



A STUDY ON FOSTERING ENVIRONMENTAL SUSTAINABILITY IN SCHOOL CAMPUSES THROUGH BIODEGRADABLE MATERIALS

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Abstract

In an age of global warming and other environmental issues and disasters, it is important for every human being to remember that our planet is a very sensitive creation and everything happens in one part of the world will have a collateral impact on the other part. Taken collectively, schools are major consumers of energy, paper, food, water, cleaning products, and other resources, and generate waste, pollution, and greenhouse gas emissions. They also have the potential to use resources efficiently, become producers of their own power, and serve as models of environmental sustainability for their communities, means be eco-justice. This potential, combined with their ability to teach the next generation and communities of families by example, makes schools strategic actors in the drive to transform the world's energy and resource consumption from a destructive model towards more sustainable patterns of development.

So, world should turn to products that offer Eco justice; recycled products and products grown using sustainable, natural growing practices. "Social innovation" is increasingly common and it's emerging worldwide. So, people realize that it's high time to work together to find new solutions and to challenge the age-old techniques faced by our society. In the current, digital, modern classrooms, the consumption of paper has increased tremendously. After few round of discussions with eco-club students and some experts, the researcher identified the process of process of paper mills for making papers and the environmental issues formed by these activities. So the researcher suggests an ecofriendly paper from eco-waste which leads to eco-justice.

Banana trunks were previously considered as waste. But now environment friendly banana paper is made from banana palm fiber after going through a series of process and thereby it will mark a new era for sustainability. Banana paper has a long shelf life and it is the strongest of the long fibers ever found amidst natural fibers and it is now providing endless possibilities including saving our earths green umbrella. Our main purpose is to create a new, unique paper with an attitude of serenity and character for every student who wants to embark on an eco-friendly adventure.

Key words: *environmental issues, sustainability, eco-friendly paper (banana fiber paper), eco-waste, eco-justice education*

Introduction:

Eco-justice includes social and economic justice and, by combining it with ecological awareness and appreciation, profoundly affects the way it is to be achieved. eco-justice education is a core part of education programmes across the country as it provides both the theory and examples of classroom practices essential for making the transition to a sustainable future. In general sustainability means a way to live in harmony with the environment. All of us are called to responsible stewardship and each one of us can contribute to the solution. It will take courage to face the facts about global warming and must get involved in study, planning and action.

Paper is a fundamental part of most aspects of society especially schools; world-wide a total of approximately 300 million tons of paper are produced each day and approximately 90% of this paper is produced from mature wood pulp. Today finest papers are produced all over the world. But one dismaying fact is that millions of trees are cut down in a day to make paper. Increased demands of paper production and limited wood resources have directed researcher to look for appropriate additional resources of non-wood materials for pulp and paper manufacturing. Several kinds of non-wood lingo cellulosic by-products of agricultural cultivation have been investigated by the researchers for this purpose.

The paper industry is one of the largest water polluters in the world and also a lot of the harmful pollutants. This disastrous effect will affect our worlds beautiful eco-system. Awareness of this situation should make us to compromise in a personal way and induce us to shift away from consumption habits that affect the environment so strongly.

Paper still remains as the main form of communication among people. Papers are made from mat grass, kenaf and grave and jute waste. In addition to these alternate sources, the waste paper available in plenty can be recycled for production. Eco-friendly paper production is alkali-free and non-polluting process that has advantages over conventional process. This eco-friendly method saves our mother earth from global warming. Eco-friendly product refers to those products that do not affect or cause any harm to the environment.

Banana paper (Eco-friendly Paper) is one of the unique creations gifted by the nature from eco-waste. Paper from eco-waste means managing waste in ecologically friendly way. Eco papers prove among other things, that our modern society can satisfy its growing needs without affecting the environment. This research paper is to develop a concept on banana fiber paper and also focuses on the environment impacts caused by traditional papers. Paper making using banana fiber is a new technique followed by some green schools. The

article looks at the possibility of replicating this social innovation to our schools.

Significance of eco-friendly paper making:

Conventional method of paper making uses cellulose, the form of wood chips obtained by cutting down of trees, which also affect our world in the form of global warming. Moreover in this method, various chemicals are used and these releases toxic substances to the atmosphere that causes environmental pollution (air, water and noise pollution) resulting in the need for treatment of water. Surveys state that, for manufacturing 1 ton of paper 277 eucalyptus or 462 bamboo plants are required. It is against eco-justice educational views.

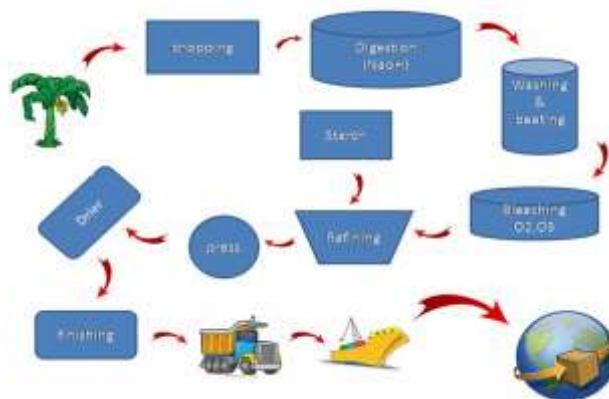
Objectives:

- To have a deeper understanding about the concept of manufacturing paper from banana fiber.
- To do a SWOT analysis of eco-paper
- Eco paper Vs traditional paper.

Eco- friendly papers made from banana stem

Banana trunks were previously considered as a waste product. Banana stem is thrown as eco-waste, which is fiber rich. Here technology turning banana waste into paper is gearing up for social, educational and commercial purpose. Banana fiber has many varied applications in the pulp and paper industry.

Banana Paper Making Process:



- **Collection of banana trunks-** The raw material is composed of agro-industrial waste. Agricultural waste is collected from banana farms. In banana plantations, after the fruits are harvested, the trunks or stems will be wasted and it is procured as raw materials. Such wastes provide obtainable sources of fibers, which leads to the reduction of other natural and synthetic fibers production that requires extra energy,

fertilizer and chemical.

- **Sorting out for quality control-** The banana plant which is ready to harvest is cut down and the pseudo-stems and stem fiber is separated using manual cutting. It is soaked or immersed vertically for 2-3 days and horizontally for 6-7 days depending on the maturity of the plant.
- **Chopping-** The banana trunk is then cut down into small pieces approximately 4-5 cm and this is called chopping of the banana stem.
- **Digestion-** The small pieces of banana stumps are dried up to 90% under sun or by using drying equipments. Then these pieces are digested using NaOH(sodium hydroxide) to soften these fibers.
- **Washing-** The softened material is then transferred to another container and washed with water in-order to remove the black liquor (residue) and unused alkali.
- **Beating-** The washed material is the subjected to beating .which consist of three steps
 1. Initial cutting of materials into small pieces
 2. Separation of fiber
 3. Wet beating

In this method the wet fiber is beated to duration of 4-5 hours in order to get the desired quality pulp. According to the quality of paper needed appropriate amount of fillers, loading material or chemicals are used during. For board making and bag making, the color of the paper doesn't matter. For production of hard boards, suitable quantity of resins like urea-formaldehyde and phenol- formaldehyde are added to maintain pH.

- **Bleaching-** Bleaching is a process which reduces the lignin content to less than 5%. By a series of bleaching process the desired whiteness of paper can be achieved. The chemical commonly used for bleaching is chlorine which is of environmental concern and now a days the pulp industry prefers different alternatives such as oxygen, ozone, hydrogen per oxide

In the case of a plant designed to produce pulp to make brown sack paper or linerboard for boxes and packaging, the pulp does not always need to be bleached to a high brightness. Bleaching decreases the mass of pulp produced by about 5%, decreases the strength of the fibers and adds to the cost of manufacture.

- **Adding binding materials-** The binding agents such as starch, polysaccharide, resins, and gums are used. These agents are added to enhance or modify the coherence between the fibers. They also increase the dry strength of paper.

- **Refining-** The stored pulp material is viscous and ready to be molded into any shape or size. It is poured on desired mold which is a wooden frame with desired thickness and shape with a wire mesh. Finally shake the wooden frame so that the pulp spread uniformly over the frame.
- **Screw pressing-** After the pulp is allowed to settle a piece of cloth made of cotton is placed over the half dried pulp and it is screw pressed to remove moisture. The paper thus obtained will be smooth, wrinkle free and attractive.
- **Drying-** The screws and cloth is removed to peel the paper out from the cloth and dry it separately to obtain papers. It may take several hours to dry under room temperature and hence a drier can be used in such cases since it is economical for bulk manufacturing.
- **Finishing-** The dried papers are then ironed to make it suitable to pass the quality check for different quality papers and it is cut into different shapes and size using calibrated knives. Skilled people cut the paper into standard sizes and assuring a top notch product. To ensure quality, strict packing standards are practiced. Bar code identification is used to simplify warehouse accounting, leading to less headaches and more time to work with paper.

Thus, eco- friendly papers are ready to use.

SWOT Analysis- Banana Paper

Strengths:

- It is an environmentally friendly product, i.e., It is 100% chemical free tissue paper.
- It is original product, based on the concept of preservation and harmony with nature.
- The paper is made with less toxic processes and thus results in less pollution.
- It has shelf life of over 100 years as it is the strongest and it can be folded for as many as 3000 times.
- By-product of banana fruit cultivation and hence raw material is cheap and abundant.

Weakness

- The regulated banana paper is rougher and more textured compared with most printer paper, and a lot more expensive.
- High production cost for the final product.
- Not much expertise as yet in India for banana fiber extraction.
- No patent held by India on banana fiber.
- Lack of dedicated branding and market expansion drive from entrepreneurs.

Opportunities

- It is a field not yet exploited to its full potential.
- There is a growing trend for eco-friendly products with the rise in environmental awareness & with increased government regulation there is now a trend towards sustainability in the pulp & paper industry.
- There is an ever-growing need for environmental awareness.
- Existing domestic products.
- Increasing awareness on a global level on the benefits of using natural fiber made products.

Threats

- High level of competition from synthetic fibers.
- Low level of R & D to invent cost effective means of production.
- Maintenance of quality if wanted to export.
- Competition from existing processed food crops.
- Unfair trade regulations & practices.

Banana Paper Vs Traditional Paper

- Banana paper is superior to normal paper. The resistance rate of the paper is double of that of normal white paper.
- Banana paper is lot more resistant to water and won't lose any of its properties if it gets wet, yet totally bio-degradable.
- Banana paper is less flammable than normal paper.
- It is healthier to read from banana paper than from white paper, as it reflects less light.
- The long fibers in banana paper are tough and long, making the paper difficult to tear.
- Banana paper is 300 times stronger than pulped paper and it is naturally fire resistant.
- In banana paper no additives: no chemicals, glues or dyes in production.
- Banana paper has longevity of 700 years. In some countries banana fiber is used for making currency paper.

Scope of the study

The technology meets all the criteria required to be an environmentally – sustainable manufacturing process with significant benefits when compared to the traditional methods of paper production. Being completely biodegradable and naturally occurring, the banana paper are expected to be in great demand in the eco-friendly movement as they pose no toxic effects

to man and nature. Each ton of banana fiber paper saves between 17-20 trees.

The convinced schools and students can attempt to institutionalize the production in schools. As a result school can produce papers for their needs and using these eco- friendly papers students can expertise in making chart papers, diaries, photo frames, decoration items, greeting cards, show pieces, pen stands and so on due to the durability and strength of this eco friendly paper. Various items made by the students are used as mementos or prizes which are given away to dignitaries or students during various school functions or events. The eco-club students can exhibit these banana fiber paper products at district and state level environmental events and programmes. It may sensitized other students and community members about the benefits of eco-friendly banana fiber papers.

Conclusion

There is a great scope for effectively utilizing banana pseudo stem waste for the production of banana fiber paper. With dwindling traditional resources, the paper industry is also facing an acute shortage of raw materials. There is an urgent need to look for bio renewable and biodegradable raw materials. Banana fibers satisfying both these primary requirements represents an excellent alternative for the pulp industry. Paper made out of banana fiber is identified to be of high strength and is used for multivariate purposes (i.e, paper bags, currency notes, books etc.). However the technologies for extraction of fibers and paper making from pseudo stem are available, yet it has not been adopted by the schools mainly due to high transport cost.

Taking into consideration the large availability of banana stem waste in the country, an eco-technology group for sustainable development, took up the production of paper from agro-waste. Earlier All India Khadi and Village Industries Association evolved a simple technology for this and later on it was further improved at Dharamitra (Wardha, Maharashtra).

Standing out as one of the best examples of Education for Sustainable Development (ESD), this initiative – ecofriendly banana fiber papers presents the attempt of students turning into green students. Therefore, government needs to take necessary steps to promote the infrastructure of paper making from banana fiber, which will definitely minimize the environment degradation as well. The school and school authorities should take proper initiative in bringing about ecofriendly products for maintaining eco-justice.

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