

LOCAL KNOWLEDGE OF MANAGEMENT SYSTEM OF FOREST ECOSYSTEM BY TOGUTIL ETHNIC GROUP ON HALMAHERA ISLAND, INDONESIA: TRADITIONAL UTILIZATION AND CONSERVATION

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Abstract

Logging and industrial mining have brought rapid change to the functions of forests. This also occurred on Halmahera Island, Indonesia. The Togutil ethnic group who lived in the Halmahera forest, especially in Buli village, had lost their local practical knowledge related to traditional forest conservation. This was due to the existence of nickel mining in their indigenous forest area. The study location was an area far from mining activity; therefore, local knowledge-based forest conservation practice could still be found. Research results show that the Togutil ethnic group on Halmahera Island, especially in the Akelamo and Oba, Tidore Kepulauan areas, had local knowledge of traditional forest ecosystem management through the classification of forest areas where there existed zones of food and medicinal plants, hunting, plantation and settlements, bird habitats, taboo, and watersheds. The classification of forest areas through a zone system was a conservative practice of biodiversity by maintaining local tradition.

Keywords: Local knowledge; Forest ecosystem management; Biodiversity; Togutil

Introduction

Indonesia is a developing country with 109 million ha forest areas, and it is the third largest tropical rainforests in the world after Brazil and Congo. Of the forest areas, almost half of them have been degraded [1]. The conservation area of forest in Indonesia has decrease every year due to natural disaster and logging permits are given by the government to capital owners, therefore, protection forests are threatened to be converted into other utilization [2]. Indonesia has the highest biodiversity index compare to other Asia-Pacific countries [3].

Indonesia has 1,340 ethnic groups. The ethnic groups who live in rural areas rely on forest products. Those ethnic groups differ in terms of culture. The cultural practices conducted by those ethnic groups are varied but have the same purpose, which is to maintain their ancestral cultures, which they believe to be positively based on social and environmental aspects. Among those ethnic groups, there is one ethnic group on Halmahera Island, the Togutil

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ethnic group, who live a nomadic life. The ethnic group still practices a local wisdom knowledge for conservation [4].

United Nations Educational, Scientific, and Cultural Organization (UNESCO) and United Nations Environment Programme (UNEP) state that a sustainable development needs cultural diversity and biodiversity as equally important and primary components. According to UNESCO we cannot understand and conserve our environment if we do not understand the culture of the people who shape the nature. Moreover, UNEP states that cultural diversity is the reflection of biodiversity [5].

Cultural practices by local people give a contribution to forest conservation [6]. Traditional beliefs on taboo matters help in maintaining environmental conservation rules since everyone restrains themselves from using the resources carelessly. Local knowledge is an effort to find a way to manage natural resources with minimum environmental degradation [7]. Forest plays important role in social and economic aspects by providing various needs useful for local people and a place to live as well as a food source for wildlife [8]. Local farmers prefer exotic species for economic interest or other environmental reasons [9].

Local knowledge is an important asset to achieve the target of biodiversity; traditional knowledge and practices applied by customary society or local community are they key to prevent biodiversity damage and achieve sustainable development. Local knowledge analysis on vegetation function and species preference helps to identify and protect priority species for ecological, economic and social interest [10]. The restoration of damaged forest through indigenous forest-based management by local society could decrease flood occurrence [11]. The conservation of local knowledge is important to protect local tradition that has positive social and ecological values for sustainable development.

Local knowledge and modern science complement each other to support conservation activities [12]. In this modern era, the global community has realized the concern on the deterioration and the decrease of biodiversity on earth and their consequences for human health and prosperity. What concern more is, however, the loss of cultural diversity in terms of local knowledge that can be seen, in some cases, from the loss of plant and animal species [5]. In order to anticipate the loss of local knowledge, documentation is needed through sustainable studies. Local knowledge could also be integrated into school curriculum through formal science thus it becomes an important aspect in the development [13]. Sustainable forest management is conducted by local society because forest provides useful resources for their life. In addition, for the last few decades, a shift in forest management has occurred that overlook local society tradition [14]. The shift is related to the loss of traditional practices [15]. Human activity in the modern era that inconsistent with biodiversity and landscape conservation will have a negative impact on sustainable development [16-18].

Industrial logging and mining have brought rapid change to the functions of forests in Indonesia, especially on Halmahera Island. This occurs in the eastern part of Halmahera. The *Togutil* ethnic groups located in Buli, Baburino, and Gaifoli villages have lost their traditional practical knowledge related to forest conservation due to the existence of nickel mining in their indigenous forest area. The study location was one of the areas far from mining activity; therefore, traditional knowledge-based forest protection practices could still be found. In this area, the *Togutil* ethnic group maintain their activities of hunting and collecting resin from *Agathis dammara* and *Aquillaria Moluccensis* woods. The collection of non-timber forest products is considered an important activity in their life. The *Togutil* ethnic group have a basic philosophy, which is “no forest no life”. A balanced forest management has a positive impact on the life of the *Togutil* ethnic group in their interaction with their environment.

It was important to conduct research since it tried to document the local knowledge of the *Togutil* ethnic group on Halmahera Island of the forest ecosystem management system

aimed at preserving it. The traditional conservation practice of the *Togutil* ethnic group is not systematically documented; therefore the research aimed to document the local knowledge of the *Togutil* ethnic group related to the traditional forest management system. The management system consisted of the grouping of forest areas into various zones: 1) a food and medicinal plants zone, 2) a bird habitat zone, 3) a hunting zone, 4) a plantation and settlement zone, 5) a watershed zone, and 6) a taboo zone. The focus of the study was to find out which types of the plant were protected for medicine and food.

Methodology

Area of Study

The research was conducted in two locations, a settlement area of the *Togutil* ethnic group in Akelamo, East Halmahera Regency (128°40'21"E), and Oba, Tidore Kepulauan City (127°44'24"E) (Figure 1). *Togutil* ethnic group in these two areas still live in nomadic life and still maintain their local knowledge to protect their surrounding forest ecosystem. The distance of the settlement of nomadic ethnic group from the village in Oba area is 40km and 45km from the village in Akelamo area. Both ethnic groups use the same language, which is Tobelo language and same tradition and ritual despite the hundreds of kilometer of distances between them. Timber and non-timber forest products are their main livelihood and the economic activity among groups is conducted in *barter* or exchange.

Methods

Information presented in the research was part of a data series collected by the authors in March–June 2013, July–September 2014, and November–December 2015. Qualitative and quantitative approaches were used to collect data on local knowledge and forest management through in-depth interviews, participant observation and field [19, 20]. In-depth interview was conducted to the key informants selected based on purposive sampling [21]. Open questions were asked to uncover the knowledge map of the key informant [22, 23]. The interview was conducted in local language by visiting each informant individually. The agreement was gained from the informants prior to the research referring to the ethical code of International Society of Ethnobiology (ISE) [24].

There were 84 research informants, as shown in Table 1. Questions related to local knowledge of management system and forest functions were asked to the following age groups: children (5–11 years), teenagers and young adults (12–25 years), adults (26–45 years), middle-aged (46–65 years) and elderly (≥ 65 years). Plant specimens with unknown scientific names were collected and identified in the Laboratory of Botani Bogoriense, Center of Biological Research, Indonesian Institute of Science (*Lembaga Ilmu Pengetahuan Indonesia-LIPI*). Data from the research results were analyzed in a qualitative descriptive manner.

Table 1. Demographic Description of Interviewed Informants

Category	Sub-Category	Akelamo <i>Togutil</i> Ethnic Group	Oba <i>Togutil</i> Ethnic Group	Total	%	
Gender	Male	23	34	57	68	
	Female	15	12	27	32	
Age	Children	5-11 years	5	6	11	13
	Teenagers	12-25 years	10	14	14	17
	Adults	26-45 years	8	11	19	23
	Elder	46-65 years	12	11	23	27
	old aged	66 + years	3	4	7	8
Marital Status	Married	27	32	59	70	
	Not Married	11	14	25	30	
Education	-	-	-	-	-	

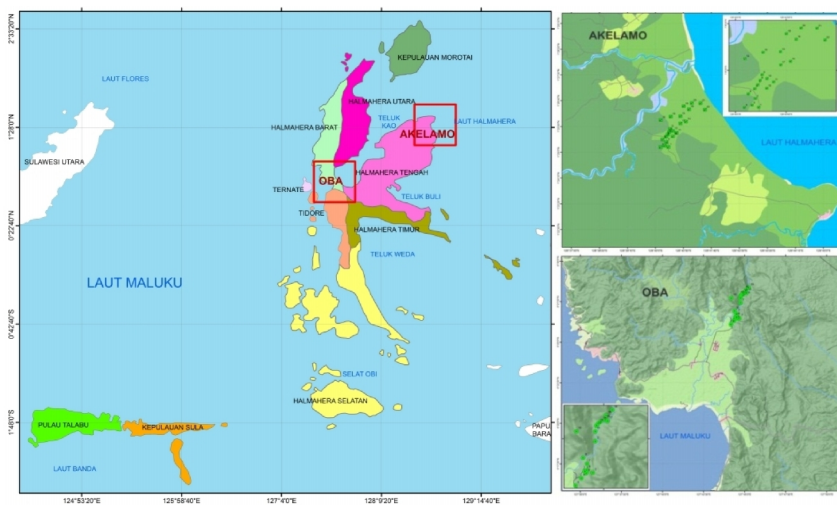


Fig. 1. Study site in East Halmahera

Results

A traditional forest management system was still being practiced by the nomadic *Togutil* ethnic group in the Akelamo area of East Halmahera and the Oba area of Tidore Kepulauan. These nomadic ethnic groups determined areas of utilization that are considered to have potential as useful areas or have high utilization value. There are 22 utilization areas in Akelamo (Table 2) and 18 utilization areas in Oba (Table 3).

Table 2. Utilization area in Akelamo

No	Local Term	Definition in Bahasa	Definisin in English
1	<i>Tutukur</i>	Hutan kami	Our forest
2	<i>Kailupa Ino</i>	Tanaman Ceiba pentandra	<i>Ceiba pentandra</i> plant
3	<i>Bobahara Ino</i>	Bobahara (nama orang penjaga hutan)	The name of the forest guard
4	<i>Hohaokino</i>	Hutan yang bersahabat	Friendly forest
5	<i>Humulitino</i>	Kulit kayu	Tree bark
6	<i>Gohora Ino</i>	Pohon jambu	Guava tree
7	<i>Hambiki Ino</i>	Tanaman <i>Cucurbita maxima</i>	<i>Cucurbita maxima</i> plant
8	<i>Dagasuli Ino</i>	Dagasuli (nama orang penjaga hutan)	The name of the forest guard
9	<i>Pedai Ino</i>	Pedai (nama orang penjaga hutan)	The name of the forest guard
10	<i>Lepa Ino</i>	Lepa (nama orang penjaga hutan)	The name of the forest guard
11	<i>Baru Yoboboleta</i>	Hutan cadangan	Reserve forest
12	<i>Ode Ota-ota</i>	Hutan pada bukit	Forest on the hill
13	<i>Heleododoomu</i>	Hutan dekat air	Forest near water
14	<i>Baburino</i>	Hutan penjaga	Protector forest
15	<i>Peda Wiha-wiha</i>	Hutan yang basah	Wet forest
16	<i>Hategou</i>	Hutan yang nyaman	Comfortable forest
17	<i>Tauyaoku-uku</i>	Hutan yang seram	Spooky forest
18	<i>Kahoyo Kukurunga</i>	Hutan kandang anjing pemburu	Forest of hunter dog cage
19	<i>Gapole Iha</i>	Hutan berbatu	Stony forest
20	<i>Pugu-pugu</i>	Hutan pada gunung yang berkelok	Forest on winding mountain
21	<i>Makahar</i>	Makahar (nama orang penjaga hutan)	The name of the forest guard
22	<i>Kumulitino</i>	Hutan yang jauh	Distant forest

The nomadic *Togutil* ethnic group stated that the determination of an area with high utilization value was based on seven criteria: 1) the number of plants is varied, 2) the existence

of a clean water source, 3) the number of consumable plants as a source of main carbohydrates, 4) the number of diverse medicinal plants, 5) the number of animals found (mammals, birds, insects), and 6) and 7) the number of animals which making sound (birds). If an area met the criteria, it means that there was high potential that its forest resources could be used to support daily life. The forest plays an important role in conserving biodiversity and providing water flow to the villages. The important role of the forest in the Akelamo area of East Halmahera was the reason why the *Togutil* ethnic group protected and utilized the forest in a sustainable way. According to them, the most important function of the forest is as a food source, a supplier of medicinal plants and a water source. Thus, the life of the *Togutil* ethnic group in the forest was an ecological phenomenon because they were part of an ecological system known as an “ecosystem.” The area used by the *Togutil* ethnic group in the Akelamo and Oba areas on Halmahera Island was a protected area for joint use in a certain period of time by groups with family relationships. In each area, there were two to three heads of family. In addition, each area had the potential for forest product resources to be sustainably and responsibly used.

Table 3. Utilization area in Akelamo

No	Local Term	Definition in Bahasa Indonesia	Definition in English
1	<i>Tayawi</i>	Air sungai yang jernih	Clean water river
2	<i>Gugubali</i>	Nama orang penjaga kawasan hutan	The name of the forest guard
3	<i>Namo-namo</i>	Gunung	Mountain
4	<i>Akere hoburu</i>	Air dari pohon <i>Canarium</i>	Water from <i>Canarium</i> tree
5	<i>Jagaguna</i>	Nama orang penjaga hutan	The name of the forest guard
6	<i>Suwam</i>	Nama penjaga sungai	The name of the river guard
7	<i>Bay dan Roray</i>	Nama orang penjaga air sungai	The name of the water river guard
8	<i>Timodi</i>	Nama orang penjaga kawasan hutan	The name of the forest guard
9	<i>Akere tofu</i>	Air yang banyak	Lots of water
10	<i>Akere omanahi</i>	Air yang deras	Heavy water
11	<i>Akere ogogora</i>	Air dari tanaman Jambu (<i>Syzygium aqueum</i>)	Water from Guava (<i>Syzygium aqueum</i>) tree
12	<i>Akere sambiki</i>	Air dari tanaman <i>Cucurbita maxima</i>	Water from <i>Cucurbita maxima</i> plant
13	<i>Baipopo</i>	Nama orang penjaga kawasan hutan	The name of the forest guard
14	<i>Akere guraci</i>	Air sungai yang kecil	Small river water
15	<i>Akere dowora</i>	Air dowora (nama orang penjaga air sungai)	Water of <i>dowora</i> (the name of the forest guard)
16	<i>Akere gowaya</i>	Air dari tumbuhan Jambu <i>Syzygium malaccense</i>	Water from Guava (<i>Syzygium aqueum</i>) tree
17	<i>Akere haramati</i>	Air pemberkatan	Holy water
18	<i>Heleo madokara</i>	Kawasan kemerah-merahan	Reddish area

The management system of the forest area practiced by the *Togutil* ethnic group was based on a heritage of knowledge from their ancestors. The nomadic tribe did not open new lands, instead they moved from one area to another predetermined area (Tables 2 and 3). Every utilization area had six utilization zones: 1) a food and medicinal plants zone, 2) a bird habitat zone, 3) a hunting zone, 4) a plantation and settlement zone, 5) a watershed zone, and 6) a taboo zone.

Food and Medicinal Plants Zone

Food plant zone is a zone determined based on the number of plants with potential to be used as staple foods, i.e: *Metroxylon sagu*, *Arenga piñata*, *Arenga macrocarpa*, *Arenga* sp, and *Livistona rotundifolia*. Plants in each area were identified for their number and type. Plants suitable to be processed for food was taken selectively based on the age of the plant, which was at minimum 7 years and based on the diameter. Medicinal plant zone is a zone within which exists important medicinal plant often used for treatment activities. Plants often found in every zone as the main medicinal plants were *Lophopyxis maingayi* Hook.F., *Cinnamomum macrophyllum* Miq., *Actinodaphne procera* Nees, *Bauhinia lingua* D.C., *Momordica cochinchinensis* (Lour.) Spreng., *Macaranga involucrata* (Roxb.) Baill., *Loeseneriella*

pauciflora (DC.) A.C.Sm., *Rourea minor* (Gaertn.) Alston, *Canarium decumanum* Gaertner., *Canarium indicum*, *Macaranga involucrata* (Roxb.)Baill., *Ficus variegata* Blume, *Etilingera heliconiifolia*. *Etilingera* sp., and *Alpinia eremochlamys* K.Schum.

Local knowledge practiced by the *Togutil* ethnic group in utilizing useful plants, especially food and medicinal plants, in their daily life was used on six conditions: 1) there had to be *Himaloa* activity (asking permission from the plant), 2) the plant taken had to have an easily accessible habitat and be found in large amounts; in other words, it had to be taken selectively, 3) the plant had to be taken as needed, 4) the plant species could only be taken once, except for the part of the plant that was needed most (specifically for medicinal plants), 5) plants were taken before sunrise (specifically for medicinal plants), and 6) the number of plants taken had to be even (not odd) (specifically for medicinal plants). The ethnic group believed that all plants are useful, thus they should be protected in the common interest. Parts of plants have benefits to human and they perceive plants as being useful for them as well as for others (*Omomo de ogota mata-mata ma guna ngomi nako ngomi ua ga onyawa mahomoa*).

This traditional knowledge of the utilization of medicinal and food plants was followed with conservation technique by maintaining the availability of the plants to fulfil their need. Why does plant should be taken before sunrise? Why can't take the plant at random? According to them, the plant should be taken before sunrise because at that time it has better peculiar property, fresher and naturally clean. This time-specific plant removal has a meaning that a certain plant cannot be used carelessly. If in a certain case, the plant should be taken other than the determined time due to an emergency situation, *Himaloa*, for other groups it called *Koraka*, should be conducted. The term means to ask permission to the plant before it parts being taken to be used for medicinal treatment. *Himaloa* is a ritual to ask permission to the plant to be taken. The ritual is conducted by an individual instead of a group. *Himaloa* is a ritual to respect a plant because they believe that plants have their own life.

Based on the practice of the local knowledge approach to plant utilization applied by the *Togutil* ethnic group, it can be confirmed that the effort of the ethnic group in protecting medicinal plant resources in their habitat was part of the maintained conservation behavior. This conservation model was an ethno-conservation concept leading to the local wisdom of the *Togutil* ethnic group. The practice of *Himaloa* was a factual event in the nomadic *Togutil* ethnic group. The importance of local knowledge possessed by the ethnic group indicated that their ancestors had good conservation skills, especially traditional knowledge-based conservation. This type of conservation is a culture that has been practiced for hundreds of years. Various direct trials with nature had resulted in products that can be used to add to their knowledge of how to use and protect useful plants in forest areas.

Hunting Zone

A hunting zone is a forest area specifically set aside for hunting wild boar (*Sus scrofa*) and deer (*Axis kuhlii*). The *Togutil* ethnic group knew the birth cycle of wild boar, which is in January, February and March, and thus it estimated that baby wild boar would stop breastfeeding around August–September. Hunting activity was only conducted during months when the baby wild boar stopped breastfeeding, because if the ravin was pregnant it could not be killed. There were also prohibitions among the ethnic group in relation to hunting activity in the forest. One prohibition, for example, was directed at men: not butchering or hunting animals when their wives were pregnant. The prohibition had knowledge value that if it was violated it would result in a curse where everything they did to the animals would have an impact on the baby their wives were carrying. For pregnant women, it was prohibited for them to be out at dawn and they had to love animals and were prohibited to kill animals. These prohibitions have been practiced up until now as a form of maintaining the ancestral tradition.

Bird Habitat Zone

Important areas for bird habitats were found in this zone. The areas consisted of areas with the potential to overwhelm forest product resources, such as *Pometia pinnata*, *Agathis*

dammara, *Aquilaria Moluccensis*, *Phalaenopsis violacea*, *Barringtonia racemosa* (L.) Spreng, *Horsfieldia irya* (Gaertn) L. *Ficus variegata*, *Canarium decumanum* Gaertner, and *Canarium indicum* plants. The protection of these important areas was conducted through the traditional protection pattern by establishing prohibitions in order to protect the bird habitat. Those prohibitions were: 1) prohibition to take firewood in an area where many birds were found, and 2) prohibition to take timber and non-timber forest products. These types of prohibition applied to the ethnic group and have been practiced up until now. This traditional protection concept called “ethno-conservation” was the supplementation of a traditionally protected area. The protection itself had a direct impact on the stability of the ecological system.

The approach was very effective because their life is still very traditional. Their life needs were based on the forest condition and the product of their surrounding environment. This traditional protection approach was conducted to maintain a sustainable ecological stability that contributed more to a better life needs. Important area for traditionally protected bird could also be part of a more effective approach. This was a genius way from nomadic *Togutil* ethnic group for sustainable conservation and utilization that also focused on type and habitat of bird. It was a traditional approach with a goal of sustainable biodiversity. Birds mostly found in the area were Ternate Chattering Lory (*Lorius garrulus*), Blue-and-White Kingfisher (*Todirhampus diops*), Papua Male Blyth’s Hornbill (*Rhyticeros plicatus*) sub-species *ruficollis*, *Eclectus Parrot* (*eclectus roratus*) and Bidadari Halmahera (*Semioptera wallacii*).

Taboo Zone

The *Togutil* ethnic group had a forest protection concept called the “prohibited forest” (*Hongana ihigumayaua*). The prohibited forest could be found in all utilization areas (Figs. 2 and 3). Since the old times, the prohibited forest had been part of their belief system that the forest had a guardian spirit who protects the forest. Anyone who entered the forest would become sick or even die. This prohibition applied to all age groups. According to the ethnic group, *hongana* (forest), *akere* (river), *tonaka* (land) and *yoku* (mountain) had a direct relationship with the life of the ethnic group. Those places were the food supplier for other animals and they could not be disturbed. The prohibited forest was a symbol of belief in the life of the *Togutil* ethnic group.

Plantation and Settlement Zone

These zones were areas used for land management. The land use of the *Togutil* ethnic group could be divided into land for plantation and settlement. Plantation land is land used to plant various crops such as *Cocos nucifera* L. *Carica papaya*, *Manihot utilissima*, *Gnetum gnemon*, *Musa paradisiaca*, *Saccharum edule*, and *Xanthosoma sp.* Settlement land is land chosen based on the watershed and the existence of secondary forest. Their house is called a *befak*. This traditional house was built temporarily for 3–4 months and after that period they would move to another area. The groups that still maintained the local tradition would not open a new land when they moved. On the contrary, they would reuse the previously abandoned farmland.



Fig. 2. Traditional house (*Befak*) of Nomadic *Togutil* tribe

Watershed Zone

This zone functioned as an area for activities such as showers and washing and for searching for types of animal to be consumed, such as *Anguilla sp*, *Macrobrachium rosenbergii*, *Channa striata*, and *Pomacea canaliculata*. The watershed zone had an important role in the life of the *Togutil* ethnic group. When they moved to a forest area, they had to look for a calm and clear watershed. The area had to have many plants that could be used to catch fish by poisoning them. The types of plant used by the *Togutil* ethnic group for poisoning the fish were: *Horsfieldia irya* (Gaertn.) L. *Barringtonia procera* (Miers) R, *Barringtonia magnifica* Lauterb, and *Phexandrum obtusifolium* Burck. The type of traditional water conservation conducted by the nomadic *Togutil* tribe was a prohibition to cut plants around the river.

Local knowledge of forest ecosystem management practiced by *Togutil* tribe is an effort for effective biodiversity preservation on Halmahera Island. The result of the research becomes a base in optimizing forestry sector in Indonesia to develop traditional protection concept through the empowerment of remote communities in protecting their indigenous forests. Maintaining local customs will have an influence on the stability of biodiversity in the local level, especially in the stability of forest ecosystem. The data research becomes a reference for local government to develop a form of local regulation related to local wisdom-based forest protection by strengthening the role of local traditional communities in managing forest in their village for sustainable development.

The research result also becomes a reference for local government to design local-wisdom based environmental education model for sustainable development. The environmental education model is designed to encourage the awareness of society as a whole to build a character that loves the environment and implement it in the daily life. Local wisdom-based environmental education is expected to change the paradigm and behavior of all communities' components. It is particularly for the education sector to participate in the implementation of three pillars of sustainable development: fair and sustainable economic development aspect, environmental preservation, and the development of socio-cultural perseverance.

Table 4. Category of Area Utilization

No	Category of Area Utilization	Description
1	Hunting	Areas use for hunting wild boar, maleo, deer, and caterpillar on sago. The hunting tools used are toxic wood, tree sap, and bait from insect
2	Prohibition/taboo	Sacred areas. It is prohibited to enter and have activities in the areas
3	Medicinal plants	Areas determined individually or by group to find out about the habitat of medicinal plants. They determine points of location of medicinal plants thus If someone is sick, the nearest and the farthest points are known.
4	Settlement and plantation	Areas close to water source to make it easier for showers, washing, processing food crops obtained from the yard or forest, looking for firewood, timber for house building, braid and rope.
5	Food plants	Areas having the main food sources are indicated with significant amount of food plants
6	Water source	Drinking water areas and are used to process sago with the significant amount of plants and clean water as the indicators
	Bird habitat	Birds are easily to find in these following areas: swamp area, bushes, secondary forest and primary forest with high canopy
7	Other;	No information, no detail explanation

Discussion

The behavior of the *Togutil* tribe in protecting their forest traditionally needs to be developed in every village in the island area in Indonesia. The concept of traditional protection is integrated into the school curriculum to fulfill the learning needs of children in the villages so that their knowledge of local culture-based traditional forest management will remain. The

activity of traditional protection conducted by the *Togutil* tribe affects the availability of food and herb medicine resources to support the needs and health of the family in the future. The local community conducts tropical forest management based on their cultural knowledge for the sake of future generations [25, 26]. Stated that communities often faced with challenges tend to have more local knowledge than those who rarely face critical times [27-30].

In the aspect of daily life, the local community cannot be separated from the influence of their surrounding nature, especially that related to forest management. The forest is the supplier of food, housing, clothing, medicines, and so on. Conservation of biodiversity through traditional practices and agro-ecological and ecosystem knowledge will increase the role of the community in protecting the forest [17, 31, 32]. Local culture practices have contributed to forest conservation. Traditional beliefs in taboo matters help to uphold environmental preservation regulations since everyone restrains themselves from using resources carelessly, especially those related to holy places. Specifically, the role of local practical knowledge in biodiversity conservation is very important in protecting the forest and other natural resources [33, 6].

Every village that still maintains its local tradition to protect the surrounding flora and fauna needs to implement customary law related to forest management. Forest management using customary law will minimize illegal logging conducted by the community [34-36]. Customary law is an approach to traditional forest management and preservation. Indigenous people's local knowledge related to biodiversity conservation is a traditional management approach that should be maintained to protect the forest so that the ecosystem remains stable [37-39]. Indigenous people need to cultivate useful crops to fulfil their needs and develop integrated customary forest conservation [40, 41]. The development of integrated customary forest is aimed at minimizing the risk of forest fires, protecting the forest from illegal logging and protecting habitats from various living things. The role of indigenous people in protecting the forest is aimed at protecting the ecological system and meeting the needs in terms of foods and medicines [42, 43].

The *Togutil* ethnic group are aware of the importance of biodiversity in the future to create a generation that cares about local biodiversity. Communities that continue to interact with their surrounding environment tend to have local knowledge regarding utilization and conservation, especially cultivation activities related to their surrounding resources [44]. Various traditional conservation practices in the form of tradition, myth, and folklore have a positive impact on the stability of forest areas [45]. Traditional conservation practice is mostly conducted on plants because they have an important role as the source of food and medicine [46]. The most important part of conservation is creating awareness among people about the diversity of plants that are useful for the survival of their family; thus, each family will cultivate plants for health purposes [47-49].

Conclusions

The *Togutil* ethnic group on Halmahera Island had local knowledge of traditional forest management through the classification of forest areas into various zones: a food and medicinal plants zone, a hunting zone, a plantation and settlement zone, a bird habitat zone, a taboo zone, and a watershed zone. The classification of forest areas through the zone system was a conservative practice of biodiversity by maintaining local tradition. The life of the *Togutil* ethnic group that utilized and conducted traditional conservation was maintained to make it one of the important parts of future conservation approaches. The reason is that when local tradition is maintained by a society, activities related to conservation will still be conducted. In contrast, the loss of local tradition will influence the loss of conservation practice activities. The most appropriate strategy for maintaining local knowledge related to biodiversity conservation is promoting an indigenous society-based management resources system and integrating it into the

local school curriculum. Indigenous society-based integrated forest management is key to forest ecosystem protection. We recommend carrying out a further survey to find out about the local knowledge of the *Togutil* ethnic group regarding traditional conservation practice in central Halmahera because, according to the research informant, a group in that area that has the stature as European was found. In addition, a further survey needs to be conducted on the Mange ethnic group on the Taliabu Islands.

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