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From Looms to Sustainability: Textile Innovation in Malegaon and Yeola

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Abstract

This study focuses on sustainable textile innovation in two important small-scale textile clusters in Maharashtra i.e. Malegaon and Yeola. Both clusters have ancient weaving and cloth-processing cultures, but are exposed to modern pressures from environmental controls, market trends and supply-chain disruptions. Applying a mixed-methods research methodology combining field interviews, primary weaver and mill operator surveys and secondary review of data, the study charts prevailing sustainability practice, spotlights technological and social innovation and assesses hindrances and prospects for upscaling green solutions. Findings point to a patchwork of piecemeal innovations and community-initiated interventions which are balanced against constraints in finance, access to technology and market linkage. The article concludes with context-specific policy proposals for policymakers, business leaders and researchers to speed up a just and economically feasible shift towards sustainable textiles in Malegaon and Yeola.

Keywords: *Sustainability, Innovation*

Introduction

Textile manufacturing is one of India's longest-standing cottage and industrial pursuits. Agglomerations such as Malegaon and Yeola are concentrated economies in which localized supply chains, traditional expertise, and small and medium scale enterprises cohabit. These agglomerations have been historically based upon handloom and powerloom production but are now at a turning point. Global buyers and regulatory regimes require reduced ecological impacts, whereas domestic markets increasingly value traceability and ethical manufacturing. Malegaon, the hub of powerloom-based bulk production of shirting and home furnishings and Yeola, its traditional linkage to hand-woven saris and warp-based processing units, both reflect the challenge: how to maintain livelihoods and traditional techniques while minimizing water, energy and chemical footprints.

Textile sustainability is three-dimensional

- Environmental i.e. water consumption, effluent, energy, chemistry of dyes etc.
- Economic i.e. productivity, market access, livelihoods and
- Social i.e. conditions of work, gender equality, skills.

Innovations could be technological, managerial or market-oriented. This paper examines how innovations both new and old are evolving in Malegaon and Yeola, evaluating their scalability and effect.

Objectives

1. To record current sustainability practices and innovations in Malegaon and Yeola textile clusters.
2. To examine the drivers and limitations affecting the adoption of sustainable technologies and practices.
3. To assess the socio-economic effects of sustainability interventions on weavers, mill workers, and small entrepreneurs.
4. To provide workable suggestions to stakeholders for speeding up sustainable textile transformations specific to Malegaon and Yeola.

Research Methodology

This research employs the mixed-methods approach that uses both qualitative and quantitative methods:

- **Collection of primary data**:
  Semi-structured interviews with 25 stakeholders from the two clusters i.e. powerloom owners, small textile mill managers, master weavers, dye-house operators, cooperative leaders, and NGO representatives at local levels.

A short structured questionnaire was given to 120 respondents (60 at Malegaon, 60 at Yeola) for production practices, energy and water usage, waste management, and views regarding sustainable innovations.

- **Review of secondary data**:
  Review of government reports, industry association documents, academic literature on cluster development and textile sustainability in textile clusters.

Limitations:

1. This is an exploratory study at the cluster level and not an exhaustive census.
2. Seasonal fluctuations in production and informal activities may not be accurately captured.
3. Financial and proprietary limitations restricted access to comprehensive effluent quality reports at some units.

Review Of Literature

- **Sharma & Narula (2020),** surveyed 113 firm managers in Indian textile industry to identify drivers like market demand, regulatory pressure, economic incentives and obstacles like high up-front cost, lack of technology, skill gaps. They find that external pressures from regulatory and market are more significant drivers than internal managerial ones.
- **Ray & Sharma (2022),** look at garment industry clusters in NCR and how clusters are leveraging joint CSR and sustainability projects. They emphasis pooling resources, shared infrastructure, policy supports in scale etc.
- **Bapat et al. (2023),** discuss how smaller textile and manufacturing units are implementing greener manufacturing through energy efficiency, waste minimization, resource use etc. They show potential but also constraints in finance and scale.
- **Roy, Shukla & Laha (2024),** in *A Comprehensive Review on Indian Textile Heritage for Sustainability* review traditional techniques of handloom, natural dyes, block prints, etc. and how they contribute to cultural value and environmental sustainability; also note challenges like standardization, cost, market demand etc.

Data Collection And Analysis

Analysis Based on Survey:

- Awareness: 78% of the respondents indicated awareness of "sustainability" as a term; 44% connected it with conservation of water and energy specifically.
- Practices: 52% indicated utilization of at least one resource-saving practice (e.g., timed loom runs, partial recycling of process water, low-salt dye recipes). Only 18% indicated use of formal effluent treatment on-site.
- Ability to invest: 62% of small-unit owners identified restricted access to cheap finance as the principal obstacle to taking up more advanced sustainability technologies (e.g., new ETPs, solarization).
- Incentives from markets: Only 26% had reached higher-value markets for environmentally friendly products; the majority supplied price-conscious local or national customers.

Diagram 1: Analysis Based on Survey

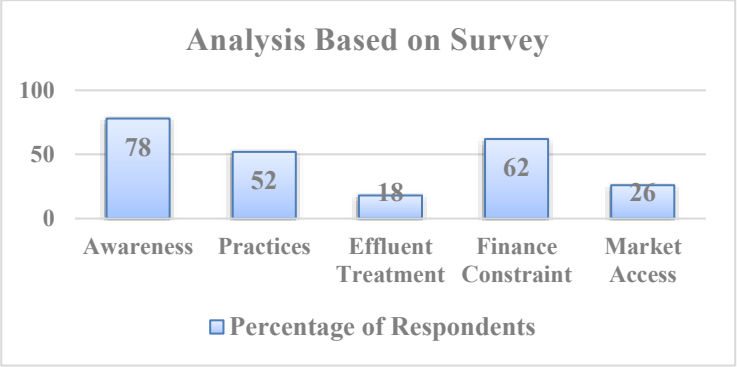
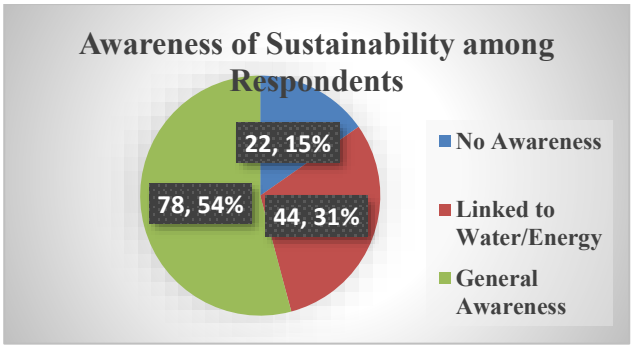


Diagram 2: Awareness of Sustainability among Respondents



Interview Insights:

- Incrementalism vs. drastic change: Most operators like to make small incremental changes e.g., maintenance and repair to minimize energy losses rather than invest large amounts of capital. Incremental changes are seen as less risky.
- Cluster cooperation potential: Some stakeholders showed a desire to enter into collective facilities e.g. shared ETP and shared solar but did not have a well-trusted governance mechanism.
- Indigenous knowledge as resource: Yeola's handloom clusters had reported indigenous dyeing and yarn-management methods that cut down on chemical use; but these are left untapped in large markets.
- NGOs and government schemes: Where NGOs offered technical support e.g., low-cost dyeing workshops, energy audits etc. take-up was greater. Subsidies were considered useful but bureaucratically limiting.

Field Observations

- Malegaon dye houses differed significantly in process control and cleanliness; some had basic sedimentation tanks, while others released untreated effluent. Yeola handloom sheds tended to have high standards of yarn conditioning that minimized rework and waste.

Findings

1. **Pockets of good practice with lack of uniform adoption:**
   There are areas of good practice in both clusters but no uniform adoption. Information gaps and financial constraints are key deterrents.
2. **Significant potential for resource efficiency opportunities:**
   Low-cost interventions like pump maintenance, tuning of looms, scheduling of processes, rainwater collection etc. can result in quantifiable energy and water savings without significant capital expenditure.
3. **Cluster-level solutions under investigated:**
   Shared facilities like CETPs, solar plants, centralized testing labs etc. provide economies of scale but require institutional design and trust-building.
4. **Gap in market linkage:**
   Failure to differentiate markets stifles investment in sustainable inputs. Producers are afraid costs cannot be recouped without guaranteed market premiums.
5. **Social and skill dimensions count:**
   Any change must encompass training and transition routes for workers; otherwise, productivity advances might not be given full expression in the form of enhanced livelihoods.

Suggestions:

For Cluster Stakeholders (weavers, mill owners, cooperatives):

- Install low-cost cleaner production first: programmed loom maintenance, drip system for water recycling, and multi-stage dye-bath practices to eliminate chemical load.
- Organize or consolidate producer cooperatives to share resources for shared infrastructure and negotiate improved prices with purchasers.

For Policymakers and Local Government:

- Provide accessible finance like low-interest loans, credit guarantees etc. specifically for small textile units to be used for sustainability improvements.
- Finance and subsidize pilot schemes for cluster-level renewable energy (solar rooftops) and CETPs with transparent governance terms and capacity-building provisions.

For NGOs and Technical Agencies:

- Offer modular technical package assistance: energy audits, best practices in the dye-house, and training curricula that are accessible to weavers and operators.
- Encourage pilot certification schemes (local eco-labels) that are in harmony with Malegaon and Yeola's product realities to develop market differentiation.

For Market Actors and Buyers

- Develop long-term purchase contracts or premium prices for sustainably produced lots to minimize market risk for producers.
- Invest in traceability and narratives emphasizing locality (Malegaon/Yeola), traditional skills, and sustainability enhancements to appeal to ethical consumers.

Area For Further Study

1. Researcher can undertake lifecycle assessment studies on Malegaon and Yeola products to estimate environmental gains from suggested interventions.
2. Study can be done to evaluate socio-economic implications of mechanization and sustainability adoption to frame fair transition plans.

Conclusion

Malegaon and Yeola are microcosms of India's wider textile sustainability dilemma where traditional and small-scale industry facing new environmental and market pressures. This research discovers that awareness of sustainability is present, but uneven adoption is influenced by finance, technical expertise, and market incentives.

Yet, there is substantial potential for significant improvement through incremental cleaner production, cluster-level collective infrastructure and mechanisms for market linkage.
A practical route for such clusters prioritizes as
(1) low-impact, affordable interventions to establish confidence and rapid gains;
(2) construction of trusted cooperative governance for common facilities; and
(3) cooperation with market actors able to underwrite the worth of sustainable production.

A sustainable and equitable transition will necessitate multi-stakeholder effort: policymakers to facilitate finance and infrastructure, NGOs and technical agencies to provide capacity-building, industry leaders to incubate scalable models, and buyers to remunerate enhanced practices. Through targeted interventions that honor local skills and livelihoods, Malegaon and Yeola can transition from conventional looms to sustainable looms for preserving heritage and responding to the needs of a greener textile economy.

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Conflicts of interest
The authors declare that there are no conflicts of interest regarding the publication of this paper.

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