

Preliminary Observations on Indigenous Knowledge and the Uses of Natural Resources in Banting and Padawan

(Pemerhatian Awal Tentang Kearifan Tempatan dan Kegunaan Sumber Asli di Banting dan Padawan)

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ABSTRACT

This paper discusses preliminary findings of the study on indigenous knowledge of various cultural, religious, medicinal and culinary uses of the natural resources found in two different indigenous communities in Sarawak, namely the Iban of Banting and the Bidayuh of Padawan. Structured interviews were carried out with each household head in the selected villages to determine indigenous knowledge of these communities on the usage of and reliance on natural resources. Through focus group discussions, indigenous knowledge on the various uses of identified natural resources is still available in these two communities. Their dependence on natural resources as building materials, food and, in the economic aspects still exist. However, their dependence on natural resource is diminishing. The indigenous knowledge gap between the old and younger generation of both Iban dan Bidayuh areas has also been identified. Most of the young people are no longer practicing traditional way of life because they are more comfortable with the modern way of life today. In addition, most Iban people in Banting, and the Bidayuh in Padawan have embraced Christianity and practiced modern way of life.

Keywords: Indigenous knowledge; natural resources; modernisation; Iban; Bidayuh

ABSTRAK

Berdasarkan penemuan awal kajian, maka makalah ini bertujuan membincangkan kegunaan sumber asli dalam kehidupan etnik Iban di Banting, Sri Aman, dan etnik Bidayuh di Padawan, Kuching, Sarawak, berdasarkan pengetahuan peribumi. Seterusnya, cabaran amalan pengetahuan peribumi juga dibincangkan. Temu bual berstruktur telah dikendalikan bersama setiap ketua isi rumah di kampung-kampung terpilih untuk mengetahui kearifan tempatan bagi masyarakat tersebut berkaitan dengan penggunaan dan kebergantungan terhadap sumber asli. Melalui perbincangan dalam kumpulan, kearifan tempatan mengenai pelbagai kegunaan sumber asli yang dikenalpasti adalah masih terdapat dalam kedua-dua komuniti ini. Kebergantungan kepada sumber asli sebagai bahan binaan, makanan dan dalam aspek ekonomi adalah masih wujud. Walau bagaimanapun, kebergantungan mereka terhadap sumber asli adalah semakin berkurangan. Kelompongan kearifan tempatan di antara generasi tua dan muda juga telah dikenalpasti di kedua-dua kawasan Iban dan Bidayuh tersebut. Kebanyakan generasi muda tidak lagi mengamalkan cara hidup tradisional kerana mereka lebih selesa dengan cara hidup moden masa kini. Selain itu, kebanyakan orang Iban di Banting dan Bidayuh di Padawan telah memeluk agama Kristian dan mengamalkan cara hidup moden.

Kata kunci: kearifan tempatan; sumber asli; modenisasi; Iban; Bidayuh

INTRODUCTION

Indigenous people and their communities are generally descended from original inhabitants of the land in which they inhabit and as such have a historical relationship with their land (UNEP 1992). Over many generations, they have developed a holistic traditional knowledge of their lands, natural resources and environment. Traditional or indigenous knowledge plays an important role in the daily lives of the indigenous communities of Sarawak (Nicholas & Lasimbang 2004). These cultural and traditional practices usually involve the utilization of natural resources and play a part in their livelihood strategies and daily activities such as during paddy planting, hunting, fishing, home building, handicraft making as well as in curing simple ailments. Previous studies have been conducted on the use of plants, animals and aquatic species by different indigenous groups (Friendlander et al. 2016; Hernandez et al. 2015; Whitney et al. 2016) showing the importance of these resources to the indigenous community as they are closely associated with their natural environment. Any changes in the environment will affect the people's livelihood strategies. Likewise changes in people's livelihood strategies will also affect the environment. Modernization processes affect the symbiotic relationship between communities and nature. The Iban and Bidayuh are no exception.

Traditionally, the indigenous community in Sarawak has always relied on their indigenous knowledge on the uses of these natural resources found in their surrounding forests to sustain their livelihood. However, the value of indigenous knowledge held by the older generation is being diminished by various factors such as religion, modernization, urbanization, as well as the loss of natural resources due to the rapid exploitation of forest areas for development of commercial agricultural activities. Therefore it is important to document the various uses of these natural resources before the knowledge is lost forever. This knowledge will also help to ensure the conservation and sustainable use of natural resources by giving value to the resources. The aim of this paper is to outline the utilisation of natural resources based on the indigenous knowledge of the Iban community of Banting and the Bidayuh community of Padawan. This paper will also discuss the factors of the erosion of indigenous knowledge among the two communities.

INDIGENOUS KNOWLEDGE

Indigenous knowledge is an experience based-knowledge of the indigenous community on how resources are used to ensure the survival of the community. Generations of community members have developed the knowledge of sustaining livelihood while integrating with the environment over time. Like most indigenous communities, the Iban and the Bidayuh do not have a formal writing system with which to preserve their knowledge. The knowledge is traditionally passed down orally, through story telling, rituals, songs and customary laws. There are various terminologies and corresponding definitions of indigenous knowledge. 'Indigenous knowledge' is the most widely used term, and is defined as the local knowledge that is unique to a given culture or society (Sillitoe et al. 2002). 'Traditional knowledge' is another widely used term and is defined as a static, low level of change in old knowledge that is handed down orally from generation to generation. The difference between 'indigenous knowledge' and 'traditional knowledge' is that the former constitutes change and evolution, while the latter is mostly preserved without change. For the purpose of this paper, the term indigenous knowledge will be used as knowledge is not a static phenomenon but one that is constantly evolving with changes in the surrounding environment of the community.

Indigenous knowledge plays a vital role in the daily lives of not only the indigenous community itself, but also a vast majority of people. In recent years, the importance of indigenous knowledge has been recognized as an invaluable asset in the field of biotechnology and bioprospecting (Nordin 2001). It has proven invaluable in identification of plants and their by-products with pharmacological value which could be utilized in the production of modern medicines. Traditional medicine also remains a popular and affordable method of healing the sick in poor marginalised communities.

NATURAL RESOURCES

Natural resources are natural assets (raw materials) occurring in nature that can be used for economic production or consumption. They are subdivided into four categories: mineral and energy resources, soil resources, water resources and biological resources and they are subject to quantitative depletion through human use (OECD 2001).

Natural resources can be categorised as renewable or non-renewable resources. Non-renewable resources are resources that do not form naturally in the environment or have a very slow formation rate such as fossil fuels. Renewable resources are resources that can be replenished naturally. Sunlight, air and wind are examples of renewable resources that have a rapid recovery rate that exceeds human consumption therefore their quantity is not noticeably affected. Some renewable resources such as the forests and wildlife have a slower recovery rate, therefore are susceptible to depletion by over-use. Therefore, a proper management of these natural resources is important to ensure sustainable use. Traditionally hunters and gatherers, indigenous people living on the land have relied on natural resources for generations (Friedlander et al. 2016).

Access to these natural resources is important for many rural households as their livelihoods are inherently dependent on crop and animal agriculture, forest and fisheries resources as well as the underlying environmental services that sustain these resources (Lee & Neves 2009). Several studies on the livelihood strategies of rural communities have also shown that the economic activities of the rural communities still rely heavily on natural resources (Intan 2014; Johnny 2014; Salleh 2006).

BACKGROUND OF INDIGENOUS PEOPLE OF SARAWAK: BIDAYUH AND IBAN

The indigenous community in Malaysia is defined as the original inhabitants of the land which includes the Malays and Orang Asli in Peninsular Malaysia as well as the various indigenous ethnics in Sabah and Sarawak (Othman et al. 2009). There are about 40 different ethnic groups in Sarawak. According to Sarawak Facts and Figures 2014, the Iban make up 28.8% of the total population in Sarawak, making them the largest indigenous ethnic group in Sarawak. Iban are mostly found in the coastal regions of Sarawak such as along the Batang Lupar riverine. The Bidayuh make up 8% of the total Sarawak population, making them the third largest indigenous ethnic group in Sarawak. They are mostly settled in the interior uplands and highlands. Collectively, along with various groups of Orang Ulu, the Iban and Bidayuh are known as the Dayak. The Dayak identity is based on similarities in physical appearance, cultural elements, customary

law and death ritual, but differ in language, culture, art forms, clothing, housing architecture and social organization (Chang 2002). Dayak groups mainly live along the rivers, uplands and highlands. They share similarities in farming practices, collection of jungle produce, hunting and fishing, as well as tools and handicraft making. In these indigenous communities, their traditional livelihood relies very much on the availability of natural resources that surround them and their indigenous knowledge revolves around the utilization and management of those resources (Joe & Insham 2004).

LOCATION OF THE STUDY: PADAWAN AND BANTING

The two study locations were chosen to represent the coastal riverine community (Banting) and upland community (Padawan). Padawan is a sub-district of Kuching Division. It has an area of 526 square kilometres and the majority of the population is Bidayuh with some Chinese around the Teng Bukap Bazaar. As of 2009, there are two main roads leading to Padawan sub-district, namely Jalan Padawan and Jalan Puncak Borneo. Padawan is known for its various tourist attractions such as Borneo Highlands Resort, Annah Rais Hot Spring, Annah Rais Homestay Programme, as well as its mountainous surroundings that provide habitat for a vast array of flora and fauna, including the Rafflesia flower. Besides this, Padawan is also known for the Bengoh Dam Project.

Padawan consists mostly of upland hilly terrain and is home to the Biatah Bidayuh. The Biatah is further divided into Biya and Bi'anah groups. There are 46 Bidayuh villages in the area. A majority of the villagers remain heavily dependent on natural resources, especially forest resources of Gunung Penrissen for their livelihoods.

Banting, on the other hand, is situated down the Strap River in the sub-district of Lingga, which is part of the Sri Aman Division, and is only accessible by a 45- to 60-minute boat ride from Lingga as there is no road access to Banting. However, the villagers are equipped with basic amenities such as gravity fed water supply from the nearby Gunung Lesong and 24-hour electricity supplied by a SESCO run generator across the river from their longhouses. There are eleven longhouses in Banting, six of which are situated in Ulu Banting and five of which are situated in Ili Banting. These

longhouses are situated close to each other and are connected by a combination of cement walkways and wooden *belian* jetties. Depending on the tide, certain areas near the river bank will be inundated by water during certain times of day. The main livelihood activity for the people of Banting is semi-permanent cultivation of wet rice as well as fishing. Banting is well known for its aquatic natural resource, especially freshwater prawns. Various species of freshwater fish can be found in Banting, such as *lajong*, *baong*, *tapah* and *labang*. According to Penghulu Belie of Banting, a large number of people have migrated out of Banting over the years for work and education, only returning during Gawai or Christmas.

METHODOLOGY

This is an exploratory research carried out in Banting and Padawan to determine the utilisation of natural resources based on the indigenous knowledge of the Iban and Bidayuh and its challenges. The communities involved in this study are the Balau Iban of Banting and the Biatah Bidayuh of Padawan. The study was carried out during intermittent visits to Banting and Padawan. In Banting, 118 respondents from all eleven longhouses in the area were involved in the study. In Padawan, interviews were carried out with 237 respondents from five different villages. Here, the term village is used as there is only one longhouse in Annah Rais, and the other Bidayuh villages

constitute of individual family houses or single houses. Table 1 shows the list of villages involved in the study from both areas.

Interviews were conducted with the heads of the households using structured questionnaires to collect information on their economic status, livestock breeding and agricultural practices, crop cultivation, traditional practices with regards to farming, and use of natural resources to supplement their livelihood. Heads of each household were selected to be interviewed as they are the most knowledgeable about the utilisation of resources especially building materials and land use. For this method, probability sampling was employed, as individuals selected are known and sampled independently of each other. The respondents were interviewed individually in their own homes. Focus group discussions (FGD) were carried out with the community heads of each area visited to gather information about the indigenous knowledge on the types of flora and fauna available in a particular area as well as their uses. A seminar was conducted in both areas at the end of the survey period to gain feedback from the heads of the villages for verification of information collected. Intermittent visits to the field are also carried out to verify some information with key informants in the villages.

To ensure the quality and integrity of the study, respondents of the research were made aware of the nature of the research and consent was obtained from all participants. The participants also had rights to anonymity on any sensitive information they have shared, with their results kept confidential.

TABLE1. List of villages involved from Banting and Padawan

Banting	Padawan
Batu Tembang	Annah Rais
Sungai Perin	Sapit
Teluk Mulong	Parang
Nansang Hilir	Kiding
Nansang Ulu	Sadir
Dampa Padang	
Bunga Raya	
Tanjung Punggu	
Chabu Ili	
Chabu Ulu	
Banting Hilir	

FINDINGS AND DISCUSSION

USES OF NATURAL RESOURCES

Uses of natural resources can be divided into several categories, namely: edible species, uses of chemical compounds (medicinal), religious and magical uses (ritual practices) and technical uses (for building materials, handicrafts, tools).

The Iban in Banting mostly rely on the forest for food and technical uses. The women frequently forage in the forests for edible plants such as *midin* (*Stenochlaena Palustris*), tapioca leaves, and various shoots for their own consumption. Some of these plants are planted near their houses such as tapioca and yam. The forest is also a source of materials for their traditional handicrafts, such as *bemban* (*Donax Graneis*) for mats and bags. Nowadays, only the older generation have the knowledge in weaving as the younger generation are more focussed on their schooling and do not have the time to learn. Thus the knowledge and skills in weaving is slowly dying out as it is not passed down to the younger generation.

The Bidayuh of Padawan also forage for jungle produce for their own consumption as well as material for handicrafts. In terms of medicinal usage, the villagers of Kampung Annah Rais collect *bakah baras* (*Liana* sp.), a type of vine, which is used to make tea. The vine is soaked and stripped off its bark, which is then dried and cut into smaller pieces. The dried bark is boiled in water and can be drunk with or without sugar. To add flavour, sometimes *pandan* (*Pandanus odoratissimus* L. f.) leaves are added. It is believed to have health benefits and helps cool the body. *Bakah baras* is sold by the villagers to tourists and visitors to the longhouse. *Daun kokot* (*Diplazium esculentum*) is a type of fiddle head fern that is used by the Bidayuh to heal boils and skin rashes. The head of the fern is pounded into a paste and applied onto the affected areas for instant relief.

The *sirih* (betel) leaf is a popular medicinal plant common in both communities, and is used to heal bruises and stomach aches. The heated leaf is placed on the bruised area to encourage blood flow and helps the bruise to fade. All these uses of natural resources were inherited from generation to generation and considered as indigenous knowledge of the communities in these areas.

Besides its medicinal properties, the *sirih* leaf is also used in rituals such as *miring* ceremony as part of the offerings.

Most notably in the Bidayuh community is the versatile usage of bamboo. There are various types of bamboo (*buruk* or *buluk*) as identified by the villagers in Padawan, and their various uses differ according to type. Commonly used for building materials such as walls, flooring and bridges, is known locally as *buruk brunei* (brunei bamboo). Another, *buruk tering* (tering bamboo) is also a common building material. In Sapit, villagers fashion a smoking pipe out of bamboo which is equivalent to the modern day vaporiser, known locally as *supak*.

Timber is mainly utilized as building materials or firewood. Hardwood such as *belian* (*Eusideroxylon zwageri*), *meranti* (*Shorea* sp.), and *selangan batu* (*Shorea* sp.) are generally used to build houses in the past. In the olden days, these timber were sourced directly from the surrounding forests, with the villagers working together to collect the timber. Nowadays there is an increasing scarcity in the availability of these hardwoods due to commercial logging activities as well as clearing of land for oil palm plantations. This affects both Banting and Padawan and is a widespread phenomenon throughout Sarawak.

FARMING PRACTICES

“As long as there is rice, we can still survive.” –
an Iban paddy farmer in Banting.

Paddy farming (*bumai* in Iban or *birumuh* in Biatah Bidayuh) has been an integral part of the Iban and Bidayuh community in Sarawak. According to Sarawak Facts & Figures (2012), 127,000 hectares of land in Sarawak is cultivated with paddy. Extensive study of Iban agriculture has been done and documented by Freeman (1955), Padoch (1982), Mertz & Christensen (1997), Ichikawa (2004) and Kendawang et al. (2005). According to Kendawang et al. (2005) findings, the Iban traditional agriculture year is signalled by observing star constellations. For the purpose of rice cultivation, the following three main constellations are key;

1. *Bintang Banyak*: Pleiades, marking the commencement of land selection (*manggul*);

2. *Bintang Tiga*: Orion, marking the season for dibbling (*nugal*), i.e. sowing of the rice seed (August/September);
3. *Bintang Tangkong Peredah*: Sirius, marking the end of the growing season. Rice plants sown after Sirius has passed its zenith (in the middle of October) will not mature properly.

In Banting, not many farmers observe the star based calendar as this knowledge is mostly lost to the younger generation.

Based on information gain through fieldwork data, both communities have their own belief and practices when it comes to paddy farming. Prior to the introduction of Christianity in Banting in 1859 by missionaries, the Iban of Banting were animists and believed in the spirits of the land and forests. This belief is carried out in the ritual of *miring* or offering at the start of the planting season. This

ritual is carried out to seek blessings for a bountiful harvest from the *petara* (gods) by presenting an offering consisting of a combination of salt, betel nut, tobacco leaves, rice cakes (*tumpi*), and rice puffs (*rendai*) in bamboo baskets known as *piring*.

The Bidayuh community also traditionally carry out a seed blessing ritual at the beginning of the planting season in order to ensure a good harvest.

Both communities believe in birds of omen, wherein the sound of certain birds dictated whether or not they are able to carry out their work in the farm. When they hear the sound of certain birds of omen as shown in Table 2 below, they must immediately stop their work and head home. However, as most of the people have converted to Christianity, this belief is no longer widely practiced in both areas.

TABLE 2. Birds of Omen in the Bidayuh and Iban Community

Bidayuh birds of omen	Iban birds of omen
<i>Sasik</i>	<i>Ketupung</i>
<i>Kusah</i>	<i>Papau</i>

HUNTING AND FISHING

The Iban and Bidayuh share similar practices and belief when it comes to hunting or fishing. For example, in both communities, when meeting with a hunting party or a hunter, one must not ask where they are headed as it is believed that this will spoil their hunt, or *jelungan*, as the Ibans call it. It is also frowned upon to make an early booking of the catch as this will also cause *jelungan*. Hunters and fishermen are also not allowed to talk in a loud voice, boast about their exploits, or mention the name of the animals they are hunting, as these are all believed to be causes of *jelungan*. Certain foods are prohibited when going hunting, like strong smelling food such as *belachan* (shrimp paste) and oily food. Smelly food is thought to attract unwanted company such as supernatural beings who might steal their catch or disturb their hunt. Oily food is believed to 'grease the traps' so to speak, allowing the trapped animal to free itself. Hunters are also not allowed to wear perfume or bathe using scented soaps before going hunting as this will alert the animals of their presence.

There is also a belief among the Bidayuh and Iban that one is not allowed to mention or talk

about food before going hunting or fishing, as it is believed to cause a disaster. This belief is termed *kempunan* by the Iban and *punun* by the Bidayuh, which translated means "a longing or craving that leads to disappointment". The Iban of Banting in particular still believe in *kempunan* as their villages are built along a river that is infested with crocodiles.

FACTORS INFLUENCING A CHANGE IN TRADITIONAL PRACTICES AND CUSTOMS

Traditional customs, knowledge and practices are ever evolving to suit the changing times and lifestyles of the modern generation. Some practices and beliefs are no longer practiced. All relegated folklores and old wives' tales are even forgotten. There are various reasons why indigenous knowledge and traditions have fallen out of popularity. Among others are the advent of organized religion, urbanization, modernization, and lack of interest among the younger generation. The deteriorating indigenous knowledge intrinsically linked to the uses of natural resources also contributes to the change of practices and

beliefs as the communities learn to adapt by using alternatives that are readily available to replace the use of these natural resources.

As discussed above the communities have their own indigenous knowledge regarding the utilisation of natural resources but that knowledge seems to be withering. Several contributing factors are religion, practicality, education, modernisation, depletion of natural resources, and the availability of modern amenities. These factors shall be discussed as follows.

RELIGION

With the advent of Christianity in Sarawak, some of the traditional practices and spiritual rituals are dying out such as *bemanang* (shamanism). This is due to the fact that it is becoming difficult for the former shaman to find their successor. In Banting, there is no longer a shaman. For those villagers who still require the services of a shaman, they will enlist one from a different village. For the Iban in Banting who have converted to Christianity, Christian prayers have replaced the *miring* ritual. The farmers perform prayers according to Christian teachings prior to the planting of crops. The Bidayuh of Padawan conduct prayers in the local church to bless their rice seeds prior to the planting season.

PRACTICALITY

Modern tools and materials have also replaced traditional tools and materials. For example, during the olden days, houses were built using material harvested from natural resources such as *atap* (roof) of *apong* (*Nypa fruticans*) and *mulong* (*Metroxylon sagu*), *baji* (wooden wedges) in place of nails, as well as walls made out of tree bark. Nowadays, *atap* has been replaced by zinc roofs, *baji* with steel nails and walls made out of wood bought from the sawmills that are contrary to direct harvesting from the nearby forests.

Modern tools and methods have also found their way into the local farming techniques. The *ketap*, a tool made of bamboo, has been replaced by the sickle to expedite the harvesting process in order to fulfil the need for greater rice production both to sell as well as for own consumption.

EDUCATION

The younger generation is not exposed to traditional knowledge because among the community itself, it is not really expressed and adapted. They are sent to schools where they learn a more scientific approach to daily life. The formal education system has decreased the practical everyday life aspects of indigenous knowledge and associated ways of learning. There is only a primary school in the village in Banting, so secondary school students will be sent to boarding schools outside their villages in nearby towns such as Lingga or Sri Aman. Once they leave their villages in Banting, they will no longer keep in touch with their traditional heritage and culture, especially in the reliance on natural resources and the knowledge of the usage of such resources.

AVAILABILITY OF MODERN FACILITIES

Through our interviews with the villagers, we had garnered quite a number of traditional knowledge regarding the uses of natural resources for medicine such as herbs and roots especially from the older generation. However most of these are no longer practiced as the villagers have come to rely on modern medicine. Many expressed a greater level of trust in clinics and hospitals in the nearby towns and only rely on their traditional medicine for less serious ailments such as simple stomach aches and minor aches and sprains.

MODERNISATION AND LAND USE CHANGE IN SARAWAK

Modernization is defined as a shift from traditional, rural and agrarian based economies into secular, urban and industrial based economies. The changes occur in terms of belief wherein traditional religion is replaced by scientific or secular religion, geographically there will be a more urbanised population and economically there will be a shift from subsistence farming to a more industrialized economy based on production of goods and services. This shift in economic development can be seen in the transformation of Malaysia's economy from a primarily commodity-based economy to a manufacturing and industry based one. Malaysia was predominantly exporting rubber and tin until

the 1970s, and subsequently became an exporter of manufactured goods after overcoming the colonial heritage that had shaped its economic structure based on primary commodity dependency (Furuoka 2014). However, Sarawak's economy still remains driven by the export of primary commodities such as liquefied natural gas (LNG) and petroleum (Furuoka 2014). This highlights the contrast in economic development in Sarawak and the rest of Malaysia.

There are three main categories of forests classified as Permanent Forest (PF) which is to remain under forest cover in perpetuity. These consist of: (i) Forest Reserves (FR) or production forests, (ii) Protected Forests, which are reserved for the conservation of soils and waters, and where intensive production of crops are impracticable; and (iii) Communal Forests, which are used by communities that dwell in the area (Hon & Shibata 2013).

The Forest (Amendment) Ordinance requires that a permit is needed in order to remove forest produce (Government of Sarawak, 2001). The Forest Department of Sarawak (FDS) is in charge of the management of permanent forests including national parks and wildlife sanctuaries. FDS is in charge of issuing logging licenses and permits for such activities, thus has control over land use and logging regulating (Government of Sarawak 1998a; 1998b).

In 2014, it was reported that the total forested area in Sarawak was 8.03 Mha or 64.89 percent of land (SPU, 2014) and agricultural land was 2.04 Mha (16.48%). Rubber (*Hevea brasiliensis*) was originally the main agricultural activity significantly impacting the forests of Sarawak in 1905 when it was planted large scale in the form of smallholders after its introduction in 1881 (Aiken & Leigh, 1992). Large scale logging begun in the late 1940s mostly along the coastal peat swamp forest and intensified during the 1970s with the improvement of hill logging technology which accelerated the exploitation of interior forests (Aiken & Leigh, 1992). Logging activities continued to thrive until its peak in 1991 with 19 million square metres harvested before its eventual decline (Hon & Shibata 2013).

In recent years, forest plantations are increasingly gaining ground, causing significant changes of land use in Sarawak. More land in Sarawak has been allocated for oil palm plantations under the Third National Agriculture Policy (1998-

2010) (MOA, 1998). Since 2002, an average annual increment of 10.5% in planted area was achieved, making it the highest for all states in Malaysia (Hon & Shibata 2013).

Logging and timber activities in Sarawak may have inevitably affected the expansion of shifting cultivation areas by providing road accessibility to native land, allowing ease of access to these previously difficult to access areas (Ichikawa 2007; Hon & Shibata 2013).

These major land use changes in the state of Sarawak through the years invariably affects the people of Banting and Padawan. These factors affect their land rights and access to land, forest plantations such as oil palm and rubber affect their agricultural practices as well. Some members of the community may in the future be more interested in planting cash crops instead of paddy, and some may no longer be involved in agriculture at all, choosing to move away from the village to seek other sources of income.

DEPLETION OF NATURAL RESOURCES

Commercial logging activities and oil palm plantations have depleted their natural resources. Timber, especially hardwood such as *meranti* and *belian* are extremely difficult to find in the nearby forests. Only the younger, smaller trees are left in the forest, therefore the villagers would have to purchase timber from nearby saw mills if they need to renovate their longhouses or houses. The destruction of the natural habitat of wild animals has also seen a decrease in animals such as deer. The villagers very rarely go hunting nowadays and most of the villagers interviewed stated that they no longer go hunting. The depletion of natural resources also affects the making of handicrafts. The villagers in Banting no longer use rattan in their handicraft, as it is difficult to come by. They now use *bemban* as well as commercial material such as plastic rope to weave their mats, baskets, bags, hats and others. According to the villagers, rattan is still available in Padawan, however the number is dwindling.

Several studies have been conducted to show that community participation is important in the conservation efforts to ensure sustainability in biodiversity and development (Phoa 2009; Hussein et al. 2015; Whitney et al. 2016) Besides that, it is also important to include the conservation of the traditional knowledge of local communities such

as the medicinal, technical, culinary and ritual uses of natural resources along with the conservation of natural resources to ensure sustainability for the future generation.

CONCLUSION

The Dayaks of olden days had to rely solely on their indigenous knowledge to get by as they lived on the land and its surroundings. Modernization has changed their lives particularly the young generation of Iban in Banting and Bidayuh in Padawan in terms of introducing new methods and practices of curing diseases, farming or cultivating various plants, fishing, building houses, making handicrafts and harvesting resources from the forest. In both areas in Banting and Padawan, it was found that there is a marked deterioration of indigenous knowledge among the younger generation on uses of natural resources. Most of the younger generation no longer practice the old ways as they are influenced by a modernized way of life, and the advent of Christianity has essentially diminished their belief in old spiritual customs and traditions. However, it is generally recognized among the Iban of Banting and the Bidayuh of Padawan the need to preserve their indigenous knowledge for posterity and prevent their culture and old practices to fade away with time. Preservation of their indigenous knowledge should go hand in hand with the conservation efforts with regards to natural resources on which they rely on. It is hoped that they are able to synthesize the old and new knowledge to better improve their lives.

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