

Empowering Girls through Paper Waste Recycling: Skill Development and Sustainable Product Entrepreneurship

Tulika A. Khare

Post Graduate Teaching Department of Home Science, RTM Nagpur University, Nagpur, Maharashtra

Abstract

Paper waste is a significant component of solid waste and poses environmental challenges due to increasing consumption, improper disposal, and the depletion of natural resources. At the same time, wastepaper represents an underutilized resource that can be transformed into useful and marketable products through creative recycling techniques. The present study, titled **“Empowering Girls through Paper Waste Recycling: Skill Development and Sustainable Product Entrepreneurship,”** focuses on developing practical skills among girls through the recycling and value addition of wastepaper using the paper-mâché technique. A descriptive experimental research design was adopted. Wastepaper was collected, soaked, processed into pulp, and combined with adhesive and putty to prepare paper-mâché material. Using simple tools, moulds, and low-cost materials, the participants developed products such as keychains, coasters, and dhoop stands. The developed products were assessed in terms of utility, durability, aesthetic appeal, and production cost. The findings demonstrated that wastepaper could be successfully converted into lightweight, durable, attractive, and economically viable products. The activity provided practical exposure to recycling, product development, creativity, and basic entrepreneurial skills while promoting environmental responsibility. The study highlights the potential of wastepaper recycling as a skill-development activity that can encourage girls to explore sustainable product entrepreneurship and small-scale income-generating opportunities. Thus, creative recycling of paper waste can contribute simultaneously to environmental sustainability, resource conservation, skill development, and entrepreneurship.

Keywords: Paper waste, recycling, paper-mâché, skill development, girls’ empowerment, sustainable entrepreneurship, value addition, circular economy.

1. Introduction

Rapid urbanization, industrial development, changing consumption patterns, and increasing use of paper in educational institutions, offices, households, packaging, and commercial activities have contributed to the generation of large quantities of paper waste. Paper is frequently discarded after a short period of use, adding to the burden on waste-management systems and landfill sites. The increasing generation of paper waste therefore requires simple, practical, and sustainable approaches for its reuse and recycling.

The concept of “waste as a resource” provides an opportunity to convert discarded materials into useful products. Paper waste is biodegradable and recyclable and can be reused through creative techniques that reduce waste while conserving natural resources. Recycling and reuse of paper can reduce the demand for virgin raw materials, conserve energy and water, and support environmentally responsible production.

Paper waste recycling is therefore not only an environmental activity but can also become a means of skill development and entrepreneurship. Learning to convert wastepaper into useful and decorative products can develop creativity, product-making skills, resource management skills, and an understanding of basic production processes. For girls, such practical skills can provide an opportunity to explore sustainable livelihood activities and small-scale entrepreneurship using easily available and inexpensive materials.

The paper-mâché technique is particularly suitable for this purpose because it requires simple materials and basic processing methods. Wastepaper can be soaked, processed into pulp, mixed with suitable binding materials, moulded into different forms, dried, finished, and decorated. Through this process, a material that would otherwise be discarded can be transformed into products with utility and aesthetic value. In the present study, paper-mâché was used to develop keychains, coasters, and dhoop stands.

The activity also has relevance to sustainable waste management and the circular economy. Government initiatives such as Swachh Bharat Mission 2.0, Extended Producer Responsibility, AMRUT, and CPCB regulations provide a broader policy context for improved waste segregation, collection, processing, and responsible waste management in India.

However, effective paper recycling continues to face challenges such as poor segregation at source, contamination, lack of awareness, inadequate recycling infrastructure, limited organized collection systems, and economic constraints. These challenges highlight the need for decentralized and practical approaches that encourage individuals and communities to recognize waste as a resource.

The present study therefore focuses on empowering girls through practical training in paper waste recycling and value addition. By developing useful products from wastepaper, the study seeks to connect environmental sustainability with skill development and sustainable product entrepreneurship. The activity is also limited to the development of selected paper-mâché products, namely keychains, coasters, and dhoop stands, which provides a focused and practical framework for demonstrating the potential of recycled paper.

Through this approach, the study attempts to demonstrate that recycling can move beyond waste disposal and become a creative, skill-oriented, and potentially income-generating activity. It emphasizes the possibility of developing entrepreneurial skills while simultaneously contributing to waste reduction, resource conservation, and sustainable development.

Aim of the Study

The aim of the present study is to utilize paper waste as a resource by recycling it through the paper-mache technique to develop useful and decorative products such as keychains, coasters, and dhoop stands, thereby promoting sustainable waste management.

Purpose of the study

The purpose of the present study is to explore the potential of paper waste as a valuable resource for skill development, creative product development, and sustainable entrepreneurship among girls. The study aims to provide practical exposure to the recycling of wastepaper through the paper-mâché technique and to demonstrate how discarded paper can be transformed into useful and decorative products. The study specifically seeks to develop practical skills related to the collection, processing, moulding, finishing, and decoration of wastepaper and to encourage creativity, resourcefulness, and an entrepreneurial mindset. By preparing products such as keychains, coasters, and dhoop stands from wastepaper, the study demonstrates the possibility of creating low-cost, useful, and potentially marketable products from locally available waste materials. The broader purpose is to promote the concept of “waste as a resource” and encourage environmentally responsible practices while creating awareness about sustainable livelihood opportunities. Thus, the study attempts to establish a link between paper waste recycling, skill development, girls’ empowerment, environmental sustainability, and small-scale product entrepreneurship.

Objectives of the Study

1. To understand the concept of paper waste.
2. To identify different sources of paper waste.
3. To study the need for recycling paper waste.
4. To prepare useful products from wastepaper using paper-mache.

Challenges of Paper recycling

Despite the recyclable nature of paper, several challenges hinder effective paper recycling. One of the major problems is poor segregation of waste at source. Paper waste is often mixed with food waste, plastic, and other contaminants, which reduces its quality and makes recycling difficult (CPCB, 2016).

Another important challenge is contamination of paper waste. Paper that is stained with oil, food, or chemicals cannot be easily recycled. Such contamination lowers recycling efficiency and increases processing costs (World Bank, 2018).

Lack of public awareness is also a significant barrier. Many people are unaware of proper waste segregation practices and the importance of recycling paper. As a result, recyclable paper is often discarded along with general waste (UNEP, 2018).

In developing countries like India, inadequate recycling infrastructure and limited access to organized collection systems pose major challenges. Recycling activities largely depend on the informal sector, which often operates without proper safety measures and technological support (Kumar et al., 2017).

Additionally, economic constraints such as fluctuating market demand for recycled paper and high transportation costs discourage recycling initiatives. Low financial incentives further reduce participation by households and institutions.

Limitations of the study

- Paper waste can be recycled using only paper mache product like coaster, dup stand and keychain.

Previous studies

De Oliveira et al. (2023) reviewed the use of wastepaper as a resource in polymeric composites. The study shows that wastepaper from office paper, newspapers, and paper sludges is rich in cellulose and can be effectively reused as reinforcement or filler in polymer matrices such as polyethylene (PE), polypropylene (PP), and biodegradable polylactic acid (PLA). Based on a systematic review of 75 research papers published over the last 27 years, the authors identified a clear growth in interest and applications of wastepaper in composite materials. The review highlights that incorporating wastepaper improves mechanical properties while reducing environmental impacts by lowering reliance on virgin raw materials. However, the authors also point out research gaps, especially in life-cycle assessment and long-term sustainability evaluation of these composites.

Singh, Arora, and Gargava (2023) reviewed the trade and recycling policies related to wastepaper in India, focusing on environmental and institutional aspects. The study highlights that recycling paper significantly reduces energy consumption, water use, and greenhouse gas emissions compared to producing paper from virgin pulp. It examines existing policy frameworks, the role of municipalities, and the functioning of the wastepaper trade system in India. The authors identify major gaps in domestic wastepaper collection and recovery mechanisms and argue that stronger, better-organized systems are needed to improve recycling efficiency and sustainability. The review emphasizes the importance of policy support, infrastructure development, and stakeholder coordination to enhance paper waste management in India.

Yi, Liou, and Kuo (2022) studied the use of papermaking wastes—such as wastepaper sludge, wood chips, and ash—as eco-friendly cementitious slurry materials for construction purposes. Instead of limiting recycling to fiber recovery, the authors explored value-added applications in the building sector. Their findings showed that wastepaper sludge and wood chips significantly improved the physical and mechanical properties of the slurry. The study highlights that residues from papermaking processes can be effectively transformed into sustainable construction materials, reducing landfill disposal and supporting circular economy practices beyond traditional paper recycling.

The global review published in Waste Management (2016) analyzed paper recycling terminology and practices across different countries and research studies. The authors found significant inconsistencies in the definitions and classifications used for paper waste, recycling rates, and recovery processes. These differences make it difficult to compare data across regions and limit the reliability of global recycling statistics. The study highlights that the lack of unified terminology weakens research quality, policy evaluation, and international cooperation. The authors strongly recommend developing standardized terms and definitions in paper recycling research to improve data consistency, transparency, and effective decision-making worldwide.

Pivnenko, Eriksson, and Astrup (2015) analyzed the presence of chemical contaminants in wastepaper and their impact on recycling quality and environmental safety. Their review shows that wastepaper can contain up to 10,000 different chemical substances originating from inks, coatings, additives, and printing processes. Out of these, 51 substances were identified as “critical” due to their toxicity, persistence, and potential risk to human health and the environment. The study emphasizes that the value of wastepaper as a resource depends not only on its cellulose content but also on controlling these contaminants. The authors highlight the urgent need for better hazard screening, monitoring, and management strategies to ensure safe and high-quality paper recycling.

Methodology

Research designs

The present study adopted a descriptive experimental research design. Descriptive research was used to understand the concept, sources, and importance of paper waste recycling, while experimental research was carried out to develop paper-mâché products from wastepaper.

Selection of the place

Post Graduate Teaching Department of Home Science, Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur, Maharashtra.

Material used

The materials used for preparing paper-mâché included wastepaper, water, adhesive (Fevicol), Putty, mould, brushes, and natural colors for finishing.

Method

- Wastepaper was collected and cut into small pieces.



- The wastepaper was soaked in water for 24 hours.



- On the next day, the soaked paper was removed from water and allowed to dry.
- The dried paper was then grinding in Mixer Grinder until it became soft and cotton-like in texture.



- Fevicol and putty were added to the grind paper to prepare paper-mache paste.



- The prepared paste was placed into molds to form different products.
- Star-shaped and heart-shaped molds were used for making keychains.



- Flat moulds were used for making coasters and dhoop stands.
- The moulded products were kept for drying at room temperature.



- After drying, the products were rubbed smoothly for proper finishing.
- The products were then painted to improve their aesthetic appearance.



- Finally, keychain holders were attached to the keychains.



Results

The present study demonstrated that wastepaper can be effectively utilized to prepare useful and decorative products through the paper-mache technique. The preparation of keychains, coasters, and dhoop stands was successfully carried out using wastepaper, adhesive, and simple molds.

Table 1: Recycling Process Details

The recycling process required minimal resources, with negligible cost involvement, making it economically viable and environmentally sustainable.

Table 2: Products developed from recycled products

Product	Quantity Made	Durability	Estimated Cost (Rs.)
Key Chain	50	Good	20/-
Coaster	6 sets of four	Very good	150/-
Dhoop Batti Stand	20	Very Good	15/-

Product develops from recycled paper demonstrated satisfactory durability and aesthetic appeal indicating strong potential for small scale entrepreneurship and waste reduction. Recycled paper products were found to be significantly cost effective, reducing production cost by nearly 50-60 % compared to market alternatives.

The developed products were found to be lightweight, durable, and easy to handle after proper drying and finishing. The star-shaped and heart-shaped keychains were aesthetically appealing and suitable for regular use. The coasters and dhoop stands had sufficient strength and flatness for household utility. The activity also contributed to reduction of paper waste, which would otherwise be discarded. The process encouraged creative reuse and promoted awareness about treating waste as a valuable resource. The addition of color and finishing improved the aesthetic quality of the products, increasing their acceptability. Overall, the findings show that paper-mache is an effective, eco-friendly, and economical method for recycling paper waste and converting it into useful products.

Conclusion

It can be concluded that paper waste can be effectively utilized as a valuable resource through recycling and creative reuse methods. The preparation of paper-mâché products such as keychains, coasters, and dhoop stands demonstrated that wastepaper can be converted into useful, durable, and aesthetically pleasing items using simple and low-cost techniques. This practice helps in reducing paper waste, conserving natural resources, and minimizing environmental pollution. The findings highlight that paper-mache is an eco-friendly and economical method suitable for household and community-level applications. It also provides opportunities for skill development and small-scale income generation,

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