

## **Indigenous Plant-Based Dyeing in Nagaland: Sustainability, Culture, and Socio-Economic Transitions**

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### **Abstract**

*India has an old history of eco-friendly textiles, which are synonymous with traditional plant-based dyeing methods. Traditional dyeing techniques are associated with tribal knowledge, traditional customs, and traditional ways of living in Nagaland, a highly diverse hill state located in northeastern India. Among the traditional customs of the Angami Naga, tribals of Nagaland, who are renowned for their checkered woollens, an element of love between natives, nature, and textiles can be highlighted. However, an increase can be observed recently because of market integration, as it has become a big challenge for traditional plant-based dyeing methods. Therefore, this study aims to address traditional plant-based dyeing methods in Nagaland with qualitative tools of secondary research methods, depending on policy documents, institutional documents, and recent literature published on this topic. The discussed argument emphasises that traditional methods of natural dyeing, though valuable in a natural sense, are socio-economically ignored phenomena, and this study will discuss ways of adapting eco-friendly textile technology with indigenous knowledge systems with a focus on cultural heritage, sustainability, and development.*

**Keywords:** *Indigenous knowledge, natural dyes, Nagaland, sustainable textiles, cultural economy, socio economic transitions.*

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### **Contextual Background**

Traditionally, natural dyes, obtained from plants, minerals, and organic elements, which are intrinsically linked to indigenous knowledge systems, have been a vital part of India's textile culture. The **Ao**, **Angami**, **Lotha**, **Sumi**, and **Konyak** are some of the various tribes in Nagaland that relate highly to traditional textiles in their cultural identity, social status, and ceremonial life. Plant-based dyes prepared with forest materials like leaves, bark, roots, and seeds have long been used in dyeing other locally sourced cotton fibres.

In the twentieth century, synthetic dyes prevailed and transformed textile production all over India, particularly in the Northeast. Synthetic dyes dominated because they offered certain advantages based on colour uniformity, speed, and low cost. However, according to (Elshemi et al., 2024), these colours are associated with health risks, environmental pollution, and the production of chemical waste. On the other hand, plant-based colours are **environmentally safe** and **biodegradable**; hence, they are much in tune with sustainable manufacturing methods.

The natural dyeing tradition, which is practised both at the rural and semi-urban levels of Nagaland, exists in the form of a community-based/manufacturing-based system of business. Such a phenomenon exists along with the trends of **intergenerational continuity** and increased **business needs**, as well as declining

aspirations at the urban levels. This study is intended to explore the sustainability as well as the socioeconomic effects of natural plant-based dyes used at the Nagaland level.

## **Indigenous Dyeing Knowledge and Textile Traditions**

A major proportion of women are involved in traditional textile and fabric making, which has been a vital aspect of tribal culture and society. A correlation exists between the practice of weaving and using such handicrafts that emphasise weaving and dyed yarns or threads, especially in making shawls that denote their status, identity, and stages. Natural dyes are obtained from *Strobilanthes cucia* and *Indigofera* species for blues and blacks; tree bark and leaves are used for browns and yellows; and roots and fruits are used for reds and earthen tones, respectively (Terron and Borthakur, 2012).

The process of dyeing involves the collection of material from plants in the surrounding forests. The collected material is then brought to a boil or fermented to get plant dye. The next part is fixation using ashes or plant tannins. Finally, material like yarn or clothing obtained is dyed. The process follows (Sutradhar et al., 2015). The use of natural and readily available resources follows these methods. Earlier, information was shared through oral methods.

However, though the artisans continue with their traditional technique of dyeing the fabric, some of the individuals have also tried experimenting with new combinations of colour schemes and designs, with the soaring success of their products in the metropolitan city. It is owing to a lack of access to the forest, by virtue of the absence of textual content and the lack of interest of the young generation, that this technique is slowly coming to an end.

## **Environmental Sustainability and Ecologically Relevant**

The environmental advantages of plant-based dyeing in Nagaland are immense. The non-toxicity and biodegradability of natural dyes also ensure that soil systems and water systems are not adversely affected by their wastes. The hilly terrain and the prevalence of forests around Nagaland make environmentally safe methods of agriculture especially necessary.

In this, reusing dye baths, using seasonal batches of plants, and using fewer resources to conserve water, along with minimising resource extraction, are major focuses. Unlike in industrial dyeing, where wastewater with heavy chemical concentration and more infrastructure is used, the indigenous method is done on a scale that maintains a delicate ecological balance (Arputharaja et al., 2016).

However, it must be understood that these practices are informal in nature, and the scope these practices embrace in comparison to the environmental impacts they can bring in can be considered noteworthy. It is not very common to see the environmental management structure in Nagaland, or the concept of urban sustainability, include traditional crafts as part of the list of green projects coming up in this region.

## **Livelihoods, Markets, and Cultural Economy**

The conventional plant-based dyeing techniques indeed provide an individual with an additional source of income. The making also creates many employment opportunities and maintains a family's economic order. It is also enormously empowering for women. The ultra-wealthy city-dwellers and travel-oriented consumers of **fair-trade** and **“green” products** are greatly raising the demand for this type of garment-making.

However, the artists do not receive very high amounts of profitability. Profitability is hard to obtain by artists due to the unpredictable nature of accessing the market, high labour costs, competition from the manufacture of artificial dyes, and the lack of pricing power. Most of the activities involved in weaving and dyeing can be characterised as informal.

Moreover, there is no branding or market linkages, as well as entrepreneurial information, to enable artists to increase their output and penetrate the high-value market. These challenges are analysed as a pointer to socio-economic development that is integrated with culture preservation.

## **Governance, Policy, and Development Context**

The environmental factors in which the Nagaland Handloom and Handicraft Industry operates are affected by both federal and state legislation. By opening the markets, as well as infrastructure and training facilities, the government, through the **Ministry of Textiles and the Ministry of Development of North Eastern Region (DoNER)**, tries to promote the handloom industry as well as handicrafts.

There are provisions for the development of craft clusters, exhibitions, and design with the help of the Department of Industries and Commerce and a number of such bodies under state governments. But such programs are more useful for product diversification and commercialisation, rather than environmental sustainability or traditional ways of dyeing.

The eco-friendly characteristics of the traditional methods of dyeing have not received special attention in the environmental regulations, which, in turn, focus primarily on the regulation of pollutants in industry. Similarly, the crafts do not appear in the plans of sustainable development and conservation of traditions and cultural heritage of regional urban planning.

## Schemes and Institutional Framework Supporting Traditional Dyeing

Scheme / Initiative	Implementing Authority	Key Objectives	Relevance to Plant-Based Dyeing & Traditional Textiles	Limitations
<b>National Handloom Development Programme (NHDP)</b>	Ministry of Textiles, Government of India	Promoting the handloom sector through financial, raw material, infrastructure, skill development, and marketing support	Provides essential institutional backing for handloom weavers whose work relies on natural dyeing; creates market access through expos and Pehchan Card benefits that artisans can use to access multiple schemes	<b>No explicit mandate for natural dyes</b> or sustainability outcomes; support tends to favour overall handloom productivity rather than eco-dyed niche products
<b>Small Cluster Development Programme (SCDP)</b> (under NHDP)	Ministry of Textiles & Directorate of Industries & Commerce, Nagaland	Support cluster-based growth, distribute looms and equipment, and strengthen community weaving units	Helps build collective capacities and shared infrastructure for artisans, including those using plant-based dyes, as cluster units get equipment and material support	Focus is on handloom capacity; <b>plant dyeing is not explicitly targeted</b>
<b>Samarth-Scheme for Capacity Building in Textile Sector</b>	Ministry of Textiles, Government of India	Provide free skill training across the textile value chain	Training under this scheme in Nagaland has included <b>dyeing sessions</b> to strengthen skills among handloom practitioners, potentially enhancing understanding of traditional plant dye techniques	Training tends to be general textile skill-focused rather than plant-dye specific, and often short-term
<b>Nagaland Handloom &amp; Handicrafts Development</b>	Government of Nagaland, Dept. of Industries & Commerce	Market access, raw material supply, product development, fairs & exhibitions	Operates <b>dyeing centres</b> that support sustainable dyeing of yarns/fabrics and integrates them into regional branding	As a state entity, <b>resources are limited</b> , and focus remains broader on handicrafts rather

<b>Corporation (NHHDC)</b>			(“Meraki Nagaland”), offering artisans stable venues for sale and design support	than only on eco-dye processes
<b>State Handloom Expos / HATHKARGHA MELA</b>	Directorate of Industries & Commerce, Govt. of Nagaland (funded via NHDP)	Showcase indigenous textiles & crafts	By giving artisans direct market access and visibility, including products dyed with local botanical colours, these expos strengthen demand signals for eco-friendly products	Short-term events don’t automatically lead to sustained income or post-expo support

### **Institutional and Policy Effectiveness in Sustaining Traditional Dyeing Practices**

The existing programmes will contribute to the promotion of conventional plant-based dyeing in Nagaland in an indirect manner. The skills, infrastructure, and access provided to the artists of the handloom sector, who work in natural dyeing, have already improved via the **National Handloom Development Programme**, the **Samarth Programme**, and the programmes undertaken by the government under the Nagaland Handloom and Handicrafts Development Corporation. The digital programme and the credit-linked programme enable the artists to work as better entrepreneurs; however, cluster development and expos help the artists achieve better exposure and cluster organisation. Nevertheless, these programmes have helped the artists of the handloom industry, not those engaged in the promotion of eco-dyeing. The revolutionary benefits of the conventional dyeing process of the Nagaland textile industry will not come to fruition due to the lack of programmes promoting the process of natural dye extraction.

### **Structural Inequalities and Knowledge Marginalisation**

Traditional plant-based dyeing practitioners in Nagaland face structural inequalities arising from the market dominance of industrial textiles and synthetic dyes. Large-scale producers benefit from economies of scale, **strong distribution networks**, and **institutional backing**, while indigenous artisans operate largely within informal systems with limited bargaining power.

Knowledge appropriation further exacerbates these inequalities. **Designers** and **commercial enterprises** often draw upon indigenous motifs and dyeing knowledge without adequate recognition or benefit-sharing mechanisms. The absence of legal instruments to protect traditional knowledge leaves communities vulnerable to exploitation. Additionally, artisans are under-represented in the development planning and policy-making processes. While commercial outcomes remain core to present programs, there is scarce involvement of the artisan in decision-making aspects relating to resource governance, sustainability, or conservation of culture. All this works against **long-term sustainability** in traditional dyeing methods, which increases marginalisation.

## Conclusion

Environmental knowledge, cultural continuity, and the subsistence livelihoods based upon indigenous knowledge systems feature in the traditional approaches and methods of dyeing that are used by the Nagas. Besides adding the dimension of the enhancement of the social identity of the Nagas, the traditional approaches and methods of dyeing possess the scope of the application of the '**environmentally friendly**' dimension of dyeing. However, the traditional craftspeople are faced with the challenge of the marginalization of the contribution of the traditional craftspeople in the domain of the craft and the economy as a whole due to the systemic injustice that has been faced by them as a result of the lack of institutional recognition concerning the introduction of the dimension of sustainability and culture over the desire to '**develop**' as well as '**commercialize**.' It is important to introduce the indigenous approaches of dyeing with the approaches and concepts of sustainable development.

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