ISSN 2522-9400 **European Modern Studies Journal** *Vol 7 No 2*
available at www.journal-ems.com
DOI: 10.59573/emsj.7(2).2023.17

Knowledge and Values of Noken from Three Highlander Ethnics in Indonesian New Guinea

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Abstract. Nokens are cultural carrying bags made from natural fibres originally from Indonesian New Guinea. The goals of this research are to investigate their knowledge and values made by Dani, Lani and Mee ethnics in Jayawijaya. Survey and questioners were used to gather data, and ten respondents of each ethnic were selected. Research variables are plant natural fibres and their extraction, natural dyeing used, local names, purpose, local values, economic and marketing values. The results indicate that each ethnic used different natural fibres, but each has similar fibres of inner cambium trees for hanger, mouth, and basement sections, as they retain tension and tensile. Recently, synthetic fibres are applied because they are available, cheaper, and colourful. Noken has multi-functional uses, social, cultural, philosophy values and represents women independence. It indirectly reflects simplicity, unity, harmony, natural dependence, peace, and fertility of both women and the land.

Keywords: ethnics, Indonesia, Jayawijaya, local knowledge, noken

Introduction

New Guinnea has the world's richest island flora (Cámara-Frodin et al., 2020), politically governed into two administrations, Papua New Guinea (PNG) in the east-half and Indonesian New Guinea in the west-half. Indonesian New Guinea has two provincial administrations, Papua province with capital city of Jayapura at the eastern side and West Papua province with capital city of Manokwari in the western side. Both provinces culturally are well-acknowledged as the land of Papua or Tanah Papua in Indonesian. The land Papua is well known with its multi-ethnic, at about 261 local ethnics with its own culture, languages, and religions (Ananta-Utami et al., 2016). Indigenous ethnics of Papua or Papuanese belong to Melanesian and it is different from the Malay at the western Indonesia. This land also has rich in sculptures, traditional songs, communal dance well-know as Yosim pancar (Yospan), and handmade carrying bag from plant-based fibres called noken. It is multifunctional knotted or woven bag, handcraft of the people of Papua and has been listed in the United Nation of Education, Scientific, and Cultural Organization (UNESCO) intangible cultural heritage lists as cultural heritage of Indonesia since 2012 (www.unesco.org).

Beside richesness in biodiversity, Indonesian New Guinea has the highest ethnics compared to the other islands in the Indonesian archipelago, and topographically laying from

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seagrass, mangrove to the alpine ecosystem (Cámara-Frodin et al., 2020). Consequently, local knowledge or wisdom practices in the land of Papua are also enormous ranging from agricultural practices, housing types, beliefs, handicrafts and others. Staple foods for highlanders are sweet potato (*Ipomoeae* sp) (Saraswati-Soplanit et al., 2013), red pandanus (*Pandanus coneidus*) (Murtiningrum-Zarungallo et al., 2012; Sarungallo-Hariyadi et al., 2015), and wild meats from wild pig (*Sus* sp.), rusa deer (*Cervus* sp.), tree kangaroo (*Dendrolagus* sp.) (Pangau-Adam et al., 2012; Pattiselanno-Lloyd et al., 2020), whereas the coastal people are sago (*Metroxylon sago*) (Yamamoto-Yanagidate et al., 2018.), Taro (*Colocasia esculenta*) (Prana-Prana et al., 2010), and sea fishes (Fuada et al., 2019). The highlanders live in their traditional houses or huts namely honai and it has a similar shape to the Eskimo house, but the honai is made from branches of wood or poles for the main structures of frames and walls, grasses (*Imperata cylindrica*) for roofing material thighten with peeled thin rattan (Arobaya & Pattiselanno, 2007; Wanma et al., 2013). Firewood is the main energy for cooking and heating during the day and night times and modern transportation is still limited.

Noken is a handmade carrying bag made from natural fibres and traditionally used to carry daily needs and agricultural products including firewood and latched on the women's head. It has multiple usages with huge flexibility. Noken made in Raja Ampat is different from those made in Jayawijaya and is influenced by a number of factors, such as culture, topographical area, necessities and availability of natural fibres (National Geographic, 2017).

Local knowledge is a collection of facts and relates to the entire system of concepts, beliefs and perceptions that people hold about the world around them (www.FAO.org). In simple terms, local knowledge is the knowledge or wisom that people in community have developed over time and continued to be in practices. The highlanders consisting of three ethnics of Dani, Lani and Mee have been living together in Jayawijaya district Papua province at about 3.500 above sea level and well acknowledged for making Noken. The Dani and Lani are the indigenous ethnics of Jayawijaya, while the Mee is from migrant the another next highland. They lives together in harmony for many generation. This research, therefore, is designed to investigate the local knowledge in making noken made by three ethnics in Jayawijaya. Research goals are detailly described as follows: a) to identify plant producing natural fibres used for making noken; extraction method, b) to figure out the flow chart in making noken; c) to identify noken local name, proposed made and their utilizations; d) to examine local noken's values and; e) to determine marketing chain and economic values of noken for three ethnic groups.

Methodology

This research was located the Jayawijaya district, namely Husoak village at Hubikiak sub-district representing for Dani ethnic, Abonery village at Pyramid sub-districts for Lani ethnic, and Wamena village at Wamena sub-district for the Mee migrant ethnic. The research sites are presented in Figure 1.

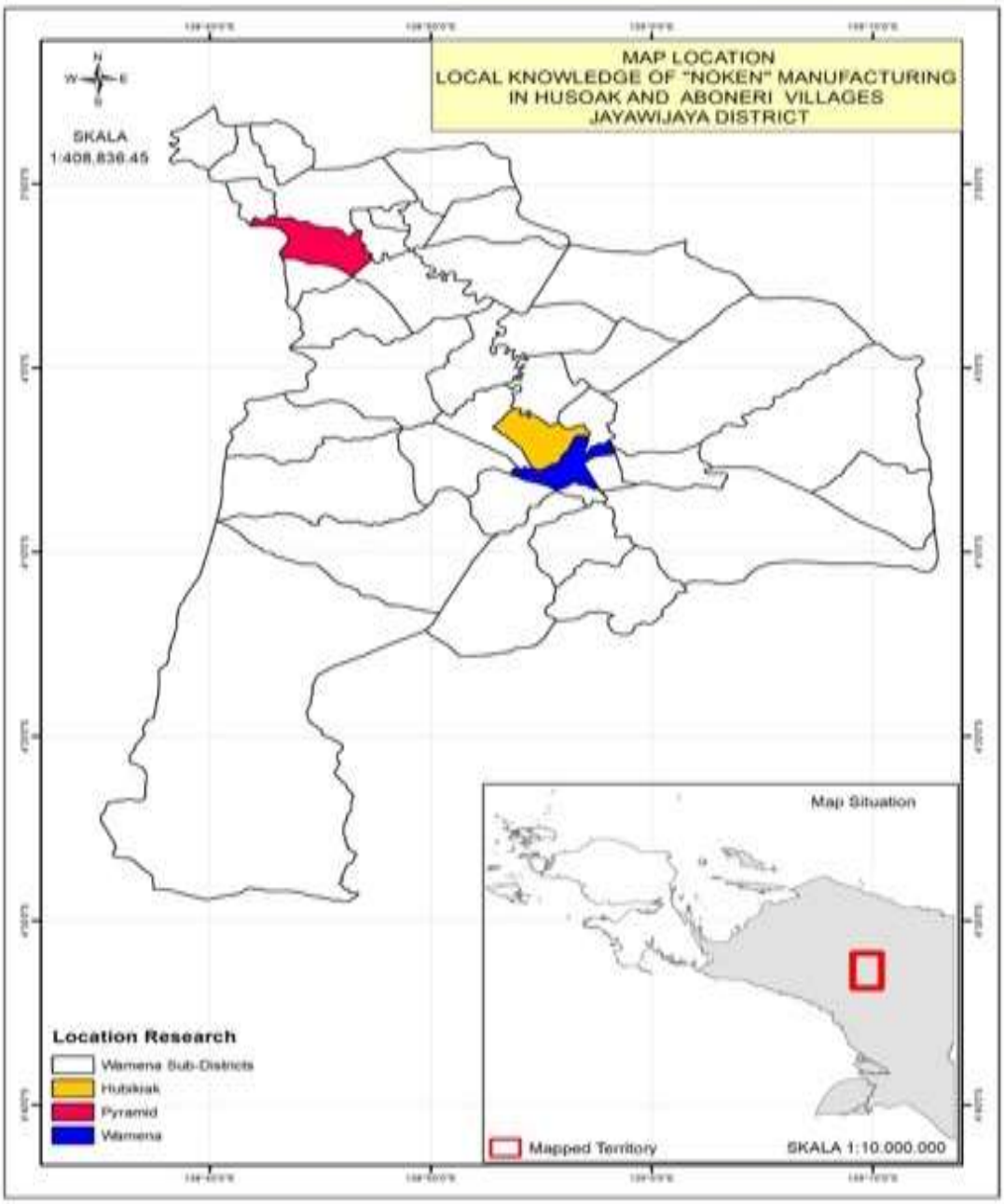

Figure 1. Research sitew in Jayawijaya district

Material and Methods

Tools used for this research are pocket camera, GPS, long knife, stationery and questioners. Field survey was used to collect data, and structural interview was used to collect data from selected respondents (*purposive sampling*). Ten respondents were selected according to their social status for each village based on their community and cultural roles, consisting of five women who make noken, one respondent for head village, ethnic leader, religious leader, and two young women. Botanical name was identified with the help from taxonomist at the Herbarium of Manokwariences, Biodiversity Research Centre, University of Papua.

Research Variables

This research has five main variables. The first is natural and synthetics fibers covering botanical and local name, plant type, parts of plant-used, Indonesian names, habitat, extraction and processing method of natural fibres, commercial name and reasons using synthetic fibers. The second is making noken to describe noken name, design, lines assklembing, the kitting method, tools used and decorative pattern, and quality control. Noken local name, proposed made and description of uses for each ethnic is the third variable of noken name, proposes and description of uses. Then the fourth is local noken's values mentioning description of social, culture, philoshopy and independence values for noken. The last is marketing chains and economical values to illustrate marketing chain existed, prices of noken, and times spent in making single noken.

Results

Natural and Synthetic Fibres

Plant producing natural fibres used for noken's raw material recorded from three ethnics in Jayawijaya are summarized in Table 1.

Table 1. Plants producing natural fibres for noken's raw material of the three ethnics in Jayawijaya

No	Plant producing natural fibres (local and botanical names, Indonesian, types, and habitat)	Description for parts of plant used	Natural fibres extracting methods
	Dani ethnics		
1	Helalu, *Pipturus argenteus* G.Frost Wedd, Urticaceae, Lobiri, tree, SF	Inner bark or cambium,	Young branches were cut off from their mother branch, peel out the barks, epidermis was scratch out with knife on water (river, pond, or dwelling), and inner bar cambium were washed with water and dried on the direct sunlight.
2	Wein, *Ficus benjamina*, Moraceae, beringin, tree, SF	Inner bark or cambium	Young branches were cut off from their mother trees, divided into 40-50 cm long, heated on the fire, punched with wooden sticks homogenously to disintegrate epidermis and cambium, and then inner cambium are separated using knife. Inner cambium then were buried on the muddy or wet soil to make the fibres strength and durable during one week. Fibres were washed and dried under direct sunlight for 2-3 days.
3	Henawun, *Wikstroemia venosa*, Thymelaceae, gaharu, tree, SF	Inner bark or cambium,	Un mature stems were cutt off, barka were peeled out from the stems, laid down on the flatten stones or wood, and punched to disintegrate the epidermis from cambium bark.
4	Lisani, *Acalypha amentaceae*, Euphorbiaceae, teh-tehan merah, herbs, SF	Inner bark or cambium	Outer barks were peeled out with knife, dried under direct sunlight, fibres were cleaned from unwanted material and woven fibres were twisted.

5	Oae, *Crotalaria usaramaoensis*, Fabaceae, orok-orok, herbs, garden	Outer skin	Mature stem was pull out from soil, and bark were peeled out from the stem with hand, and epidermis were smoothly removed using knifes.
6	Itiwan, *Althernantera sessilis*, Amaranthaceae, Kremah, herbs, garden	Outer skin	Mature plants were uprooted and directly dried under direct sunlight untuk dry, dried skins were scraped to peel epidermis and the skins were twisted to make fibres.
7	Jiwin, *Eleocharis indica*, Cyperaceae, Purun tikus, herbs, swamp	Skin grass	Grasses were uprooted, crushed with hand smoothly to disintegrate skin and fibres, the fibres then are dried until dry.
8	Sel, *Dendrobium d'albertisii*, Ochidaceae, Anggrek albert, SF	Orchid skin	Orchid main stems were dried and outer stem were extracted, and dried. These fibres were used for decoration purposes, decorative pattern, not strength purposes
9	Weayu, *Melastoma* sp., Metlastomataceae, Senggani, herbs, garden	Flowers	Fresh flowers were crushed homogeneously and mixed directly with the fibres for natural dyeing.
	Lani ethnic		
1	Giru, *Ficus* sp, Moraceae, beringin, tree, SF	Skin bark	Barks were peeled out and cambium was separated with dull material to produce rough fibres. The fibres were dried in direct sunlight.
2	Kumulingi, *Pypturus* sp. Urticaceae, Kaser, herbs, garden	Skin bark	Young stems were cut off, the skins were pull off and dried in the direct sunlight
3	Ligi, *Malothus* sp., Euphorbiaceae, Balik angin, shrubs, garden	Thin bark	Barks were pull off and washed in water, and dried in the direct sunlight
4	Tenangup, *Pandanus* sp., Pandanaceae, pandan, Shrubs, SF	Stilt roots	Stilt roots were cut off from the main stem, ripped into fourth section longitudinally, and dipped in water for 30 minutes. Coarse and white fibres were extracted by scratching with knife and dried in the direct sunlight.
5	Tilan, *Ficus bejamina*, Moraceae, beringin, tree, SF	Inner bark or cambium	Young branches were cut off from their mother, an average of 40 50 cm long, heated on the fire, punched with wooden sticks homogenously to disintegrate epidermis and cambium, and were separated using knife. Cambium then were buried on the muddy or wet soil to make the fibres strength and durable for a week. Fibres were washed and dried under direct sunlight for 2-3 days.
6	Keya, *Debregeasia longifolia*, Urticaceae, Tongtogoan, herb,	Outer skin	Plant are uprooted, the outer skins were separated to obtained fibres and dried under direct sunlight

7	Nupur, *Debregeasia s*p., Urticaceae,	Outer skin	Plant are uprooted, the outer skins were separated to obtained fibres and dried under direct sunlight
8	Yilakamburu, *Alyxia papuana*, Apocynaceae, Pulosari, liana, SF,	skin of stem	6-8 m stems were harvested, and divided into 1 m each, fibres were extracted by scratching the outer skin, and dried it.
9	Walia, *Pypturus sp.* Urticaceae, herbs, garden	skin	1 m main stem was cut off, dried under direct sunlight, outer skin was peeled off, and disintegrate into fibres.
10	Wumbak, *Krausella forbesii*, Sapotaceae, tree, SF	Inner bark or cambium	Young saplings 5 m tall maximum were cut off, the barks were separated from wood next to the running water or river, scratching homogenously to obtain coarse fibres, and dried under direct sunlight.
11	Wii, *Dendrobium sp*, Orchidaceae, epiphyte, PF	Outer skin	Orchid main stems were dried and outer stem were extracted, and dried. These fibres were used for decoration purposes, decorative pattern, not strength purposes
12	Tenambeli, *Dendrobium d'albertisii*, Orchidaceae, epiphyte, PF		Orchid main stems were dried and outer stem were extracted, and dried. These fibres were used for decoration purposes, decorative pattern, not strength purposes
	Mee ethnic		
1	Danio, *Gnetum gnemon* L, Gnetaceae, Melinjo, tree, SF	bark	Barks were peeled from the main stem, punched with wooden sticks to disintegrate fibres and epidermis. Fibres were washed and dried under direct sunlight.
2	Oba, *Wikstroemia venosa*, tree, SF	bark	Bark were peeled out from the stems, laid down on the flatten stones or wood, and punched to disintegrated the epidermis from the cambium bark
3	Tokeipo, *Pandanus coneideus*, Pandanaceae, Buah Merah, shrubs, HY, SCF	Stilt skin	Stilt roots were cut off from the main stem, ripped into fourth section longitudinally, and dipped in water for 30 minutes. Coarse and white fibres were extracted by scratching with knife and dried in the direct sunlight

Note: SF=secondary forest; PF= primary forest; SCF=shifting cultivation field; HY=house yard

Table 1 highlights that three ethnics in Jayawijaya distric have different sources of natural fibres to make noken. Dani has extracted natural fibres from trees (3 species), herbs (6 species) and Lani extracts from 12 plants (trees, epiphytes, herbs and shrubs) producing natural fibres, while Mee has limited options, compared to Dani and Lani, which has only three species (tree and herbs). They have similar fibres used for noken main body structure, which are mostly extracted from inner cambium bark of trees. Fibres from herbs, shrubs and ephiphytes are used for decorative purposes not the main structured-linen and these fibres are relatively easy to be collected.

With respect to the methods how the the natural fibres are collected (Figure 2), they are majority (65%) collected by punching, scratching and then disintegrating inner cambium

barks from epidermis, expeeling epidermis and fibres using traditional tools, and mostly collected from the tree barks.

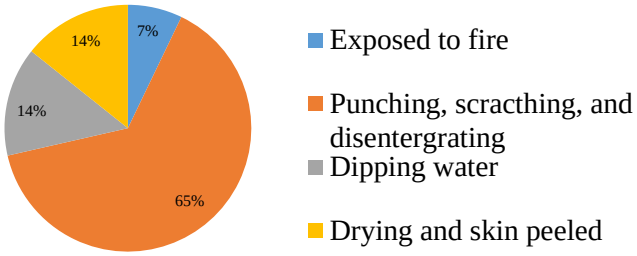

Figure 2. Local methods to extract natural fibres for noken material from three ethnics in Jayawijaya district

The natural fibres of trees's barks, herbs and shrubs are the Jayawijaya's noken main material for structural purposes, where strength, elasticity and plasticity are the highest demanding characteristics. Even though, there are no scientific data on natural fibres's strength and elasticity published, it is empirically true that this traditional hand-made carrying bag is very strong and elastic. It is supported by the facts that there are no informations of accidents being reported that noken fibres are broken, break out or disintegrated when it is in used.

The noken made from the natural fibres by three ethnics in Jayawijaya has five sections, and each section in detail is illustrated in Figure 3. Section 1 is for hanger, mouth and body are shown by sections 2 and 3, respectively. The hanger, mouth and body are classified as the main structure, in which stress and strain are occurred while it is in used, and the strength natural fibres are required and selected from the inner barks of trees. Section 5 is noken's basement and section 4 is decorative patterns. Outer skins of *Dendrobium* sp., herbs and shrubs are used for noken decorating motif as illustrated in Fig. 3 section 4.

Legends: (1) hanger; (2) aperture or mouth; (3) body; (4) decorative element; (5) basement

Figure 3. Five sections of noken body made by three local ethnics in Jayawijaya

Existence of the natural fibres for noken raw material recently has been replaced with the synthetic fibers. Three local ethnics have been used approximately eight synthetic fibres

such as policerry, nylon, wool, silk, cotton, rayon, polyester and orchid lines. The respondents of the noken maker majority argued that synthetic fibres have many advantages compared to natural fibres. They are available any times at any seasons, various colors, directly used, low prices and available at the local markets.

On other hands, an extradionary efforts are needed to collect the natural fibres. They are not for saleable at the local markets, availability in the nature are depleted due to overharvested, and the noken's makers are responsible for their own needs of the natural fibres.

Extraction natural fibres by three ethnics in Jayawijaya in general, could be summarized as follow: selection of the plant producing fibres, cutting or uprooting, pre-processing, processing, washing, drying, dyeing, and twisting. Series process to extract natural fibres from Pandanaceae by local ethnic in Jayawijaya is shown in Figure 4. After mature stilt roof of *Pandanus coneideus* was cut off from the mother stem, the stilt roots were punched, scratched, and the fibres are disintegrated manually closed to the water. There are no roles between men and women in dividing works for making noken. However, men are responsible to collect raw material and extracting plant-based fibres. The selection of stilt root of *Pandanus* sp. by the local man, and other activities of extraction natural fibres closed to water ponds were illustrated in Figure 4a and 4b. Young stilt roots are more preferable as their skins are still immature and cut off easily from the mother plant. After been punching homogenously to disintegrate their epidermis skin, the coursed fibres were washed frequently in water pond and finest-white natural fibres collected (Fig. 4c) then dried under direct sunlight for 1-2 consecutive weeks. The natural fibres from other cambium plants ready to be twisted (Fig. 4d) to produce natural lines, where fibres are twisted together both with and without staining.

a)

b)

c)

d)

Figure 4. Processes from selection, extraction natural fibres in Jayawijaya; local man selects stilt root candidate from *Pandanus* sp. (a), and other activities in extracting natural fibres next to water pond (b), dried, fined and white natural fibres of *Pandanus* sp. (c), and natural fibres from other cambium plants ready to be twisted (d)

As been tabulated in Table 1, three ethnics in Jayawijaya are also using natural and shynthetic dyeing to coloring the natural fibres. Flower *Melastoma* sp extracts and limestone powder from burning crustacean shells are applied and mixed directly into the natural fibres. The synthetic dyeing are applied directly into the natural fibres (Fig. 5a), and then dried under direct sunlight (Fig. 5b). Single or bundle of the dried natural fibres were twisted manually to make single line or layer for noken. During twisting, kitchen ashes were manually powdered into the natural fibres to make them strong and easily to form a noken line, as illustrated in Figure 5c.

a) b) c)

Figure 5. Processes from coloring to twisting natural fibres in Jayawijaya, a) synthetic dyeing application; b) coloring fibres dried; c) twisting mixed with kitchen ashes

Noken Designing

Several fundamental values are considered in making noken, consisting of patterning design, noken shapes, motive or decorative variation, its utilization and the beauty or art of noken. In Jayawijaya generally, the nokens from the natural fibres have a common design and patterns, dominated with heavy brown to black wish color combined with decorative ornaments from white, yellow, and blue (Fig. 3). It is significantly different from those made from non-coloring fibres without decorative ornaments and the light brown natural fibres are dominant (Fig. 6a). Noken from natural fibres has an oval design for general purposes and rectangle or square shapes are produced for specific purposes, like bookcase, and other purposes. Mouth and hanger of the nokens are constructed with attention, as these two sections will suffer from tension and tensile strength when it is in service or uses. These sections have fibres' density per square inchi are is higher that those are other noken sections.

a) b)

Figure 6. View of noken made from the natural fibres (a) and synthetic fibres (b)

The noken made from the synthetic fibres are more colorfull, atrractive, and have various in designs, shape and pattern or motive (Fig. 6b). At least four basic designs are recorded in Jayawijaya, such as natural, customary or cultural symbols, geometrical pattern, and an abstract one. The natural pattern consists of flora and fauna motive, mainly endemic species such as bird of paradise (cenderawasih), coconut tree, cauarina, and roses. The cultural objects or symbols include arrows, megalithic stone, tifa, honai, axes, and others. Geometrical patterns cover from stars, rectangles, triangle, wave, circular, flags, rainbow, heart, and the others. Abstract patterns reflect the combination amongst the color of the synthetic fibres in producing beautiful and artistic noken.

Noken's Lines Assembling

Noken is handmade carrying bags meaning every process from collecting material from the forest, extracting natural fibres, drying the fibres, staining, decorating, and assembling are made by the hands, especially the mature women. The noken is made with full of cares, inner beauty of the maker, and technically could be divided into two main processes, raw material preparation and line fibres assembling, respectively. Detailed process how noken is assembled by Dani, Lani and Mee ethnics, respectively, in Jayawijaya is illustrated in Figure 7.

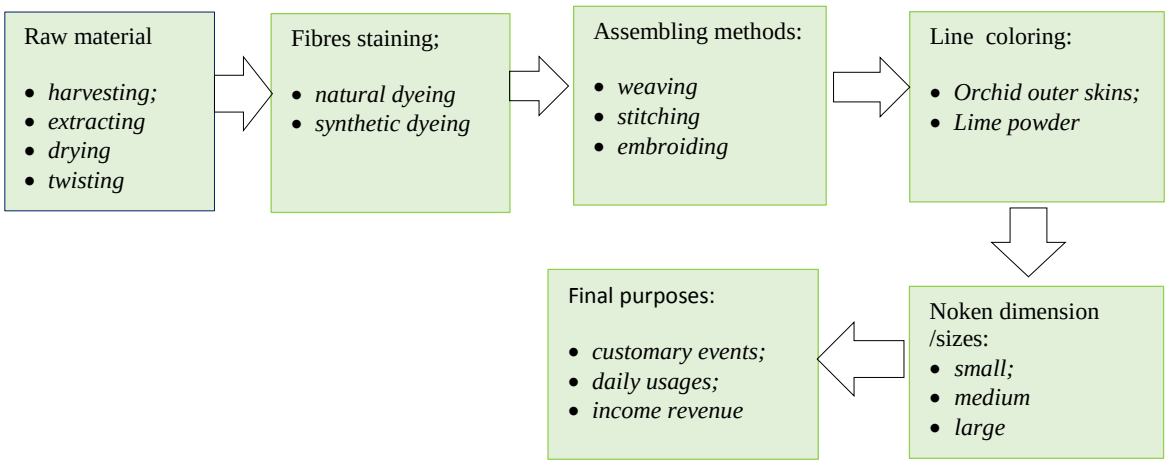

Figure 7. Flow charts for making noken made by three ethnics in Jayawijaya district

Figure 7 illustrates six-processes in making noken. Series of raw material process (selection plant fibres material, extraction, drying and staining) was elaborated in the previous paragraphs, represented with the lined blue box. The natural fibers are stained both using natural dyeing like mixing with the flower of *Melostoma* sp. and synthetic dyeing (see Fig. 5a), To assemble the lines into noken, three methods were employed namely weaving, stitching and embroiding, using two different needles as illustrated in Figure 8. The first needle is locally namely as hakken or hakpen (Fig. 8a) used for knitting the synthetic fibres and the second is umbrella needles the for natural fibres (Fig. 8b). The name for an umbrella needle is used because the material is made from the recycled umbrella bars. During assembling, women will decide noken's sizes, small, medium or large sizes. The noken for customary purposes, likes wedding dowry, fine, crimes, cultural presents, are made from the natural fibres in large size with decorative pattern using the outer skin of orchid, herbs, shrubs, and white lime powder called as pamur in local language. The noken for common uses and income revenue is made in small to medium size from both natural and synthetic fibres because the prices are reasonable and marketed acceptable for local customers.

a)

b)

Figure 8. Two needles used in assembling noken in Jayawijaya, hakpen needles (a) and umbrella needle (b)

Full tighted and pulled lines assembling noken is the simplest method is to statify the quality control (QC) and guarantee the noken quality in fulfillment customer satisfactions. The noken's maker frequently pull the lining arrangements properly, lines are knitted, and twisting lines joints are distributed properly. These skills are not actually taught but they are naturally earned by noken makers souls.

Noken Local Names, Proposed Made and Descriptions of Usages

Noken is a general term used to describe handmade carrying bags made from the natural fibres. However, today noken is also applied for handmade carrying bag made from the synthetic fibres (see Fig. 6b). Here in Tanah Papua, noken is multiple purposed-carrying bags with various size, colour, material made as well as in their utilizations. The noken made in Dani and Lani ethnics have different names, utilization and purposes and they are summarised in Table 3.

Table 3 indicates that two indigenous ethnics in Jayawijaya have different for general terms for noken, where *su* is the general term for Dani, *sum* is for Lani, and *agia* is for Mee ethnic that is absent presented in Table 3. Lani has two missing languages compared to Dani, especially for hat and cultural identity of purposes. This is probably due to the facts that noken is originally multifunctional carrying bags, not intended for hat and cultural identity to specific ethnics. This handmade carrying bags is the simple, fashionable for vacation, schooling, shopping, cultural ceremony and recently as cultural attributes of the land of Papua.

Table 3. Local name, purposes made and their description for two local ethnics in Jayawijaya

No	Local Name		Purposes made	Description
	Dani	Lani		
1	Ye Su Su Aka	Anggop Yum Pugurak	Donated for customary events	Donated for condolence, customary penalty, proposed marriage, wedding ceremony, ethnic leader ceremony, safety bag for cultural heritage matters.
2	Yekerek heleka	Generak yum	Babby carrying bag	Baby carrying bag or baby hammock
3	Hanom su	Tabo yum	Cigarette bag	fulfilment with tobacco, matches, other small material

4	Hetik su	Yumonggok	Small noken	Designed for books, cooked foods, money and other daily necessities
5	Hetik su	Yum		Designed for carrying vegetables, tubers crops, fruits, hunted animal, fire wood, and other material harvested or collected from forest or fields
6	Kukulak su Kirnak su	-	Hat noken	Designed for hat or cap to protect from sun light or cultural identity.
7	Kurima su Yali su Hubula su	-	Cultural identity	Noken from Kurima Noken from Yali Noken from Hula Each represents their identity

Local Noken's Values

The three ethnics in Jayawijaya had similar wisdom's values for noken. Noken is highest customary valuable matters. It is culturally similar to having the megalith stones, and pigs. It represents spiritual values, ranging from a symbol of peace for tribe war, exchange items for murder cases, donated material for wedding ceremony, dowry married couple, and contribution of members to family for cultural events.

The local noken's values for three ethnics in Jayawijaya can be divided into social, cultural, philosophy, and independence especially for women values. Social values mean that relationships, botherhoodness, respectiveness, and giftness to other society members inside and outside clans could be offered by bartering the noken. Noken is a symbol of peace, generosity and harmony in local society. Cultural values for noken are that it is invaluable heritage originally from the ancestors, and acknowledged by all local ethnics in the land of Papua. In Papuanese culture, noken is like a mother, who always take care of and feed her family. It is a symbol of fertility both for women and the land of Papua. Philosophy values represent that it is traditional carrying bags, simplest in design, made from natural-based materials, with the simplest tools and methods, but it has multifunctional values. It has strength, integrity, togetherness, adaptableness, and elasticity. Independence values for noken belong to women meaning they earn income, create their own jobs, feed the family, share household expenditure with their husband, and responsibility to their family.

Noken is culturally identic to women, especially mature women. Despite of the ages, the mature women are justified by their capabilities and capacities in making noken, as the noken is a symbol of living and philosophy of the most local ethnics in Papua. Un marriaged women are socially acceptable on the capability in making noken, indicating that she could be contributed parallelly with her husband in sharing housing economy expenditure when she has married. It is also a symbolic culture for independence, fertility, genrocity, and motherly souls of the marriaged women in the social statue. It also reflects the proudness of children or young generation in wearing their own mother's handy craft for their school bag or daily needs.

Local knowledge in making noken is transferred informally to young generations, mainly the young women by direct involvements in daily activities for any processes in making noken, as illustrated in Figure 4b and 5c and there are no formal classes, courses specifically designed or offered for making noken in Jayawijaya or other places in the land of Papua being reported until present.

Marketing chain, economic values, and time spending

Noken is made by women during leisure time in their own house in day or night times, classified as informal activity and it is undertaken when the main housing works are finished.

Noken is sold or marketed directly at traditionally market in and out Jayawijaya district. Specific customers are to directly buying both from the noken maker and the local traditional market. The customer could also order noken with special design with special prices. Frequently, these customers are also acted as intermediate traders or collectors and they will sell their collection to other customers with taking profits. There are several local hand handycraft shops in Jayapura city, not in Jayawijaya, to sell the Jayawijaya's noken where the noken makers supply their products to the shops.

In general, marketing chains and actors involved in selling noken made by three-ethnics in Jayawijaya are described in Figure 9.

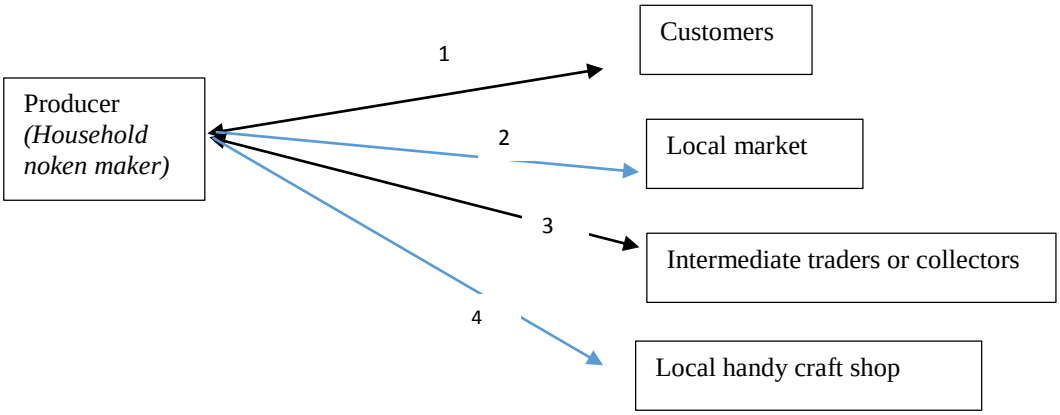

Figure 9. Marketing chains for noken made by three ethnics in Jayawijaya

Figure 9 illustrates that there are four schemes of marketing noken made by three ethnics in Jayawijaya region and actors involved. Marketing actors are noken makers, customers, local market, intermediate traders or collectors, and local handy craft shops. From four marketing chain can be grouped into two schemes, black lines for scheme 1 and 3, and blue lines for scheme 2 and 4 with similar characteristic.

Scheme 1 and 3 explain that relationship amongst noken makers, customers and intermediate traders or collectors are in two directions, while scheme 2 and 4 the relationships are in single direction, where noken makers come to the local markets or the handycraft shops to sell their products. The intermediate persons come from the local or non-local community. They are selling noken to the customers or the local craft shops with higher prices.

An average of prices for noken made by three ethnics marketed in traditional markets in Jayawijaya distrit are in vary, depending on the sizes, raw material made of, and decorative patterns, as summarized in Table 4.

Table 4. Prices of noken made by three ethnics in Jayawijaya

No	Noken sizes	Price (IDR)	Influenced price
1	Small	50.000 – 150.000	Fibres material (synthetic or natural); decorative pattern; sizes; and noken design (simple or non-simple).
2	Medium	200.000 – 350.000	
3	Large	500.000 – 1.000.000	

The plant-based or natural fibres noken made in Jayawijaya have higher in prices compared to those made from the synthetic fibres. Table 4 indicates that the lower prices are applied for the noken made from the synthetic fibres. Noken for cultural purposes has the highest prices, and even it is not for sale as the main purposes are for cultural sharing between the community members.

Assuming availability in noken material, times spent to finish single noken depend on the noken design and size. However, at average, the noken made from the natual fibres of a regular design for small size can be finished for 2-5 days, middle size for one week, and large size for three weeks to two months.

Discussion

Three ethics in Jayawijaya are comparable in using plant-based fibres for noken. Limited source of plant fiber for the Mee ethnic is probably due to the fact that they are not indigenous to Jayawijaya, where all potent natural fibres are not accessable due to customary rules. It is restricted to access natural resources here including plant origin fibres for noken material, where customary right of the land and other related natural resources belong to the Dani and Lani. Cultural permits are required to access local natural resources, including natural fibres (Pattiselanno et al., 2019). Three plant produced fibres of the Mee ethnic are planted or cultivated for multi-purpose at house yards or agricultural field to supply nutritious vegetables and plant fibres. *Gnetum gnemon* is a common tropical plant producing leave for vegetable, fruits for nut production and inner cambium bark or noken fiber raw material (Wahyudi, 2017). Similarly, *Pandanus coneides* is famous Pandanaceae in Tanah Papua, leafs used for traditional roofs, red fruits for source of healthy plant's fat oil, vitamin and other essential minerals, and outer skin of its stilt root is for noken material (Purwanto & Munawaro, 2010). Numbers of plants producing fibres reported here are different to those reported by the previous papers (Arobaya & Pattiselanno, 2007; Dekme, 2015; Wanma et al., 2013), where less than 20 plant producing fibres used by local ethnic in Jayawijaya.

Air dried inner cambium bark of *Gnetum* sp. for raw material of the noken linen and the noken made from these fibres is illustrated in Figure 11a and 11b. The fibres from the inner cambium tree barks are fundamentally used for the main structural noken's lines, mainly for hanger and mouth (Fig. 11b_4) and noken's decorating motifs are made from orchid skins or other shrubs (Fig. 11b_1 and 11b_2). Densities of noken's lines for noken body (Fig.11b_3) is less than those are for mouth and hanger sections (Fig.11b_4).

Figure 11. Natural fibres from inner cambium barks of *Gnetum* sp. (a), noken made from the Gnetum fibres (b), yellowsih outer skin of orchid (b_1), brown outer skin of orchid (b_2), density of line noken's body (b_3) and hanger and mouth sections (b_4)

Both natural and synthetic dyieng are used for noken's staining, extract of *Melasome* sp. flower and white lime powder for the natural dyeing and textile dyeing for the synthetic, respectively. The natural fibres are recently replaced with the synthetic fibres because they

are cheaper, available at any time and seasons, vary in colour, and colourful senses. It is greatly concerned that the plant producing fibres have to be replanted for future supplying needs. It is an example from the Mee ethnic planting multi-purpose plant for natural fibres production and dailly nutritients source.

Each ethnic in Papua has different material, purposes, dyeing, and pattern in making noken (National Geographic, 2017). It depends on the geographical condition and material availability (Marit, 2018). Noken made in Jayawijaya are different to those made from Raja Ampat and Yapen (Kosmas Assem et al., 2020; National Geographic, 2017; Walianggen & Rumatora, 2019). The Jayawijaya's noken are made from the strength and elastic material, intentive works employed, and the sizes and functions are adjustable. A large noken could be used for baby sleeping bags, carrying firewood, and other products agriculture of potato, sweet potato, carrot, and so on. Proposed making noken is changing over times and income generating is main reasons in replacing natural with synthetic fibres.

The noken's design basically falls oval and rectangle, where the first is for cultural purpose made from natural fibres (see Fig. 3), while rectangle is for fashionable purpose from synthetic fibres. The nylon line is used for synthetic noken when elasticity is required. The synthetic fibres produce colourful noken with various shapes, sizes and decorations (Fig.6b) and recently are equipped with routsleting on the mouth section.

In Jayawijaya, culturally noken has different terms, which could manifest diversity of noken made and marketed. It is made for school bags, cigarette and mobile phone cases, fashionable travelling bags, and soon. It is economically sound good to earn an extra income informally for women, and empowering local ethnics. Noken making activities are an alternative work besides agricultural practices and commonly done during spare times in day or night times by house wives or mature women. Noken is made during a spare time by house wives. When the main housing and land works are finished, the wifes spend their spare times by making noken to earn an extra income, obey the cultural heritage, and provide multifunctional bags for family members. At average, small size noken could be made in 2-5 days, not consecutively, medium size for one week, and large size for up to two months.

Nokens have multi-local values ranging from social, cultural, philosophy, and independence. Noken is knotted and woven with simplest tools and methods but it is richness in philosophy, harmony and strength and represents the etnomathematic of noken for Papuanese (Nusantara, 2015).

Noken made in Jayawijaya is marketed locally and regionally in Jayapura city. The local woman from Jayawijaya district surrounded with young customers sells noken at the front building Sentani Airport, Jayapura, where she could easily find any customers of domestic or local tourist targets, as illustrated in Figure 12. Selling directly to customers in the city could earn more profit than selling it at Jayawijaya district (Dewi et al., 2018).

Figure 12. Noken maker selling their products at the terminal airport Jayapura

It is principally important to be highlighted that marketing systems could be facilitated by the goverment both at district and provincial levels by initiating community shops or cooperative firms marketed fully local ethnics merchandise, such as noken, painting ornaments, sculptures etc are substantially urgent established in facilitating the potency of creative economy of the local ethnics.

Conclusion

Conclusions of the research outlined in these results could be concluded as follows:

1. Three local ethnics in Jayawijaya, Dani, Lani and Mee, respectively, have made noken from natural fibres decorated with natural dyeing only for cultural purposes, without decoration are for daily uses, while synthetic fibres are made with specific purpose for extra house generating incomes;
2. Existence of natural fibres recently is being dominated with the synthetic fibres, as these fibres are cheaper, available at any times and seasons, sold at local market, various colour, interesting design and pattern;
3. Noken has multi-functional uses, and multi values from social, culture, philosophy, and independency;
4. Noken indirectly reflects the simplicity, unity, harmony, local ethnic in Jayawijaya living with their surrounding nature;
5. Local knowledge for making noken is transferred informally to the young generation, mainly from mother to the daughter by involving directly to making noken.

Acknowledgement

The authors would like to offer sincere thanks to the people in three villages, in Jayawijaya for their honest support, hospitality, and times spending during this field research. Sincerely appreciations are for Novita Yogi for providing example for various Mee's noken and their original fibres.

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