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Small Scale Ecology and Society: Forest-Culture of Papua Nutmeg (*Myristica argentea* Warb.)

Ekologi dan Masyarakat Skala Lokal : Hutan Budidaya Pala Papua (Myristica argentea Warb.)

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ABSTRACT

*Identities and entities can be found in the cultural and ecological environment of a community when its members interact with each other. The Papua nutmeg (*Myristica argentea* Warb.) has been utilized by the Baham-Matta ethnic in the western part of Papua for centuries as part of their traditional ecological knowledge of non-timber forest products (NTFPs). However, this practice has not been scientifically constructed as part of social forestry science. Therefore, this paper seeks to contribute to an empirical understanding of the forest-culture of the local community and its implications for adaptive forest governance in West Papua. This study found that adaptive resource management has been applied to the Papua nutmeg, which is called *henggi* in Iha language and endemic to the tropical forest of the western part of Papua. The treatment of Papua nutmeg consists of three stages, namely pre-harvest, harvest, and post-harvest, all of which form a holistic unity which is sustainable until today. The Papuan nutmeg is traditionally managed and locally conserved using a traditional method known as the *sasi* system.*

INTISARI

Identitas dan entitas dapat ditemukan pada lingkungan budaya dan ekologi masyarakat saat mereka berinteraksi. Pala papua (*Myristica argentea* Warb.) telah dimanfaatkan selama berabad-abad oleh etnis Baham-Matta di Papua Barat berdasarkan sistem pengetahuan ekologis tradisional sebagai bagian dari hasil hutan bukan kayu (HHBK) unggulan. Namun disayangkan fenomena ini belum dikonstruksi secara ilmiah sebagai bagian dari ilmu perhutanan sosial. Oleh karena itu makalah ini berusaha memberi kontribusi pada pemahaman empiris tentang hutan-budaya dari praktik masyarakat lokal dan implikasinya terhadap tata kelola hutan adaptif di Papua Barat. Hasil kajian ini menemukan bahwa pengelolaan sumber daya adaptif pala papua yang disebut *Henggi* dalam bahasa Iha adalah tumbuhan endemik yang berasal dari hutan alam tropis di Papua Barat. Pemanfaatan pala papua terdiri dari tiga tahapan yaitu pra panen, panen dan pasca panen. Pengelolaaannya masih sangat sederhana dan bersifat tradisional dengan salah satu keunggulannya adalah konservasi tradisional menggunakan sistem “Sasi”.

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Introduction

There is an increasing trend towards the application of adaptive land management which involves local communities (Abdel & Kobbail 2011; Armitage et al. 2007; Klooster 2002). An increasing number of studies have been dedicated to the investigation of socio-ecological systems (Karpouzoglou et al. 2016). This has led to an awareness of the importance of natural and vegetarian resources to the knowledge and conservation of landscapes (Leopold 2004).

Human activities have a strong effect on the land cover and exert a selective force on tree species and functional traits, thereby potentially shaping the distribution of ecosystem services in the landscape (Thijs et al. 2015; Maryudi 2015). One of such activities is sustainable management in the utilization of forest (Naveh 2007; Musacchio 2009). Forest utilization may involve either tangible entities, such as timber or non-timber forest productions (NTFPs), or intangible entities, such as property right, physiological aspect, spiritual aspect, emotional aspect, spiritual aspect, cultural aspect, and welfare (WCPA 2000).

Then, the local knowledge of natural resource utilization can be used to develop a modern conservation system, to support researchers in the fields of ecology, and to improve the properly adaptive method of their cultural system (Liu et al. 2010). To a large extent, inhabitants' traditional knowledge, which consists of past and present beliefs, traditions, practices, and views developed by indigenous and local communities (Cámara-Leret et al. 2014; Setiawan et al. 2016; Prabowo et al. 2017), are important to be constructed as a science. The science relevant to natural resource management is continuously produced using the science of sustainability, social-ecological systems, and resilience thinking frameworks and approaches (Charnley et al. 2017; Folke et al. 2005).

Ethnoecological studies of adaptive resource management emphasize localities that have distinct biophysical and sociocultural characteristics (Naveh 2007; Musacchio 2009; Ens et al. 2015). Therefore, the concept of forest management should be

redesigned since the local communities have been traditionally handling the sustainable management for centuries (Devkota et al. 2010). A similar finding was also generated by previous studies on black fruits (Ungirwalu et al. 2016; Ungirwalu et al. 2017). In this research, we focus on the construction of local knowledge of ecology in a small scale society which involves the utilization and protection of natural resources, and then here we propose the term "forest-culture" to describe the construction process.

A great proportion of Papuan ecosystem service still adorns the island which has the most unique and beautiful landscape on earth. There are many landscape and biodiversity areas that are still untouched. Papua is a habitat for 11,000–25,000 species of plants, 602 species of birds, 125 species of mammals, and 223 species of reptiles (Petocz 1987; Muller 2005; Marshall et al. 2007). Papuan pluralism is not only reflected in its abundant natural resources, but also in the number of languages with not less than 269 local languages spoken by its indigenous inhabitants. Each location has its own characteristics, which include socio-culture and biophysical aspects, so a specific approach should be considered and applied to each location. In addition to that, the ecological condition as part of the natural resources is playing a crucial role in the development of socio-culture.

In the Indonesian Province of West Papua, there exists a wide spectrum of forms of sustainable utilization and conservation of forest resources. However, none of these is well documented in the scientific literature. The study reported in this paper sought to examine one such under-studied case of adaptive resource management in Papua as exemplified in the traditional utilization and conservation of a tree species endemic to a particular area. Thus, this research investigates the involvement of the Baham-Matta ethnic in the traditional management of Papua nutmeg (*Myristica argentea* Warb.) as one of the NTFPs. Through this research, we aim to construct the concept of traditionally adaptive management of Papua nutmeg from forest-culture perspective.

Materials and Methods

Study area

In general, forests still dominate the landscape of Papua, including Fakfak Regency. Based on the data on actual land cover in 2014, forests cover 81.5 percent of the regency's total area (Bapeda Fakfak Regency 2015). This study took place in Fakfak Regency with a geographical position of $131^{\circ} 53' 03'' - 133^{\circ} 29' 19''$ E and $2^{\circ} 30' 58'' - 3^{\circ} 57' 51''$ S. Then, several villages were specifically selected from five districts in the regency, namely West Fakfak, East Fakfak, Fakfak, Central Fakfak, and Kramongmongga districts. The villages were Werpigan, Kwama, Sanggram, Brongkendik, Pirma, Pikipik, Kwamkwamur, and Bahbadan (Fig 1.). The eight villages were assumed to represent the local communities which frequently utilize Papua nutmeg in the tropical forest of the western part of Papua. The focus of the study is the construction of forest-culture on the local scale, i.e. the Baham-Matta ethnic.

Interview and data collection

The first stage of the snow ball technique was to find, identify, select, and sample the respondents through the rolling process. We performed interviews from one respondent to another until we ultimately found the key respondents, i.e. the individual who

really understood the knowledge system and the utilization of Papua nutmeg. The second stage was observation in which the researchers involved themselves in a particular community to observe and understand the process of Papua nutmeg utilization. The third stage was the collection of ecological data on Papua nutmeg using the multiple plot system at the site of utilization to know the composition of plant species. Furthermore, the focus of data collection was that information had to meet a series of requirements in order to accurately explain the social interaction and system of local knowledge in relation to the traditional concept of forest-culture in the local biodiversity of Papua nutmeg and its utilization. Primary and secondary data were obtained, which included the ethnography of the Baham-Matta ethnic and ecological information on the habitat of Papua nutmeg using various ethnographical methods (Spradley 2006), such as observation, interview, and literature study.

Data analysis

Site observation was performed by using the selective plot technique with multiple observation plots as the center of our ecological observation of Papua nutmeg. Further descriptive analysis was carried out to observe the composition of plant

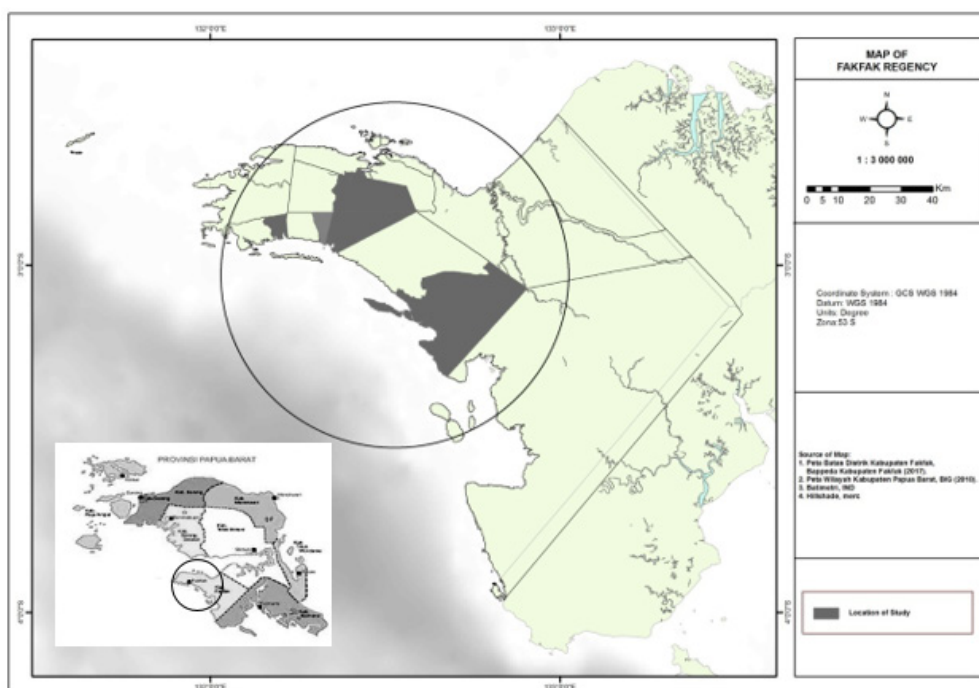


Figure 1. Study area
Gambar 1. Lokasi Penelitian

species in the locations of Papua nutmeg utilization and the shape of habitat changes as part of the construction of ecological knowledge.

Constructivism is a rational and empirical synthesis of perspectives on the condition of interaction between object and subject through external and internal realities (Suparno 1997). This study applied naturalist and social constructionist approaches. The naturalist theory shows the perspective of nature and environment as the external part of a community which exists independently, separated from the community (Awang 2006). Social constructionist is based on fundamental dialectic (Berger & Luckmann 1990) and the theory of system (Parsons 1961). According to Odum (1992), a system is a group of interactively related objects in certain conditions which forms a holistic process. First, the external stage is described as continuous involvement of humans in the world by means of physical and mental activities. Second, the objectivity stage is the process through which human activities are producing objectivity of the realities outside the humans themselves. Third, the internalization process is the adaptation of the reality of object to the human self as part of human creativity (Setiadi et al. 2006).

Ethnoscience, which is a part of ethnography, describes the interaction between knowledge of a local community and nature as biotic and abiotic conditions. Therefore, we applied data derived from cognition and the linguistic process of local classification and implemented semantic analysis as a methodical approach. Then, the data on the ethnography and ethnoscience of the Baham-Matta ethnic, along with the ecology of Papua nutmeg, were classified holistically by means of interpretative ethics (Geertz 1992; Spradley 2006) as the approach. Moreover, descriptive statistics (Monteiro et al. 2006) were used to analyze the participation of respondents in the construction of local knowledge during pre-harvest, harvest, and post-harvest stages of Papua nutmeg management.

Results and Discussion

Relationship between forest-culture and science construction

Epistemologically, the ethnoecological construction of NTFPs modifies the natural and cultural system model of Fischer-Kowalski and Weisz (1999) which places the environmental scope of the forest locus and the social environment as a whole through causality in two directions (Fig 2.). The process of adaptation to the forest ecological environment and its social interaction produce a cultural product used as an identity and an entity for ethnicity in Papua which are embodied in cultural symbols, as well as tangible works or artifacts.

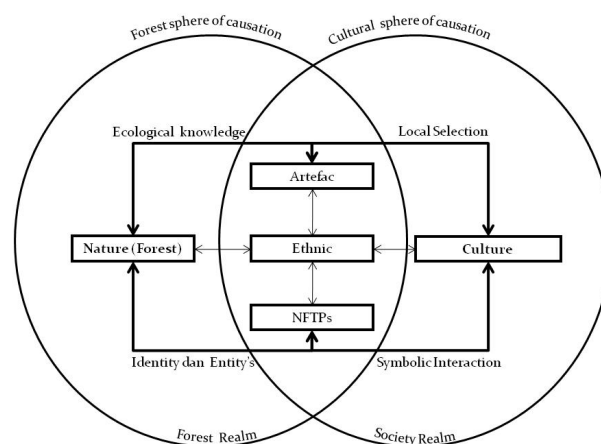


Figure 2. Construction of the Forest-culture and Ecological Knowledge on Papua Nutmeg NTFPs (Modified from Fischer-Kowalski & Weisz (1999))

Gambar 2. Kontruksi budaya-hutan dan pengetahuan ekologis HHBK Papua (dimodifikasi dari Fischer-Kowalski & Weisz (1999))

In the local wisdom, Papus nutmeg is utilized as a cultural product through the process of local selection within its natural environment. The ecological knowledge of Papua nutmeg is part of local wisdom which includes a deep understanding of their culture in the utilization of natural resources with sustainable practices. Furthermore, according to Awang (2006), local wisdom also contains the behavior of the people when responding to the environment, which is known as environmental determinism. Moreover, the community realizes that it relies on the environment, so in general they will make their best effort to maintain the existence of the environment. In line with this, the meta-analysis

study carried out by Stanley et al. (2012) concluded that, in most cases, harvesting NTFPs is ecologically sustainable (Sinasson et al. 2017).

Sasi is one form of local wisdom for the utilization and protection of Papua nutmeg which has become a tradition within the Baham-Matta community. This tradition is passed from one generation to another through an informal learning process with the direct involvement of family members until it becomes collective local knowledge. The construction of local knowledge is based on an understanding of symbolic systems and understanding of dialectics (Greezt 2003).

Sasi is actually prohibition signs which are installed in certain places, so that the people who enter the territory belonging to a landowner (a garden) or to a hamlet do not pick the nutmeg fruits which grow therein. In the villages, *sasi* takes the form of branched wood that is plugged in the ground or hung on a nutmeg tree. The installation is usually carried out by community leaders or landowners, and it will be removed later when the trees are ready for harvest. Those who violate this rule will be subject to customary sanctions with mutually agreed compensation or payments. *Sasi* is used to maintain nutmeg quality, especially harvested nutmegs which have ripened physiologically.

The process of introducing physical identification and harvesting seasons are part of a series of systematic knowledge which refers to the local perceptions and beliefs as a cognitive symbol shared by all members of the Baham-Mata ethnic group. Papuan forest and nutmeg stand as symbols of the constitution of the Baham-Matta ethnic. These symbols of constitution are actualized in the form of several rituals, such as bringing offerings to female nutmegs (consisting of palm, betel, lime, and tobacco) and putting a *sarong* (traditional cloth) on male nutmegs. This series of ethnoecological processes serves as an expression of gratitude for a bountiful harvest. Meanwhile, the area of land and the number of nutmeg trees owned by an individual can serve as a symbol of the individual's social status. The total area of land and the number of nutmeg trees belonging to a clan can determine whether the clan can be considered honorable and influential in the decision-making process within the local community.

Many anthropologists, ethnobiologists, and other academics have proposed different terms and theories about indigenous, local, and traditional communities in their effort to explain the whole practices and knowledge which belong to a particular community by examining its customs. Customs demonstrate the cultural practices and knowledge of the members of a local community as long-term residents and produce various traditions which are reflected in the members' lives, practices, and beliefs in the process of change and adaptation to their ecological and social environment.

History of the Baham-Matta ethnic group

Etymologically, the word "Baham-Matta" is derived from two words. The word "Baham" means something that has already happened or something that has already existed. In Iha language, the concept is called "Ponggo", which refers to the occurrence or origin of the Bahamese people and all events surrounding them. Besides that, Baham is also the name of a mountain which is considered sacred by the Bahamese ancestors, because the mountain is believed to be the place where the events or the existence of the Bahamese people began. The word "Matta" refers to the people who inhabit the region called "Wuh", which ranges from the centre to the end of the peninsula, and it is originally derived from the sacred mountain of the Bahamese. Therefore, the words "Baham" and "Matta" can no longer be used in isolation, but they must be mentioned together because the whole concept which the two words originally had has been integrated into a single word.

In terms of social relationship, the Baham-Matta ethnic group is said to have a characteristic similar to that of the Iroquois Indian in America in which the property right of natural resource utilization is based on the patrilineal system. However, the traditional leadership system is known as the King's leadership system (Malinowski 1948; Mansoben 1995). Moreover, the origin of the Baham-Matta ethnic group can be traced back by means of myths, since the Baham-Matta ethnic group has been implementing traditional culture as part of their belief system. The Baham-Matta ethnic group (Patuanan) has seven territories of kingship and its territory, as described in Table 1.

Table 1. Ethnic territory of the Baham-Matta ethnic group
Tabel 1. Wilayah Petuanan/Raja etnis Baham-Matta

No.	Patuanan	Kings Name	Petuanan Territory
1.	King Ati-Ati	Mr. Achmad Bay	Villages Torea, Sipatnanam, Wayati, Karas, and Three Island
2.	King Fatagar	Mr. Heru Uswanas	Dulan Pok-Pok includes Fak-Fak Town
3.	King Patipi	Mr. Achmad Iba	Patipi Island, Patipi Sand up villages Kayuni
4.	KingRumbati	Mr. Muhammad S. Bauw	villages Tani Sepata, and Rumbati
5.	King Pig-Pig and Sekar	Mr. Petrus Tigtigweria	villages Pig-Pig, Kokas, Ugar island
6.	King Wertuar	Mr. Musa Heremba	villages Homor Kopma, Kokas Town and Kramangmongga
7.	King Arguni	Mr. Paus-paus	Arguni and Bomberai

Source: Primary data, 2018

Sumber: Data primer, 2018.

The utilization of natural resources does not generally cause any conflict because there is mutual respect among members of the local community and strong obedience to the agreement which has been made. Based on such principles, the community formulates the agreement on the division and control of natural resources, and the community in Fakfak District has been known as a social group which closely adheres to their own custom.

The ecological environment of the Baham-Matta ethnic group can be classified into three out of four types of ecological zones spread throughout Papua (Mansoben 1995) which consist of (1) swampy, coastal, and riverine areas; (2) coastal lowland areas; and (3) foothills and small valleys.

Utilization of Papua nutmeg

The small scale utilization of Papua nutmeg by the Baham-Matta ethnic can be divided into three main stages which consist of (1) pre-harvest, i.e. early activities to identify species, harvest time, and pest control technique; (2) harvest, i.e. the collection of mature fruits based on traditional ecological knowledge and using environmentally friendly technique; and (3) post-harvest, i.e. the production of advanced products, such as candies, syrup, jelly, and jam. The local knowledge regulates different practices based on age strata at all three stages of nutmeg utilization: pre-harvest, harvest, and post-harvest.

In average, the local knowledge is mostly practiced by the male members of the community (79.4%), and

these male-dominated practices might be related to the patrilineal system prevailing within the Baham-Matta community (Fig 3.). Most of the roles are performed by adults (54.1%) which are generally determined by their age, degree of involvement, and skills at all three stages. The initial step in the pre-harvest stage is more focused on the physical identification of fruits which involves direct observation on tree stands during the fruit season and the ways to protect them. This is closely related to the skills, time, and energy required to engage in those activities.

Children aged 5–16 years old and youths aged 17–29 years old who take part in the pre-harvest stage are still few (only 22.2 percent). They have undeveloped skills, less experience in identifying the species and mature fruits, and less ability to perform traditional activities related to *sasi*. *Sasi* can be defined as a prohibition to reap the results of certain natural resources as a conservational effort in order to maintain the quality and population of biological resources. This conservation system is commonly found in eastern Indonesia (Mantjoro 1996; Harkes & Novaczek 2002). Adults aged above 30 years old dominate pre-harvest activities at 55.6 percent as a consequence of their developed skills and vast experience. The skills and knowledge are obtained informally through direct observation in the field. This process is part of the local system of interaction between humans and environment which prevails at all stages of nutmeg utilization. The ancestors played a crucial role in protecting and transferring

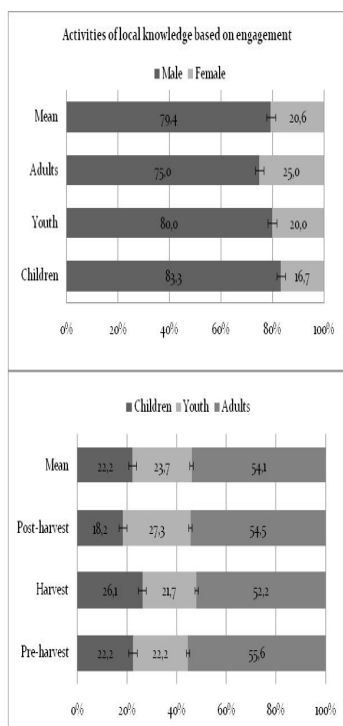


Figure 3. Local knowledge scale based on the processes of Papua nutmeg utilization

Gambar 3. Skala Distribusi Pengetahuan Lokal berdasarkan Tahapan Pemanfaatan Pala di Papua

the local knowledge each time they performed activities related to the traditional conservation and utilization of nutmeg (Tamalene et al. 2016).

Papua nutmeg harvest is collectively carried out by children (26.1 percent), youths (21.7 percent) and adults (52.2 percent). This stage requires more skills, more efficiency, and more people. During the post-harvest stage, however, fewer children are involved (18.2 percent). This stage requires considerable skills and experience, so in general only youth and adults meet the criteria. This starts with the conversion of nutmeg meat into other products with higher economic value, such as sweets, syrup, jam, and other processed products. Youth are actively involved in this process (27.3 percent), while adults only act as supervisors. The adults (54.5 percent) take an active part in post-harvest activities which demand even higher skills and are related to advanced nutmeg products.

Unfortunately, the knowledge of ethno-techno-conservation (Ungirwalu et al. 2017) has been slightly degrading due to the decreasing number of local people being involved in the utilization of natural resources. There are several driving factors behind this decrease in local people involvement: (1)

the number of skilled people is low; (2) the learning process of required skills is time-consuming; (3) the population of Papua nutmeg plants is decreasing considerably; and (4) the people pay less attention to the natural habitat of Papua nutmeg as a result of adverse environmental changes and conflicts over land ownerships. As stated by Riordan et al. (2016), such conflicts and debates mainly revolve around the utilization, management, property, and conservation of the natural resources.

The utilization of Papua nutmeg based on the concept of forest-culture land use is carried out with an eco-philosophical framework which combines ethno-ecological views with the personal morality of each ethnic group as the main factor. These ethical standards are based on the unique framework prevailing in each community which has shifted from exploitation to adjustment, adaptation, and interaction with the environment.

The utilization of Papua nutmeg represents an interaction between people and natural resources based on traditional concepts, including the conservation knowledge. This condition implies that, during the utilization process, development is always dynamic (co-evolution) as a response to changes in the environmental condition and vice versa (de Boo & Wiersum 2011). As part of ethnoscience in social contacts, the internalization, externalization, and objectification of local knowledge (Berger & Luckmann 1990) occur as a result of the continuous process of cultural regulation and mythology.

Ecology of Papua nutmeg

Ever since the first publications about nutmegs in general began to appear, the plant has been known to originate from the Maluku archipelago. Maluku has been internationally known since the 10th century AD as one of the trading posts along the silk road which extended to the Indonesian archipelago. It is also called the “Spice Islands” because the region is one of the most important spice producers in the world. This has frequently turned the region into a battleground for various economic interests which sought to establish a capitalist hegemony.

Nutmeg is part of the Myristicaceae family which can be found in lowland rainforests throughout the

world (Marshall et al. 2007). According to The Plan list, Myristicaceae is a group of medium-sized families with 21 genera and includes 1,144 species of scientific plants in the world. Nutmeg is one of high economic value species in the world (\$50/kg). In addition to the well-known Banda nutmeg (*Myristica fragans* Houtt.), Papua nutmeg (*Myristica argentea* Warb.) is another nutmeg species in Indonesia. Papua nutmeg is a species which is endemic to Papua Island and known locally as *henggi* or Fakfak nutmeg, based on the official name of the region in which they can be found. Papuan nutmeg species is also categorized as one of non-timber forest products (NTFPs). The plant's main distinguishing morphological feature is its oval shape and larger pieces and fruits (Fig 4.).

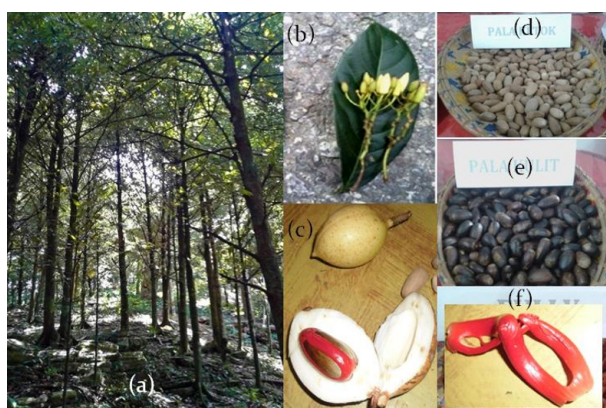


Figure 4. Morphological description of *Myristica argentea* Warb (a): Tree stands; (b): Flowers and Leaves; (c): Fruit; (d): Pericarp; (e): Fruit shell; (f): Mace

Gambar 4. Deskripsi morfologis *Myristica argentea* Warb (a): Tegakan Pohon; (B): Bunga dan Daun; (c): Buah; (d): Biji; (e): Kulit buah; (f): Bunga pala

Morphologically, Papua nutmeg can grow up to 10–20 meters tall, while the crown of trees may vary between pyramidal (conical), oval (cylindrical), and round shapes. Nutmeg begins to generate fruits after 8–9 years of age, produces the maximum result at the age of 25 years, and can last until the age of 60 years. It produces shiny green leaves with a length of 5–15 cm and width of 3–7 cm, while the length of the petiole is 0.7–1.5 cm. A 10 to 12-year-old nutmeg tree can produce about 800–2,000 fruits per year from 2–3 harvests. One unique feature of nutmeg is that it is a dioecious plant, meaning that the male and female flowers do not occupy the same tree.

The comparative advantage of this plant lies in the fact that the whole fruit (pericarp, fruit shell, and mace)

can be utilized as a source of dietary supplements and other alternative foods from the very beginning. Wallace (1869) wrote in his diary that nutmeg is one of the means of exchange used by local people in Papua (Marshad 2011). An ethnobotanical study by Powell (1976) has identified nutmeg as one of the 650 species of Papuasian flora (134 families and 378 genera) and one of approximately 231 species which can be used as foodstuff with edible shoots, leaves, stems, berries, flowers, tubers, and roots. These identified species have generally been used as the sources of staple food, as well as of supplement food, for most ethnic groups scattered in the Papuasian region.

Actual intensive utilization of Papua nutmeg provides financial benefits as the main source of livelihood for the Baham-Matta community in the form of the nutmeg plant itself and its post-production results. It has even been used as an important identity marker, being the main part of the symbol of the Fakfak Regency government.

Physiographically, the distribution of Papua nutmeg based on the typological condition of the habitat is grouped into three ecological zones, namely (1) natural forest, (2) secondary forest, and (3) home garden (Fig 5). Human activities in these landscapes have a strong effect on the land cover and exert a selective force on tree species and functional traits, thereby potentially shaping the distribution of ecosystem services in the landscape (Thijs et al. 2015). Then, the three zones play an important role in the formation of traditional knowledge on how to utilize Papua nutmeg at the three main stages of pre-harvest, harvest, and post-harvest.

However, the management system has not yet been comprehensively defined. The concept of forest values and functions are very much differentiated and narrowly classified (positivistic-mechanistic). This is evident in the prevailing shifts of land and forest functions to production, protection, and conservation, while limiting local people's access to the land and the space for the local people to perform customary activities (Awang 2004; Maryudi et al. 2012).

Plant typology is based on the plant's existence in certain landscapes which become its habitat. Then, the community recognizes the importance of a balanced ecology in the utilization of natural

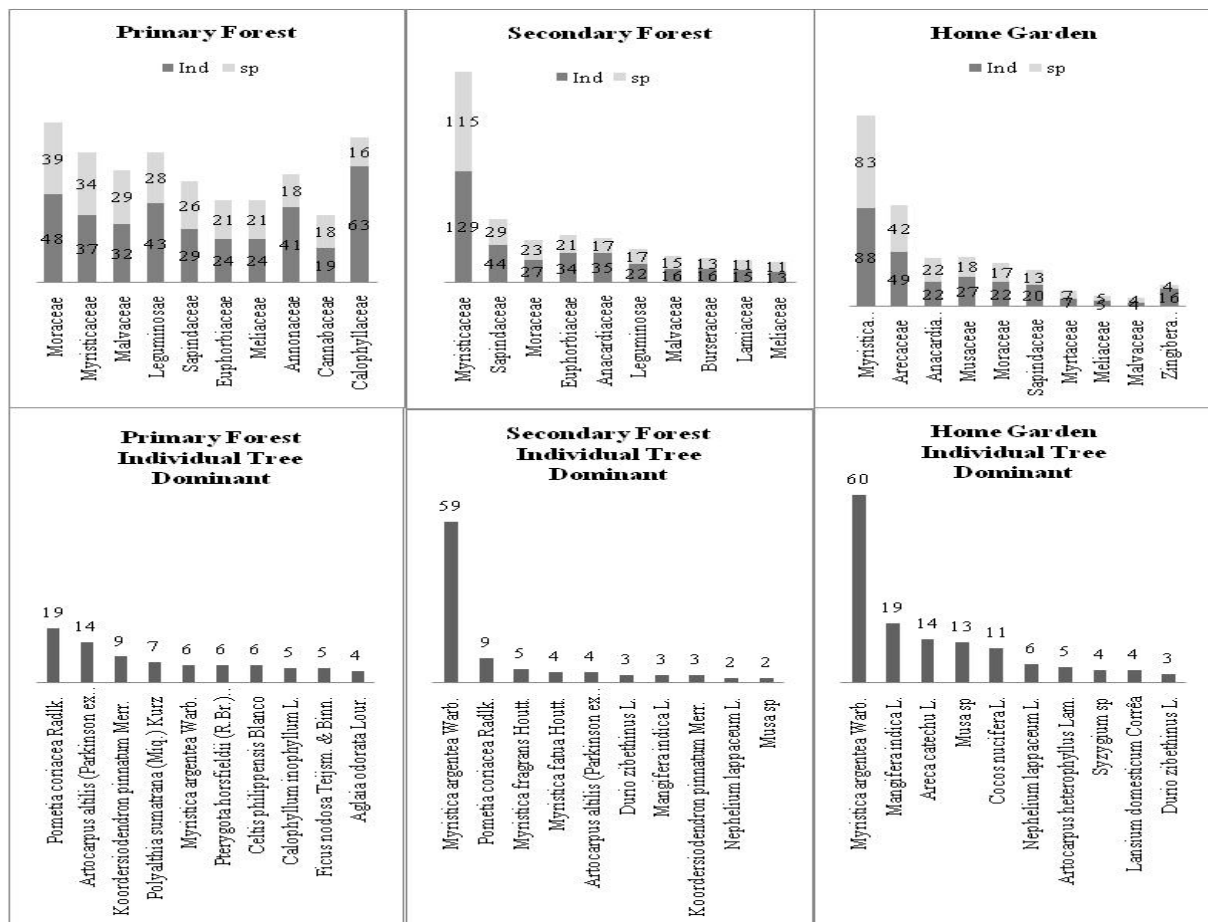


Figure 5. The ecological habitats and dominant tree species
 Gambar 5. Habitat ekologis dan species pohon dominan

resources. This attitude is reflected in actions dedicated to the conservation, care, and protection of plants. These plants at the same time become a symbol of land ownership by means of natural signs which mark the boundaries of land ownership. These boundaries are traditionally marked by a set of stones which are neatly arranged surrounding the Papua nutmeg habitat. Although the available strategic policy has included the identification program, boundary arrangement, and mapping of land ownerships, no customary forest in West Papua has received the state recognition as customary forests so far. Berger and Luckman (1990) argue that, in a wider scope, local ecological knowledge depends heavily on the recognition of objectivity before it can be fully accepted by a community as part of its members' social lives.

The primary forests in Papuan lowland areas are the ecological habitats of *Pometia coriacea* Radlk. and *Artocarpus altilis* (Parkinson ex F.A.Zorn) Fosberg, whose tree stands dominate the areas.

Lowland forests in Papua are characterized by high vegetation and diverse floral compositions (Paijman 1976; Marshall et al. 2007). Papuan primary forests are largely undisturbed, but some parts of the area have been slightly altered due to various human activities, such as food gathering and hunting, which result in changes in land cover, species utilization, and ecosystem services (Thijs et al. 2015). In a similar vein, Benítez et al. (2016) also stated that resources which are obtained from local ecological knowledge come from the nature and change the environment in which they grow. The fulfillment of subsistent needs is characterized by the dependence on natural resources and local technology which is utilized in traditional ways and is environmentally friendly because such technology does not have negative impacts on the forests. Anthropogenic activities, such as food gathering and hunting, have been conducted for a long time. These activities depend much on natural condition.

Papua nutmeg is not the dominant species

which can be found in primary forests. Meanwhile, secondary forests and home gardens are dominated by Papua nutmeg. The locations which are dominated by Papua nutmeg are called *dusun pala* (literally, 'nutmeg village'). Secondary forest is part of a forest which has been disturbed anthropologically and regenerated naturally (Kanel & Shrestha 2001) and some secondary succession process conditions occur in response to ecological changes (Murdjoko et al. 2017). Gardening is one of the oldest farming systems in the world (Castro et al. 2016). In the garden system, human activities are more dominant. In this case, the specific plant grown in local gardens is Papua nutmeg, and the location of the gardens is generally close to the settlement of local people.

Conclusion

The practice of utilizing, preserving, and owning NTFPs on a local scale is actually a process which involves forest communities and the environment. Therefore, this practice has autonomously formulated

decisions about sustainable forest use based on the local knowledge about forest management system, forest utilization, forest ownership, and reaping of forest benefits (Maryudi et al. 2012) which has been applied by the local communities for many years.

This study illustrates the dualistic contrasts between knowledge and action, theories and practices, as well as facts and value of natural resources in Papua. Such differences can be observed on a small scale by examining the forest management system applied by the Baham-Matta ethnic (Fig 6.).

The forest-culture concept can ontologically describe such significant differences in large-scale forest management systems prevailing in West Papua and the construction of the ecological knowledge about the utilization of NTFPs, especially Papua nutmeg, on a small scale within the Baham-Matta community.

The environment has always been part of the



Figure 6. The concept of forest-culture for Papua nutmeg NTFPs
Gambar 6. Konsep budaya-hutan HHBK Pala Papua

process of how local people create local knowledge, especially about Papua nutmeg utilization, to fulfill their daily needs and to perform their traditional rituals. However, on a large scale, the forest is officially under the authority of the government, which may lead to conflicts over forest utilization between local communities and the government. Much empirical evidence of forest management outside Java demonstrates how the private sectors may become powerful actors in conflicts over land use (Prabowo et al. 2017).

As in some other regions in Indonesia, the existence of customary forests in Papua has not been officially recognized. This condition prevails, even though the Law on the special autonomy (*otonomi khusus* or Otsus) of Papua states that indigenous people have the right of ownership over the forests. This unfortunate situation happens because of the poor way by which the relevant government regulations were made. Therefore, it would be equally important to also consider historical and political aspects as a representation of local perception and cognitive factor. In this way, the distribution, accessibility, and power of the local people could also be better understood (Graffigna et al. 2011).

The forest management in Papua is handled by technocrats, bureaucrats, and companies who tend to use the positive-mechanistic paradigm by focusing mainly on timber extraction. In the management, utilization, and ownership of the forest, human is not considered part of the natural resources. Foucault (2007) stated that the government set conditions in which they exercise their authority to control the subjectivity of local people. In contrast, from the ecologist perspective, the forest-culture which is applied to Papua nutmeg and its NTFPs is taken into account as a cognitive reorientation of traditional utilization. Ideally, the point of ecology is that humans are able to adapt to environmental alterations and see the forests from the environmental perspective (Awang 2006). This attitude is based on the fact of human dependency on forests with strongly positive correlation between both parties (Stevens 1997; Maryudi et al. 2012). Therefore, the concept must be taken into consideration when formulating relevant policies. This concept describes community forest

as a decentralized mode of forest governance which partially conforms to expectations (Krott et al. 2014).

Decisions on forest management should be linked to wider social, economic, and environmental perspectives. Those three aspects should be also considered as the main factors when applying sustainable forest management in Indonesia, in which social capital must be connected to cultural capital during the integration process. Furthermore, the social capital can be modified and adapted to present needs and the condition of natural resources. Recognition is also needed to fill the gap between technocracy and local knowledge which counts on references to and subjectivity of the local people in order to design proper policies for managing the environment (Riordan et al. 2016). Hence, a good understanding of forest-culture is important for the Baham-Matta community to utilize and promote Papua nutmeg as a local commodity, as well as the process and skills required to manage it. Moreover, the concept of forest-culture can be further studied and expanded for the purpose of supporting the combination between social and ecological capital on a small scale as a potential approach in the formulation of policies related to natural resource management in Papua.

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