE - V

BANK LOAN

Year	Loan Amount at the Beginning of the Year	Loan Repayment at the End of the Year	Outstanding Balance at the end of the Year	Interest (12%)
1st	1971200.00	394240.00	1576960.00	236500.00
2nd	1576960.00	394240.00	1182720.00	189200.00
3rd	1182720.00	394240.00	788480.00	141900.00
4th	788480.00	394240.00	394240.00	94600.00
5th	394240.00	394240.00	0.00	47300.00

TABLE - VI

PROFITABITY ANALYSIS

(Rs. Lakhs)

Description	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
CAPACITY UTILIZATION	75%	80%	85%	90%	90%	90%	90%	90%	90%	90%
Total Turnover	22.500	24.000	25.500	27.000	27.000	27.000	27.000	27.000	27.000	27.000
Less: cost of production	16.080	16.853	17.626	18.400	18.400	18.400	18.400	18.400	18.400	18.400
Gross Operating Profit	**6.420**	**7.147**	**7.874**	**8.600**	**8.600**	**8.600**	**8.600**	**8.600**	**8.600**	**8.600**
Less: pre-operative expenses written off	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Net Profit	**6.400**	**7.127**	**7.854**	**8.580**	**8.580**	**8.580**	**8.580**	**8.580**	**8.580**	**8.580**
Add back :-										
- depreciation	1.530	1.530	1.530	1.530	1.530	1.530	1.530	1.530	1.530	1.530
- expenses written off	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
TOTAL CASH ACCRUALS	**7.950**	**8.677**	**9.404**	**10.130**	**10.130**	**10.130**	**10.130**	**10.130**	**10.130**	**10.130**

TABLE - VII

CASH FLOW STATEMENT

(Rs. Lakhs)

Description	Procurement Stage	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
CAPACITY UTILIZATION		75%	80%	85%	90%	90%	90%	90%	90%	90%	90%
A. Source of Fund											
Owner's Equity	4.928										
Gross Operating Profit		6.420	7.147	7.874	8.600	8.600	8.600	8.600	8.600	8.600	8.600
Bank Interest		2.365	1.892	1.419	0.946	0.473					
Profit after Depreciation but before Interest		8.785	9.039	9.293	9.546	9.073	8.600	8.600	8.600	8.600	8.600
Depreciation		1.530	1.530	1.530	1.530	1.530	1.530	1.530	1.530	1.530	1.530
Bank Loan	19.712										
Total of A	**24.640**	**10.315**	**10.569**	**10.823**	**11.076**	**10.603**	**10.130**	**10.130**	**10.130**	**10.130**	**10.130**
B. Application of Fund											
Project Expenditure	24.640										
Repayment of Bank Loan		3.942	3.942	3.942	3.942	3.942					
Interest on Bank Loan			2.365	1.892	1.419	0.946	0.473				
Total of B	**24.640**	**3.942**	**6.307**	**5.834**	**5.361**	**4.888**	**0.473**				
Opening Balance of Cash			6.372	10.634	15.622	21.337	27.052	36.709	46.840	56.970	67.101
Surplus/Deficit during the year		6.372	4.261	4.988	5.715	5.715	9.657	10.130	10.130	10.130	10.130
Cumulative surplus		**6.372**	**10.634**	**15.622**	**21.337**	**27.052**	**36.709**	**46.840**	**56.970**	**67.101**	**77.231**

TABLE - VIII

PROJECTED BALANCE SHEET

(Rs. Lakhs)

Description	Pre-operative stage	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
LIABILITIES											
Equity Capital	4.928	4.928	4.928	4.928	4.928	4.928	4.928	4.928	4.928	4.928	4.928
Reserve or Surplus		6.420	13.566	21.440	30.040	38.641	47.241	55.842	64.442	73.043	81.643
Bank Loan	19.712	15.770	11.827	7.885	3.942						
Interest Payable		2.365	1.892	1.419	0.946	0.473					
Total	**24.640**	**29.482**	**32.214**	**35.672**	**39.857**	**44.042**	**52.169**	**60.770**	**69.370**	**77.971**	**86.571**
ASSETS											
Fixed Assets	22.540	21.010	19.480	17.950	16.420	14.890	13.360	11.830	10.300	8.770	7.240
Current Assets	2.100	2.100	2.100	2.100	2.100	2.100	2.100	2.100	2.100	2.100	2.100
Cash or Bank Balance		6.372	10.634	15.622	21.337	27.052	36.709	46.840	56.970	67.101	77.231
Total	**24.640**	**29.482**	**32.214**	**35.672**	**39.857**	**44.042**	**52.169**	**60.770**	**69.370**	**77.971**	**86.571**

TABLE - IX

BREAK-EVEN ANALYSIS

Sl. No.	Particulars	Amount in Rupees
A	**FIXED COST**	
1	Interest on Bank Loan	236500.00
2	Utility	26400.00
3	Depreciation	153000.00
4	Maintenance & Repair	28650.00
5	Miscellaneous Expenditure	3840.00
	TOTAL OF (A)	**448390.00**
B	**VARIABLE COST**	
1	Raw Material Cost	768000.00
2	Manpower Cost	450000.00
3	Utility	237600.00
4	Maintenance & Repair	28650.00
5	Miscellaneous Expenditure	3840.00
6	Marketing Cost	58094.40
	TOTAL OF (B)	**1546184.40**
C	**TOTAL COST (A + B)**	1994574.40
D	**SALES REALIZATION (TURNOVER)**	3000000.00
E	**GROSS PROFIT**	1005425.60
F	**BREAK - EVEN POINT**	**30.84%**

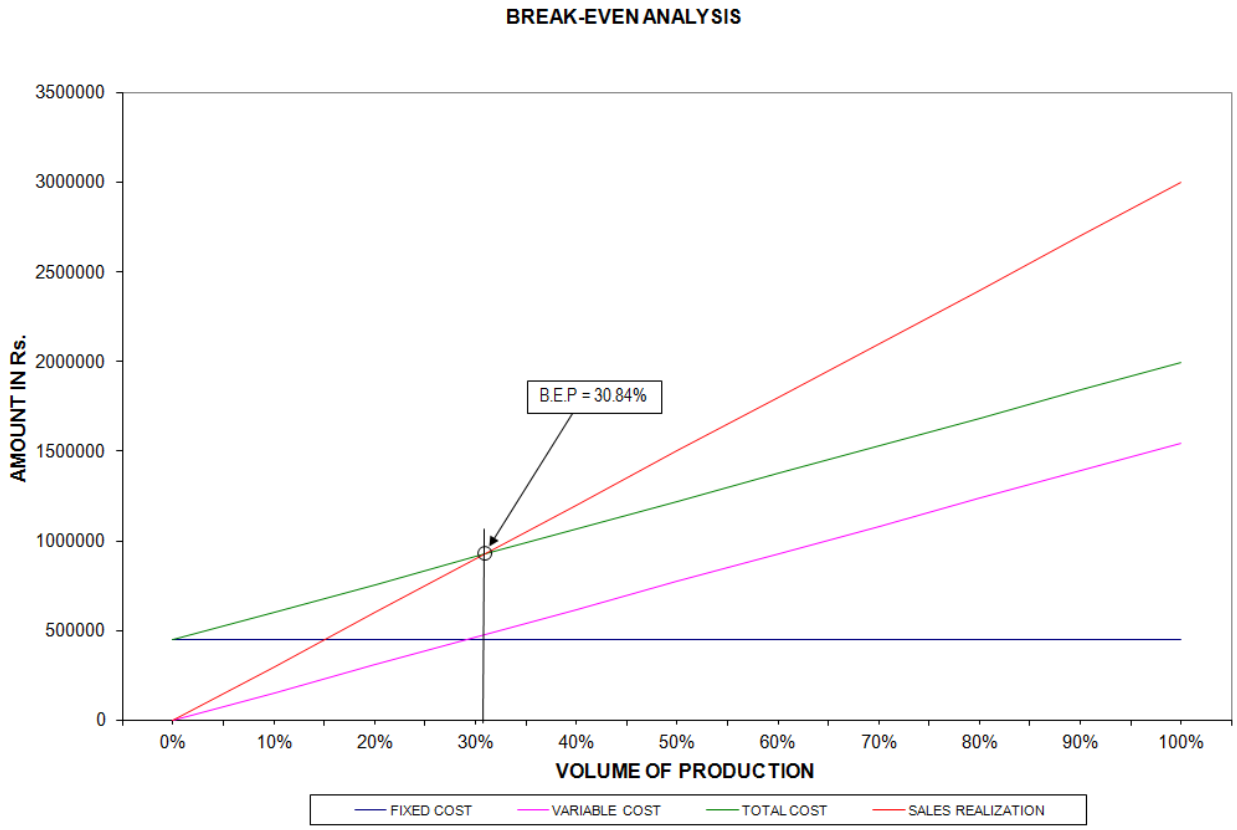

Figure-III : Graphical representation of Break Even Point Analysis