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Indigenous People and Their Traditional Knowledge on Tropical Plant Cultivation and Utilization: A Case Study of *Murut* Communities of Sabah, Borneo

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Abstract

This study was conducted in *Murut* indigenous people inhibited two villages of Keningau district of Sabah Borneo which is blessed with vast cultural diversities. In this regard, 120 randomly selected households from the *Nabaai* and *Gana* tribes of *Murut* community were investigated with a view to identify their homestead plants, use pattern and also their Traditional Knowledge on plant utilization. Five major research tools (e.g., review of secondary information, key Informant interview, household survey with semi-structured questionnaire and focus group discussion) was employed in this study. It is found that the plant species found in the homestead of the *Nabaai* and *Gana* tribes are utilized for three main reasons i.e., i) food production, ii) medicine, and iii) fuel wood. There are 23 utilization pattern has been identified in this study which is much lesser than what was found a decade ago (68 utilization). The *Nabaai* and *Gana* tribes practice Traditional Knowledge in their daily life especially, in medicinal plant utilization. The findings also show that most of the Traditional Knowledge on plant utilization is lying with the respondents with low income group (59%) because of their high dependency on utilization of the surrounding resources in their daily life. Appropriate steps to preserve and conserve the Traditional Knowledge on plant utilization possessed and practiced by the *Murut* indigenous communities are deemed necessary before this huge nature treasure is forgotten.

1. Introduction

Tropical rainforests forests are the home to many indigenous and traditional people. Indigenous communities around the world have a wide range of knowledge about the natural resources on which they are directly dependent for their livelihoods (Muhammed et al. 2010). Indigenous people occupy 4% of the world's population (Chowdhury et al. 2009) and they possess most diversified wealth of traditional knowledge (Sanon et al. 2007). This traditional knowledge (TK) is a world treasure and is normally passed on from one generation to the next by oral expressions and practices. Regrettably, this practice is slowly vanishing (Kulip 2003).

Borneo has a vast diversity of indigenous people. Sabah lies to the tip of Borneo with an inland area of 74,500 km2 and a total population of 3.1 million comprising of 40 different indigenous ethnic groups recorded by the Kadazandusun Cultural Association. The indigenous people in Sabah are called *Bumiputera*. They speak more than 50 languages and 80 dialects. They are collectively referred to as the *Bumiputera* of Sabah. The largest ethnic group is the Kadazandusun which makes of one-third (33.3%) of the population followed by the *Bajau* (13%) and the *Murut* (3.2%).

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Most of the *Bumiputera* in Sabah live in rural areas and have mixed economies combining subsistence farming with many other ways of making a living. Most of them depend on plants of the nearby forest for their food, medicine, fuel, building materials, etc. Furthermore, hunting and fishing are important aspects of their livelihoods. For centuries, they have been engaged in regional markets exchanging forest products and agricultural surpluses for valued trade items. In short, it can be said that the *Bumiputera* have a large reliance on the land around them for their everyday life (Forest Peoples Programme 2008).

The *Murut* population is estimated to be 91,700 and they are the third largest group (SCB, 2011). They are distributed in Keningau, Tenom, Nabawan/Pensiangan and Kalabakan districts of Sabah (Kulip 2003). *Murut* people have generally continued to grow rice on the lowland areas as their main crop whereas shifting cultivation is practiced on hill areas (Schulze & Suriani 1999). The forest is also a source for a number of products gathered by villagers. The most important products include vegetables, rattan and timber. The use of forest sources is closely related to the daily activities incorporated by the *Murut* culture which has been passed down from one generation to the next. This traditional norm of the *Murut* community enables them to possess rich knowledge of local plants and animals (Sheil & Salim 2011). Rutter (2004) classified the *Murut* into two groups (viz. hill *Murut* and *Murut* of the plains) based on their settling. Those live in the interior and remote areas are known as Hill *Murut* while the more modernized group who live in the forest peripheries is known as *Murut* of the plains. This research will be focusing more on the *Murut* of the plains. The *Murut* of the plains are considered to be more similar to the mainstream people of Malaysia as many of them have migrated into city areas for stable employment and meanwhile have adopted modern way of living.

Rural people have a collective wealth of knowledge about plant utilization. Sanon et al. (2007) gave an example that rural women are more knowledgeable about plant utilization such as which species are best for fire wood, food and medicine. Traditional healers are experts in the use of medicinal plants. Pastoralists know which species provide the best fodder and medicines for their livestock. The importance of IK in managing natural forest resources and environment has gained increasing recognition over the past two decades (Muhammed et al. 2010). Emery (2000) in this research on integrating Indigenous Knowledge (IK) in project planning and implementation stated the guidelines that could assist Governments at all levels to focus their attention into certain aspects that can significantly improve the capacity of any Government to benefit from the inclusion of indigenous and their traditional knowledge. Therefore, any bio-cultural conservation should take into account the importance of respecting traditional values and spiritual leaders. The stimulation of practices that favor connection with the environment and the right to ownership of inhabited land and the use of their natural resources should be documented and preserved as a natural treasure by the indigenous world (Molares & Ladio 2011).

The amount of information known about TK on plant species is shown to decline with the increase in wealth. For example, the amount and proportion of the known and valued species have been observed to reduce with wealth amongst resource-dependent communities in India and Indonesia (Thomas 2008). The knowledge, innovation and practices of indigenous peoples are part and parcel of their cultures. This knowledge is important not just in terms of the description, proper management and harvesting of a project. In addition, the knowledge is also very important in terms of the maintenance of ecological processes and biodiversity that linked to traditional economic activities such as cultivation or animal farming (Chowdhury et al. 2009).

Previous study on the traditional medicinal plants in the *Murut* community of Sabah region conducted by Kulip (2003) showed that only the elderly people of this community know most of the plants and their traditional uses. The younger generations has lost interest in their ancient customs of plant utilization. Moreover, many *Murut* people have migrated to urban areas to find work and access modern facilities. Therefore, there is a need for further research on plant species and their utilization by this community in this region. The *Murut* of the plains are known for being the more modernized groups of *Murut*. The *Nabaai* tribe

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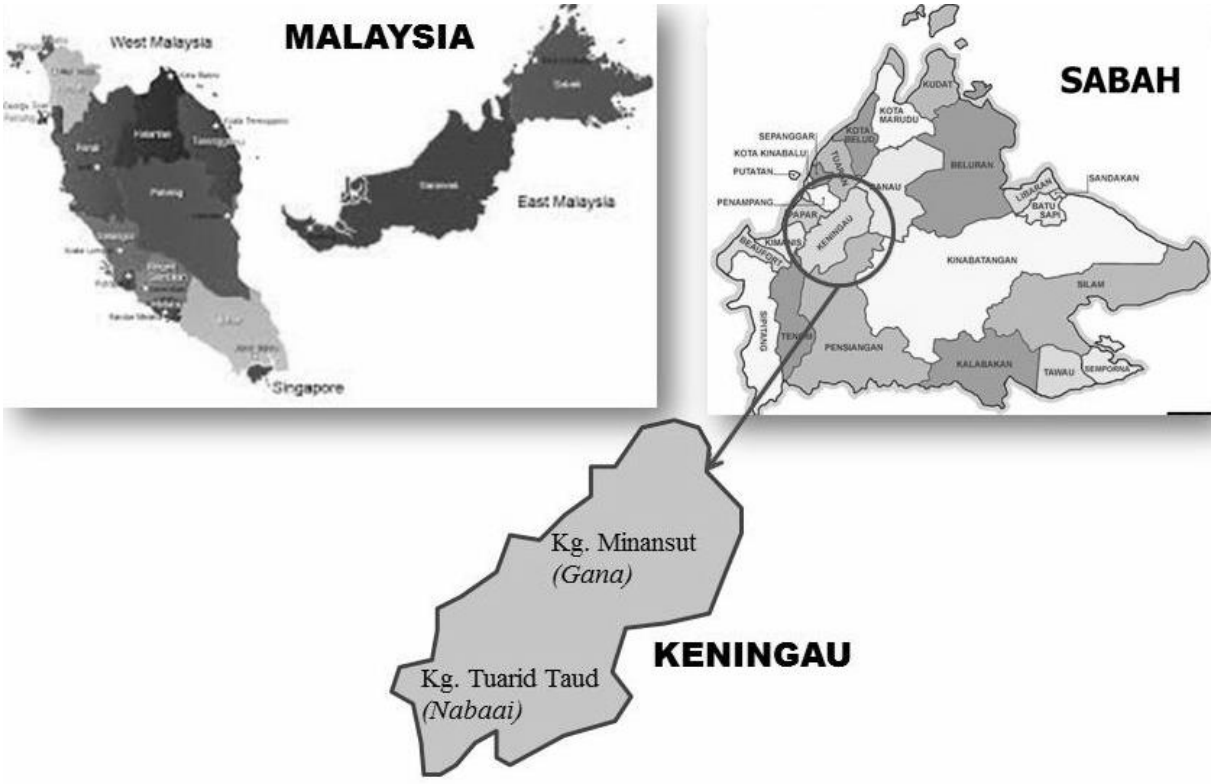
for instance was very numerous and lived in long houses but epidemic and modernization has reduced the population of this tribe (Woolley 2004). Hence, this research has focused on two tribes from the *Murut* of the plains specifically (i) *Nabaai* and (ii) *Gana* in order to document their remaining traditional knowledge and practices before it become forgotten through time. This study was carried out to (i) document the utilization pattern of the identified plant species and (ii) explore and analyze the role of plants in the daily life of the *Murut* communities in Sabah.

2. Methodology

2.1. Study Areas

The research was carried out in *Murut* inhibited Keningau district of Sabah. The district covers an area of 3,532.82 km^2. The total population of Keningau district is 173,103 (Department of Statistics Malaysia 2010). The district consists of three major ethnic groups which are Kadazan (39.6%), *Murut* (16.8%) and *Bajau* (3.1%). *Murut* being the second largest ethnic group in the district is formed by a number of tribes such as *Nabaai*, *Gana*, Ambual, Dusun *Murut*, Baukan and Apin-apin Kuijau. Two villages viz., Tuarid Taud and Minansut have been selected from Keningau district for this study (Fig. 1). One village i.e., Tuarid Taud is inhibited by the *Nabaai* tribe while the other village, Minansut is mostly inhibited by the *Gana* tribe.



2.2. Sampling Techniques

Three types of sampling techniques were applied in this study i.e. selective sampling, stratified random sampling and simple random sampling. The study has been selectively chosen in Keningau. There are about 245 villages in the district of Keningau (Department of Statistics 2010). Two villages were selectively chosen based on the *Murut* tribe present in each village. This study aims to focus on the more modernized group of *Murut* known as *Murut* of the plains specifically the *Nabaai* tribe and *Gana* tribe. Hence, Tuarid Taud and Minansut were selectively chosen for this study. This is because the practice of passing on traditional knowledge from one generation to the next is slowly vanishing in these tribes (Kulip 2003).

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A total of 120 households (HHs) were selected from two villages i.e., 60 from Tuarid Taud and 60 from Minansut. The HHs was divided into subgroups before sampling. Each subgroup are called stratum. The advantages of using this sampling technique is the flexibility in the choice of the sample design for different strata (Kitambara n.d.). HHs were grouped based on the household income. Three strata were formed i.e., is high income group (Annual HH income ≥MYR 18,000), middle income group (Annual HH income MYR 6,000 – MYR 17,999) and lower income group (Annual HH income ≤MYR 6,000). This could enable the estimation of each stratum in addition to the estimation of the population. Simple random sampling was used to randomly choose approximately 20 HHs from each stratum.

2.3. Research Tools and Data Collection

This research was conducted based on both primary and secondary information. Mainly five major research tools (e.g. review of secondary information, key Informant interview, and household survey with semi-structured questionnaire and Focus Group discussion) was employed in this study. Firstly, available secondary information on *Murut* communities with relevance to the study has been reviewed and analyzed carefully. Secondly, key Informant Interview was conducted in order to obtain detailed information for questionnaire finalization and pre-test. Generally, the *Murut* communities center on the village head and village heads are normally the person to entertain guests into their village (Rutter, 2004). Moreover, the village head is usually the person who is aware of their custom and tradition. Hence, the primary key Informant was the village head. There are also other key informants such as school teachers, community head, elected representative of the local council, etc. Thirdly, a semi- structured questionnaire was finalized based on the interview with the key informants. The questions related to the plant species commonly found in the homesteads and their functional utilization by the community was the major focus of this study. A total of 120 HHs was surveyed in this study. Focus Group Discussion (FGD) with the *Murut* communities was then conducted in order to receive more clear understanding on plant utilization. This gave a chance to cross-check the information and nullifies the irrelevant statements received in individual interview. Two such FGDs (one in each village) were conducted during the field visits.

3. Results and Discussion

3.1. Demographic and Socio-Economic Information

The demography and socio-economic data of the respondents in Tuarid Taud and Minansut were obtained in order to understand their background, economic situation and family life. A total of 69 male respondents (57.02%) and 26 female respondents (42.98%) were selected for interview. The ratio of male is to female is 1:0.8. Most of the respondents are married (79.34%) but there are 18 singles (14.88%), 4 divorcees (3.30%) and 4 widows (3.30%) included in the interview.

Rural families are generally large. It is found that the mean size of the respondent's family in Tuarid Taud is seven (ranging from 2 to 19) (Table 1) while the mean size of the respondent's family in Minansut is six (ranging from 3 to 12). Average earning members per households (HH-1) for Tuarid Taud and Minansut is three (ranging from 0 to 9). The household (HH) members of most of the families are large but the members involved in contributing to the HH income are relatively small. On an average, each family in Tuarid Taud has a mean monthly income of MYR 1,500 (range between MYR 40 to MYR 5,500) while the mean monthly income of each family in Minansut is slightly higher with an income of MYR 1,700 (range between MYR 60 to MYR 6,500). Even though most household members are relatively large but the members that are involved in contributing for the household income are relatively small (2 people HH^{-1}) compared to the maximum number of children HH^{-1} which could reach to 16 children. This is because most of the newer generation of children opted to continue their education after secondary school. However, only a few of the children are involved in contributing to the HH income. Those children usually do not continue their education after secondary school. Moreover, the head of the house are mostly the person in charge of bringing in the money for the family. The mothers of the household are mostly housewives and remains at home to look after the younger children. Moreover, most villagers opt to stay in the village and settle down

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once they have completed their secondary school education. They step into the conjugal life at an early state which contributes to the high number of children per household (HH^{-1}) (5 children HH^{-1}).

The respondents are from a wide range of income status. Commonly, respondent with a high income status owns a larger land area compared to those in the middle income status and lower income status. The land area in Tuarid Taud is utilized primarily for housing, paddy and rubber. Each family in Tuarid Taud has a mean land area of 0.28 acres for housing (Table 2). The mean land area utilized for rubber planting (8.40 acres) is comparatively larger compared to the average land area utilized for paddy (2.99 acres). On the other hand, Minansut has more diverse land utilization pattern. The total land is utilized for housing, paddy, rubber, oil palm and farming. The mean land area for housing is 0.58 acres. The mean land area for paddy and rubber is approximately the same with values of 3.43 acres and 3.46 acres respectively. The respondents of the Minansut village utilize a larger land area for oil palm cultivation (6.21 acres) instead of rubber and there is also some land utilized for fruit and vegetable farming.

Table 1: Socio-demographic characteristics of the respondents

Parameters	Village	Sum	Mean	Min	Max	Std. Dev.	S.E.M.
Children	1*	508	4.98	0	14	2.76	0.36
	2**		5.24	1	16	2.98	0.48
Family Income (MYR)/Y	1	19,6583.00	1527.34	40	5500.00	1287.29	167.59
	2		1711.05	60	6500.00	1516.61	246.03
HHs Members	1	776	6.68	2	19	2.56	0.33
	2		6.16	3	12	2.34	0.38
Earning Members	1	282	2.32	0	9	1.81	0.24
	2		2.39	1	7	1.52	0.25

*1 = Village Tuarid Taud, **2 = Village Minansut**;** Min= Minimum, Max.= Maximum, Std. Dev.= Standard Deviation, SEM.= Standard Error of the Mean

Table 2: Land use pattern in Tuarid Taud and Minansut

Parameters	Sum	Village	Mean	Min	Max	Std. Dev.	S.E.M.
Total Land Area (acres)	777.63	1*	5.88	0.20	33.50	6.85	0.85
		2 **	7.60	0.10	41.30	7.547	1.01
Housing Land	50.24	1	0.28	0.20	0.60	0.10	0.01
		2	0.58	0.10	2.50	0.52	0.07
Paddy Land	256.15	1	2.99	0.50	7.00	1.66	0.26
		2	3.43	0.50	12.00	3.30	0.52
Rubber Land	344.30	1	8.40	1.00	15.00	3.55	0.68
		2	3.46	1.00	15.00	3.02	0.52
Oil Palm Land	114.30	1	0.00	0.00	0.00	0.00	0.00
		2	6.21	22.00	0.80	6.61	1.65
Farm Land	12.50	1	0.00	0.00	0.00	0.00	0.00
		2	3.13	1.50	4.00	1.18	0.59

*1 = Village Tuarid Taud, **2 = Village Minansut

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The education level of the respondents from Tuarid Taud and Minansut are similar (Table 3). The Sijil Pelajaran Malaysia (SPM) or Malaysian Certificate of Education has the highest number of respondents (38.02%). There are very few respondents with higher educational certificate. Nine respondents (7.44%) hold a diploma certificate and 7 respondents (5.79%) with a degree certificate. The frequencies for the other educational status are Primary School Assessment Test or UPSR (15.70%) and Lower Secondary Assessment or PMR (23.14%). The state of the literacy level of both villages is quite high since most of the villages were able to complete their secondary school education. This can be related to the role of the Malaysian Government which provides free education to all their citizens until the end of their secondary school education. Hence, it is compulsory for all the Malaysian citizens to enroll into a public education institution. In the 2000 census, 88.7% of the total population in Malaysia is considered literate (Asian Info 2002).

Table 3: Educational status of the respondents

Village	Highest Education												Total
	UPSR	%	PMR	%	SPM	%	Dip.	%	Deg.	%	In. Edu.	%	
Tuarid Taud	14	11.57	15	12.40	20	16.53	4	3.31	5	4.13	7	5.79	65
Minansut	5	4.13	13	10.74	26	21.49	5	4.13	2	1.65	5	4.13	56
Total	19	15.70	28	23.14	46	38.02	9	7.44	7	5.79	12	9.92	121

The frequency distribution for occupation in Tuarid Taud and Minansut are tabulated collectively as shown in Fig. 2. It shows that many respondents who are self-employed (43%). This shows the highest frequency of occupation in both villages. There is also a high frequency of unemployed respondents (23%). However, there are 19 respondents (16%) working in the Government sector and 14 respondents (12%) working in the Private Service. The other respondents are students (6%). Students with the age of 18 and above were also included in the interview. Although the literacy level is quite high in the study areas, their education level is not good enough for a proper job employment.

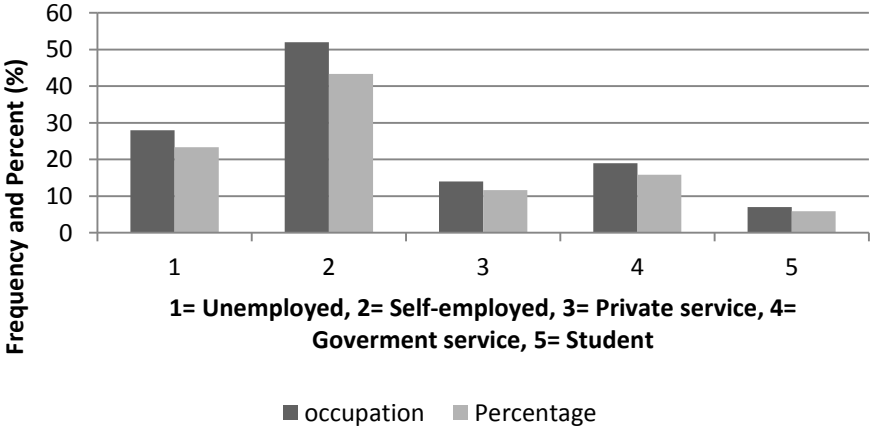

Figure 2: The frequency distribution of the respondent's occupation

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Therefore, most of the villagers end up helping out with the family work and becoming farmers. This scenario can be seen in both villages whereby most of the respondents are farmers. Villagers with a higher paid job would tend to migrate into city areas. Hence, most of the villages in both the selected villages are self-employed farmers. The village environment provides the households with enough resources to support their family. Village life do not require high cost of living. Most of the respondents have a large family size. Furthermore, they are able to maintain their family with the resources obtained in their village since most of them live on simple rural subsistence.

3.2. Plants Availability and Utilization Pattern

Plants that are found in the homesteads (Fig. 3) have been categorized into six major which are horticultural trees (Ht), horticultural plants (Hp), vegetables (V), medicinal plants (Mp), trees (T) and non-wood species (Nw). Fig. 4 shows the frequency distribution of the type of plants found in the homesteads. Horticultural trees (32%) show the highest frequency followed by vegetables (25%). Horticultural plants (16%) and medicinal plants (16%) show the same number of frequency distribution. Non-wood species has a frequency of 6% while tree species has a frequency of 5%. It is found that the plant species found in the homesteads of the *Nabaai* and *Gana* tribes are utilized mainly for three main reasons i.e., i) food production, ii) medicine, and iii) fuel wood. Sometimes, the fruits obtained from the horticultural trees are sold in nearby open markets. In this regard, Chowdhury (2009) opined that despite their agriculture, the tradition of eating wild fruits and plants has not disappeared from the indigenous community. Fruits obtained are eaten fresh without processing such as Mango (Mangifera indica), Avocado (Persea americana) and Longan (Dimocarpus longan). Vegetable like, Ginger lily (Etlingera elatior), Lady's finger (Abelmoschus esculentus) and Cucumber (Cucumis sativus) are cooked together with other ingredients for HHs food consumption. Tuhau or Malaysian ginger (Zingiber sp.) is used regularly as vegetable and pickles. Table 4 shows an extended list of plant species that are available in the homesteads of these tribes.

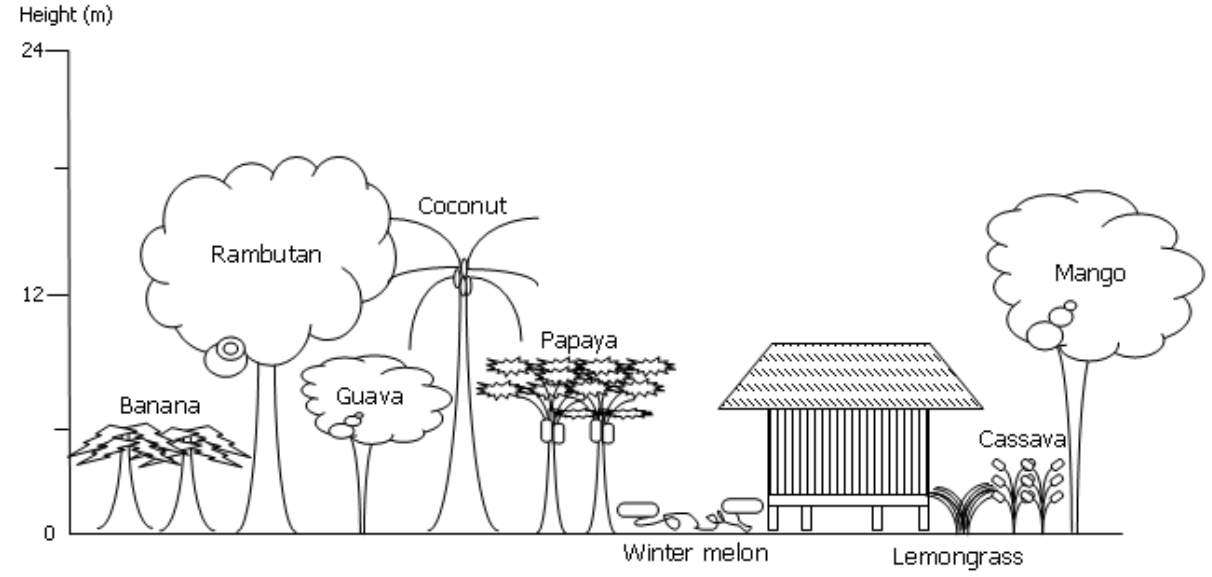

Figure 3: Schematic presentation of a typical homestead

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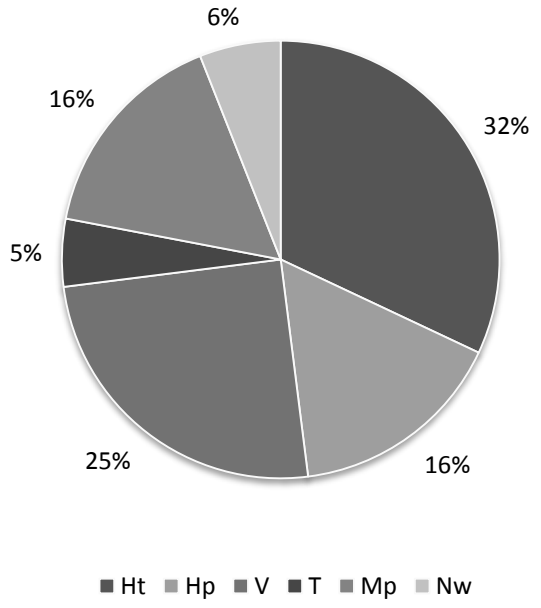

* Ht= horticultural trees, Hp= horticultural plants, V= vegetables, Mp= medicinal plants, T= trees and Nw= non-wood species

Figure 4: Frequency distribution of the plant types available in the homesteads

Plants have traditionally been used as a source of medicine for the *Nabaai* and *Gana* tribes for the various ailments afflicting humans. It was evident from the field surveys that these two tribes have rich TK on traditional medicine as there were many traditional medicinal plants identified from the study. They are knowledgeable on the medicinal value of some plants, usually to treat common ailments such as fevers, gastric and abdominal pain. A total of 23 different utilization patterns has been identified and recorded through this research. Table 5 is the summarized table of the plants with their local name, scientific name, plant type, medical use and ailments against which these are used. This result has conformity with Kulip's (2003) research finding where it was opined that the *Murut* community is rich in traditional knowledge of medicinal plant utilization.

It is evident from this study that the villagers are still interested in cultivating plants with medicinal value in their homesteads. Tree species are also found in the homesteads. The function of the tree species is mainly for shading and fuelwood. *Murut* community is famous for producing their own local liquor called Montoku. The process for producing Montoku requires outdoor cooking. Hence, fuelwood is required for this purpose. Non-timber species is found only in some homesteads. The species found are bamboo, rattan and sago palm. Non-timber species is utilized for making huts in the paddy. Results of the questionnaire survey and focus group discussion show that the *Murut* communities in both studies area have meanwhile forgotten their traditional knowledge of knitting mats and baskets from those non-timber species.

Plants have traditionally been used as a source of medicine for the *Nabaai* and *Gana* tribes for the various ailments afflicting humans. It was evident from the field surveys that these two tribes have rich TK on traditional medicine as there were many traditional medicinal plants identified from the study. They are knowledgeable on the medicinal value of some plants, usually to treat common ailments such as fevers, gastric and abdominal pain. There are 23 utilization pattern identified. However, these two tribes are slowly forgetting their practice of traditional medicine as compared to a study conducted by Kulip in 2003. He found 68 medicinal plant species used traditionally by the *Murut* community in Sabah. He concluded that modernization was the cause of the degradation of TK in plant utilization. Lower income group (HH annual income < MYR 6,000) possesses the most TK found in this study indicates that this TK may be disappear over time unless steps are taken to preserve and conserve it.

3.3. Storehouse of Traditional Knowledge

The *Nabaai* and *Gana* tribes practice Traditional Knowledge (TK) in their daily life especially, in medicinal plant utilization (Table 4). Fig. 5 shows that most of the TK on plant utilization is obtained from the respondents with low income level (59%). There are some TK obtained from the respondents with middle income level (25%) and respondents from the high income level (16%). An annual household income of MYR 18,000 and above is classified as high income group, an annual household income between MYR 6,000 – MYR17,999 is classified as middle income group while an annual household income of lower than MYR 6,000 is classified as lower income group. From the field survey, it is found that most of this TK is obtained from

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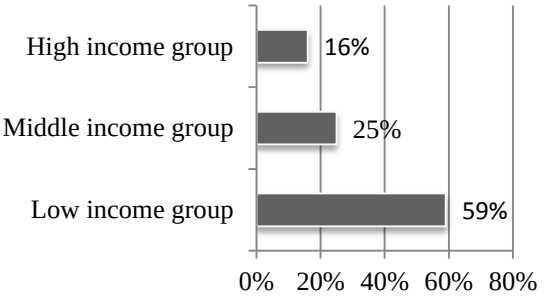
the poorer group of people. Because the poor people highly depend on their surrounding environment for their livelihoods. As they depend on their surrounding resources for their basic needs, they become more knowledgeable on how to utilize those resources (Chowdhury et al. 2009). Besides, there is a general global pattern that TK reflects dependence upon wild resources (Pilgrim et al., 2007) which is also reflected in this study.



*Low income group= annual income < MYR 6,000, Middle income group= annual income between MYR 6,000 – MYR 17,999 and High income group= annual income ≥ MYR 18,000

Figure 5: Traditional knowledge possession by different level of income groups

Table 4: Plant species found in the homesteads of the study areas

No.	Species Name				No. of Individuals		
	Local Name	English Name	*Scientific Name*	Type	1*	2**	Total
1	Nangka	Jackfruit	*Artocarpus heterophyllus*	Ht	16	15	31
2	Rambutan	Rambutan	*Nephelium lappaceum*	Ht	29	32	61
3	Rambutan Hutan	Wild rambutan	*Nephelium lappaceum* L.	Ht	5	0	5
4	Mangga	Mango	*Mangifera indica*	Ht	30	36	66
5	Mangga wani	Malaysian mango	*Mangifera caesia*	Ht	28	9	37
6	Durian	Durian	*Durio zibethinus*	Ht	15	25	40
7	Durian belanda, Lampunjong	Soursop	*Annona muricata*	Ht	8	16	24
8	Manggis	Mangosteen	*Garcinia mangostana*	Ht	5	8	13
9	Jambu batu	Guava	*Psidium guajava*	Ht	16	40	56
10	Jambu air	Bellfruit	*Syzygium samarangense*	Ht	1	0	1
11	Pokok kelapa	Coconut tree	*Cocos nucifera*	Ht	29	29	58
12	Seramai	Malay gooseberry	*Phyllanthus acidus*	Ht	11	10	21
13	Betik betina	Papaya (male)	*Carica papaya*	Hp	27	29	56
14	Betik jantan	Papaya (female)	*Carica papaya*	Hp	20	11	31
15	Pokok pisang	Banana	*Musa acuminate*	Hp	27	28	55
16	Pokok Jagung	Corn	*Zea mays*	Hp	3	1	4
17	Nanas	Pineapple	*Ananas comosus*	Hp	18	17	35
18	Tarap	Marang	*Artocarpus odoratissimus*	Ht	18	14	32
19	Langsat	Langsat	*Lansium domesticum*	Ht	12	19	31
20	Mata kucing	Longan	*Dimocarpus longan*	Ht	5	13	18
21	Mengkudu	Indian mulberry	*Morinda citrifolia*	Ht	5	4	9
22	Buluh	Bamboo	*Bambusa* sp.	Nt	6	11	17
23	Pinang	Betelnut	*Areca catechu*	Ht	7	13	20
24	Serai makan	Lemongrass	*Cymbopogon citrates*	Mp	30	19	49
25	Kunyit	Turmeric	*Curcuma longa*	Mp	2	0	2
26	Ubi kayu	Cassava	*Manihot esculenta*	V	24	19	43
27	Kundur	Winter melon	*Benincasa hispida*	Mp	5	11	16
28	Terung	Brinjal	*Solanum melongena*	V	17	14	31
29	Pandan	Pandan	*Pandanus amaryllifolius*	V	1	2	3
30	Pokok bunga raya	Hibiscus	*Hibiscus rosasinensis*	Mp	13	21	34
31	Pokok jarak	Jatropha	*Jatropha curcas*	T	4	10	14
32	Kapok	Java cotton	*Ceiba pentandra*	T	1	2	3
33	Lada	Chilli	*Capsicum* sp.	V	22	26	48
34	Tomato	Tomato	*Solanum lycopersicum*	V	6	4	10
35	Pokok markisa	Passion fruit	*Passiflora edulis*	Hp	1	1	2
36	Buah naga	Dragon fruit	*Stenocereus queretaroensis*	Hp	6	22	28
37	Rosel	Roselle	*Hibiscus sabdariffa*	Hp	4	1	5
38	Lidah buaya	Aloe vera	*Aloe vera*	Mp	7	13	20

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39	Sayur manis	Sabah vege	*Sauropus androgynus*	V	23	12	35
40	Rumput kepala bulat	Lesser Roundhead	*Hyptis capitata*	Mp	1	0	1
41	Rumput semalu	Sensitive plant	*Mimosa pudica*	Mp	2	0	2
42	Daun sambung, Tawawo	Gyura	*Gyura procumbens*	Mp	5	18	23
43	Benggalai	Wild ginger	*Zingiber zerumbet*	Mp	8	8	16
44	Kantan	Ginger lily	*Etlingera elatior*	V	3	6	9
45	Lengkuas	Galangal	*Alpinia galangal*	V	9	17	26
46	Kaktus	Cactus	*Opuntia humifusa*	V	10	5	15
47	Serai mandi	Citronella	*Cymbopogon nardus*	Mp	2	12	14
48	Labu	Pumpkin	*Cucurbita* sp.	V	2	20	22
49	Bendi	Lady finger	*Abelmoschus esculentus*	V	0	10	10
50	Cinnamomum	Cinnamomum	*Cinnamomum cassia*	T	1	5	6
51	Gajus	Cashew	*Anacardium occidentale*	Ht	0	5	5
52	Daun keladi	Aroids	*Colocasia* sp.	V	2	12	14
53	Sukun	Breadfruit	*Artocarpus altilis*	Ht	1	7	8
54	Timun	Cucumber	*Cucumis sativus*	V	1	7	8
55	Sawit	Oil Palm	*Elaeis guineensis*	Nt	0	7	7
56	Getah	Rubber tree	*Hevea brasiliensis*	T	0	6	6
57	Koko	Cocoa	*Theobroma cacao*	Ht	0	6	6
58	Bayam hutan	Prickly amaranth	*Amaranthus spinosus*	V	0	11	11
59	Limau nipis	Key lime	*Citrus aurantifolia*	Hp	0	13	13
60	Limau kasturi	Calamasi	*Citrus microcarpa*	Hp	1	10	11
61	Lemon	Lemon	*Citrus limon*	Hp	2	7	9
62	Halia	Ginger	*Zingiber officinale*	V	1	13	14
63	Bawang	Onion	*Allium cepa*	V	1	12	13
64	Ros	Rose	*Rosa sp.*	Hp	1	13	14
65	Peria	Bitter gourd	*Momordica charantia*	V	1	10	11
66	Setawar	Life plan	*Cyrtandromea grandis*	Mp	1	5	6
67	Buah lemak	Avocado	*Persea americana*	Ht	1	9	10
68	Limau Gajah	Pomelo	*Citrus grandis*	Ht	1	3	4
69	Belimbing	Starfruit	*Averrhoe carambola*	Ht	1	6	7
70	Rumbia	Sago palm	*Metroxylon sagu*	Nt	1	5	6
71	Tebu	Sugar cane	*Saccharum officinarum*	Nt	1	9	10
72	Tebu Merah	Sugar cane	*Saccharum sp.*	Nt	1	4	5
73	Kedondong	Canarium	*Canarium spp.*	Ht	1	2	3
74	Sirih	Betel leaf	*Piper betle*	V	0	14	14
75	Tuhau	Malaysian ginger	*Zingiber sp.*	V	1	6	7
76	Lidah Jin	Sansevieria	*Sansevieria sp.*	Mp	1	14	15
77	Cempedak	Cempedak	*Artocarpus integar*	Ht	1	5	6
78	Inai	Henna	*Lawsonia inermis*	Mp	0	4	4
79	Bina	Madeira vine	*Anredera cordifolia*	Mp	0	16	16
80	Bunga loceng	Allamanda	*Allamanda cathartica*	Mp	26	53	79
81	Misai kucing	Java tea	*Orthosiphon stamineus*	Mp	3	5	8
82	Hempedu bumi	Creat	*Andrographis paniculata*	Mp	4	6	10
83	Asam jawa	Tamarind	*Tamarindus indica*	Ht	2	3	5
84	Kacang papan	Pea	*Pisum sativum*	Ht	4	3	7
85	Kesumba	Lipstick tree	*Bixa orellana*	T	0	1	1
				Total:	611	970	1,571

*1 = Village Tuarid Taud, **2 = Village Minansut
Note: This analysis excludes grasses (except for the ones with medical value) and ornamental plants. Bamboo and lemon grass was not counted as individuals rather as clumps or group.

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Table 5: Plant species utilization pattern

No.	Local Name	*Scientific Name*	Type	Uses	Utilization Pattern		
					Parts Utilized	Method Used	Against which ailments
1	Daun Sambung, Tawawo	*Gynura procumbens*	Mp	Medicine	Young shoots	Extract the juice for drinking	Fever, Gastric
2	Kacang papan, kacang sepat	*Pisum sativum*	V	Medicine Food	Young shoots	Extract the juice for drinking	Fever
3	Bina	*Andiredrea cordifolia*	Mp	Medicine	Leaves	Grill the leaves and paste on the affected area	Gastric
4	Coconut	*Cocus nucifera*	Hp	Medicine Food	Cambium	Boil and drink	For women after childbirth (for cleansing the blood).
5	Kesumba, Suliabai	*Bixa orellana*	Ht	Medicine	Leaves	Grill the leaves and paste on the affected area	Pain
6	Kesumba, Suliabai	*Bixa orellana*	Ht	Medicine	Fruits	Create paste by pounding	Hair dye
7	Papaya	*Carica papaya*	Ht	Medicine Food	Young shoots	Boil and drink	High blood pressure
8	Bunga raya	*Hibiscus rosasinensis*	Hp	Medicine Ornament	Leaves	Break the veins	Fever
9	Bunga raya	*Hibiscus rosasinensis*	Hp	Medicine Ornament	Red flower	Create paste by pounding then paste on the affected area.	Boil and carbuncle
10	Ubi keledek	*Ipomoea batatas*	V	Medicine Food	Tuber	Create paste by pounding then paste on the affected area.	Boil and carbuncle
11	Inai	*Lawsonia inermis*	Mp	Medicine	Leaves	Create paste by pounding then paste on the affected area	Pain and itch
12	Buah susu, Avocado	*Persea americana*	Ht	Food Medicine	Young shoots	Boil and drink	Viral fever
13	Belimbing, Starfruit	*Averrhoa carambola*	Ht	Food Medicine	Young shoots	Boil and drink	Viral fever
14	Lampunjong, Durian belanda	*Annona muricata*	Ht	Food Medicine	Leaves	Boil and drink	Constipation
15	Lampunjong, Durian belanda	*Annona muricata*	Ht	Food Medicine	Fruits	Cook and eat	Asthma for kids
16	Jambu batu, Guava	*Psidium guajava*	Ht	Food Medicine	Young shoot	Boil and drink	Constipation, fever
17	Jambu batu, Guava	*Psidium guajava*	Ht	Food Medicine	Young shoot	Bath with warm water	Chickenpox
18	Benggalai	*Zingiber zebetus*	Mp	Medicine	Leaves	Create paste by pounding then paste on the affected area	Wounds
19	White Periwinkle	*Catharanthus roseus*	Mp	Medicine	Flower	Create paste by pounding then paste	Skin whitening
20	Lalang	*Imperata cylindrica*	Mp	Medicine	Roots	Boil and drink	Smallpox
21	Serai mandi	*Cymbopogon nardus*	Mp	Food Medicine	All	Bath in warm water	Fever, tiredness, jaundice
22	Peria	*Momordica charantia*	V	Food Medicine	Leaves	Boil with lime water and drink	Smallpox
23	Tarap	*Artocarpus odoratissimus*	Ht	Food Medicine	Latex	Spread on affected area	Rough skin

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4. Conclusion

The plant utilization patterns by the *Nabaai* and *Gana* tribes indicate that they depend on homestead plants. However; the number of uses has been greatly reduced over a decade. Comparison with the previous study conducted by Kulip (2003) indicates that many plant utilization patterns have already been lost (current study identified 23 uses where previous study identified 68 different uses). Especially, they are still rich in traditional knowledge of medicinal plant utilization. Worrisome finding is that the rich TK possessed by the *Murut* can be vanished off in near future as this study shows that most of the the TK are lying with the marginalized poorer segment. Therefore, it is suggested for appropriate Government and non-Government initiatives to preserve and conserve TK on plant utilization before this huge nature treasure is forgotten.

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