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Integration of non-timber forest products and local culture in weaving practices and fabric motifs in Wajo District, Indonesia

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Abstract. *Nuraeni S, Sadapotto A, Ferlin, Prastiyo A. 2025. Integration of non-timber forest products and local culture in weaving practices and fabric motifs in Wajo District, Indonesia. Asian J For 9: 153-165.* Traditional woven fabrics are a cultural heritage that holds symbolic, social, and ecological values in Indonesian society. Wajo District in South Sulawesi, Indonesia, is renowned as one of the centers of traditional sarong and weaving, which strongly upholds local cultural values. However, modernisation of materials and changes in market preferences pose challenges to the sustainability of weaving practices and the utilisation of Non-Timber Forest Products (NTFPs). This study aims to examine the integration of NTFPs into the production process of sarongs and weavings, and to understand the cultural significance of the motifs and materials used in these products. This research was conducted from June to July 2023 in two main locations, Tosora Village in Majauleng Sub-district and Pakkana Village in Tanasitolo Sub-district, both located in Wajo District, South Sulawesi Province. The study population consisted of five silk shops and 29 traditional weavers who were actively involved in sarong production in both villages. The methods employed include literature studies, direct observation, and visual documentation of the traditional sarongs and weavings produced. The results show that 14 sarongs/weavings use natural silk (*Bombyx mori*), 13 use viscose, and three are made of polyester. The selection of these materials is influenced by social status, material availability, and cultural values. The motifs found reflect the philosophy of life of the Bugis people, such as social status, marriage, and the relationship between humans and nature. The study concludes that although traditional motifs remain visually preserved, the practice of natural dyeing using NTFPs has largely disappeared, with all weavers relying exclusively on synthetic dyes, indicating a significant loss of traditional ecological knowledge and a disconnection from local natural resources.

Keywords: Industry, local culture, NTFPs, silk fabric, traditional weaving

INTRODUCTION

Traditional weaving in Indonesia is rooted in the interconnectedness of nature and culture, with Non-Timber Forest Products (NTFPs) serving as both material inputs and cultural markers. Across the archipelago, weaving traditions have developed as expressions of ecological knowledge and social identity, where fibers, dyes, and motifs symbolize the relationship between humans and their environment (Millar and Kettle 2024). In areas such as Wajo District, South Sulawesi, the use of NTFPs, especially silk, which produces fibers, illustrates how environmental resources are embedded in cultural systems. These materials are not only ecologically sustainable but also reflect deeply held local values, historical memories, and local beliefs. Traditional weaving thus becomes a site of interaction between biodiversity conservation and cultural preservation.

In the face of increasing modernization, traditional craft practices that rely on NTFPs face pressures from the availability of synthetic alternatives, industrial production, and market-driven design preferences. These changes pose a dangerous threat to the ecological base from which artisans obtain their materials and marginalize the cultural knowledge systems transmitted through craft. Nevertheless, integrating NTFPs into contemporary weaving practices remains crucial for fostering environmentally sustainable livelihoods and ensuring cultural resilience (Mugari et al. 2024). Understanding how traditional weavers negotiate the balance between resource availability, economic needs, and cultural continuity offers valuable insights into adaptive strategies that align environmental management with heritage conservation.

Traditional woven fabrics in Indonesia carry multi-layered meanings that extend beyond their utilitarian functions (Parameswara et al. 2023). They embody symbolic, social, and ecological dimensions that are passed down from generation to generation through oral history, apprenticeship, and practice (Ding and Kolosnichenko 2024). Their motifs often contain moral teachings, reflect social hierarchies, and represent people's relationships with nature and the divine. In many areas, weaving is not simply a household activity but also a culturally embedded expression of identity, femininity, and social belonging (Gurung 2017). These cultural elements are particularly prominent in Wajo District, where traditional sarong weaving remains a vital part of both daily life and formal ceremonies.

Wajo District is historically known as one of the main weaving centers in South Sulawesi. Its reputation stems not only from the quality of its woven products but also from the preservation of traditional techniques, tools, and motifs that have been preserved for centuries (Mathory et al. 2022). The Bugis people in Wajo have long upheld a complex philosophy reflected in their weaving, where each

motif holds a special meaning related to ancestral knowledge, social aspirations, and harmony with nature. However, despite this rich heritage, the weaving tradition faces significant challenges (Sadapotto et al. 2024). The spread of industrial textiles, shifting fashion trends, and reduced access to traditional materials have all contributed to the erosion of the indigenous knowledge systems that support the use of NTFPs (Pagán et al. 2020).

The role of NTFPs in weaving practices needs to be re-evaluated not only from a material perspective but also from a cultural and ecological perspective. Natural silk from *Bombyx mori*, for example, is not just a textile material but also a product of a specific ecological process involving mulberry cultivation and silkworm care, both of which are knowledge systems related to land use and seasonal rhythms. This study aims to investigate the integration of NTFPs into weaving practices and their contribution to the cultural significance of motifs and materials within the sarong weaving community in Wajo District. This study examines how weavers balance the tension between tradition and innovation in their material selection and design, and how cultural values are maintained or transformed in response to shifting social and environmental conditions. Through this approach, this research contributes to a deeper understanding of how local ecological resources and cultural values are interrelated in maintaining traditional craft practices and community identity.

MATERIALS AND METHODS

Research location

This research was conducted from June to July 2023 in two central locations, Tosora Village (Majauleng Sub-district) and Pakkana Village (Tanasitolo Sub-district), both situated in Wajo District, South Sulawesi Province, Indonesia (Figure 1). These villages were selected not only for their historical significance in traditional weaving and sericulture but also for their active engagement in these practices to this day. The local population in both villages consists predominantly of women who work as traditional silk weavers, while the men are mostly engaged in farming, livestock raising, or labor work. Approximately 93% of the weavers are housewives, and weaving remains a vital economic activity, often performed for 5-8 hours daily, producing 2-5 pieces of silk fabric per month, depending on the complexity of the motif. A significant portion of the households (about 50%) have been involved in weaving for 1-5 years, with another 20% engaged in it for over a decade.

Although weaving provides financial support, it is often supplemented by secondary occupations such as small-scale trading or livestock keeping. The community's involvement in NTFPs, such as natural dyes and mulberry for silkworm rearing, remains limited due to practical challenges. The majority of respondents (100%) still rely on synthetic dyes, citing reasons such as the lengthy processing time, difficulty in accessing natural dye sources, and limited availability. Around 70% of respondents reported that accessing NTFPs was difficult, and 60% noted a noticeable decline in the availability of NTFPs. Furthermore, 80% acknowledged the loss of traditional knowledge related to the preparation of natural dyes. Environmental challenges, such as unpredictable rainfall patterns and climate shifts, were also cited.

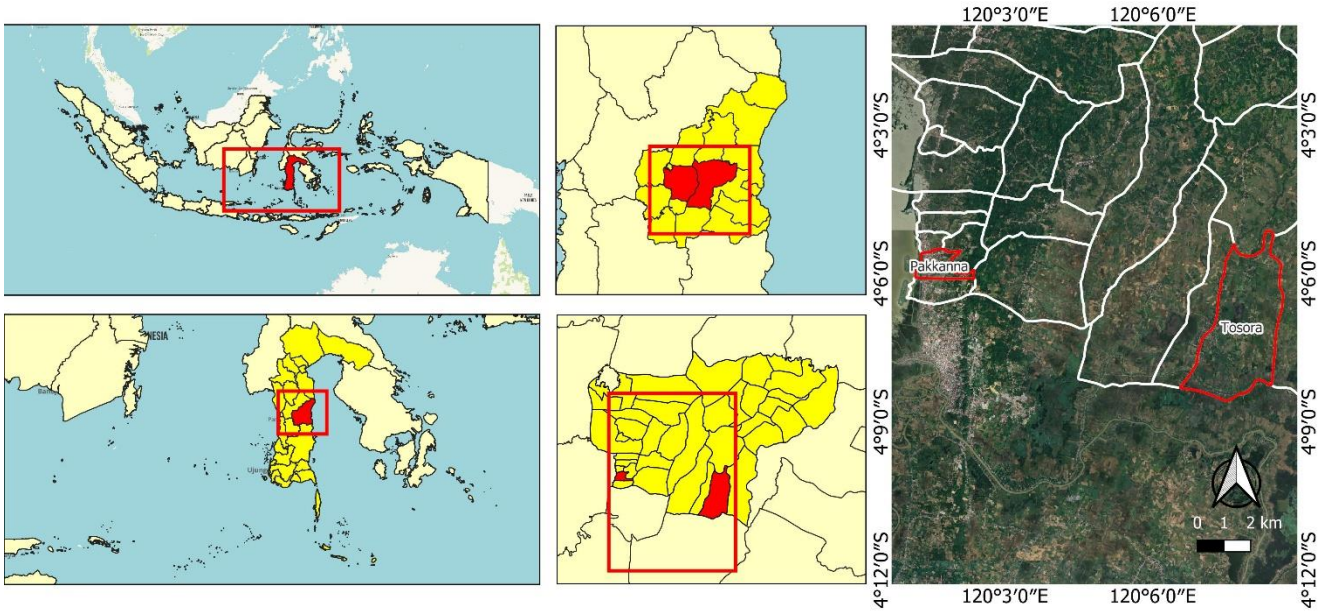

Figure 1. Map of silk center research locations in Wajo District, South Sulawesi, Indonesia

Despite these obstacles, some community members (notably 20%) continue to cultivate mulberry plants and practice sericulture, although youth participation is minimal due to perceived difficulties and a lack of interest. Only 7% of young people are involved in weaving activities, with most perceiving it as monotonous or time-consuming. Overall, while traditional knowledge and NTFP use persist, they are under significant threat from modernization, declining youth engagement, and environmental pressures, making Wajo District a critical area for research on the sustainable integration of NTFPs in cultural and economic practices.

Data collection procedures

This study used a qualitative descriptive design. Primary data were obtained through two main techniques: (i) Direct observation, and (ii) In-depth semi-structured interviews. Observations were conducted at the weaving site to document the production process, equipment used, material preparation, and motif design practices. These observations were guided by a checklist that included elements such as the type of loom, yarn processing, dye use, and weaving patterns. Semi-structured interviews were conducted with selected informants, including five silk sarong entrepreneurs and 29 active weavers from two villages.

Semi-structured interviews included a combination of open-ended and closed-ended questions to gather qualitative insights and categorical responses. Examples of closed-ended primary questions used in the interviews included: (i) Do you incorporate traditional cultural symbols in your textile motifs? (yes/no), (ii) Have you received formal training in weaving techniques? (yes/no), (iii) Are you currently using natural dyes derived from NTFPs? (yes/no/not sure). This was followed by open-ended questions to explore the reasons and context behind their responses. Such as: (i) If yes, can you explain which symbols you use and what they mean? (ii) How did the training influence your weaving practices? All interviews were documented (with the consent of the participants) and transcribed for thematic analysis. This approach provided an in-depth understanding of the integration of NTFPs and cultural values in local silk production.

Data analysis

The collected data were analyzed using a qualitative descriptive approach, structured based on three main research themes: (i) Integration of NTFPs in sericulture, (ii) Traditional Wajo weaving practices, and (iii) Diversity of textile motifs in local Wajo culture, (iv) Weavers' knowledge in the use of natural dyes and NTFPs. To describe the level of knowledge quantitatively, the knowledge score can be calculated using the formula:

$$x = \frac{f \times r}{n}$$

Where x is the average score of one indicator, f is the number of respondents who answered "yes" to the indicator, r is the fixed score for a "yes" answer (in a dichotomous system, r = 1), and n is the total number of respondents. This formula is useful for determining the proportion of respondents who have certain knowledge of one indicator. The resulting x value is between 0 and 1, reflecting how many respondents understand the topic in the indicator. The formula for calculating the overall Knowledge Index (KI) of all indicators in the questionnaire:

$$\mathbf{KI} = \frac{\sum(x1 + x2 + \cdots xn)}{N}$$

Where KI is the total knowledge index, x1 to xn are the average scores of each knowledge indicator (the result of the first formula), and N is the number of knowledge indicators used in the survey. This formula provides an overview of the level of knowledge of respondents collectively on all aspects asked, with a value of 0 (don't know) and 1 (know). The knowledge index categories can be seen in Table 1.

Data reduction and categorization

Transcripts from interviews and field observations were organized into main thematic categories. Manual coding was conducted to classify data related to the use of NTFPs in silk cultivation (e.g., the availability of mulberry leaves and the use of local materials for silkworm cultivation), the transmission of traditional weaving knowledge, and the characteristics of motifs embedded in cultural narratives.

Thematic analysis

Recurring patterns and concepts were identified among respondents. For example, the use of synthetic dyes among all weavers was a consistent theme, indicating that no natural dyes or NTFPs were used in the dyeing process. Instead, NTFPs were referred to in relation to sericulture inputs, not textile processing. The meaning of cultural motifs and their relationship to local identity also emerged as prominent subthemes.

Descriptive frequency analysis

Responses to the closed-ended interview questions were summarized using frequency counts and percentages to support qualitative interpretations. Such as: (i) Do you use synthetic dyes in the weaving process? Yes (%), (ii) Are you currently using forest-derived materials (NTFPs) in your silk processing? Yes (%) and no (%).

Table 1. Knowledge index categories on natural dyes/Non-Timber Forest Products (NTFPs)

Index value	Knowledge level	Description
0.00-0.25	Very low (no knowledge)	No knowledge at all about natural dyes or Non-Timber Forest Products (NTFPs)
0.26-0.50	Low (passive knowledge)	Has only heard of or seen natural dyes/NTFPs, with no real understanding
0.51-0.75	Moderate (basic understanding)	Has some foundational knowledge, possibly from training or general awareness
0.76-1.00	High (active knowledge)	Has received training and can apply or explain the use of natural dyes/NTFPs

Triangulation for validation

Interview data were cross-verified through field observations and photo documentation to ensure reliability and accuracy. For example, the exclusive presence of synthetic dyes was confirmed through inspection of materials and discussions with weavers and shopkeepers. Although this study relied primarily on qualitative data, conversion of some responses into descriptive statistics (frequencies, percentages) was used to support thematic findings. This approach strengthened the rigor and transparency of the analysis but remained consistent with the qualitative nature of the study.

RESULTS AND DISCUSSION

Integration of NTFPs in sericulture

The natural silk industry in Wajo reflects a closely interconnected production chain, starting with moriculture, where mulberry leaves (*Morus alba*) are cultivated as the main food for silkworms. It continues with sericulture, where silkworms are raised in a controlled environment to produce quality cocoons. The harvested cocoons are then boiled, unraveled, and spun into raw silk thread, which is subsequently processed and woven into silk fabrics, such as sarongs (Figure 2). Developing creative silk motifs involves combining elements derived from local knowledge and the environment (Yang and Jung 2024).

The use of NTFPs in the silk weaving industry in Wajo District remains limited to independently managed mulberry plantations. The potential of other NTFPs, such as natural dyes, thread-strengthening materials, or packaging from natural fibers, has not been widely utilised in an integrated manner. Sustainable management of NTFPs can strengthen household economies, especially in areas with traditional craft practices (Derebe et al. 2023). Limited technical knowledge and minimal institutions make it difficult for innovation to develop. Strengthening community networks can encourage the collective utilisation of NTFPs (Meinhold and Darr 2019). A village-based system involving the processing, documentation, and promotion of NTFPs woven products is crucial, particularly given the growing global demand for natural products. The success of NTFPs integration is highly dependent on the quality of human resources and synergy between institutions (Sardeshpande and Shackleton 2019). The low involvement of the younger generation is a challenge in maintaining the sustainability of the weaving industry and preserving local culture. For this reason, active involvement is necessary through creative training, NTFP festivals, and business incubators grounded in local wisdom. Sustaining Wajo's weaving heritage requires coordinated efforts among governments, communities, and research institutions to build an inclusive NTFP-based ecosystem (Sheppard et al. 2020). Moriculture (Figure 3) and sericulture (Figure 4) must be maintained as local cultural heritage.

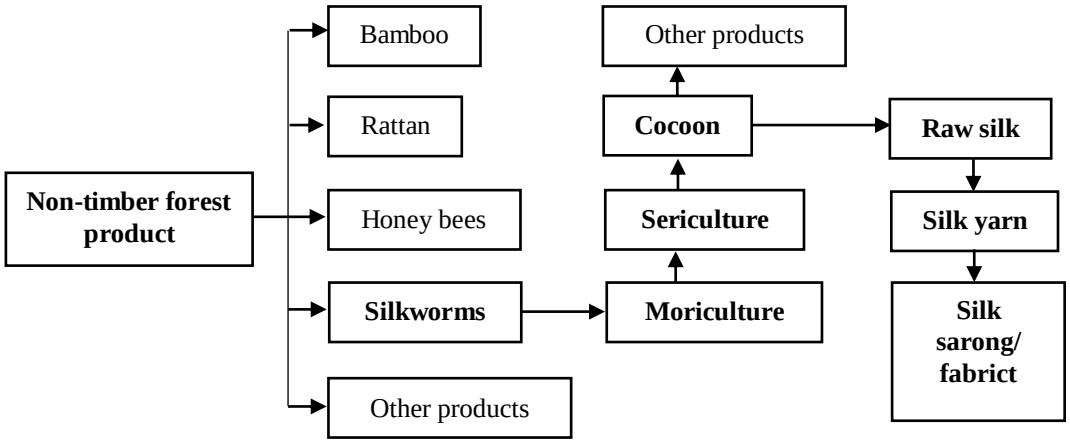

Figure 2. Natural silk is a non-timber forest product that has a chain of industrial activities

Figure 3. Moriculture practices in Wajo District, South Sulawesi, Indonesia

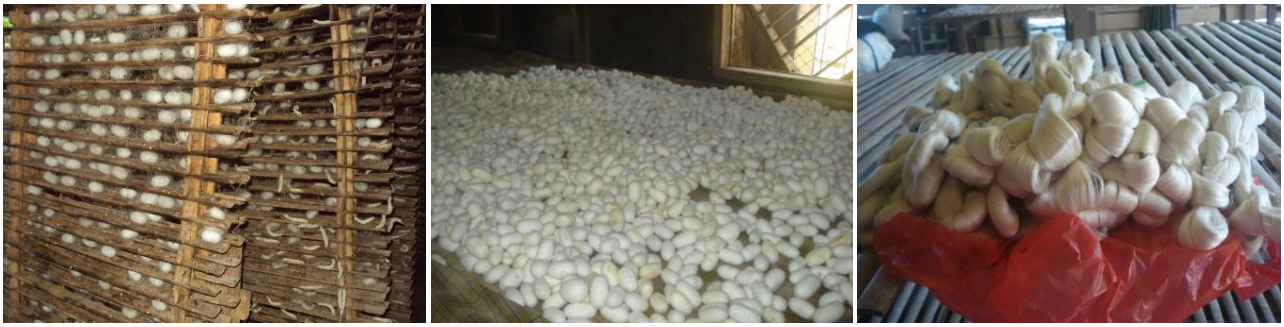

Figure 4. Sericulture practices in Wajo District, South Sulawesi, Indonesia

Silkworm farming in Wajo District remains a subsistence-based activity, primarily conducted individually by households. Since silkworm farming in Wajo is still conducted at the household level, improving efficiency and production capacity remains a challenge. Group-based management would provide more effective access to training, technology, and markets (Iacovone et al. 2022). The lack of technical support and structured training contributes to stagnation in silkworm farming practices, making them vulnerable to climate and disease pressures. Guidance on sanitation management and silkworm life cycle monitoring is necessary to prevent declines in cocoon productivity (Sujatha et al. 2024). As a result, it isn't easy to evaluate farming performance in a measurable way. On the other hand, feed availability still depends on backyard mulberry trees, which produce inconsistently due to factors such as plant age and seasonal conditions. The enormous economic potential of silkworm farming has not yet been tapped due to a lack of innovation and cross-sector collaboration. Partnering with research institutions or universities could be a starting point to introduce more efficient and adaptive farming practices. Technology transfer from academics to farmers has been demonstrated to enhance productivity in pilot programs (Vasavi et al. 2025). Developing educational demo plots based on NTFPs could serve as both an innovation hub and a tool for community empowerment. If this development is carried out consistently, Wajo's silk weaving industry can potentially become a success story of integrating NTFPs with local economic growth.

Traditional weaving practices of Wajo

In Wajo District, traditional Bugis weaving has been passed down through generations of women, who typically learn the craft from an early age (Sadapotto et al. 2025). Weaving in Indonesia is a traditional craft deeply rooted in daily life and a key expression of cultural and social identity, particularly during significant ceremonies (Wirsa et al. 2025). Wajo weaving employs two main looms, the *Gedogan* (backstrap loom) and *Alat Tenun Bukan Mesin-ATBM* (non-mechanical handloom), each requiring different techniques and influencing the resulting motifs and fabric quality. The choice of loom and weaving technique, from plain weave to songket, directly shapes the structure and aesthetics of Wajo fabrics (Figure 5).

Traditional weaving practices in Wajo involve distinct technical steps that have been passed down through generations. One key aspect is the use of traditional looms, such as the *Gedogan* and the *ATBM*. The *Gedogan* is a simple loom made from wood and back straps. It is typically used by women sitting cross-legged on the floor to manually weave fabric at home. The *ATBM*, although still manually operated and not powered by electricity, enables a greater production capacity. It has a vertical wooden structure that enables the weaver to work while seated on a bench. Both tools require thread as the primary material, consisting of warp threads, which are arranged vertically to form the structural base of the fabric, and weft threads, which are woven horizontally to create patterns and fill the fabric (Ibrahim and Nabil 2025). Weaving is more than just a technical skill; it's an art form. It reflects the rhythm of daily life and local wisdom, as each step is carried out with patience, precision, and symbolic meaning.

In the traditional weaving process in Wajo, two important preparation stages are known as *massau'* and *mappali*. *Massau'* is the step where warp threads are arranged and inserted into tools called *bulo-bulo* or *jakka*, which help keep the threads straight and evenly spaced based on the intended pattern. This step is important because any misalignment can ruin the structure and symmetry of the final design. After dyeing the threads with natural or synthetic colors, the weft threads go through *mappali*, a process of rewinding the thread onto small wooden or bamboo spindles called *bulo-bulo*. This makes it easier to insert the thread into the loom (Jones et al. 2025). The mappali process prepares weft threads by rewinding them smoothly onto spindles, making them ready for easy insertion into the loom. Both of these steps demonstrate the importance of careful preparation and technical skill in weaving. The weaver's accuracy and experience play a big role in producing high-quality fabric. Wajo's weaving traditions encompass precise technical steps that demonstrate both inherited craftsmanship and deep cultural insight. Weaving is typically done by women, who often learn the skill from their mothers or grandmothers as part of their artistic and vocational education (Nuque 2025). However, fewer young people are interested in weaving today due to the influence of city life and shifting values. To keep the tradition alive, we need training programs, cultural festivals, and efforts to revive local traditions (Rahma et al. 2025). Innovations have also emerged, such

as combining traditional motifs with modern designs to cater to the current market (Wahyuni 2025) and utilizing digital tools for promotion (Socawangi et al. 2025). Preserving Wajo weaving requires cross-sector collaboration. Support from the government, schools, and local communities is crucial in encouraging new generations and promoting the development of weaving-based businesses. It's also helpful to incorporate local culture into school lessons, teach design skills, and protect traditional designs through legal rights (Utama and Rahayu 2025). By honoring cultural values, utilizing natural resources wisely, and remaining open to new ideas, Wajo weaving can evolve into a robust and meaningful cultural tradition.

Diversity of textile motifs in Wajo's local culture

Wajo's silk motifs visually encapsulate the region's cultural values, local stories, and historical richness. This causes the cultural potential contained in the motifs to be less explored and difficult to pass on to future generations consistently. Visual and narrative documentation of local motifs is crucial for supporting efforts to preserve and develop culture-based product designs (Gumulya et al. 2023).

Motif of silk thread

Silk material is derived from threads woven from silkworm cocoons. High-quality silk has become a weaving icon, renowned for its beauty and smoothness, which gives it a luxurious impression. Silk weaving motifs, crafted using genuine silk thread, are showcased in Table 2.

The diversity of silk weaving motifs in Wajo District shows a close relationship between visual forms and local cultural values passed down from generation to generation. The *Balo Renni* motif, which combines geometric shapes in the form of small squares with flowers at their center, reflects the harmony between order and natural beauty. In Bugis culture, flowers are often associated with fertility, eternity, and hope for a bright future, while squares symbolise the order and discipline of agrarian life. The presence of floral elements within geometric patterns reveals a combination of aesthetic and symbolic values in the lives of the Wajo people (Busrah et al. 2023). The *Bulu Merak* motif, which depicts peacock feathers in a naturalistic manner, symbolizes social status and beauty. In the Bugis tradition, peacocks are often associated with luxury and grandeur because of their striking and symmetrical feathers. This indicates that the wearer of the peacock feather motif seeks to convey dignity and elegance, or, as part of a meaningful ceremony, emphasizes social status aspects (Brinkgreve and Leijfeldt 2017). Using fauna motifs in this detailed form shows the weaver's ability to transform natural symbols into meaningful weaving.

The *Balo Cacak Wali* motif, in its single version and combined with *Bombang*, features interlocking pyramids and triangles. This form embodies the philosophy of balance between the upper and lower worlds, as well as the continuity of life. This motif is typical in Bugis-Makassar culture, which values social hierarchy and neat social structures (Syamsidah 2019). This motif is often used in symbolic contexts to depict intergenerational relationships and community stability. The unification of the *Bombang* (ocean wave) form adds spiritual meaning because the sea links the human and ancestral worlds. Meanwhile, the *Kotak-Kotak*, *Corak Lebba*, and *Jijjiri* motifs show a variety of complex geometric shapes with touches of crystals and bold lines. These motifs depict the architectural aesthetics and traditional Bugis spatial arrangements, including stilt houses and stone arrangements in rituals. The crystals in the motifs can be interpreted as a representation of light or spiritual enlightenment. In Wajo society, the emphasis on geometric shapes reflects an appreciation for order and harmonious social structures (Akil et al. 2022). Other floral motifs, such as *Bunga Caggellung*, *Bunga Caramming*, *Bunga Domeng*, and *Bunga* in general, depict a variety of local plants that are symbols of fertility, beauty, and the preservation of nature. The complete representation of flowers with leaves or fruit signifies the close relationship between Bugis women and nature, which serves as a source of life and nurturing. Floral patterned fabrics are often used in celebrations or as a symbol of hope and happiness, emphasizing the role of women in preserving culture through weaving (Ranathunga et al. 2024). Visually, the diversity of silk fabric motifs is evident in Figure 6.

Table 2. Diversity of motifs using silk thread

Motif name	Motif type	Coloring	Fabric type	Size (cm)	Loom name
Balo Renni	Geometric and Naturalist	Synthetic	Sarong	120×250	*Gedogan*
Bulu Merak	Naturalist	Synthetic	Weaving	100×100	*ATBM*
Balo Cacak Wali and *Bombang*	Geometric	Synthetic	Weaving	100×100	*ATBM*
Balo Cacak Wali	Geometric	Synthetic	Weaving	100×100	*ATBM*
Bunga Caggellung	Naturalist	Synthetic	Sarong	120×250	*ATBM*
Bunga Caramming	Naturalist	Synthetic	Sarong	120×250	*ATBM*
Bunga Domeng	Geometric and Naturalist	Synthetic	Sarong	120×250	*ATBM*
Bunga	Naturalist	Synthetic	Sarong	100×100	*ATBM*
Balo Cobok	Geometric	Synthetic	Weaving	100×100	*ATBM*
Balo Mesa	Geometric	Synthetic	Sarong	120×250	*Gedogan*
Kotak-Kotak	Geometric	Synthetic	Sarong	120×250	*Gedogan*
Jijjiri	Geometric	Synthetic	Sarong	120×250	*Gedogan*
Candi Sitongko	Geometric	Synthetic	Sarong	120×250	*Gedogan*
Corak Lebba	Geometric	Synthetic	Sarong	120×250	*Gedogan*

Motif of viscose thread

Viscose material is absorbent and has a soft texture, but it wrinkles easily. Silk-woven motifs made with viscose thread are shown in Table 3. The *Cantik Manis* motif embodies neat and orderly beauty, characterized by its vertical lines, hexagonal shapes, and crisscross patterns. In Bugis-Makassar culture, this motif is often interpreted as a symbol of comfort and harmony in life. Hexagons in traditional weaving can reflect social order and interconnected community structures, while vertical lines symbolise growth and continuity between generations (Pandey 2024). Combining these elements shows local values that uphold social order and structured beauty in everyday life. The *Bori' Kaca Sitongkok* and *Kepala Subhanallah* motifs blend geometric and naturalistic elements, such as vertical straight lines and floral motifs. In Bugis culture, flowers are often interpreted as symbols of beauty and fertility. At the same time, vertical lines are seen as representing spiritual power or a vertical relationship between humans and the creator (Mawardi 2025). The name *"Subhanallah"* explicitly reflects the religious influence of Islam, which has been long assimilated into the culture of the South Sulawesi community. Therefore, these two motifs represent a blend of aesthetic values and spirituality in the lives of local people.

Table 3. Diversity of motifs using viscose thread

Motif name	Motif type	Coloring	Fabric type	Size (cm)	Loom name
Cantik Manis	Geometric	Synthetic	Sarong	120×250	*Gedogan*
Bori' Kaca Sitongkok	Geometric and Naturalist	Synthetic	Sarong	120×250	*Gedogan*
Balo Mallo'bang	Geometric	Synthetic	Sarong	120×250	*Gedogan*
Bunga Lagosi	Naturalist	Synthetic	Sarong	120×250	*Gedogan*
Kepala Subhanallah	Geometric and Naturalist	Synthetic	Sarong	120×250	*Gedogan*
Merak	Naturalist	Synthetic	Weaving	100×100	*ATBM*
Bunga Gerangkang	Geometric and Naturalist	Synthetic	Sarong	120×250	*Gedogan*
Balo Kristal	Geometric	Synthetic	Sarong	120×250	*Gedogan*
Balo Tettong	Geometric	Synthetic	Sarong	120×250	*Gedogan*
Golo-Golo	Geometric and Naturalist	Synthetic	Sarong	120×250	*Gedogan*
Jijjiri	Geometric	Synthetic	Sarong	120×250	*Gedogan*
Candi Sitongkok	Geometric	Synthetic	Sarong	120×250	*Gedogan*
Pucuk	Naturalist	Synthetic	Sarong	120×250	*Gedogan*

Figure 5. A. *Gedogan*, B. *ATBM*, C. Weft thread, D. Warp thread, E. *Massau'* (winding tool), F. *Mappali* (thread joining process)

Figure 6. Diversity of silk fabric motifs. A. *Balo Renni*, B. *Bulu Merak*, C. *Balo Cacak Wali* and *Bombang*, D. *Balo Cacak Wali*, E. *Bunga Caggellung*, F. *Bunga Caramming*, G. *Bunga Domeng*, H. *Bunga*, I. *Balo Cobok*, J. *Balo Mesa*, K. *Kotak-Kotak*, L. *Jijjiri*, M. *Candi Sitongko*, N. *Corak Lebba*

The *Merak* and *Bunga Lagosi* motif is a naturalistic type that displays animal forms (peacocks) and flora (complete with leaves and flowers). In Bugis culture, the peacock symbolizes elegance and splendor, often associated with high social status or respect in traditional ceremonies (Wolf-Gould et al. 2025). Meanwhile, the flowers and leaves in the *Lagosi* flower motif demonstrate the local people's closeness to nature and their respect for the cycle of life. The representation of flora and fauna in this weaving also reflects ecological practices and the philosophy of harmony with nature that is embedded in traditional culture. Motifs such as *Candi Sitongkok*, *Balo Kristal*, and *Golo-Golo* display complex geometric shapes, including equilateral triangles, crystals, and hexagons, combined with symbols of tips and vertical lines. For example, the triangle in the *Candi Sitongkok* motif resembles the shape of a traditional house's roof structure or even a sacred building, reflecting spiritual elements and protection. Meanwhile, the crystals and shoots in various motifs depict ideals and hopes for a bright future (Zhao 2023). These elements show the close relationship between weaving and traditional architecture, local cosmology, and the social aspirations of the Bugis people. The diversity of viscose fabric motifs is evident in Figure 7.

Table 4. Diversity of motifs using polyester thread

Motif name	Motif type	Coloring	Fabric type	Size (cm)	Loom name
Remo-Remo	Geometric	Synthetic	Sarong	120×250	*ATBM*
Pucuk Barong	Naturalist	Synthetic	Sarong	120×250	*ATBM*
Pucuk Rebbung	Naturalist	Synthetic	Sarong	120×250	*ATBM*

Figure 7. Diversity of viscose fabric motifs. A. *Cantik Manis*, B. *Bori' Kaca Sitongkok*, C. *Balo Mallo'bang*, D. *Bunga Lagosi*, E. *Kepala Subhanallah*, F. *Merak*, G. *Bunga Gerangkang*, H. *Balo Kristal*, I. *Balo Tettong*, J. *Golo-Golo*, K. *Jijjiri*, L. *Candi Sitongkok*, M. *Pucuk*

Motif of polyester thread

Polyester is a durable, synthetic material that is wrinkle-resistant, but it does not absorb sweat and can be quite rough. This thread has strong and elastic properties. Silk-woven motifs, created using polyester thread, are illustrated in Table 4. The *Remo-Remo* motif, represented by straight vertical lines, reflects a simple geometric pattern but holds significant meaning in local culture. In the context of Bugis-Makassar culture in South Sulawesi, vertical lines are often interpreted as a symbol of steadfastness, stability,

and a directed life journey. This motif is generally used on men's sarongs as a representation of the values of masculinity and determination. Meanwhile, its use of sarongs with *ATBM* demonstrates the adaptation of traditional weaving technology to meet the needs of modern production without compromising the cultural aesthetic elements. The symbolism of vertical lines is also related to the values of honesty and upright life principles, a reflection of the philosophy of life of the Bugis people, who are known to uphold *siri'* (self-respect and social solidarity). Meanwhile, the *Pucuk Barong* and *Pucuk Rebbung* motifs feature naturalistic forms with decorations that resemble plant shoots pointing upwards. The larger *Pucuk Barong* motif, decorated with flowers, symbolizes growth, hope, and prosperity, which align with the agrarian values of local communities that depend on agricultural products. Meanwhile, the *Pucuk Rebbung* motif, which resembles bamboo shoots, embodies the meanings of flexibility, durability, and social unity important characteristics in the social structure of the Bugis community. These two motifs reflect the close relationship between nature and culture, as well as how nature serves as a source of inspiration in the development of the visual identity of locally woven fabrics. Applying this naturalistic form in sarong fabrics with synthetic threads also signifies the integration of traditional aesthetics with modern materials while maintaining its philosophical meaning. The polyester fabric motif is visually apparent in Figure 8.

Most knowledge about Wajo woven motifs is passed down orally from one generation to the next within the family or weaving community (Ferlin 2023). Unfortunately, because it is not documented in writing, information about the motifs' names, meanings, and history is very vulnerable to being lost or changed. This is a serious challenge because the rich cultural narrative can be lost, especially when senior weavers or traditional elders can no longer share it. As a result, motifs that were once full of meaning can lose their original context and become mere visual ornaments. On the other hand, the absence of a standardisation system from the community, government, or cultural institutions causes difficulties in preserving and protecting motifs. When there is no clear identification system, local motifs are at risk of being imitated or exploited by outsiders without the permission or involvement of indigenous communities. Standardisation is crucial for maintaining the authenticity of motifs and serves as a basis for legal protection and promotion in the global market. Additionally, the absence of visual and narrative references makes it challenging for young designers to create new motifs that remain grounded in local culture. The development of a catalog of motifs, both digital and physical, that records names, meanings, histories, and visual patterns will significantly help the growth of the creative industry and cultural education.

The results of the study indicate that the sustainability of weaving practices in Wajo District is highly dependent on the synergistic relationship between natural resources (especially NTFPs such as silk cocoons), local wisdom manifested in a variety of meaningful motifs, and community adaptation to changes in materials and market tastes. The existence of 14 silk sarongs and weavings illustrates efforts to preserve tradition and cultural status. In comparison, the 13 viscose sarongs and weavings, along with three polyesters, reflect the economic realities and local innovations that have enabled the maintenance of production continuity. The sarong motifs studied are not merely visual ornaments, but a reflection of the values in the lives of Bugis people, ranging from social meaning and spirituality to the philosophy of human relations with nature. This finding confirms that preserving the weaving industry is sufficient from an economic perspective and demands a bias towards NTFPs conservation, transmission of cultural values, and empowerment of the weaving community as the leading actors in inheriting tradition. Therefore, policy interventions and the development of a creative economy based on NTFPs must be integrated to ensure that weaving practices in Wajo remain alive, adaptive, and sustainable amidst the challenges of the timesthe challenges of the times.

Weavers' knowledge of the use of natural dyes and NTFPs

Descriptive statistical analysis (Table 5) was conducted to assess the knowledge and practices of weavers regarding the use of synthetic dyes and their understanding of natural dyes derived from NTFPs. The data are presented in the form of frequency, percentage, cumulative frequency, and knowledge scores to identify the level of respondent engagement with natural dyes.

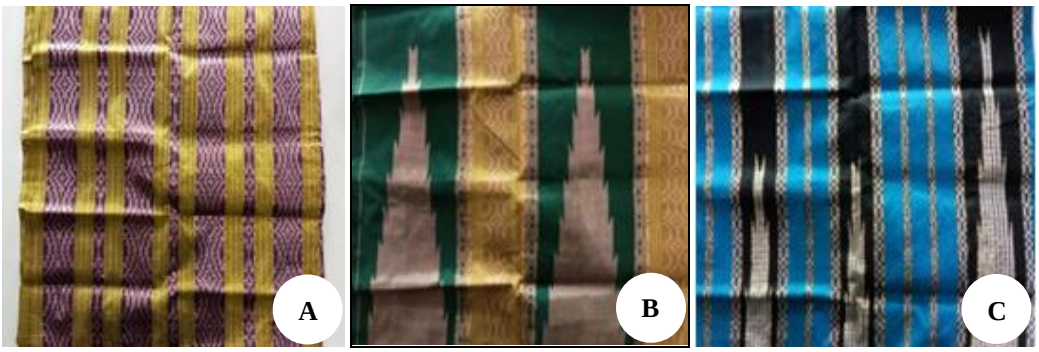

Figure 8. Diversity of polyester fabric motifs. A. *Remo-Remo*, B. *Pucuk Barong*, C. *Pucuk Rebbung*

Table 5. Knowledge index on natural dyes and NTFPs

Knowledge indicator	Frequency (f)	Percentage (%)	Score (Yes = 1, No = 0)	$\bar{x}$ (proportion)
Knows that parts of plants (leaves, flowers, twigs) can be used to print fabric motifs	19	65.51	1	0.66
Knows that natural dyes are more environmentally friendly and safer for health	5	17.24	1	0.17
Understands that using natural dyes supports the conservation of forest resources (such as NTFPs)	12	41.38	1	0.41
Has seen or is aware of the process of making or applying natural dyes	14	48.28	1	0.48
Understands that natural dyes have cultural value or are used in traditional weaving practices	3	10.34	1	0.10
Has received training or information from institutions on natural dyes or NTFPs	2	6.90	1	0.07
Able to explain or apply the use of natural dye materials	1	3.45	1	0.03
Total				1.97
Knowledge Index (KI)				0.27
Knowledge Level			Low (passive knowledge)	

The results analysis of 29 weavers in Wajo District indicates a generally low level of knowledge regarding natural dyes and NTFPs. While 65.51% of respondents knew that parts of plants (such as leaves, flowers, or twigs) can be used to print fabric motifs, only 41.38% understood the role of natural dyes in forest conservation, and 48.28% had seen or were aware of the dyeing process. Awareness of the health and environmental benefits of natural dyes was reported by just 17.24%, and cultural understanding was even lower at 10.34%. Only 6.90% had received training or institutional information, and a mere 3.45% were able to explain or apply natural dyeing techniques. The overall knowledge index (KI) was 0.27, placing respondents in the low (passive knowledge) category. These results highlight a limited level of understanding and insufficient awareness of natural dyes, signaling a gap between ecological knowledge with current weaving contexts, and emphasizing the need for greater institutional support and knowledge transfer.

Synthetic dyes are sourced from the market and are considered more practical, affordable, and easier to apply, making them the preferred choice in weaving production. The absence of traditional natural dye sources such as noni (*Morinda citrifolia*), indigo (*Indigofera tinctoria*), or sappanwood (*Caesalpinia sappan*) reflects a break between contemporary weaving practices and the biological resources that once played a vital role in traditional textile culture. This shift underscores the complete transition from nature-based to industrial dyeing systems. Modernization and the increased accessibility of synthetic materials have led to a decline in the use of natural dyes in weaving centers (Rasmussen et al. 2017; Nugroho et al. 2022). This transition is not solely due to technical convenience. Still, it is also driven by the loss of local dye plant supplies resulting from habitat degradation and the lack of cultivation efforts. This indicates a significant erosion of Traditional Ecological Knowledge (TEK), which is essential for maintaining the sustainability of locally based weaving practices. Once passed down through generations, this knowledge is no longer being taught, indicating a break in intergenerational transmission that has occurred over the last two to three generations. The situation is further worsened by the lack of policy interventions and institutional support in training or revitalizing NTFPs as a dye source. In the context of Indonesian local cultures, the loss of TEK not only undermines the foundations of sustainable production but also distances communities from the ecological wisdom that was once central to their identity (Das et al. 2025).

Although natural dyeing practices have been abandoned, traditional weaving motifs such as *balo renni* and others are still preserved in textile design. However, the continuity of visual motifs is not accompanied by ecological sustainability, making the cultural value of weaving partial. While the textiles still visually represent local identity, they have lost their ecological connection due to the use of synthetic materials, which do not reflect sustainability values. This supports the argument that cultural preservation must extend beyond form and ornamentation to encompass the entire production chain, from raw materials to product distribution (Evans 2000; Feng et al. 2025). Without public policy support and community initiatives to reintegrate NTFPs into the weaving supply chain, traditional weaving practices will become increasingly dependent on external inputs, which in the long term will harm local ecosystems and weaken cultural resilience.

This study reveals that weaving practices in Wajo District still retain traditional motifs as a cultural identity, but have experienced a significant ecological disconnect, particularly in the use of NTFP-based natural dyes. All interviewed weavers use synthetic dyes and have neither access to nor knowledge of natural dyeing, reflecting a loss of traditional ecological knowledge once embedded in local weaving practices. This is exacerbated by the absence of institutional support in the form of training, dye plant cultivation, or sustainable intervention policies to preserve the social and ecological sustainability of traditional weaving. Therefore, the core issue faced by the weaving community is not merely technical or aesthetic, but lies in the loss of the connection between culture, local natural resources, and the knowledge ecosystem that sustains them. As such, preserving traditional weaving must not be limited to the visual motifs, but must also involve restoring the raw material ecosystem and revitalizing natural dye knowledge based on NTFPs through cross-sectoral support.

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