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Optimizing Natural Resources: Dye Plant Conservation For the Harungguan Muara Ulos Weaving Industry

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Abstract : Plant dyes are used in the Harungguan Muara ulos weaving industry to optimize local natural resources. Synthetic dyes have become a fast option along with the increasing demand for ulos. However, synthetic dyes adversely affect the quality and sustainability of the environment. This research used observational methods, in-depth interviews, also gaining an understanding of current and applicable conservation practices. The research showed some local plant species are well suited to be used as a source of natural dyes, but their populations are threatened by overexploitation, lack of conservation efforts and emphasized the importance of traditional knowledge with contemporary conservation methods. The proposed recommendations educate ulos weavers on the importance of using natural dyes, and conduct follow-up research to find more efficient cultivation methods.This research make efforts to preserve Batak cultural heritage and support sustainability to strengthen the ulos weaving industry as an environmentally friendly and economically valuable cultural product.

Keywords : Conservation, Dyeing Plants, Ulos Weaving, Natural Resources, The Estuary of the River

1. INTRODUCTION

Background, Motivation and Research Gap

Indonesia is a country rich in cultural heritage, customs, traditions, arts and local wisdom. As a country rich from Sabang to Merauke, Indonesia is a paradise for lovers and observers of culture (Hasibuan, 2021). The Indonesian nation has various tribes, cultures, customs (traditions) that are not the same as other countries. All of this is reflected in the daily lives of the Indonesian people, one of which is the result of Batak culture, namely Ulos.

Woven fabrics were originally just a work of art made by the community to meet the needs of a limited social environment. Its function is for religious ceremonies, traditional ceremonies, and even developed into a women's activity to fulfill traditions and customs. In its development, apart from being a tradition and culture, woven fabrics have now become a creative industry that can characterize their area of origin, and even more broadly become a cultural product of the Indonesian nation. Woven fabrics are traditional Indonesian fabrics that are produced in various regions in Indonesia such as Lampung, Kalimantan, Sumba, Flores, Lombok and Sumbawa, Tana Toraja South Sulawesi, Tanimbar Southeast Maluku, Sumatra and there are still various other regions in Indonesia. The expertise of the Indonesian ethnic group in weaving can be seen from the results of their woven products. Weaving from each region is different and then has a unique value, function, history, meaning, and manufacturing technique (Hatane Samuel, 2022).

The manufacture of ikat woven cloth in Muara uses natural dyes derived from parts of plants that produce color (bark, stems, leaves, roots, and fruit flesh) and is one of the Non-Timber Forest Products (NTFPs) (Seran W, 2018).

The ulos weaving industry is one of Indonesia's cultural heritages that has high aesthetic and historical value. Ulos weaving, which originates from the Batak tribe in North Sumatra, not only functions as clothing

traditional, but also as a symbol of identity and pride of the local community (Dinda Syabrina, 2023). Traditional ulos coloring uses natural dyes from local plants. However, with the development of the times and increasing demand, the use of synthetic dyes has begun to replace natural dyes. This causing various impacts, both in terms of environment and culture.

Ulos Harungguan Muara is one of the ethnic ulos of Batak Toba. Ulos originating from Muara is called the king of ulos, because it has several ulos motifs that are combined into one ulos called Ulos Harungguan which is made by weavers in Muara in North Tapanuli district. Ulos Harungguan is made from thousands of threads, namely 100 threads where each motif has its own thread (Sari, 2016). (Jemaya Putri, 2024)

Conservation of natural dye plants is very important to ensure the sustainability of the ulos weaving industry. Preservation of these plants is not only about preserving natural resources, but also preserving traditional dyeing techniques that are an integral part of the Ulos textile culture.

As awareness of the negative impacts of synthetic dyes on the environment increases, attention is again drawn to more environmentally friendly natural dyes. However, the existence and availability of natural dye plants are increasingly threatened by over-exploitation and environmental changes. Many plant species used as natural dyes are now on the verge of extinction, which ultimately threatens the sustainability of ulos weaving production itself.

Despite the research conducted on the use of natural dyes in the textile industry, there is not much research that specifically studies the conservation of natural dye plants in a particular area, such as Muara District. The focus of this research is the types of plants used and the conservation methods needed. Due to over-exploitation and environmental changes, many plant species used as natural dyes are now threatened with extinction. It is essential to raise public awareness of the importance of preserving natural dye plants. In this regard, local communities are involved in conservation efforts.

Based on the information obtained from the initial interview, the author is interested in conducting further research on "Optimizing Natural Resources: Conservation of Dye Plants for the Ulos Harungguan Muara Weaving Industry". With the aim of maintaining and supporting the potential of cultural wealth that exists in the community today by optimizing the natural resources in Muara District to minimize utilization .

Problems, Objectives and Benefits of Research

The formulation of the problem in this study is 1) What are the types of natural dye plants used in the ulos weaving industry? 2) What are the factors that influence the availability of natural dye plants? 3) What is an effective conservation strategy to maintain the availability of natural dye plants?

From an economic perspective, the use of natural dyes also has high economic value. With the use of natural dyes, woven fabrics have their own aesthetics, the selling price is more expensive than woven fabrics with synthetic materials, and can reach the international market share. (Muflihati, 2019). Natural dyeing technology in textiles is an effort to develop and preserve natural dyes that utilize the natural potential of the arts and culture of the country, especially the Muara area, so that they are sustainable. This study aims to examine the types of natural dye plants used by traditional weavers in Muara District, North Tapanuli Regency, see their availability in nature around people's homes, find out what factors influence the availability of natural dye plants and effective conservation strategies to maintain the availability of these natural dye plants.

Conservation of dye plants for the Ulos weaving industry is very important and relevant as the main motivation in this study, namely the first is preserving local culture. Natural dyes used in making Ulos have high cultural value because they have been used for centuries. So it will help preserve traditions and cultural heritage by ensuring the availability of natural dye resources. The second is environmental sustainability, meaning that the use of natural dyes from plants is better known as environmentally friendly compared to synthetic ones. Where synthetic dyes contain hazardous chemicals that can pollute water and soil (according to Mrs. Dorlina Sianturi's explanation through a brief interview conducted by the researcher). The third is improving the local economy. The textile industry in Uros can be a source of income for the local community. Ensuring the availability and sustainability of natural dye resources allows this industry to grow, create jobs, and improve the local economy. The fourth is Tourism Promotion, with the conservation and sustainability of natural dye production, Ulos cloth has the potential as a cultural tourism attraction and has an attractive added value, so tourists and art and culture enthusiasts will be more numerous.

The benefits of this research are expected to provide significant contributions to:

1. Raising awareness about the importance of preserving natural dye plants among the community, weavers, and the government.
2. Provide recommendations for local and national policies that support the conservation of natural dye plants.
3. Encourage local community involvement in conservation efforts and provide them with the knowledge and skills to utilize natural resources sustainably.

4. Ensuring the sustainability of the ulos weaving industry through more environmentally friendly practices and based on the sustainable use of natural resources.

2. LITERATURE REVIEW

Ulos is a woven fabric made by Batak craftsmen in the form of a shawl. Ulos symbolizes the bond of love between parents and their children. In addition to being a symbol of the bond between parents and children, Ulos is also used to warm the body (Adriani & Fitriani, 2023). According to the thoughts of Batak ancestors, there are three sources that provide warmth to humans, namely the sun, fire, and ulos. Of the three sources of warmth. Ulos is considered the most comfortable, healthy for the body, and pleasing to the feelings (Astuti, 2019).

Today, traditional Harungguan Muara weaving in North Tapanuli Regency, especially in Muara District, is increasingly developing and is in great demand in the domestic and international markets. The production of traditional Harungguan Muara weaving uses natural dyes derived from plants. The increase in traditional weaving production also has an impact on the utilization of natural resources in the surrounding area, especially plants used for natural dyes.

Based on the results of the researcher's interview with related parties, namely one of the ulos weaving business actors in Muara, there is an increase in demand for traditional weaving that uses natural materials as a result of awareness to restore its authenticity (back to nature) and efforts to reduce environmental pollution. So far, the most commonly used textile dyes are natural and synthetic dyes. They are still used for conventional weaving, but almost no one uses natural dyes for weaving production. The use of synthetic dyes is harmful to the environment, damaging rivers.

Indonesia has no less than 70 thousand rivers. According to BPS, around 46 percent of these rivers are heavily polluted. Other data states (2022), the quality of river water in Indonesia is only 8.1 percent that meets the quality standards from 111 identified rivers (Statistics, 2023). Based on the identification results from the Ministry of Environment, there are 48,287 Batik SMEs whose production processes cause river pollution in Indonesia because they use wax, synthetic or chemical dyes, and other chemicals excessively (Rini S, 2021).

Ulos Harungguan has a meaning, namely a combination of all Batak ulos motifs processed using a hundred threads (Jemaya Putri, 2024). The types of Batak Ulos motifs that are combined in making Ulos Harungguan are Ulos Ragi Hotang, Ulos Sibolang Rasta Pamontari, Ulos Pinuncaan, Ulos Bintang Maratur, Radigup, Ulos Mangiring, Ulos Suri-suri Ganjang. (Rachman, 2022). The process of making Ulos Harungguan traditionally using natural materials begins with the selection of natural fibers that will be used to make Ulos. The fibers that are usually used are mahogany tree fibers, selawan trees, mengkudu trees, teak trees, cotton trees, semplokos trees (as a color lock). These tree fibers must be selected carefully to ensure quality and produce good colors. The process of making Ulos Harungguan is different from making other Ulos, Ulos Harungguan uses a hundred threads, full motifs and uses natural dyes.

Then the natural fibers are spun into yarn using traditional looms such as weft looms or pound looms. The spinning of yarn is done manually by hand to produce strong yarn, good colors, and beautiful motifs. After the yarn is spun, the next stage is to color the yarn naturally using natural dyes taken from other plants.

Natural dyes that are usually used are indigo leaves for blue, mangosteen bark for red, and turmeric for yellow, and other colors such as red, brown, and black. Then the thread is soaked in a natural dye solution that is cooked and then dried under the sun.

After the yarn is colored, the weaving process begins. Ulos weaving is done using a traditional loom called "tujung". Then after that, fiber from the semplokos tree is added as a color lock. The weaver also uses special patterns and designs determined by the customer. After the weaving is complete, the Ulos cloth must be dried by drying it under the sun until dry.

Ulos Harungguan motifs and types, Ulos Harungguan is said to have a meaning (collection, all kinds of Uloa motifs are already in it). The marketing price of Ulos Harungguan depends on the materials used in making Ulos. The materials used are made from natural materials and chemicals. Natural materials are priced at Rp. 4,000,000 to Rp. 5,000,000, and from chemicals at a price of Rp. 1,000,000 to Rp. 2,000,000.

Natural Dye Plants for Traditional Weaving in Muara and Sibandang Districts, West Kalimantan (2019) that The results of the study showed that Sambas weavers used 30 types of plants as natural dyes, and Muara District weavers used 11 types. Overall, there are 36 types of plants used for traditional weaving in Muara and Sambas Districts, five of which are used in both Muara and Sambas Districts. The Importance Value Index of dye plants ranges from high to low. Several types are no longer found around people's homes. Engkerebang (Psychotria megacoma), emarek (Symplocos ophirensis), lengkar (Litsea angulata), belian (Eusideroxylon zwageri), and kayu kuning (Fibraurea chloroleuca) are important types of natural dye plants that are difficult to find, so further conservation is needed.

According to Ros Sianturi, natural dyes from plants were proposed by parents in ancient times, so in accordance with the development of the era and the digital era, natural dyes are processed into synthetic dyes. In 2017, natural dyes that had

been provided by Koperindak began to be re-implemented. He said that the types of plants used to process natural yellow wood dyes = Jackfruit wood (flesh), mango tree (bark/flesh), mahogany (skin), salaon leaves produce blue/indigo fermented. the process is shaved then boiled.

The problem of lack of private land means buying dye from Bandung in paste form.

3. RESEARCH METHODS

The research was conducted in Sibandang Village, Muara District, North Tapanuli Regency, which is the center of traditional woven fabrics in North Sumatra Province, Indonesia.

The research was conducted from February to June 2024. Data collection was carried out through interviews, documentation, and direct observation of the condition of dye plants in their natural environment. By identifying the types of plants, habitats, and how the plants are harvested for ulos woven dye materials.

Interviews were conducted with key informants and ordinary informants. Key informants are village heads or community leaders who know the weaving community in the area. They are the ones who open relationships with informants or weaving respondents. Informants in this study are people who are considered to know the types of natural dyes from the past, have used, and still use natural dye plants in traditional weaving production in Muara District. From the research site there were 5 informants, with 1-2 key informants. The interview technique used was a semi-structured interview by asking questions about the types of natural dye plants, the parts used and the colors produced. The interview data were then tabulated.

Plant inventory is conducted in places where natural dye plants are located and are usually obtained by local weavers. In these locations, dye plants are generally taken and collected by the weavers themselves or their families. The inventory aims to obtain the existence of types of natural dye plants used by the community in the place where they grow. Documentation study by collecting data from existing documents, such as previous research reports, historical archives, and literature related to the conservation of dye plants and the ulos weaving industry.

Data analysis for the level of plant availability is calculated based on the Important Value Index (INP) of plant types calculated based on the method used by Kusmana (1997) as follows:

INP = KR + FR + DR (for tree species) or
INP = KR + FR (for understory plant species).
Information:
INP = Importance Value Index
K = Density, is the number of individuals of a species / area of the plot
KR = Relative Density, is the density of a species / density of all species x 100%
F = Frequency, is the number of plots of a type / number of plots of all types x 100%
FR = Relative Frequency, is the frequency of a type / frequency of all types x 100%
D = Dominance, is the total area of the base of a type / area of the plot
DR = Relative Dominance, is the dominance of a species / dominance of all species x 100%

As an indicator to estimate the diversity of natural dye plant species in a community, it is indicated by the number of natural dye plant species, and the overall vegetation diversity by calculating the Shannon-Wienner Diversity Index Value (Odum 1993) as follows:

$$H' = -\sum_{i=1}^{n}\left(\left(\frac{ni}{N}\right)\boldsymbol{ln}\left(\frac{ni}{N}\right)\right)$$

Information:
H' = Shannon Index of General Diversity:
ni = important value of each species
ln = natural logarithm
N = total Species Importance Value Index

The Shannon-Wiener Diversity Index assessment criteria, if H'< 1.5 indicates low species diversity, H' = 1.5 - 3.5 means species diversity is moderate, and H' > 3.5 indicates high species diversity (Odum 1993; Fajri and Supartini 2015).

4. RESULTS, ANALYSIS, AND DISCUSSION

Types of Natural Dye Plants

Based on the research results, it is known that natural dyes are widely found in natural forests in several villages in Muara District in particular. According to informants, the community around Muara District has long been using natural dyes from plants. The types of plants used include noni (Morinda citrifolia), turmeric (Curcuma domestica), mahogany (Swietenia mahagoni (L.) Jacq), durian (Durio zibenthinus Murr.), jackfruit (Artocarpus heterophyllus Lamk), surian (Toona sinensis Roem), red teak (Tectona grandis Linn), ketapang (Terminalia catappa), coconut (Cocos nucifera), shallot (Allium cepa L.), purple sweet potato (Ipomoea batatas L), banana (Musa Paradisiaca), avocado (Persea americana). The parts of the plant used are also varied, starting from the roots, rhizomes, leaves, stems or bark, flowers, and fruit, producing various colors (Djarwaningsih et al. 2012; Sandi 2015; Santa et al. 2015).

Based on the research results, it is known that there are 18 types of natural dye plants in Muara District, four of which are often used in the Muara District area. The five types of dye plants are turmeric (Curcuma domestica), mengkudu (Morinda citrifolia), jengkol (Archidendron pauciflorum), and rambutan (Nephelium lappaceum). These four types of dye plants are listed in the list of plants producing color and tannin Prosea (Lemmens and Wulijarni-Soetjipto 1992).

The people of Muara District use 18 types of natural dye plants to color the yarn for traditional ikat weaving (Table 1), which produce black, red, yellow, and black colors. Plants that produce

red/pink colors are mengkudu (Morinda citrifolia), dragon fruit (Cactaceae) and shallots (Amaryllidaceae). Two plants produce black, namely jengkol (Archidendron pauciflorum), and rambutan (Nephelium lappaceum). Turmeric plants Curcuma domestica) produce yellow. And there are six plants that produce brown/light brown/dark brown colors, namely Pinang (Arecaceae), Guava (Myrtaceae), Mango (Anacardiaceae), Ketapang (Combretaceae), mangosteen (Cluciaceae), jackfruit **(** Moraceae **).**

Table 1. Types of natural dye plants for traditional weaving in Muara District

o	Latin Name	Family	Local Name	abit us	Parts Used	Color
	orinda trifolia	ubiaceae	oni	ree	ot	ed/pin
	ncaria	ubiaceae	ambie	ush	eaf	ark ocolat
	urcuma mestica	ngibera ae	urmeri	erbs	nizom	ellow
	xanthor iza	ngibera ae	urcum	erbs	nizom	ellow
	ephelliu ppaceu	pindace	ambut	ree	eaves/ uit in	ack/br vn
	chiden on uciflor n	baceae	ngkol	ree	eaves/ uit in	ack/br vn
	imosa dica	baceae	imosa	erbs	eaves d ems	ght een
	angifer indica	acardia ae	ango	ree	eaf	ght own
	erminali catappa	ombreta ae	e etapan	ree	eaf	ght llow
0	*arcinia angosta*	uciacea	angos en	ree	nd	ark ocolat
1	*thocarp integer*	oraceae	ckfrui	ree	eaf	ght own
2	*eca lm*	ecaceae	etel t	ree	uit	nocola
3	*idium ajava*	yrtaceae	uava	ree	eaf	nocola
4	*izopho sp*	izophor eae	ed angro	ree	ree rk	ght llow
5	*mbusa lgaris*	baceae	amboo	ush	em	ght een
6	*omoea tatas*	nvolvul eae	weet otato	erbs	eaves d ems	ght een
7	*lium pa*	maryllis eae	ed ion	erbs	ber in	nk
8	*ylocere*	actaceae	ragon	erbs	uit	nk
	lyrhizu			uit		

The weavers of Muara District also use color enhancers or mordants such as chalk and alum, or mix several dyes in a yarn dyeing recipe that has been passed down through generations. For example, the bark of the mengkudu root (M. citrifolia) is used together with emarek leaves (S. ophirensis) to produce a brighter red color, while engkerebang leaves (P. megacoma) are used together with gambir leaves (Uncaria sp.) and betel lime.

According to Cunningham et al. (2011), emarek leaves (Symplocos ophirensis) are known to contain high levels of aluminum (Al), so it is estimated that the presence of Al functions as a mordant or color enhancer of the mengkudu roots used.

The presence of Al is also proven by the yellow color of the leaves when making the herbarium, because the Al compound reacts with flavonol during the drying process (Lemmens and Wulijarni-Soetjipto 1992). Gambir leaves (Uncaria sp.) contain tannin and are also well known as textile dyes (Lemmens and Wulijarni-Soetjipto 1992), while betel lime is commonly used as a mordant or fixative solution in traditional fabric dyeing. (Rini et al. 2011, Heryati et al. 2016).

Based on the observation results, it is known that many plants used as natural dyes in Muara District are herbs and shrubs, which are generally small in size and grow faster. However, people also use trees. Several types of plants used from the tree group, for example lengkar (Litsea angulata), rentali (Macaranga costulata), mengkudu (Morinda citrifolia), jengkol (Archidendron pauciflorum), and rambutan (Nephelium lappaceum). Litsea spp. is not included in the list of natural dye plants PROSEA (Lemmens and WulijarniSoetjipto 1992), but Teron and Borthakur (2012) stated that Litsea glutinosa bark in India is used to produce black.

Based on the research results, the lengkar tree (L. angulata) in Muara District is used to produce red color even though the part used is the same as in India, namely the bark. Other species of the genus Litsea such as L. cubeba are reported to contain medicinal ingredients as well as ingredients for the cosmetics and aromatherapy industries (Nor-Azah et al. 2016). Plants from the tree group usually have a longer lifespan and a longer time to reach reproductive age. For slow-growing species such as lengkar (L. angulata), attention is needed in their regeneration. The mengkudu tree (M. citrifolia) which is easy to propagate and grows quickly has begun to be planted in yards by local people, perhaps because it is also known as a food and medicine so that it is used daily. Tarum (Marsdenia sp.) as a herbaceous plant is also easy to plant in yards, as is turmeric (C. domestica). However, the types of emarek (S. ophirensis), engkerebang (P. megacoma) and empait (C. adenophysum) which are herbs and shrubs can only be obtained in forest areas near residential areas or purchased in neighboring villages. These types of plants seem to require a forest microclimate to support their growth better. According to Lemmens and Wulijarni-Soetjipto (1992) types of Symplocos including emarek grow well in various types of soil in tropical to subtropical conditions in mixed forests and are never found in dry conditions (arid).

One of the largest weaving production centers is in Sibandang Village, and weavers in this village use natural dye plants for some of their songket cloth production. The looms used in Muara District are traditional non-machine looms. In Muara District, the largest weaving center that still uses natural dyes is in Sibandang Village. The looms used here are smaller in size compared to those in other areas (figure 1a). Weavers in Muara District sit on the floor of the terrace of a betang house with part of the loom placed on their laps . In Sibandang, the looms are large and wide, with a permanent seat for the weaver and are part of the loom (Figure 1b).

Figure 1a

Figure 1b

The weavers in Sibandang get natural dye plants from around their homes, gardens, riverbank vegetation, or from the market. The number of types of natural dye plants used by the people in Sibandang is greater than that used by the people of Muara District, and the colors obtained are also more diverse. Color variations range from red with several shades, yellow, light brown to dark brown, black, blue, light green and light purple. The weavers said that the difficulty in using natural dyes is that the same amount of dye or plant material does not necessarily produce the same color. The addition of different mordants also produces different colors on the woven yarn. Traditional weavers in Muara District usually use chalk, tunjung, or alum as mordants. This method has not been standardized and recorded properly, because in general weavers carry out natural dyeing by trial and error methods, there is no special recipe passed down from

generation to generation. In addition, the natural dye plant materials used from generation to generation are more difficult to obtain. From this research, it is known that several types of natural dye plants used by weavers in Muara District, such as red dragon fruit (Hylocereuspolyrhizus), bamboo (Bambusa sp.), sweet potato (Ipomoea batatas), mimosa pudica and internet (Glochidion littorale) have only just been tried and are not from hereditary knowledge, with the aim of utilizing plants that are still available in the area and diversifying the colors.

The majority of natural dye plants used in Muara District are types commonly planted in yards or gardens, such as mango (Mangifera indica), mangosteen (Garcinia mangostana), jengkol (Archidendron pauciflorum), and rambutan (Nephelium lappaceum). The kesumbe plant (Bixa orellana) is rarely found, but is a shrub that is easy to plant and grows quickly. In the past, this plant was favored as an ornamental plant because it diligently flowers and bears fruit with attractive colors. The color of the flowers is white, and the fruit is bright red. Kesumbe or gelinggam in the world of natural dyes is also known as annatto, an organic dye from Bixa orellana seeds.

The dye from kesumbe is not good for textile dyes because it fades easily and does not last long when exposed to light, but this dye is resistant to soap, acids, and bases (Lemmens and Wulijarni-Soetjipto 1992). Areca nut (Areca catechu) is a plant that is quite easy to find because residents deliberately plant and harvest the fruit to be sold as industrial materials. Areca nut has many and varied benefits, such as as a betel chewing material, ornamental plant, producer of medicinal ingredients, tannery, and dye. Exports of areca nuts from Indonesia are mainly directed to South and Southeast Asia, but are processed for the small food industry (Yudha 2017).

Several types of plants are tried to be used to increase the diversity of colors of the woven yarn produced by utilizing the types of plants that are commonly found in the area. These types of plants include bamboo (Bambusa sp), dragon fruit (Hylocereus polyrhizus), sweet potato (Ipomoea batatas) and mimosa pudica (Mimosa pudica). Bamboo stems and leaves and stems of mimosa pudica plants produce a light green color, while sweet potato tubers and red dragon fruit produce a pink color. Around 11 of the 30 types of dye plants in Muara District are no longer found in the form of living plants that grow naturally, but are purchased at village markets in the form of products, for example shallots (Allium cepa) in the form of bulbs, gambir (Uncaria sp) in the form of lumps of sap, tarum (Indigofera sp) in the form of paste, sepang (Caesalpinia sappan) in the form of shavings or pieces of wood. Belian (Eusideroxylon zwageri) is obtained in the form of sawdust and belian wood chips from carpenters, who get them from the forest in Sanggauledo, Bengkayang Regency. Red mangrove (Rhizophora sp.) and yellow wood (Fibraurea chloroleuca) are also very difficult to obtain. Red mangrove is usually taken from mangrove forests in Paloh District, while yellow wood is obtained from dense forests that are no longer found around Muara District (Muflihati et al. 2018).

Turmeric (C. domestica) in Muara District is used for its rhizome to produce yellow color. Noni roots (M. citrifolia) in Muara District are used to produce red color together with emarek leaves (S ophirensis), and are used to produce pink color using tunjung mordant, lime, or alum.

According to Pujilestari and Salena (2017), these three types of mordants are also used for coloring batik using sappan wood (sepang, C. sappan) and gambir (Uncaria sp.). Tunjung is also known as ferrous sulfate (FeSO4), lime is a base compound of Ca(OH)2, and alum has the chemical formula Al2(SO4)3.

5. Conclusion , Implications, Suggestions and Recommendations

The weaving community of Muara District uses 18 types of plants as natural dyes. Four of them are used in Muara District. The importance value index of dye plants in the field ranges from high, medium to low. In Muara District, the dye plants with the highest INP are jengkol, mengkudu, ketapang and mangga. Several types of dye plants have been planted in the yard. There are several types that are difficult to obtain or are no longer found around the community's residence. Engkerebang (Psychotria megacoma), emarek (Symplocos ophirensis), lengkar (Litsea angulata), belian (Eusideroxylon zwageri), and kayu kuning (Fibraurea chloroleuca) are considered as important types of natural dye plants and are very difficult to find in the vegetation around the weaving community of Muara District and further conservation steps need to be taken.

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