# UNDERSTANDING THE UTILIZATION OF NATURAL RESOURCES FOR LIVELIHOOD IN LIWAGU WATER CATCHMENT AREA

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**Abstract**

This paper is proposed to overview the livelihood pattern and the utilization trend of natural resources by the local community in the Liwagu water catchment, Tambunan, Sabah. It will be a basic contention to understand how human being managing their resources for livelihood, especially to obtained needs as well as to maximize satisfaction of want. This is one of the key process in doing water conservation plan for the area managed by the community. Preliminary study has been conducted to understand the dependence on natural resource as a life support system. Collected data was analyzed descriptively as well as SWOT analysis. Principal Component Analysis (PCA) has been used to identify the attitudinal pattern of local community towards their livelihood. Results presented will serve as baseline documentation to enhance natural resources management towards sustainable living without affecting the freshwater resources. In overall, the livelihood pattern of local community relatively depended on natural resources. Whereas, the uses of those resources is likely to meet the domestic needs. In terms of attitude, they are classified into five groups, where the majority of is Pro-infrastructure. While SWOT analysis indicate that the use of natural resources in Liwagu catchment areas is under control.

**Keywords:** Livelihood, utilization, water catchment, local community, natural resources.

***Abstrak***

*Kertas kerja ini diketengahkan untuk memberi gambaran keseluruhan tentang corak kehidupan dan trend penggunaan sumber asli oleh masyarakat setempat di kawasan tadahan air Liwagu, Tambunan, Sabah. Ia akan menjadi satu perbincangan asas untuk memahami bagaimana manusia menguruskan sumber-sumber mereka untuk kehidupan, terutama dengan keperluan yang diperoleh serta untuk memaksimumkan kepuasan keperluan. Ia merupakan salah satu proses utama dalam pelan pemuliharaan air yang dilakukan untuk kawasan yang diuruskan oleh masyarakat. Kajian awal telah dijalankan untuk memahami pergantungan kepada sumber asli sebagai sistem sokongan hidup. Data yang diperoleh dianalisis secara deskriptif serta analisis SWOT. Principal Component Analysis (PCA) telah digunakan untuk mengenal pasti pola sikap masyarakat tempatan terhadap kehidupan mereka. Hasil kajian yang dibentangkan akan menjadi garis dasar dokumentasi bagi meningkatkan pengurusan sumber semula jadi ke arah kehidupan lestari tanpa menjejaskan sumber air tawar. Secara keseluruhannya, corak mata pencarian masyarakat tempatan memang bergantung kepada sumber asli. Sementara itu, penggunaan sumber-sumber mungkin untuk memenuhi keperluan domestik. Dari segi sikap, ia dikelaskan kepada lima kumpulan, di mana majoriti adalah Pro-infrastruktur. Analisis SWOT menunjukkan penggunaan sumber asli di kawasan tadahan Liwagu adalah terkawal.*

***Kata kunci**: Kehidupan, penggunaan, tadahan air, komuniti setempat, sumber asli.*

## Introduction

Liwagu water catchment in Tambunan is an important source for water supply in Sabah. It also has long been established as a native settlement for the Dusun community. For many years, this local community has fully optimized the natural resources for several purposes in living. The concerns on water supply and restoration in recent years led to the study on understanding the community livelihood patterns in the water catchment area. Understanding

on how the community managing the resources to obtained needs as well as to maximize satisfaction of want has to be reveal, as is one of the key process in the preparation of better water conservation plan for the area that managed by the local community. Hence, focus on the study is to looks in to (1) livelihood pattern, (2) Utilitarian or natural resources and (3) attitudinal pattern of community towards livelihood. Human being relies on natural resources for livelihood. Natural resources such as land, forest, rivers and wildlife are sources of livelihood (Felix, 2007). As a life support system, natural resources are subject to fluctuations in value and the changes that being related to the predictable function of resource. Basically livelihood is all about life management that refers to what, why and how human want to be for living. Those questions deal with their perspective (thinking), behavior (action) and motivation (intention) that forms the way of utilization.

The identification of livelihood is related to sustainability. The Brundtland Commission in 1987 has first introduced sustainable livelihood (SL) as a concern on resource ownership and also access to basic needs and livelihood security. Livelihoods not only provide food and income, but also contribute significantly to identity, social capital, and personal and social fulfillment (Goldman & Young, 2015). As for The International Institute for Sustainable Development (IISD), SL refers to: "concerned with people's capacities to generate and maintain their means of living, enhance their well-being, and that of future generations". Chambers and Conway (1992 in Elasha et al., 2011) concluded that "Livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base". Elasha et al. (2011) further made their point that "livelihood is something to do with activities, entitlements and assets by which people make a living. Those are referred as natural or biological, social aspect and physical aspect [1]."

Basically, livelihood assessment would define individual, household, or a community behavior under specific frame conditions, as well as to understand livelihood system. Those definition and thought concluded livelihood as a process of perception (thinking), believes and action that framing a human interaction among them and also the physical environment.

## Materials and Methods

Data collection took place in the vicinity of Crocker Range Park. The Liwagu water catchment area is composed of two main tributaries, Nukakatan River and Mensangoh River. The nine villages involves for the survey are Kampung Nukakatan, Kampung Libang Laut, Kampung Garas, Kampung Pahu, Kampung Tuhan, Kampung Kumawanan, Kampung Kiporing and Kampung Sintuong-tuong (see Figure 1.). These villages resided by the local community from the Dusun ethnic. Geographically, the average elevation of the site is 744 meters above sea level. In 1984, part of the area has been included in Crocker Range Park gazette as protected area (Fera et al., 2013). The hilly land covered by dipterocarp forest, while the flat land is cultivated with wet paddy (Julius, 1996). Data was collected via field work, interviews and questionnaire. Principal Component Analysis (PCA) was performed to identify the behavioral pattern as SWOT conducted for analysis.

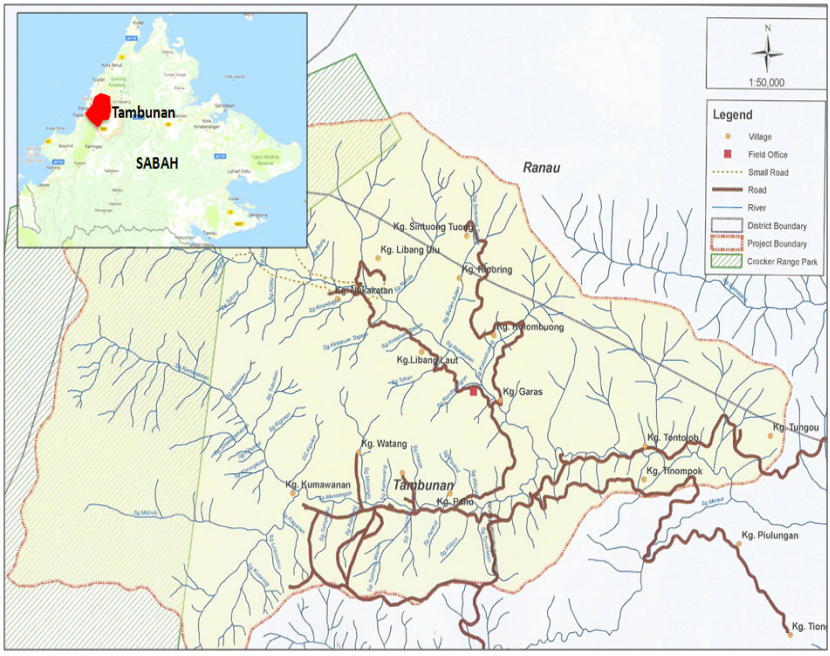


**Figure 1** Study site
Source: Modified from WWF Malaysia (2011); Googlemap (2016)

## Livelihood Pattern

Tambunan is well known as a Dusun community land as they are the earliest group resided Tambunan before 1960's. Most of them came along from various areas outside Tambunan, such as Ranau and Keningau, mainly for farming and for new settlements. Most of the household are resided in Kampung Garas (24.5%), Kampung Kumawanan (18.9%), Kampung Kiporing (15.1%) and Kampung Pahu (13.2%). This is because the villages are the main spots for earliest settlements. This is also due to topographical factors that cause them to prefer lowland for better accessibility. As population growth, demands for agricultural and settlement land drive them to extend and exploring new ground in adjacent.

Educational background shows that the eldest community members of the study site have relatively lack of formal education. Anyhow, the raising of awareness on the importance of education, as well as the existence of schools has encouraged them to send their children for better education. This has increased the number of literacy that has successfully completed their studies at the tertiary level with diploma, degrees and masters. New emerging groups of employment are formed as a result of the development in formal education. A higher level of education and knowledge may increase people's awareness on future benefits of complying natural resources management toward better management (Amede et al., 2006).

Rural households often pursue diverse livelihood strategies including farming, hunting, fishing and gathering. Education enhancement and the opportunities to access global formations via the globalization communication technology have affected the employment pattern of the community. They are now keen to serve for public and private sectors, rather the inherited the traditional work as farmers and collector for wild products. Women are now not only act as full time housewives and do farming, but they are also involves in decisions making for any community programs. They are also pursuing small scale business, such as selling of wild products collected from the forest and producing traditional food for local market. The changing of employment pattern has also contributed to various sources of income. In average 58.5% of them in estimate earned RM700 per month,

which is below the poverty line; 22.6% have no income; while only 18.9% are above the poverty line. This clearly exhibits that most of them are still within poverty level, taking household income as the indication.

The community of Tambunan catchment area has experienced better infrastructure in recent year. The most current basic facilities provided are electricity supply and road access. The electricity supply has replaced mini hydropower plants[2] and diesel generator which is the result of innovation by local community. It has helped them to reduce the cost for fuel; while the upgrading of the road has assisted more convent mobility and access. The only service they are less satisfied with is the health service, which they perceive as still lacking of medicines supplies and appropriate treatment. They are expecting better service to avoid having them traveling all the way to the public hospitals in the urban centre.

So far, they have not experienced any difficulty in food supply as agriculture remains as their most prioritized activity. But they believe the use of rivers as for domestic (e.g. water supply, fish, etc) has been declined. This is mainly caused by the decreasing of water quality that has been polluted by pesticides and fertilizer. As for domestic purposes[3], they consume gravity water from the Sabah Parks.

Food sources are being consumed from their livestock, as well as from crops, such as wet paddy, fruits and vegetables. Fish and red meat are still the most important sources for protein, but they do no longer rely on wild supplies from the forest and rivers. In fact they are now rearing their own fishes in man-made ponds. It means that the natural environment is capable to support living, as the community tend resilience.

**Utilization of Natural Resources**

Land, forest and water are highly valuable natural resources for the local community in Liwagu catchment area. The level of livelihood dependence on natural capital, given the natural resource use involved in all activities undertaken by the households (Harrison, 2015). Utilization of natural resources can be classified base in to either domestically use or commercial purposes.

Based on the local community, natural resources are mainly used for food, medicine and health, handicraft, grazing for livestock, building and also for settlement. The esthetical value of rivers and springs, as well as the hilly land which is covered by green forest provides a potential for commercialization.

***Land***

Land is an important asset to the community due to their dependence on it. "*Land is very important. It is easier to earn if we owned one*"[4], said a man who has resigned in almost two years from public service department to work on his land. He is now ventures into fish farming and also fruits planting. He is happier and satisfied with his live. The most important land-use is for farming and settlement; followed by grazing, harvesting and hunting. Farming has been closely associated with the survival of the community, while settlement is of course the very basic needs for the household livelihood.

Higher agricultural potential increases the benefit of using land in a degrading way since the short-term benefits may be high (Amede et al., 2006). The agricultural pattern for Liwagu land is dynamic. Some traditional agriculture lands have been converted into grazing land due to the decline of crop yields. Agricultural activities have also shifted into commercial farming, which is focus on rubber plantation[5] and moving forward to palm oil plantations. Selection of plants will continue to change depends on the current value of the species. Local community are now more interested in rubber plantation. This is due to economical benefits[6] and also encouraged by the low productivity of other crops, such as vegetables and tobacco.

Land is sensitive to local community. Declined of their land ownership is a controversial issue that has ruined their moral. Kampung Kiporing, Kampung Sintuong-tuong and Kampung Kolombuong had once known as farming project site for vegetables, ginger and tobacco. The hilly land area in the east of the catchment area is currently being claimed as a dry land by the farmers because of the depleting of water supply and river's flows. As a result, farming was declined and it is now turned to a grazing land and small vegetables farm for domestic use. The poor water supply not only influences

land fertility, but also agricultural productivity and the function of the mini hydro in Kampung Kolombuong.

***Forest***

Forest is the home for biodiversity. It has become a major food store, as well as the source for wood and non-wood products. Wildlife including plants is important for food and to be sold in the local market. Forest hunting is no longer popular due to the depletion of wild animal and increasing of farming activities. Wild plants have played important role in food supply. The increasing demand for wild plant-based material such as *tuhau* has changed the pattern of its uses. *Tuhau* has now become an important commodity for variety food and other purposes: such as pickles, flavor additives and also an important ingredient in '*tuhau* floss'. High distribution of *tuhau* in the Liwagu catchment has turned the forest role as a main supplier to fulfill the demand of the species. Some of the shrub species such as *tawawoh* and *gembirang* were often being used for medication purposes.

Timber and several kinds of woods remain as important raw material for house buildings and other uses in providing traditional equipment for local uses such as firewood (Figure 2) and tobacco drying process (Figure 3). They use bamboo and rattan to produce basket so called '*barait'* and *'ginalogalo'* (Figure 4).

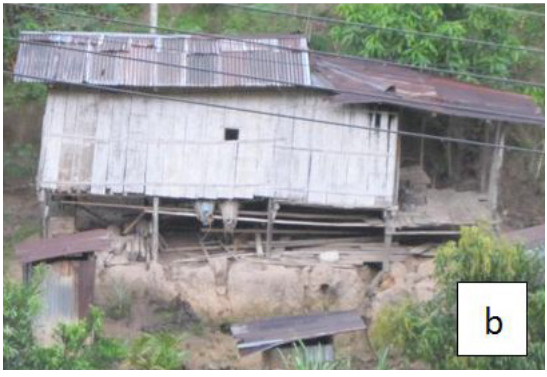


**Figure 2** Bamboo house


**Figure 3** Firewood store

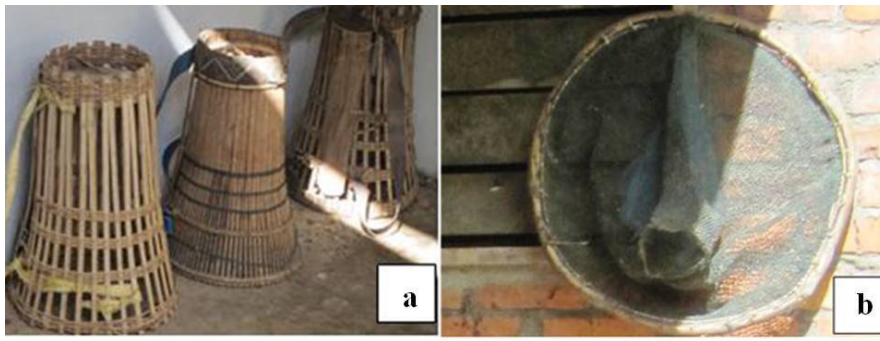


**Figure 4** Traditional product
(a) *Barait* and *Ginalogalo;* (b) *Siud*

Despite of the harvest of trees and bamboo are only permitted from private-owned land, permission from both the head village and the Village Development and Security Committee (JKKK) is compulsory. Used of those resources from *sogindai*[7] can be apply depend on the consideration from village authority.

***Rivers***

Rivers are significantly related to livelihood, especially as source of food for the rural community (Spencer et al., 2016). It is also highly important for water supply. The water quality of rivers may degrade due to the changes in the land cover patterns within the watershed as human activities increase

(Juan Huang et al., 2013). For the case of the study site, the Nungkakatan river and Mensangoh rivers merged with the Melaut river to supply water to the entire vicinity. Rivers has once become an important source of protein to the local community's food system. It is the habitat for fishes and other aquatic life.

The change of land activities may increase the source of pollution load in the river system (Rahmah et al., 2011). Agricultural activities are the main source of water pollution in Liwagu water catchment. It was a mentioned that only smaller size fishes can be found due to the overused of fertilizer and pesticide in the nearby farms. It cause long term habitat loss on aquatic life and threaten fish population. As the result, most of the rivers are currently being used for farming and to run the mini hydropower plant, especially in Kampung Nungkakatan and Kampung Kolombuong. Anyway, the function of the plants has been decline lately due to the decreased of water level which directly reduces the water flows. This is meant that quantity and quality of water has the potential to change human lives and livelihoods, even may affect societies and economies.

**Community Attitude Towards Livelihood**

Environmental status can be influenced by human's attitude (Shamsuddin, 2015). Human society is responsible for the management of ecosystems and water resources. Understanding the utilization behaviour can lead for better management on particular resources. Factor analysis via PCA indicates the local community behavioral pattern towards livelihood, which is classified into five groups based on their characteristics (see Table 1). Table 1 shows the category of community's attitude. Majority of them clustered as pro-infrastructure (12%), following by potential entrepreneur (11%), pro-utilitarian (4%), pro-administration (3 %) and pro-environmental change (2%).

Pro-infrastructure believes in physical support and infrastructure to achieve a better livelihood. For this group, input of physical facilities to their settlement may bring to better livelihood. Whereas, lacking of infrastructure may limit their abilities on resource management.

Potential entrepreneur are self-reliant in life management. They take their own initiatives to deal with environmental changes. The potential of entrepreneurship in tourism industry is shown by their ability to indentify key tourism products and high willingness to participate in this sector.

Pro-utilitarian actively uses natural resources for domestic and commercial purposes. They optimised forest and river to survive. This behaviour drive them to preserve and conserve resources for survival purposes.

Pro-development is actively involved in administration. These group show their interest in local planning and take higher responsible in the community-based management.

Pro-environment exhibits high concern on environmental changes. This group are sensitive with environmental disturbance such as pollution, degradation, as well as the impact from climate change.

**Table 1** Community attitude pattern toward livelihood

| Attitudinal Pattern | Variance Explained (%) | Distinctive Attitudes Towards Livelihood |
|---|---|---|
| Pro-Infrastructure | 12 | Much concern in physical support (e.g. infrastructure) |
| Potential Entrepreneur | 11 | Having concern and awareness for both utilitarian and conservation aspects in managing natural resources |
| Pro-Utilitarian | 4 | Active user of natural resources |
| Pro-Development | 3 | Actively involved in the administrative work |
| Pro-Environment | 2 | High concern on environment quality |
| Total | 32 | |

The importance of identifying attitudinal patterns is to understand local community's views, needs, ability and willingness concerning activities which is significanltly related to their livelihood. This is essential because they would take the role as the main actor in sustaining and managing their surrounding environment.

## The SWOT Analysis

SWOT is a situation analysis generated information from actual scenario via case study. In SWOT analysis, strengths and weaknesses are considered as internal factors, while opportunities and threats are the external influences. It is helpful to match the goals, programs and capacities of operations such as environmental management. The analysis revealed strengths, weaknesses, opportunities and threats of utilization of natural resources in Tambunan catchment area (see Table 2).

**Table 2** SWOT Analysis

| | |
|---|---|
| **STRENGTHS**<br>Abundant of natural resources<br>Willingness to participate<br>Willingness to improve<br>Opportunity<br>Awareness<br>Ability | **WEAKNESSES**<br>Overused of fertilizer and pesticide<br>Financial constraints<br>Lack of experiences |
| **OPPORTUNITIES**<br>Capacity building<br>Business initiative<br>Formal Education<br>Authoritative concern<br>NGO's support | **THREATS**<br>The market price of the crop<br>Lack of infrastructure<br>Lack guidance from the experts |

Strength is internal factor refers to a positive attribute within the control of person involved. There are six matter that has been listed as strength factors in utilizing of natural resources for the study area. There are including the abundant of natural resources, community's willingness to participate, the willingness to improve, opportunity, awareness and ability. These are the basic potentials that will drive them to improve their livelihood internally.

Weakness factor are negative influence within the control of the party in charged. The overused of fertilizer and pesticide, financial constraints, lack of experiences and the lack guidance from the experts are believed to be the inherent limitations of the local community in managing their natural resources.

Within the study of livelihoods it is well recognised that external factors play a role in the sustainability of livelihoods (Harrison, 2015). Various external attractive factors offered to the local community to continuously exist and develop their natural resources. Propel opportunities such as capacity building, business initiative, formal education, authoritative concern and NGO's support are available to be chosen.

Threat is mainly concerning to the external negative factors, which is beyond the control of organization. This disturbance may hinder the organization's goals and contribute to the operational risk. Only three issues being listed as external threats to the use of natural resources for the catchment areas studied, namely the market price of the crops, the lack of infrastructure and lack guidance from the experts.

In overall, SWOT assessments has described that the issues inherent in the use of natural resources in Liwagu catchment areas is under control. List of internal and external positive factors are equally balanced. This shows the ability of local community to control their attitude towards natural resources and freely to choose the opportunities that has been served by several parties. As for negative factors, only the market price is beyond the control of local community. Lack of infrastructure and guidance are just can be handle by negotiation with the authorities and stakeholders who offers opportunity.

## Conclusion

Tambunan catchment area is important to be manage sustainably both by the local community and the government, as well as other stakeholders. Thus the livelihood pattern, attitude and the internal and external factor of situation in environmental management must be first reveal. This is the first step to plan a better management design.

Analysis on basic livelihood pattern shows the changes in employment pattern, from the conventional traditional activities into multi-occupational involvement in both government and private sector. Housewives group remains doing unpaid work such as farming and gathering of wild sources

for their family. Even though they did express themselves 'unemployed', but they had played very important role in a family. By the way, the transformation of employment pattern does not release them from the poverty line.

As for the awareness of the importance in education development started to obtain their formal education in several levels. The rapid development in infrastructure has improved their livelihood. They are now having better access to information, education opportunity and more services provided by the authority, as welfare for the community has been highlight as priority.

Analysis on utilitarian is related to how the community optimizes natural resources and operating land-use. Land is the most important resource for survival as most of them are farmers. Farming, building, settlement and grazing are the main purposes that shape the pattern of their current land-use. The increasing demand and better market price of rubber and oil palm is the main factor to land-use change.

Utilitarian scenario shows high dependency on natural resource by local community due to the abundant of natural resources, especially wild plant from the forest. The belief that this natural resource is limitless makes some of them ignore to conserve.

SWOT analysis has summarised the strengths, weaknesses, opportunities and threats the environmental management of the study site. List of internal and external positive factors shows the ability of local community to control the ability of local community to control their environment.

Findings of this study have successfully provided a general overview of livelihood and related issues in the targeted site including attitudinal patterns toward livelihood and the SWOT interpretations. A more in-depth research is needed for a better outlook of the explored issues.

## Notes

[1] Natural or biological resources; social aspect that looking on community, family, participation, empowerment, social networks and physical aspect (Clinic, schools etc.).
[2] In Kampung Kolombuong.
[3] Cooking and drinking.
[4] *"Tanah sangat penting. Kalau ada tanah, apa pun kita boleh usaha untuk cari pendapatan,"* a respondent from Kampung Kumawanan.
[5] Especially in Kampung Kumawanan.
[6] Good price.
[7] Village gazette forest.

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