

The indigenous art of orchid *noken* making by the Mee Tribe in the highland of Central Mountains, Indonesian Papua

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Abstract. Runtuboi YY, Padang DA, Peday MH, Arobaya AYS, Ungirwalu A, Auri A, Dimara PA, Susanti CME, Panambe N, Benu NMH. 2023. The indigenous art of orchid *noken* making by the Mee Tribe in the highland of Central Mountains, Indonesian Papua. *Biodiversitas* 24: 3881-3890. The eastern Indonesian Papua boasts remarkable biodiversity and valuable natural resources. Despite this, there has been a lack of scientific investigation into the sustainable utilization of these resources by the diverse ethnic groups residing in Papua. This paper discusses the traditional practice of the men of the Mee Tribe, who specialize in crafting a traditional bag called orchid *noken*. The study aims to document and preserve the local knowledge and expertise of the Mee Tribe regarding the use of plants in their craftwork. The field study was conducted in August 2014 in the village of Bomomani, located in the Dogiyai District of Papua Province. Qualitative methods, such as interviews and participatory observation, were employed to collect data from 18 key informants selected for their knowledge of the Mee Tribe's traditional practices of orchid *noken* making. The study uncovered that the Mee Tribe relies on nine species of wild plants, including orchids, ferns, and rattans, as the primary raw materials for crafting *noken*. Specific parts of these plants are carefully selected and incorporated into the crafting process, employing different processing techniques to achieve the desired colors and textures in the final product. The findings highlight the immense significance of the orchid *noken* in the daily lives of the Mee Tribe. This study demonstrates that *noken* is a product closely associated with the local knowledge and culture of the Mee Tribe. Additionally, by documenting and understanding the Mee Tribe's traditional practices, the research contributes to the conservation of plant diversity and the preservation of Papuan cultural heritage. This study ensures the continued transmission of traditional knowledge and practices to future generations, safeguarding the invaluable cultural heritage of Papuans.

Keywords: New Guinean orchid, non-timber forest product, orchid ethnobotany, Papua, traditional wisdom

INTRODUCTION

The western part of New Guinea Island, known as eastern Indonesian Papua, is famous for its vast forest cover, rich biodiversity, and valuable oil and natural gas resources (Cámara-Leret et al. 2020; Hidayatulloh et al. 2022). These resources have attracted attention for biodiversity conservation, climate change mitigation, and private sector investments in mining, oil, gas, and large-scale plantations. They also play a crucial role in the daily lives of the Papuan people, providing multiple uses (Ungirwalu et al. 2021). However, The scientific exploration of how the diverse ethnic groups (in Papua) sustainably use natural resources under their cultural traditions has been lacking (Ananta et al. 2016; Cámara-Leret and Dennehy 2019a,b).

In Papua, rural populations heavily rely on natural resources, including various plant resources, to meet their socioeconomic needs (Cámara-Leret and Dennehy 2019a; Runtuboi et al. 2021). The socio-cultural lives of Papuans are closely linked to natural resources, and their long-term

interaction with the environment has shaped adaptive and sustainable customs (Pieroni and Quave 2014; Ungirwalu et al. 2017; Pei et al. 2020). This is evident in the local knowledge and practices, categorized as traditional (ecological) knowledge, manifested in the appreciation of *noken*, a traditional bag product (Kanem and Norris 2018; Wahyudi et al. 2023).

Recognizing its significance, the United Nations designated *noken* as an intangible cultural heritage in 2012 (Kanem and Norris 2018; Yang et al. 2018). *Noken* holds significant socio-cultural value among native Papuans (Wahyudi et al. 2023), representing more than just a commodity. It is deeply intertwined with their way of life, culture, traditions, and identity, fostering a strong sense of cultural heritage and craftsmanship. Unfortunately, the local knowledge of Papuan Tribes, like other indigenous peoples, is at risk of extinction due to a lack of documentation and preservation (Mardero et al. 2023; Ray 2023). The absence of local policies or organizations focused on conserving cultural heritage and traditions has

made many cultural heritages fragile and endangered (Yang et al. 2018).

Noken, crafted by Papuan Tribes, are varied and made from various natural plant fibers, which is part of ethnobotanical knowledge (Rahman et al. 2019; Avianto et al. 2021; Wahyudi et al. 2023). The materials used, manufacturing methods, sizes, and local names of *noken* vary among different Papuan Tribes, including the Mee Tribe in the central highlands of Papua. *Noken* making is typically a female-dominated craft (Dewi et al. 2018; Marit 2018), but there is a unique type made by men of the Mee Tribe using wild mountainous orchids in the sub-district of Mapia, locally well-known as orchid *noken*. This orchid *noken* stands out for its distinct motifs created with natural fibers, primarily orchids. Alternative materials like yarn have replaced forest-based natural fibers in *noken* production (Avianto et al. 2021).

Orchid plants, renowned for their rich species diversity and widespread distribution in New Guinea Island, including the West New Guinea region, are valuable non-timber forest products (Arobaya et al. 2022; Pammai et al. 2022). Orchids hold global economic significance and represent one of the most diverse species in the world's biodiversity records (Vollering et al. 2016; Cámara-Leret et al. 2020; Taylor et al. 2021). Using orchids as the primary material for crafting *noken* is more prevalent among the indigenous people residing in the highlands of Papua than those living in the coastal areas (Wahyudi et al. 2023). Nevertheless, there is a scarcity of detailed reports

regarding ethnobotanical knowledge on the orchid species utilized by the Papuan Tribes in *noken* production.

Despite the abundance of orchid plant biodiversity in the Papua region, the ethnobotanical practice of orchids by Papuan Tribes remains poorly documented (Cámara-Leret and Dennehy 2019b). There needs to be more literature on the local practice of orchid-based handicrafts than traditional knowledge of medicine or local food. Detailed information about the plant species, the *noken* crafting process, and the local knowledge of the Mee Tribe in *noken* production is scarce. This study aims to fill this gap by documenting the local knowledge and utilization of plants in the traditional orchid *noken* made by the men of the Mee Tribe.

MATERIALS AND METHODS

Study area

The research was conducted in August 2014 in the village of Bomomani, as indicated in Figure 1. The geographical coordinates of the village are approximately 3°56'48.52" S and 135°56'34.63" E. Bomomani is situated in the sub-district of Mapia, within the Dogiyai District of Papua Province, Indonesia. The study area, covering an expanse of 203 km², is home to a population of 2003 as of 2014. The entire region of the Mapia Sub-district is characterized by mountainous terrain featuring cliffs and an elevation of 1,700 m above sea level.

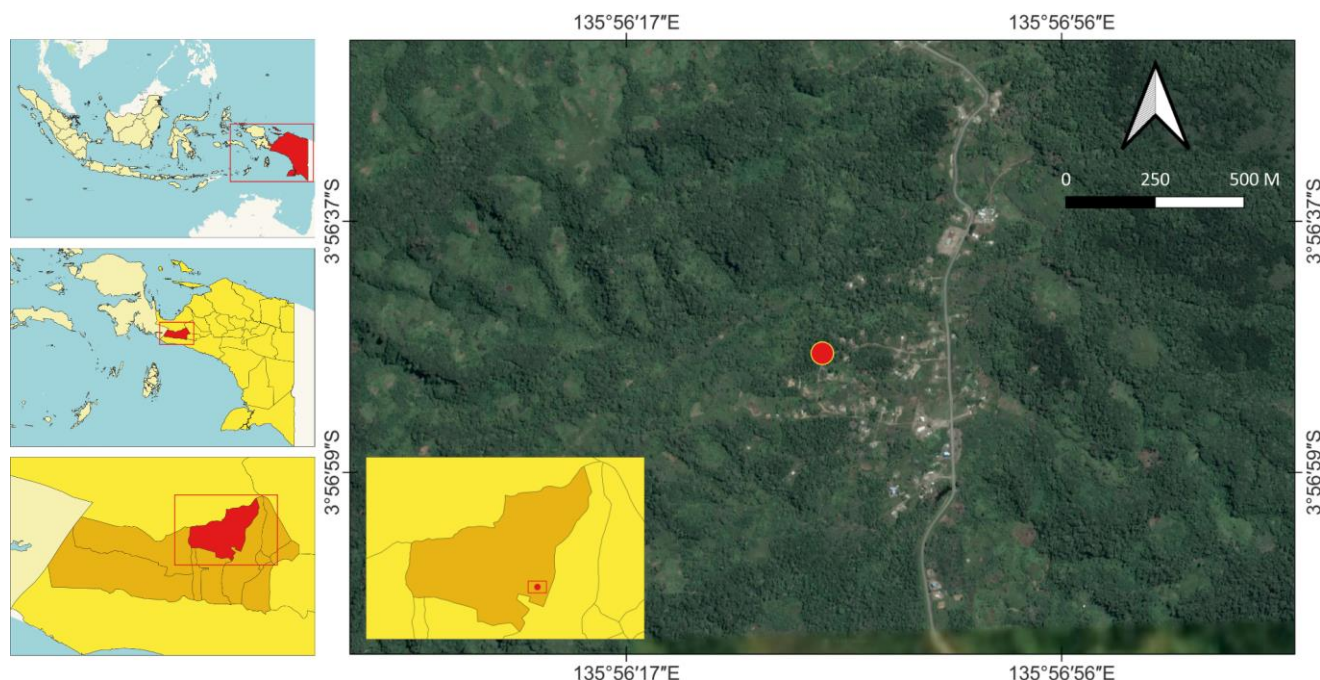


Figure 1. The geographical location of the Mee Tribe in Bomomani Village, sub-district of Mapia, district of Dogiyai, Papua Province, Indonesia

Data collection

This study employs qualitative methods to obtain comprehensive results. Data were collected through an ethnobotanical inventory utilizing several techniques, namely semi-structured interviews, participatory observation, and voucher specimens for plant samples. Direct interviews were conducted with key informants who possessed relevant knowledge about the utilization of plants in crafting orchid *noken*. The interviews aimed to gather information such as the names of species, characteristics of plants, details about the specific plant parts utilized, the process of crafting *noken*, and cultural aspects of the Mee Tribe. The selection of informants deliberately targeted individuals from the local population who were knowledgeable in this field, including craft workers, *noken* sellers, religious/customs leaders, and government officials. Some interviews were conducted while the artisans were actively creating a *noken*, allowing for an assessment of their knowledge and skills.

The study's informants were selected using a combination of purposive sampling, as outlined by Etikan et al. (2016), and the snowball sampling technique. Initially, a key informant was deliberately chosen, and subsequently, additional informants were recommended by the previously selected informants using the snowball sampling method. The process of selecting informants for the study utilized the snowball sampling technique until data saturation was reached. This means that the recruitment of new informants ceased when information had been gathered sufficiently, and further participants were deemed unlikely to provide significantly new or different insights. A total of 18 key informants were interviewed for this study. These included craft workers, *noken* sellers, and religious and custom leaders.

Subsequently, certain informants invited the researchers on guided tours to areas where plants were collected, aiding in identifying plants discussed during the interviews. This activity also assessed the informant's ability to identify plants in their natural habitat.

While collecting specimens in the field, interviews and observations were conducted simultaneously, capturing information about the plants and the surrounding environmental conditions, recorded in a field notebook. The voucher specimens were deposited in the Herbarium Manokwariense at the Universitas of Papua, West Papua Province, Indonesia; the identification of plants using species identifiers from the Forestry Research and Development Agency, Manokwari. Information technology tools, such as tape recorders and handy cameras, were used during data collection.

Data analysis

The empirical data were processed and analyzed descriptively, following data reduction, data presentation, and drawing conclusions based on the selected thematic analysis. They were presented as narrative texts, tables, and figures. Therefore, to assess the plant's utilization, we apply thematic analysis. In addition to analyzing empirical data, the authors use a literature review to confirm and enrich the discussion of the research findings.

RESULTS AND DISCUSSION

Characteristics of the Mee Tribe

The Mee Tribe, an indigenous group, resides in the central highlands of Papua, specifically in the Dogiyai, Deiyai, and Paniai regencies. Their settlements are located in various geographical areas, including mountains, foothills, and valleys such as Kamu Valley, Mapia, and the vicinity of Lake Tigi, Tage and Paniai (Pekei 2013). These regions have altitudes ranging from 500 to 1,700 meters above sea level. The diverse and extensive geographical conditions strongly influence the culture and characteristics of the Mee Tribe in each area. While the Mee populations share similar socio-cultural traits, some minor differences can be observed. For instance, the Mee Tribes of Kamu (Moanemani) Valley, Waghete, Enarotali, and Mapia have different Mee dialects. The word *noken* in the Mee language is pronounced as "Agiya" in Kamu Valley and "Agiha" in Mapia.

Crafting *noken* is a common cultural practice that unites the Mee Tribe and other Papuans (Avianto et al. 2021). *Noken* holds significant cultural importance in their daily lives. It serves various purposes, such as transporting agricultural products, livestock, carrying infants, storing traditional ceremonial equipment and personal accessories during travel. Both men and women in the Mee Tribe are associated with *noken*, which remains an integral part of their identity. The production of *noken* involves utilizing natural plant fibers as raw materials. However, the specific resources used may vary across regions based on local plant availability and the biophysical conditions of each area.

The majority, around 90%, of the residents in Bomomani Village are native Mee, while approximately 5% consist of migrants. The Mee people live in small patrilineal societies comprising groups of relatives, fostering strong family and kinship ties, particularly evident in their cooperative forest-gardening activities. Traditional farming, animal husbandry, hunting, and utilizing natural resources are the primary means of subsistence for the people in Bomomani Village. They cultivate taro, tubers, peanuts, vegetables, and coffee within their forest gardens. Additionally, they raise pigs, chickens, and rabbits, while wild pigs and various bird species are commonly hunted. Similar to other Papuan Tribes, the daily activities of the Mee, such as gardening, hunting, and gathering, are shaped by their understanding of the complex spatial geography of their environment. In Bomomani Village, the *noken* remains an essential item in their personal and communal activities throughout their daily lives.

Wild plant diversity as raw material for crafting orchid *noken*

The production of orchid *noken* involves the utilization of natural plant fibers. Through interviews and observations, we discovered that the Mee Tribe incorporates nine species of wild plants from seven families as the primary raw materials for crafting orchid *noken*. Each plant species was carefully documented,

noting their scientific and local names and growth habits (Table 1). The documentation also includes information regarding the specific parts of the plants used, their utilized form, and the preparation methods involved (Table 2). Significantly, all the plants employed in the *noken* making process grow naturally in the mountainous forests surrounding the Mee Tribe's settlements.

This table provides information about various plant species that serve as raw materials for orchid *noken*, a traditional bag crafted by the Mee men in Bomomani Village (Figure 2). The plants used as raw materials for orchid *noken* include orchid species from the family Orchidaceae, such as *Dendrobium* aff. *Centrale* J.J.Sm., *Dendrobium* aff. *Regale* Schltr., and *Dendrobium* section *diplocaulobium* sp. (Schuiteman 2013). These orchids are epiphytes, which grow on other plants without parasitism (Schuiteman 2013). However, these orchid species are becoming increasingly rare in the forest, and some do not even flower, making it challenging to identify their scientific names. Based on interviews conducted, it was found that the Mee men rarely saw flowers from these orchids and could not provide descriptions. Nevertheless, during the research, one flowering orchid species was discovered. This particular species has star-shaped flowers with a distinct pink-white colour which is close to the species *Dendrobium* section *diplocaulobium* (Figure 2.C).

In a recent study conducted by Wahyudi (2023) on the *noken* making practices of the Dani, Lani and Mee Tribes

in the highlands of Papua, significant insights were gained regarding the orchid species utilized by these indigenous communities. The research revealed that the Dani and Lani tribes employ two distinct orchid species, *Dendrobium dalbertisii* Rchb.f. and *Dendrobium* sp. to produce *noken*. Our study also filled a notable gap in ethnobotanical research by highlighting that the Mee Tribe in Mapia utilizes three orchid species in *noken* production (Table 1).

In addition to orchids, other plant species are used as raw materials for orchid *noken's* manufacture, including *Cyathea contaiminans* (Wall. Ex Hook.) Copel., *Nephrolepis* sp., *Dryopteris hirtipes* (Blume) Kuntze, *Dicranopteris linearis* (Burm.f.) Underw., *Pipturus argenteus* (G.Frost.) Wedd. and *Calamus* sp. These plants have different growth habits, such as herbs, shrubs, and lianas, and are referred to locally as *Pupu*, *Epiho*, and *One* (Table 1). The Mee Tribe has discovered that four different species of ferns (Figures 2.D-G) are abundantly available near their settlements. These ferns are used as thread fibers, resulting in a dark, almost black color for the *noken*. Furthermore, using ferns in handicrafts has also been reported in several places (Suryana et al. 2018; Dadang et al. 2020). Using ferns offers the advantage of interchangeability in producing orchid *noken* as a handicraft. Among the non-timber forest products, *Calamus* sp., a thorny climbing palm commonly known as rattan, holds significant importance (Figure 2.I).

Table 1. Plants species as raw materials of orchid *noken* by Mee Tribe in Bomomani Village, Mapia Sub-district, Dogiyai District, Papua Province, Indonesia

Family	Scientific name	Local name	Habitus
Orchidaceae	1. <i>Dendrobium</i> aff <i>centrale</i> J.J.Sm.	<i>Toha</i>	Epiphyte
Orchidaceae	2. <i>Dendrobium</i> aff <i>regale</i> Schltr.	<i>Hati Toha</i>	Epiphyte
Orchidaceae	3. <i>Dendrobium</i> section <i>Diplocaulobium</i> sp.	<i>Bitu</i>	Epiphyte
Cyateaceae	<i>Cyathea contaiminans</i> (Wall. ex Hook.) Copel	<i>Pupu</i>	Herb
Nephrolepidaceae	<i>Nephrolepis</i> sp.	<i>Pupu</i>	Herb
Thelypteridaceae	<i>Dryopteris hirtipes</i> (Blume) Kuntze.	<i>Pupu</i>	Herb
Gleicheniaceae	<i>Dicranopteris linearis</i> (Burm.f.) Underw.	<i>Pupu</i>	Herb
Urticaceae	<i>Pipturus argenteus</i> (G.Frost.) Wedd.	<i>Epiho</i>	Shrub
Arecaceae	<i>Calamus</i> sp.	<i>One</i>	Liana

Table 2. Raw material processing of *noken* crafting

Species	Plants Part used	Raw material processing
Orchid	Bark	The stem is carefully selected and divided into four sections, followed by the separation of the skin from the stem. The extracted skin is then left to dry for one day. Once thoroughly dried, the leather is securely tied and readily available.
Ferns	Stem	The stem is harvested, ensuring the prickly parts are cleaned and removed. It is then divided into four equal pieces before undergoing a drying process lasting approximately 2-3 days. Once thoroughly dried, the resulting leather is tied and prepared for immediate use.
<i>Pipturus argenteus</i>	Bark	The stems, branches, and twigs are carefully stripped of their skin, preserving as much length as possible, typically ranging from 15 to 30 cm. The separate skin portions are left to dry naturally under the sun for several days. The dried skins are subjected to a smoking process over a stove to impart a semi-dark color. Once thoroughly dried and treated, the material is carefully split into smaller pieces, ready for use in various applications.
<i>Calamus</i> sp.	Stem	The stems are harvested and subsequently cut into smaller pieces. These pieces are left to dry naturally under warm sunlight until they are dehydrated and prepared for use in various applications.



Figure 2. The plant species used as raw materials for orchid *noken* manufacture are based on Mee's local wisdom. A. *Dendrobium* aff. *Centrale*, B. *Dendrobium* aff. *Regale*, C. *Dendrobium* sp. section *Diplocaulobium*, D. *Cyathea containinans*, E. *Nephrolepis* sp., F. *Dryopteris hirtipes*, G. *Dicranopteris linearis*, H. *Pipturus argenteus*, I. *Calamus* sp.

Rattan stalks are prized for their strength, flexibility, and uniformity, making them commercially valuable for furniture and handicrafts (Myers 2015; Mairida et al. 2016). *Calamus* sp., a specific rattan genus, has long been used as a raw material for handicraft production (Talukdar et al. 2021). The distinct patterns created with rattan are employed explicitly in making this type of *noken*, distinguishing it from other *noken* varieties found in the daily lives of the Mee people and other Papuan Tribes. *Calamus* sp. naturally grows in primary and secondary forests, shifting cultivation areas, and scrublands around the dwellings of the Mee Tribe.

Additionally, the tree bark of *P. argenteus* (Figure 2.H) serves as a base material for wrapping the orchid bark and creating a rope for weaving the orchid *noken*. The *P. argenteus*, a plant species commonly known as silverberry, is among the nine plants utilized as raw materials for *noken* made by the indigenous Mee Tribe. Wanma et al. (2013) and Wahyudi et al. (2023) also mentioned this plant as being widely used by the indigenous communities in Papua. The study confirms that the Mee Tribe in Bomomani Village employs nine plant species to produce orchid *noken*. The process closely aligns with the *noken* making practices of the Dani and Lani tribes (Wahyudi et al. 2023). This study also provides additional insights into the previous research conducted by Wahyudi et al. (2023),

who documented that the Mee Tribe utilizes three plant species to produce *noken*.

The plant part used and material processing in *noken* manufacturing

The Mee Tribe has developed a unique and selective approach to utilizing specific parts of plants in the creation of the orchid *noken*, also known as *Agiya*. This traditional craft involves carefully selecting and processing various plant materials to produce these intricately woven bags. The materials used include segments of the orchid plant stem, the bark of the *P. argenteus* species, fern stems, and the stems of the rattan species *Calamus* sp. However, a series of necessary processing steps are undertaken before incorporating each plant part into the *noken* production process. These steps are crucial in preparing the materials and ensuring their suitability for weaving. Table 2 provides an outline of the processing steps.

The Mee Tribe in Bomomani employs a similar method of processing raw materials for *noken* production as described by Wahyudi et al. (2023) in the case of the Dani, Lani and Mee Tribes and by Sonbait et al. (2021) in the case of Arfak tribe. However, there is a notable distinction in their approach. Unlike the Dani and Lani tribes, the Mee Tribe in Bomomani does not utilize the dipping method before drying. This variation stems from the fact that the

Mee Tribe employs orchid skin for coloring *noken*, necessitating a different approach in the overall process.

In creating the outer layer of the *noken*, the bark of the orchid stem is utilized to provide a lasting yellow or brownish color. This coloration technique not only enhances the aesthetic appeal of the *noken* but also ensures its longevity. Using the bark of the orchid stem, the outer layer of the *noken* acquires a vibrant hue that can withstand the rest of time. This natural coloring method showcases the resourcefulness and knowledge of the artisan in utilizing plant materials to achieve the desired visual effects in the final product.

The making of traditional orchid *noken*

Traditional *noken* has been made by the Mee Tribe, either from orchids or tree bark, for generations. This paper focuses on the traditional orchid *noken* made of various sizes to suit the intended use. This specific *noken* made by the Mee Tribe in Mapia consists of three sizes, as outlined in Table 3.

The small-sized *noken* is known as *ibo* in the local language (Table 3). It is designed to be compact and suitable for carrying smaller items. Furthermore, the medium-sized *noken* is referred to as *ibo Tide Muko-Muko*. The *ibo tide muko-muko noken* offers a slightly larger capacity, making it ideal for carrying moderate items. Moreover, the large or wide-sized *noken* is known simply as *tide*. It is significantly bigger and broader than the smaller sizes, providing ample space for carrying more oversized items or a greater quantity of belongings.

These traditional *noken* sizes represent the Mee Tribe's understanding of their community's needs and the practicality required for various purposes. The sizes range from small and compact to medium and large, enabling the Mee Tribe to utilize *noken* for different tasks, such as storing personal items, carrying groceries, or transporting goods.

The process of making orchid *noken* by the Mee Tribe follows several stages (Figure 3), as follows:

Making the orchid noken rope (Doki Kebone)

Orchid *noken* ropes are a meticulous process involving various processed materials, including orchid stem bark, *P. argenteus* bark, and fern stems. These materials are prepared in advance and are the foundation for weaving the *noken* ropes. Skilled artisans employ a technique where *P. argenteus* wood fibers are carefully wrapped with orchid or fern skin to achieve specific hues such as golden yellow or dark shades. These wrapped fibers are twisted together, creating a unique texture and color combination. This technique allows for the creation of dynamic and visually appealing *noken* ropes.

Once the fibers are prepared and twisted, the weaving process begins. Artisans use a specialized needle to weave the fibers, forming the orchid *noken* ropes. In the Mee language, these ropes are known as *Doki Kebone*. The manufacturing process of *noken* ropes typically takes around 1 to 2 days, although the exact duration may vary depending on the desired size of the *noken*. Larger *noken* may require more time and intricate weaving techniques.

Making the mouth of the orchid noken (agiya kebone)

The orchid *noken* mouth is meticulously crafted to match the desired size precisely. The artisans utilize natural fibers carefully prepared and spun for this purpose. These fibers serve as the building blocks for weaving the mouth of the *noken*, referred to as *agiya kebone* in the Mee language. During the manufacturing process, the prepared and spun fibers are intricately woven together with a needle to form the mouth of the *noken*. The artisans ensure that the weaving is done with precision, creating a structure that fits the intended size and shape of the *noken*.

The entire process of crafting the orchid *noken* mouth typically takes 1 to 2 days, although the duration may vary depending on the specific size of the *noken* being produced. Larger *noken* may require more time and intricate weaving techniques to achieve the desired result.

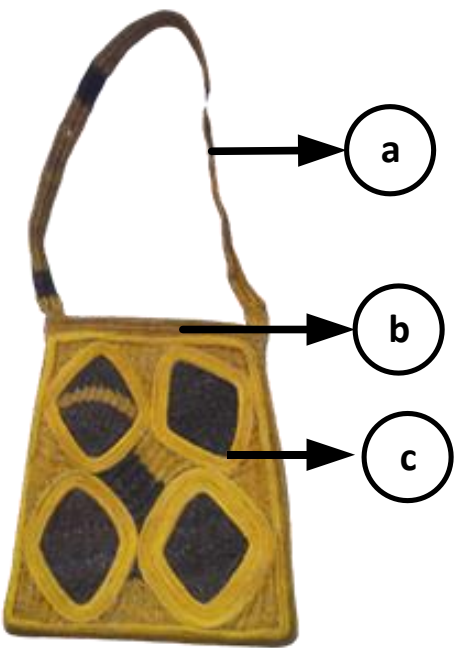


Figure 3. Part of orchid *noken* manufactured. A. The rope of the Orchid *noken*, B. The mouth of the orchid *noken*, C. The body of the orchid *noken* with a pattern

Table 3. *Noken's* sizes of Mee Tribe in Bomomani Village, Dogiyai District, Papua Province, Indonesia

Common type	Mee's local name	Characteristic
Small size	<i>Ibo</i>	with a size of about 10 x 15 cm ² , 15 x 20 cm ²
Medium size	<i>Ibo tide muko-muko</i>	with a size of about 20 x 30 cm ² , 30 x 30 cm ²
Large /wide size	<i>Tide</i>	with a size of 40 x 30 x 5 cm ³ or 50 x 40 x 5 cm ³

Body noken orchid (agiya epoo)

Crafting the body of the orchid *noken* begins by selecting the desired shape of the motifs, skillfully crafted from cleaned and dried rattan skin. The rattan fibers are crafted to form round or square motifs, serving as the foundational elements of the *noken's* body. This process highlights the artistry and expertise of the artisans in transforming rattan fibers into beautifully shaped motifs, setting the stage for the subsequent stages of *noken* production.

Artisans select motifs based on their preferences, believing that specific designs enhance *noken's* appeal to potential buyers. Threads made from *P. argenteus* fibers, ferns, and orchids are intricately woven, following the motif's desired shape and color scheme. Once the motifs are ready, they are skillfully sewn together to form an *agiya epoo* unified body in the Mee Tribe language. The duration of the process depends on the *noken's* size and the complexity of the motifs.

This process combines weaving techniques and artistic choices to create visually captivating and culturally significant orchid *noken*. The meticulous attention to detail and craftsmanship showcased in the *noken's* body exemplify the rich traditions and skilled artistry of the Mee people.

Orchid noken (toha agiya)

Once the body of the orchid *noken* is complete, the subsequent step involves connecting the *noken's* mouth and rope to the body. This is achieved by sewing it together using a rope from spun *P. argenteus* and orchid skin. The components seamlessly combine through this meticulous sewing process, resulting in the final product—the orchid *noken*, known as *toha agiya* in the Mee language. At this stage, the orchid *noken (toha agiya)* is ready to be utilized or marketed, showcasing the exquisite craftsmanship and cultural heritage of the Mee Tribe.

Weaving the traditional orchid *noken* of the Mee Tribe requires considerable time, typically from 1 to 6 months. The duration varies depending on factors such as the size of the *noken*, the complexity of the designs, the availability of materials, and the skill level of the craftsman. An experienced artisan familiar with the techniques involved in creating a typical *noken* can complete a large-sized bag in approximately 1 to 4 months. However, for an artisan who is less acquainted with the intricacies of the craft, it may take longer to complete the weaving process.

The production process of the orchid *noken* involves creating three main components, as depicted in Figures 3.A-C). These components are carefully crafted to ensure the functionality and aesthetic value of the final product. The rope is a sturdy handle or strap that allows the *noken* to be carried or hung. The mouth refers to the opening or entrance of the *noken*, designed to provide easy access to the contents stored inside. Lastly, the body of the orchid *noken* encompasses the main structure or container, where various items can be placed or stored securely. Each

component plays a crucial role in the overall design and utility of the orchid *noken*, showcasing the craftsmanship and attention to detail involved in its manufacture.

Orchid *noken*, made by the Mee Tribe, slightly differs from other Papuan Tribes. The Dani and Yali tribes in Wamena divide the making of the *noken* into five parts (Wahyudi et al. 2023), while the Mee Tribe divides it into four parts. The Mee Tribe initially separated each part of the *noken*, namely the mouth, the rope, and the body parts. Then, they are combined to become one orchid-*noken* product. Each part of the orchid-*noken* has its local name. Even though it looks simple, the stages of making this orchid-*noken* are rarely reviewed in detail in several *noken*-related publications.

Men and orchids noken

As previously mentioned, the traditional *noken* is widely recognized among the various Papuan Tribes, with each tribe having its version (Avianto et al. 2021). Women, including the Mee Tribe, commonly manufacture traditional (orchid) *noken* (Sonbait et al. 2021; Wahyudi et al. 2023). However, there is another type of traditional orchid *noken* made only by men, i.e., a traditional orchid *noken*, as the focus of this research. Upon careful observation, it is evident that this particular variety of orchid *noken* exhibits slight variations compared to the *noken* type documented by Wahyudi et al. (2023). It is important to note that not all men from the Mee Tribe contribute to making this distinctive orchid *noken*; men from the sub-district of Mapia primarily craft it. The skill of the men of the Mee Tribe in the sub-district of Mapia is recognized by the Mee Tribe in other areas, such as Enarotali and Moanemani. However, our field research discovered that only approximately 12 men's artisans specialize in orchid *noken* within the Mapia Sub-district. The knowledge and expertise in crafting orchid *noken* are passed down from parents to their children and relatives through direct communication or hands-on instruction in creating these intricate handicrafts.

The men of the Mee Tribe have an essential role in making orchid-*noken*, from selecting the raw materials to assembling the intricate weaves (Figure 4). First of all, the men of the Mee Tribe are involved in selecting the plants used as raw materials for orchid-*noken*. They have extensive knowledge about suitable plants, such as orchids, ferns, rattan, or bark, with solid and flexible fibers for weaving. The selection of these plants requires experience and expertise in identifying the characteristics of the right plants. The men of the Mee Tribe are knowledgeable about effective fiber processing techniques to ensure the plant fibers are in good condition for woven material. Once the plant fibers are ready, the Mee Tribe men use complex woven techniques to create the *noken*. They master various traditional patterns and motifs passed down from previous generations. In this weaving process, the men of the Mee Tribe show high manual skill and care in creating beautiful and unique designs.



Figure 4. Mee Artisans and the handicraft of orchid-*noken* in Bomomani Village, Dogiyai District, Papua Province, Indonesia. A. The Mee men artisans make a circle motif, part of the orchid-*noken* body (*agiya kebone*), B. Male artisans of the Mee Tribe use their artificial orchid-*noken* (*toha agiya*)

The making of *noken* by Mee men also reflects their cultural values and identity. *Noken* is an integral part of the daily life of the Mee Tribe and other Papuans (Kanem and Norris 2018; Wahyudi et al. 2023). It is used for various purposes, such as carrying goods, transporting agricultural products, or as part of traditional clothing (Risamasu et al. 2019). Mee men understand the meaning and symbolic value of *noken* in their cultural context, and they are proud to preserve this tradition by crafting *noken*. In addition, making *noken* also provides an opportunity for Mee men to generate income. Throughout Papua, *noken* is a cultural product that can potentially boost people's economies (Risamasu et al. 2019; Avianto et al. 2021). *Noken* has become a vital handicraft industry for the Mee Tribe, and Mee Tribe men are involved in producing orchid-*noken* for sale in local markets and outside their area. With their skills in making *noken*, the men of the Mee Tribe can act as artisans and entrepreneurs, thus strengthening their community's economy.

Overall, Mee men play a central role in making *noken*. With their knowledge and skills, they ensure that suitable raw materials are selected, prepare plant fibers, and create intricate weaves. This process demonstrates technical expertise and is a form of preserving the culture and identity of the Mee Tribe in the highland of central mountains, Indonesian Papua.

Preservation of *noken* as cultural heritage and traditional ecological knowledge

The Mee people's practice of making orchid-*noken*, handed down from generation to generation, demonstrates a wealth of local knowledge and cultural tradition acquired over many years (Syufi et al. 2019). This custom is a tiny element of the Mee culture, whose members constantly interact with their surroundings. Like the local wisdom of the Talang Mamak tribe in Riau (Titisari et al. 2019), protecting *noken* as an intangible cultural heritage of the Papuan people is a significant effort to protect and maintain the values, knowledge, skills, and practices of the cultural

identity of Papuan Tribes (Ananta et al. 2016; Indrawan et al. 2019).

As an integral part of the daily life of the Papuan people, *noken* has a deep cultural meaning and is a symbol of cultural identity (Kanem and Norris 2018). All Papuan Tribes have distinctive *noken* local names, materials, basic materials, and production procedures (Peketi 2013). It demonstrates that the diversity of *noken* culture is part of each tribe's cultural identity and reflects the Papuans' overall cultural identity (Salhuteru and Hutubessy 2020). Protecting *noken* as an intangible cultural heritage involves various steps and actions taken by the government, local communities, and individuals involved in making and using *noken*. The following is a description of the protection of *noken* as an intangible cultural heritage of the Papuan people: (i) Awareness and Education: The people of Papua, including the younger generation, need to be given a strong understanding of cultural and historical values and the importance of *noken* in their lives. Education and awareness of the *noken* cultural heritage must be disseminated through educational programs, seminars, workshops, and other activities. (ii) Legal recognition: The government can take steps to recognize and protect *noken* as an intangible cultural heritage. This can be done by adopting policies, regulations, or laws that specifically mention the importance of protecting and preserving the *noken* as a cultural expression of the Papuan people. The recognition of *noken* as a cultural heritage by UNESCO must be followed up with state recognition by both the local and central governments. (iii) Preservation of skills and knowledge: Support should be provided to protect and preserve the skills and knowledge associated with making *noken*. This can be done by training and mentoring *noken* artisans, transferring knowledge from the older generation to the younger generation, and recording documentation on traditional techniques, patterns, and motifs. (iv) Marketing and promotion: *Noken*, an intangible cultural heritage of the Papuan people, can be promoted through appropriate marketing efforts. The use of social media, art exhibitions,

cultural festivals, and other events can be a means to increase awareness and appreciation of *noken* as a valuable cultural heritage. (v) Protection of Intellectual Property Rights (IPRs): Protection of intellectual property rights against traditional patterns and motifs used in *noken* must be considered. This can involve the registration of traditional *noken* designs to prevent unauthorized use or misuse by other parties. (vi) Community collaboration and participation: It is essential to involve local communities in decision-making, program implementation, and activities to protect *noken* as an intangible cultural heritage. Papuan people must be actively involved in making policies and managing and maintaining *noken* to feel responsible and directly involved in conservation efforts.

In conclusion, our study focused on the production of orchid *noken* and examined the utilization of natural plant fibers in this traditional craft. Through comprehensive interviews and observations conducted within the Mee Tribe, we identified nine species of wild plants from seven families that serve as the primary raw materials for crafting orchid *noken*. Notably, all the plant resources employed in the *noken* making process are sourced naturally from the mountainous forests surrounding the settlements of the Mee Tribe. The practice and expertise of the Mee Tribe in Bomomani Village, Mapia Sub-district, indicate the diversity and uniqueness of the creation of *noken* as one of the cultural treasures and traditions embedded in the daily life of the Mee Tribe.

This research contributes to the understanding and documentation of the traditional knowledge and sustainable practices of the Mee Tribe and their cultural heritage of producing orchid *noken*. Protecting *noken* as an intangible cultural heritage for the Papuan people is an important step in preserving their cultural identity, promoting the continuation of traditions, and maintaining cultural values passed down from generation to generation. With ongoing protection efforts, *noken* can remain a valuable part of life and be able to preserve Papua's cultural wealth for the future.

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