

Pina Fabrics – An Alternative Low Cost Green Product for Sustainable Livelihood

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Abstract—Pina fibre and fabric production provides sustainable livelihood to a large number of farmers in several countries, including India. Utilisation of Pineapple leaves as raw material for the production of Pina fibre serves as profitable livelihood opportunity to rural households who have small investible funds and low skill to operate sophisticated machine and equipment. Since Pina fibre production requires small amount of working capital, as the raw material is mostly considered as waste, it does not require immense cost of procurement unlike other manufacturing ventures. Kerala being a leading producer of Pineapple, it will be a better livelihood option for the rural women in the State. The study is an analytical cum experimental type, based mainly on field observation and interactions. The findings of the study substantiates the fact that Pina fibre is indeed a profitable and viable venture to be pursued by an entrepreneur with the added advantage of sustainability aspects as it is one of the best and most viable livelihood options, especially in rural areas having pineapple cultivation. From the insights gained from the research study, a Prototype of the low-cost version of the Pineapple leaf Decorticator, which is affordable to the rural households, was designed and developed.

Keywords—Pina fibre, Sustainable Fashion, Carbon footprint, Eco-friendly, Sustainable Livelihood option, Rural Sustainability, Pineapple Leaf Decorticator.

I. INTRODUCTION

Pineapple (Ananas Anam) cultivation and production of pineapple fibre based products dates back to the Hispanic colonization of Philippines. Production of Pina fabrics dates back to 17th century in Philippines. The leading Pineapple producing countries in the world are Costa Rica, Brazil, Philippines, Thailand, China, Indonesia, India, Nigeria, Mexico, Vietnam, Hawaii, West Indies and Bangladesh. In olden days Pineapple silk was considered as the Queen of Philippine fabrics. Pina fabrics were also a most sought-after product by the elite groups in Philippines and is also considered as a status symbol by them. Pina is a textile fibre which is used for making fabrics [1].

Pina fibre and fabric production provides sustainable livelihood to a large number of farmers

in several countries, including India. During ancient times, to adorn idols and deities, Banana fabric was commonly used [2]. Similarly, fibres made from grasses, palm, coconut, hemp, sisal, pineapple, etc. were used prevalently until the dawn of Cotton as the superior among the plant fibres [3].

‘Sustainable Fashion’ has also been gaining popularity in India. Prominent leaders like Sonia Gandhi, Smriti Irani, Michelle Obama and celebrities like Emma Watson, Michael Fassbender, Gwyneth Paltrow, Vidya Balan, and Priyanka Chopra, have also started promoting sustainable fashion, by wearing organic clothes [4].

Fashion designers have started using several fabric materials and natural dyes derived from plants and fruits with a view to make their innovative artistic works more competitive, unique and sustainable besides reducing their carbon footprint by utilising the skills of local weavers and artisans. Moreover, wearing of organic clothes have also become the latest trend in fashion industry all over the world, including India [5].

Leading pineapple producing states in India are Assam, West Bengal, Karnataka, Meghalaya, Manipur, Arunachal Pradesh, Kerala and Bihar. In India the maximum area under pineapple cultivation is in Assam (14,000 hectares), followed by West Bengal (11,500 hectares) and Kerala. In Kerala the total area under pineapple cultivation is 10,200 hectares with the district of Ernakulam accounting for more than 60 per cent of the area under cultivation [6].

II. LIVELIHOOD OPTIONS OF PINEAPPLE AND PINA FIBRE

Utilisation of Pineapple leaves as raw material for the production of Pina fibre serves as profitable livelihood opportunity to rural households who have small investible funds and low skill to operate sophisticated machine and equipment. Substantial working capital requirement besides investment in plant and machinery are other major problems faced by the rural folks. Since Pina fibre production requires small amount of working capital as the raw material is mostly considered as waste, it does not require immense cost of procurement unlike other

manufacturing ventures. As the production process is highly labour intensive, the machinery required for its production is relatively less costly and complex, when compared to the requirements of other manufacturing enterprises. The products are also eco-friendly and as such it creates lesser carbon footprints during its production process.

Since Kerala is a leading producer of Pineapple, it will be a better livelihood option for the rural women in the State. Pina fibre production also provides more employment avenues because its production processes are more labour intensive. Pina fibre has potential demand in the local, national and international markets as eco-friendly and sustainable products are gaining importance with people becoming more conscious about environmental impacts of contemporary stereotypical non-green products. The district of Ernakulam is the prime centre of production of Pineapples in Kerala and it constitutes about 60 per cent of the total production in the State. The district of Ernakulam is the industrial capital of Kerala and it offers a great advantage to innovative budding entrepreneurs in various aspects. Along with flourishing of Green market opportunities and popularisation of sustainable fashion recently, will give more impetus to such endeavours that promoting sustainable fabrics and allied products. Hence, a study exploring the prospects of Pina fabrics as an alternative low cost green product for sustainable livelihood in Kerala becomes quite imperative.

III. OBJECTIVES

Following are the major objectives of the study:

- To analyse the cost and profitability related aspects of Pina fibre.
- To evaluate whether Pina fibre production is a viable livelihood option in the rural area of Kerala.
- To identify the problems faced by the marginal Pina fibre manufacturers in the study area.
- To develop the prototype of a low-cost pineapple leaf decorticator ideally suited to the rural households with indigenous materials.

IV. METHODOLOGY

The study is an analytical cum experimental type based mainly on field observation and interactions with pineapple cultivators, Pina fibre manufacturers and various officials of Krishi Bhavans. Vazhakkulam in the district of Ernakulam is taken as the area under study because it is the

prime centre of production of Pineapple in the District.

V. TOOLS OF ANALYSIS

Tools of analysis used for evaluation of the Pina fibre project, in the present study, include the following:

1. Break-even Analysis
2. Project evaluation methods such as :
 - a. Payback Period Method
 - b. Post-payback Profitability Method
 - c. Payback Reciprocal Method
 - d. Net Present Value Method

VI. COST AND PROFITABILITY OF PINA FIBRE PRODUCTION

A semi-automatic plant is capable of yielding 35 kg of pineapple leaves, per 8-hours of shift. Considering this fact, the cost and profitability related aspects of the Pina fibre production in the rural setting in the district of Ernakulam is analysed and the results of the analysis are shown in Table I. and Table II.

TABLE I. DETAILS OF THE COST AND PROFITABILITY OF PINA FIBRE PRODUCTION

Yield of fibre = 3 percent of the total quantity (weight) of pineapple leaves. Therefore, from 33kg of pineapple leaves, approx. 1 kg of pina fibre can be obtained. The machine can produce a yield of 35 kg of Pina fibre per day. Pineapple Leaves required for one day's yield, i.e. 35 kg = 35 x 33 = 1,155 kg.				
Details of Items	Amount (Rs.)	Amount (Rs.)	Total (Rs.)	Per Unit (Rs.)
Fixed Cost:				
Pina Fibre Extraction machine		75,000		
Electrical installation		3,000		
Other accessories		5,000		
Land and Building		2,50,000		
			3,35,000	
Variable Cost for producing 1kg of Pina Fibre:				
Material Cost (6,930/35)		6,930		198.00
Transportation cost (1,500/35)		1,500		42.86
Labour:				
Labourers (800x3)	2,400			
Supervisor	1,000			
Total Labour		3,400		
Labour per unit (3,400/35)				97.00

Other expenses (including electricity) (84/35)		84		2.40
Variable Cost per unit				340.26
Selling price (per kg)				450.00
Contribution per unit = Selling price – Variable Cost	450.00 - 340.26			109.74
BEP in units = Fixed Expenses/ Contribution per unit	3,35,000/ 109.74		3,052.67	
BEP in Rs. = BEP in units x Selling price per unit	3,053 x 450		13,73,701	

Source: Field Survey

TABLE II. DETAILS OF THE COST AND PROFITABILITY OF PINA FIBRE PRODUCTION

Items	Units
Average monthly profit on a single shift of 8 hours with 5 working days per week	Rs. 25,991/-
BEP in units	3,053 kg
BEP in Rs.	Rs. 13,73,701/-
Payback period	10.61 months (0.88 years)
Post Payback Profitability	Rs. 15,59,448/-
Payback Reciprocal	113.10%
Net Present Value	Rs. 8,47,062/-

Source: Field Survey

Analysis of the cost and profitability related aspects of Pina fibre manufacturing as evident from Table No. I and Table No. II, indicates that a micro-enterprise with an investment of Rs. 3,35,000/- will be able to fetch a monthly net return (before depreciation and taxes) to the tune of Rs. 25,991/- to the entrepreneur.

In this case the entrepreneur will be able to recoup the original cost of investment within a short period of 0.884 years and its post payback profitability (assuming an estimated life of the project as 5 years) comes to Rs. 15,59,448/-. Moreover the Net Present Value of such an enterprise taking 10 percent as the discount factor will amount to Rs. 8,47,062/-. All these substantiates the fact that Pina fibre is indeed a profitable and viable venture to be pursued by an entrepreneur with the added advantage of rural sustainability aspects, as it is one of the best and the most viable sustainable livelihood options, especially in rural areas having pineapple cultivation. The fact that pineapple leaves are often wasted or otherwise thrown away without any value addition makes it a much more reliable

livelihood option to economically weaker rural women folks.

VII. PROBLEMS FACED BY MARGINAL PINA FIBRE PRODUCERS

Following are the major problems identified as confronted by the marginal Pina fibre producers in the study area:

- Manual extraction process of pineapple leaf fibre is time consuming and laborious.
- The thorns and allied parts of the pineapple leaves often create allergic problems to the persons involved in their collection and processing.
- Automatic decorticator machine is costly and it needs skilled operator.
- No scientific processing of pineapple waste disposal has been evolved and production of value added products from these materials have not been resorted by many of the Pina fibre manufacturing units in the State.
- Large number of unorganized rural markets and the private traders hold the majority of the agri-business activities in the region and consumes the major chunk of the profit earned.
- Pina fibre produced in the State pass through a number of channels before reaching the ultimate consumer leading to a low bargaining power to the marginal manufacturer.
- The multitude of middlemen at different stages of marketing process take the advantage of the producers' inadequate market access and weak bargaining power.

VIII. DESIGN AND DEVELOPMENT OF THE LOW-COST PROTOTYPE OF PINA DECORTICATOR

From the insights gained from the research study, a Prototype of the low-cost version of the Pineapple Leaf Decorticator, which is affordable to the rural households, was designed and developed. It was found that such a low-cost alternative will help to reduce the cost of the machinery down to 1/10th of its actual cost, if it is manually operated and 1/4th of its cost, if it is motorised. Provisional application for patenting have already been filed for the prototype of the machine. The design and development of the Prototype of the machine is given in Figure - I, Plate - I and Plate - II.

FIGURE – I DESIGN OF THE LOW-COST PINA DECORTICATOR

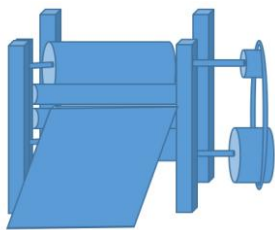


PLATE – I PROTOTYPE OF THE LOW-COST PINA DECORTICATOR – FEEDING OF PINEAPPLE LEAVES



PLATE – II PROTOTYPE OF THE LOW-COST PINA DECORTICATOR – EXTRACTION OF PINA FIBRE



IX. CONCLUSION

Analysis of the cost and profitability related aspects of Pina fibre manufacturing indicates that micro-enterprise with an investment of Rs. 3,35,000/- will be able to fetch a monthly net return to the tune of Rs. 25,991/- (before depreciation and taxes) to the entrepreneur.

In this case the entrepreneur will be able to recoup the original cost of investment within a short period of 0.884 years and its post payback profitability (assuming an estimated life of the project as 5 years) comes to Rs. 15,59,448/-. Moreover, the Net Present Value of such an enterprise taking 10 percent as the discount factor will amount to Rs. 8,47,062/-. All these substantiates the fact that Pina fibre is indeed a profitable and viable venture to be pursued by an entrepreneur with the added advantage of sustainability aspects as it's one of the sustainable alternative and most viable livelihood options, especially in rural areas having pineapple

cultivation. The fact that pineapple leaves are often thrown away otherwise wasted or thrown away without any value addition. The newly developed machine can effectively be used to extract the pineapple fibre from the agro-waste of pineapple leaves. The machinery designed and developed as part of the research work will help to reduce the cost of machinery down to 1/10th of its actual cost if it is manually operated and 1/4th of its cost if it is motorised.

The growing popularity of Pina fabrics in India will give its way to make a sustainable fashion an incredibly exciting area in the near future.

X. FUTURE AREAS OF RESEARCH/ INNOVATION

Pina fibre based masks, sanitary pads, air filters, scrubs, production of Pina Fibre reinforced plastic materials and reinforced corrugated roofing sheets, etc. have bright future prospects in the international market. Similarly, the pineapple leaf wastes can also great potential for making fuel bricks, biodegradable planting pots.

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