

Water Conservation in Block Printing: Sustainable Practices in Tradition Textile Printing.

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Abstract:

Block Printing is an Indian traditional textile printing method. It's a centuries-old art form of decorative handcraft. This printing method is especially used in the Rajasthan and Gujarat states in large quantities. However, this traditional printing method involves significant water conservation particularly in dying, pre-treatment and post-print finishes. In this era of growing environmental awareness and water shortages, eco-friendly practices in craft-based industries have become necessary. This research examines water usage in the block printing industry and explores the ways to reduce it through conservation methods. Through interviews with developers, field operations and case studies this research identifies the stages in block printing that use the most water and explore practical ways to reduce water consumption, including low water and waterless method. This research aims to define the substitute of water or explore the water conservation techniques in block printing without affecting the designs and quality of print.

Key Words:

Block Printing, Traditional, Eco-friendly, Bagru, Textile, Dying Method.

1. Introduction:

Background:

Indian traditional printing methods such as block printing have been an integral part of Indian heritage and rich culture. With origins tracing back centuries, it serves as a source of artistic expression and sustenance for thousands of artisans across the nation (Craft Revival Trust, 2015). This detailed and labour-intensive craft involves intricate designs using hand-carved wooden blocks and is widely practiced in Rajasthan, Gujarat, and Madhya Pradesh (Textiles Committee, n.d.).



Fig.01 Block Carving

Historically, block printing relied on natural dyes and abundant water resources. However, increased demand, synthetic chemicals, and mechanization have substantially escalated its environmental footprint (Centre for Science and Environment, 2012). Water consumption and pollution have become critical challenges in water-scarce regions like Rajasthan (ScienceDirect, 2023).

While block printing sustains livelihoods, its viability is under threat due to unsustainable water use (Passion Lilie, n.d.). As awareness of sustainability grows, it becomes crucial to reimagine traditional crafts with environmentally-conscious practices without compromising cultural authenticity (FabDivine, n.d.; Ahmed & Husain, 2020).

Importance of Study:

This study highlights the dual significance of preserving traditional crafts and promoting environmental sustainability. With water scarcity emerging as a global concern, water-intensive crafts like block printing require adaptation to efficient and sustainable methods (Centre for Science and Environment, 2012). Focusing on water conservation in block printing addresses a pressing ecological issue while supporting an age-old craft (Bagru Store, n.d.; Singh & Sharma, 2023). Adopting sustainable practices benefits artisan communities by lowering costs and meeting growing consumer demand for eco-friendly textiles (ResearchGate, 2022). Moreover, sustainable innovation bridges tradition with contemporary relevance, opening new opportunities in both domestic and international markets (Landolina, 2021). This research is therefore of value to designers, artisans, policymakers, and educators working at the intersection of sustainability and cultural heritage (Passion Lilie, n.d.).

Aim:

To explore water preservation methods in traditional block printing and point out sustainable practices that reduce environmental effects while preserving the craft's authenticity.

Research Objective

- To study the current status of water usage in traditional block printing methods.
- To point out the particular phase in block printing where excessive water is used.
- To identify and examine methods to reduce water consumption in the printing process.
- To analyse the possible substitute and replacement for water in block printing.
- To document existing sustainable and water-saving practices used by artisans or industrials.

2. Review of Literature:

1. Traditional Water Usage in Block Printing.

Craft Revival Trust (2015) reports that traditional block printing techniques like Bagru are highly water-intensive, particularly during washing, dyeing, and finishing processes, with an estimated 20–25 litres of water used per metre of fabric.

2. Environmental Impact of Excessive Water Use.

Centre for Science and Environment (2012) highlights the impact of untreated wastewater from textile dyeing on groundwater quality, exacerbating water pollution.

3. Sustainability Gaps and Potential.

Nanda et al. (2022) argue that despite the high environmental impact of craft-based industries, structured

interventions like water recycling and training can enable artisans to adopt sustainable practices without affecting quality.

4. Consumer and Market Trends.

Ahmed & Husain (2020) find that consumer demand for sustainable textiles is rising, and heritage crafts that adapt eco-friendly processes are more competitive in global markets. This suggests market incentives for sustainability in block printing.



Fig.02 Water Damage



Fig.03 Chemical uses with water



Fig.04 Wastage of water

3. **Research Methodology**

1. **Research Design**

This research follows an exploratory and descriptive design, combining qualitative interviews with artisans and unit owners and quantitative surveys with students and professionals.

2. **Study Area**

Bagru, near Jaipur in Rajasthan, was chosen for its prominence in natural dye-based block printing and its distinctive mud-resist (dabu) technique (Bagru Store, n.d.).

3. **Sampling Techniques**

Sampling method: deliberate sampling

Only those answerers who are actively working in the block printing industry and those who are currently part of textile designing.

Sampling Size:

5 Block printing artisans

2 block printing unit owners

6 students and freelancers in the block printing field.

4. **Data Collection**

Primary Data

- **Online interviews** with artisans and printing unit operators using a pre-designed interview guide.
- **Google Form-based questionnaire** shared with artisans, students and professionals who belong to textile designs.

Secondary Data

Research papers, articles, and government reports related to block printing, water conservation, and sustainable textile practices.

5. **Data Collection Tool**

To accurately gather relevant and correct information related to water conservation practices in the block printing method at bagru, this is a combination of qualitative and quantitative research. This tool helped in collecting practical knowledge from artisans and theoretical knowledge from students and professionals related to textile designs. This tool used were:

Interview Schedule

A semi-structured interview on online mode was designed to interact with local artisans of bagru and printing unit owners. The interview incorporates open-ended questions based on:

- Process of block printing.
- Water-consuming stages.
- Which challenges the industry faces in water management.
- Any sustainable method adopts (If any)

Questionnaire survey

This survey was taken online via Google form which is shared with students, freelancers, industry owners, and professionals which are belong to block printing units or the textile field. This questionnaire was designed especially for artisans who does know only language Hindi.

Few examples of questionnaire survey:

- आपके अनुसार, क्या ब्लॉक प्रिंटिंग की प्रक्रिया में बहुत अधिक पानी की आवश्यकता होती है?
- ब्लॉक प्रिंटिंग की किस प्रक्रिया में सबसे अधिक पानी की आवश्यकता होती है?
- क्या आपके अनुभव में ब्लॉक प्रिंटिंग से निकलने वाला पानी आसपास के जल स्रोतों को प्रदूषित करता है?
- क्या आपके संस्थान/कारखाने में पानी की खपत को कम करने के लिए कोई उपाय अपनाए गए हैं?
- क्या आपने किसी वैकल्पिक तकनीक के बारे में सुना है जो पानी की खपत को कम कर सके?

7. Data Analyse Techniques

Thematic Analysis for qualitative data responses was grouped under inspirations like as awareness, techniques used, cost barriers, and artisan beliefs.

Descriptive Statistics for quantitative data responses from surveys were analysed numerical count of water consumption.

8. Limitations of the study

- This study mainly focused on bagru area, so findings may not be broad-based to other printing zones like Kutch and Sanganer.
- Language barriers and hesitation I observed form artisans' sides to share technical details.
- Due to time restrictions and accessibility, only a small group of artisans, freelancers, students, and industry owners were included in this research.
- After getting details from artisans, most of the industry does not maintain a written record of water usage. As a result, exact data of water conservation in block printing could not be documented.

9. Ethical Practices During Study

In this study, all contributors were treated with respect and their assent were taken before collecting information. The purpose of this research was elaborated to the artisans, unit owners, freelancers, professionals, and students. They were assured that their response was kept private that their name would not be revealed and it would only be used for academic purposes.

Scope of the study

This study concentrated on exploring and understanding the methods and awareness of water usage in block printing method in bagru, a village near Jaipur Rajasthan, known for its heritage in natural dying and hand block printing. This research aims to inspect the environmental aspects of this craft, especially the usage, wastage, and management of water in different stages such as washing, dying, and finishing.

This research is limited to Bagru-based artisans and people who belong to the textile field. It searches for the document traditional as well as develop sustainable practices used by artisans and how these practices are influencing environment and economic outcomes. This study also covers areas of awareness between stakeholders about sustainable practices and government or NGO initiatives promoting water consumption in art.

This research does not point to evaluate the entire Indian block printing sector but instead narrows its focus to Bagru as a case study, due to its fame in natural dye-based techniques that are known to involve significant water usage. It covers qualitative insights through interviews and field observations, and quantitative opinions via structured surveys.

While the research connects associated topics such as environmental sustainability, heritage preservation, and socio-economic conditions of artisans, its central scope remains the identification and analysis of water conservation methods in both the traditional and contemporary block printing industry at Bagru.

Finding and Data Analyse

The discovery of this research is based on raw data collected through site visits, interviews with local artisans and printing unit owners in Bagru, and responses to structured surveys from individuals familiar with traditional block printing techniques. This part highlights key insights into the amount of water consumed in different stages of block printing, awareness levels about water consumption, and the extent to which sustainable practices are embraced in Bagru. Both qualitative observations and quantitative estimates have been used to assess the practical challenges faced by artisans and the current state of water management in traditional textile production. The following table presents a breakdown of estimated daily water usage during the printing process, based on on-site observations and information provided by practitioners.

Estimated daily water consumption Bagru block printing process

S. No	Printing Process Stage	Estimated Water Used per Day (Litres)	Purpose / Notes
1	Fabric Pre-Washing	200 L	To detach starch and dirt from cotton fabric
2	Dabu (Mud Resist) Application	150 L	Mixed with mud, gum, and water for resist
3	Indigo/Natural Dyeing	300 L	Requires dye vat and repeated dipping
4	Washing after Dyeing	250 L	For colour fixing and residue removal
5	Final Rinsing & Softening	100 L	To ensure fabric softness and final cleaning
	Total Estimated Water Use	1000 L per Day	For one artisan or small workshop setup

Let's understand the details of the table given above

The facts given in table provides the detailed breakdown of water usage across various stages of traditional block print process. It discloses that the most water intensive steps in natural dyeing (300 L) and washing (250 L) jointly accounting for more than half of the daily water conservation. These steps include repeated rinsing and dye soaking to ensure colour fixation and fabric softness, which explains their high-water request.

Pre-washing (200 litres) also plays a crucial role in removing impurities and preparing the fabric for dye absorption. The dabu print (mud-resist) process, which takes a mixture of mud, gum, and lime, absorb around 150 litres on daily basis, primarily for mixing and cleaning tools. Even the final rinsing and softening phase, though relatively minor in comparison, requires about 100 litres to achieve the desired fabric texture and finish.

Overall, the total estimated water conservation for one artisan or small unit stands at approximately 1000 litres per day. These findings emphasize the significant water dependency of each printing unit, especially when scaled across the dozens of active workshops in Bagru. The data also reflects the need for introducing more efficient water management systems, including water reuse, low-water dyeing techniques, and filtration solutions, to reduce environmental strain without compromising the quality of traditional craftsmanship.

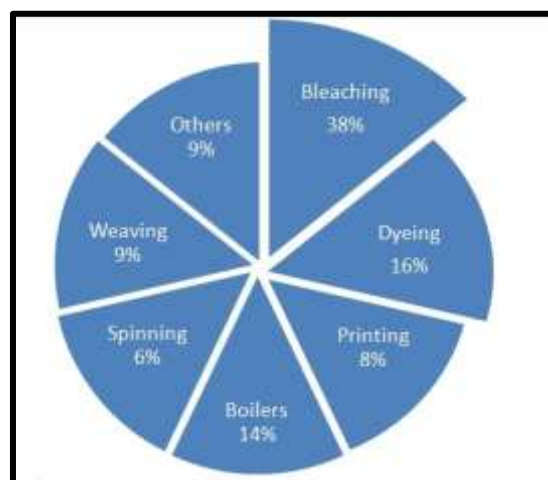


Fig.05 Water usage in Block Printing Process

Conclusion

The research spotted the crucial role that water plays in the traditional block printing industry of Bagru, Rajasthan a region known for its rich textile heritage, natural dye techniques, and artisan-driven processes like dabu (mud resist) printing. Along with interviews, field visits, and observations, it became evident that while the community is strongly rooted in preserving traditional practices, there exists a growing concern over the unsustainable levels of water consumption involved at various stages of production—especially in pre-washing, dyeing, and rinsing.

Most craftsmen continue to use old methods that require huge amount of water, with limited awareness or access to modern water-saving alternatives. However, a few innovative workshops, often supported by NGOs or government schemes, have started implementing sustainable practices like water recycling tanks, reduced-water dyeing, and rainwater harvesting systems. These efforts, though commendable, remain isolated and limited in reach.

To ensure the long-term sustainability of Bagru's block printing tradition, urgent interventions are needed. Adopting natural dyeing methods that require less water, training artisans in water-saving techniques, and installing affordable filtration and recycling units could significantly reduce the environmental footprint. In addition, local authorities and craft organizations must promote awareness programs to educate artisans about the impact of excessive water use and provide technical and financial support for sustainable infrastructure upgrades.

Replacing or modifying certain steps such as using *low-water immersion dyeing*, reusing rinse water, or switching to waterless resist-print alternatives (like oil-based pastes for certain styles) can also offer feasible alternatives without compromising the quality or cultural value of the craft.

In conclusion, this research not only highlighted on the high-water dependency in Bagru's block printing industry but also encourages meaningful discussion on how traditional crafts can adapt to sustainable practices while preserving their cultural and artistic integrity. With collective action and targeted solutions, Bagru can become a leading example of how heritage and environmental responsibility can coexist.

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