Faculty of Social Sciences and Humanities

Sustainable Livelihood Strategies of Riverine Communities at Sadong Jaya, Sarawak

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Master of Social Sciences and Humanities
2023

Sustainable Livelihood Strategies of Riverine Communities at Sadong Jaya, Sarawak

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A thesis submitted

In fulfillment of the requirements for the degree of Master

(Development Studies)

Faculty of Social Sciences and Humanities
UNIVERSITI MALAYSIA SARAWAK
2023

DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Malaysia Sarawak. Except where due acknowledgements have been made, the work is that of the author alone. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

……

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ACKNOWLEDGEMENT

First and foremost, I seek Waheguru ji's blessings who turned my dream into reality. I am thankful for this precious opportunity whom Waheguru has given me to be part of two families and be daughter of both my parents. Their love and blessings are the source and extent of my world.

Secondly, I would like to thank the management of Centre for Graduate Studies and Faculty of Social Science and Humanities for the advice and support given throughout my period of study in Universiti Malaysia Sarawak.

I am highly indebted to the continuous support to my supervisors, Dr Wong Swee Kiong and Dr Regina Garai Abdullah. Dr Regina has provided endless feedback and comments to constantly improve my work. I am privileged to have Dr Wong as she is such an amazing superwoman who has provided endless sharing of knowledge, insights, advice, and assistance that I will forever cherish. She was always there to check up on me to provide mental and even spiritual support empowering my tough journey.

They say, when a door closes, another door opens. I am very grateful to have met such a wonderful soul in the form of Dr Anwar of whom without, this amazing journey wouldn't even have started. He has imparted a great deal of philosophical and research insights deep down to the roots which have forever shaped my perspectives towards my work and everything else.

A special thanks to Mr Michael anak Pawan, sub-district officer for Sadong Jaya sub-district, village headmen and villagers whose valuable co-operation and precious time, warmth, and

willingness to share their experiences and knowledge had enabled me to materialize this thesis.

Lastly, I am very grateful for my family members who have given continuous motivation from time to time and financial support whenever I needed. I am grateful for those people who has made surviving in UNIMAS easier and enjoyable; my seniors (Owais, Phooi Ling, JoJo, Elvin, Angelina) and Bibiana, who made my work bearable and enjoyable, the Punjabi gang (Raveena, Jasmeer, Parminder) and housemates (Caroline, Chai Hong, Katherine, Farah) who took care of my wellbeing and close friends (Hameed, Shikin, Ajyp, Alwin, Ibrahim, Khirtini, Jiva, Joycelyn, Kak Ain) who constantly motivated and made life easier during bad days.

ABSTRACT

This study uses the sustainable livelihood approach to examine the livelihood assets and livelihood strategies adopted by the riverine communities at Sadong Jaya, Sarawak as well as the vulnerabilities faced by them. A mixed method approach was adopted in this study. Data was collected from focus group discussions, observations, and face-to-face interviews with 243 households in which the samples were drawn from three clusters (upper estuarine, middle estuarine and lower estuarine) in Sadong Jaya using a multi-stage sampling method. The study found that, due to the dynamic nature of the local environment with its unique geographical location prone to flash flood and monsoon flood besides environment degradation and poor socio-economic conditions, the community is susceptible to a high level of vulnerability. Local people perceived their livelihood vulnerability as the result of poor access to natural resources and limited natural resources to market and basic social amenities such as facing insufficient treated water supply for both household daily consumption besides lacking water for agriculture. The middle estuarine communities are found to be more vulnerable than the upper and lower estuarine communities at Sadong Jaya with the vulnerability index at 0.414 as compared to vulnerability index of 0.394 and 0.410 in upper and lower estuarine respectively. The riverine communities at Sadong Jaya utilize diversified livelihood strategies by optimizing the use of capital assets available to sustain their livelihoods. Communities who are better equipped with an enhanced and diversified assets base are more resilient. Overall, social asset is found to be the most equipped asset in Sadong Jaya while financial asset is the least equipped asset followed by human asset. The study found that infrastructures such as roads and bridges, water supply facilities, drainage systems, watergates and education facilities enable the riverine communities to intensify and diversify economic activities, widen job opportunities, and market opportunities. As

accessibility to education and training facilities is made available to the locals through better connectivity facilitated by various physical infrastructure, more riverine communities are involved in non-agricultural economic activities and out-migration to cities and abroad is common in the study area. The regression scores showed that riverine communities in Sadong Jaya are most likely to adopt non-agricultural livelihood activities given that they have higher education and skills level, more purchasing power to own farm tools, better health, better ability to secure financial facilities and sustain disaster conflict and possess more diversification capabilities.

Keywords: Sustainable Livelihoods, Livelihood Vulnerability Index (LVI), Sustainable Livelihood Index (SLI), Riverine Communities, Livelihood Strategies

Strategi Kehidupan Lestari Masyarakat di Perairan Sungai di Sadong Jaya, Sarawak

ABSTRAK

Kajian ini menggunakan pendekatan mata pencaharian lestari untuk meneliti aset penghidupan dan strategi penghidupan yang diterapkan oleh masyarakat di perairan sungai Sadong Jaya, Sarawak selain kerentanan yang dihadapi oleh mereka. Kajian ini mengaplikasikan kaedah gabungan. Data telah dikumpulkan dari perbincangan kumpulan fokus, pemerhatian dan wawancara bersemuka dengan 243 isi rumah yang dijadikan sampel yang diambil dari tiga kelompok (muara atas, muara tengah dan muara bawah) di Sadong Jaya menggunakan kaedah pensampelan pelbagai peringkat. Oleh kerana sifat persekitaran tempatan yang dinamik dengan lokasi geografisnya yang unik terdedah kepada banjir kilat dan banjir monsun selain kemerosotan persekitaran dan keadaan sosio-ekonomi yang buruk, masyarakat terdedah terhadap tahap kerentanan yang tinggi. Penduduk tempatan menganggap kekurangan dalam mendapat akses ke sumber semula jadi untuk dijadikan sumber pemasaran dan kemudahan sosial asas seperti kekurangan bekalan air terawat yang mencukupi untuk kegunaan harian isi rumah dan pertanian sebagai kerentanan utama penghidupan mereka. Komuniti muara tengah didapati lebih rentan daripada komuniti muara atas dan bawah di Sadong Jaya dengan indeks kerentanan pada 0.414 berbanding dengan 0.394 di muara atas dan 0.410 di muara bawah .

Komuniti sungai di Sadong Jaya menggunakan strategi penghidupan yang pelbagai dengan mengoptimumkan penggunaan aset modal yang ada untuk menampung kehidupan mereka. Komuniti yang lebih dilengkapi dengan asas aset yang dipertingkatkan dan dipelbagaikan lebih berdaya tahan. Secara keseluruhan, aset sosial didapati merupakan aset yang paling lengkap di Sadong Jaya sementara aset kewangan adalah aset yang paling

kurang diikuti oleh aset manusia. Kajian itu mendapati bahawa infrastruktur seperti jalan dan jambatan, kemudahan bekalan air, sistem perparitan, pintu air dan kemudahan pendidikan memungkinkan masyarakat sungai untuk memperhebat dan mempelbagaikan kegiatan ekonomi, memperluas peluang pekerjaan, dan peluang pasar. Oleh kerana kemudahan akses pendidikan dan latihan disediakan untuk penduduk tempatan melalui ketersambungan yang lebih baik dengan pelbagai infrastruktur fizikal, lebih banyak komuniti sungai terlibat dalam aktiviti ekonomi bukan pertanian dan penghijrahan ke bandar dan luar negara menjadi perkara biasa dalam Kawasan kajian.

Skor regresi menunjukkan bahawa komuniti sungai di Sadong Jaya kemungkinan besar akan menggunakan kegiatan mata pencaharian bukan pertanian memandangkan mereka mempunyai tahap pendidikan dan kemahiran yang lebih tinggi, lebih banyak daya beli untuk memiliki alat pertanian, kesihatan yang lebih baik, kemampuan yang lebih baik untuk mendapatkan kemudahan kewangan yang lebih baik dan mengekalkan konflik bencana, dan lebih banyak keupayaan kepelbagaian.

Kata kunci: *Penghidupan Lestari, Indeks Kerentanan Penghidupan (LVI), Indeks Kehidupan Berkelanjutan (SLI), Komuniti Sungai, Strategi Penghidupan*

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LIST OF ABBREVIATIONS

ATM	Malaysian Armed Force
BOMBA	Malaysian Fire and Rescue Department
DFID	Department for International Development
DOA	Department of Agriculture
DOF	Department of Fisheries
FAO	Food and Agriculture Organization
FELCRA	Federal Land Consolidation and Rehabilitation Authority
FELDA	Federal Land Department Authority
GDP	Gross Domestic Product
GNP	Gross National Product
GPS	Global Positioning System
HDI	Human Development Index
HPI	Happy Planet Index
JBALB	Sarawak Rural Water Supply Department
JKM	Social Welfare Department
JPAM	Malaysian Civil Defence Force
KEMAS	*Jabatan Kemajuan Masyarakat*
KKN	*Ketua Kontek Nelayan*
KS	*Ketua Super*
LKIM	Fisheries Development Authority
LSI	Livelihood Security Index
LVI	Livelihood Vulnerability Index

MPOB	Malaysian Palm Oil Board
NCR	Native Customary Rights
NGO	Non-Governmental Organization
RELA	Volunteers Department of Malaysia
SDG	Sustainable Development Goals
SESCO	Sarawak Electricity Supply Corporation
SL	Sustainable Livelihoods
SLI	Sustainable Livelihood Index
UN	United Nations
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WCED	World Commission on Environment and Development
WWF	World Wildlife Federation

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

A livelihood is described by Masud et al. (2016) as ‘a means of earning a living by an individual or household’. The idea behind the concept of ‘livelihood’ is complex and far beyond the notion of simply having a job for earning a living. Ellis (2000, 10) defines livelihood as ‘combination of assets (natural, human, physical, financial and social capital), activities and access to these (mediated by institutions and social relations) that together determine how an individual or a household make a living’. A livelihood encompasses not only income, social relations, and property rights, but also access to, and benefits derived from social and public services such as water supplies, education, and health services (Ellis, 1998).

The livelihoods of the riverine communities in general are prone to very high level of vulnerability due to their nature of livelihoods from natural hazard exposure, high occupational risks, and changes in macro-economic factors such as resource prices, fuel and input prices (Béné, 2006). The riverine communities refers to communities who live along a river basin and where majority of the people in the area practice and sustain their livelihoods with water related activities (Oriola & Chibuike, 2017). The livelihoods of rural communities do not have steady income or employment as they get involved in multiple livelihood activities either being self-employed in farming, small-scale entrepreneurship, or as waged labourers (Cherni & Hill, 2009). This includes activities such as fishing in the river and agriculture on floodplains.

The riverine communities utilize assets available and accessible to design livelihood strategies to sustain their livelihoods. The community share a close relationship with the rivers as they depend on for transportation and route navigation, to irrigate agricultural land, to generate hydroelectric power, for recreation and as centres for establishing new settlements (WWF, 2002).

A successful and resilient livelihood strategy includes a process where a livelihood can cope and recover from stresses and shocks; maintain or enhance its capabilities and assets, while reserving natural resource base to be sustainable (Chambers & Conway, 1992; Twigg & Calderone, 2019). As individuals and households have different access to resources, different livelihood strategies are adopted combining different assets. Livelihood strategies are strategies used as a means of living based on choices people make to pursue productive purposes, in pursuit of security, income, security and well-being. Different livelihood strategies are adopted by the riverine communities to continue sustain their livelihoods, combining different assets available and accessible to them. This study focuses on the pathways for sustainable livelihoods and the strategies taken up by the riverine communities to face different vulnerabilities using different capital assets.

1.2 History and development of Sadong Jaya, Sarawak

Sarawak is the largest state in Malaysia located in the northwest region of Borneo Island at 124,451 square kilometres. Sarawak is divided into twelve divisions and is further divided into districts and sub-districts. Sarawak has a relatively small population of 2,822200 people in 2019 (Department of Statistics Malaysia, 2021). Sarawak inhibits mostly Iban, Chinese, Malay, and other indigenous ethnic groups such as Bidayuh and Melanau where each ethnic groups have their own sub-ethnic groups. Each ethnic groups speak their own distinct languages and abide their own cultures and traditions.

The topography of Sarawak is rough with hilly mountains and a wide network of rivers. The coastal lowlands, which are floodplains, are susceptible to flooding, erosion, and contamination from upstream sources due to rubbish and agricultural chemicals use such as pesticides and herbicides. About 80 per cent (almost 10 million hectares) of Sarawak's total land area is covered with forest with the 2.3 million hectares remaining as settlements, towns, and agricultural crop cultivation (Sarawak Government, 2019). The Sarawak soil is relatively unsuitable for agriculture, in which it is intensively used for wet paddy, horticulture and perennial cropping (Shari & Osman-Rani, 1996). Despite with only 17 per cent of the land area suitable for agriculture (Chien & Mansel, 2017), agricultural technology from the Agricultural Department and other related agencies has helped increase land usage tremendously over the years.

Sarawak experiences an equatorial climate with a range of 23°C to 32°Cthroughout the year. There are two distinctive seasons in Sarawak namely the northeast monsoon which brings heavy rainfall between November and March and the southwest monsoon which is relatively dry from May to September (Department of Meteorology Malaysia, 2019). Depending on the locality, the average rainfall in Sarawak is between 3,300 millimetres to 4,600 millimetres. Sarawak is characterised with approximately 3,300km navigable waterway with a combined total of 5,000km length of river from 35 gazetted rivers comprising of Sungai Baram, Sungai Limbang, Sungai Lupar, Sungai Sadong and Sungai Sarawak (UNDP, 2008).

Sarawak is accounted for 9.7 per cent (RM 52,301) share of the national economy in 2018 (Department of Statistics Malaysia, 2019b). Based on the national GDP growth in 2018, Sarawak has a growth of 2.0 per cent as compared to 4.5 per cent in 2017 (Department of Statistics Malaysia, 2019b). According to the Sarawak GDP in 2019, service sectors

contributed the highest at 35.8 per cent followed by manufacturing at 26.9 per cent, mining and quarrying at 21.7 per cent, agriculture 12.1 per cent and construction at 3.3 per cent (Economic Planning Unit Sarawak, 2020).

Sadong Jaya is presently a sub-district under the administration of Asajaya district which is one of the districts under the Samarahan division located at Western Sarawak region. Sadong Jaya is located at an estuary on a floodplain at lower Sadong river where the river meets the sea. Sadong Jaya is increasingly urbanized and interconnected with neighbouring towns and cities. Similar with findings from Dudek & Chmielinski (2015), Sadong Jaya is categorised as peripheral which are under the influence of urbanized centres and are subjects of self-reliant growth. Although agriculture plays an immensely important role in the socio-economic development of Sadong Jaya, many riverine communities at Sadong Jaya diversify their livelihoods by engaging in agriculture, fisheries and small-scale enterprises selling local products. The communities constantly adapt to different vulnerabilities from climate change, environment degradation and poor socio-economic status to sustain livelihoods. The riverine communities depend on different assets which enable them to carry out different economic activities, provide access to market natural resources and employment opportunities.

1.3 Problem Statement

The concept of sustainable livelihood has been an important issue within the context of poverty alleviation, rural development, and environmental management. Scoones (1998) views sustainability as in likeliness to generate livelihood adaptation, enhance resilience, decreased vulnerability, and retained natural resource base. The Sustainable Development Goals were introduced in 2015 with an ambitious goal towards sustainable development, connecting diverse initiatives across the globe.

Malaysia has come a long way achieving remarkable economic growth to become an industrialized nation by 2020 in the Malaysia Plan 1991-1995. However, there is a need for attention to be given in Sabah and Sarawak as there are still districts that are still with poor infrastructure and are backwards (Lee & Zainal, 2018). According to World Bank (2019), the East Asia region is predicted to project a slow economic growth from 6.3 per cent in 2018 to 5.9 per cent 2019 and 2020.

The reduction of the economic growth affects the livelihoods of the communities. Livelihoods are affected by different location, assets, income, opportunity, and social relations (Ellis, 1998). Having access to various forms of livelihood capitals is important to secure or to maintain a sustainable livelihood (Ellis, 2000). Household assets and capabilities such as natural, financial, physical, human, and social capitals are important components of a livelihood. Many rural riverine communities are still dependent on the natural resources base to sustain their livelihoods. This dependence has been highlighted in several past studies in Béné (2006), Katiha et al. (2017), Ofoegbu et al. (2017), Owusu et al. (2017), Sait et al. (2018) and Sanggin et al. (2016). These literatures have shown how natural resources play an important role as part of rural livelihoods. The resources from rivers and forests are used as water sources and food supply. The river provides means of transportation for the communities to move from one location to another.

The livelihoods of the riverine communities are vulnerable due to their geographic location. Similar with many studies conducted in different developing countries such as Bangladesh and Nigeria, the riverine communities face vulnerabilities such as loss of agricultural and fisheries production due to droughts, floods, and soil erosion (Alam et al., 2017; Daw et al., 2009; Efobi & Anierobi, 2013), migration or relocations (Islam, 2017),

loss of biodiversity (Massoud et al., 2016), lack of interest in the youths in agricultural production (Adekunle et al., 2010).

The Sadong Jaya estuary has a dynamic ecosystem where the flow of water consists of tides from the seawater and freshwater from rivers (Chen et al., 2013). There are three zones in an estuary; the river meets the saltwater, the mixture of saltwater and freshwater, followed by the last zone where there is freshwater. The estuary areas are where most pressured ecosystems face environmental contaminants from environmental degradation from anthropogenic activities, climate change (Elliot et al., 2014; Miththapala, 2013), and urban and industrial runoff from inland areas that carry along rivers into estuaries (Chen et al., 2013). The estuaries are also vulnerable to natural disturbances such as tidal currents, waves and winds (Chen et al., 2013; Miththapala, 2013). During the monsoon seasons or heavy rains, the inflow of water into the estuary can cause floods into village or the floodplains (Miththapala, 2013).

Livelihood strategies are strategies taken as a means of living and strategies taken to cope with vulnerabilities faced. The efficiency and effectiveness of a household adopting a livelihood strategy is strongly linked to their socioeconomic and demographic characteristics (Farzana et al., 2017), different control and access towards livelihood capitals, geographical location, accessibility to facilities and institutions (Hatlebakk, 2009; Khatiwada et al., 2017). The scale of problem-solving or 'adjustments' may vary from villages to villages, households to households. The 'adjustments' refers to both long-term adaptative strategies and short-term coping strategies. Thus, these livelihood strategies influence the decision-making process, social networks and household compositions (Fubusa, 2010; Hatlebakk, 2009). Several studies from Akther et al. (2017); Béné (2006), Dekens (2005), Nyamwanza et al. (2013) and Tạ Thị Thanh Hương (2010) highlighted that there is a need of

understanding various mechanisms and strategies used by the community and households towards poverty alleviation and socio-economic advancement in the developing countries.

Past research has carried out livelihood studies using both qualitative and quantitative approaches in countries such as Ghana (Abukari, 2014), Zimbabwe (Nyamwanza, 2012), China (Liu et al., 2018; Shen, 2012; Wang, 2018) and India (Bhattacharjee, 2010; Dekens, 2005). Studies have covered different livelihoods such as forest-based community (Ofoegbu et al., 2017; Vue, 2018), mountain communities (Dekens, 2005); riverine and fishing communities (Akther et al., 2017; Efobi & Anierobi, 2013; Salele, 2003), and urban communities (Bhattacharjee, 2010).

According to (Chin & Ng, 2015), Malaysia lacks in localized case studies to assess the effectiveness of enforcement and understanding of issues at a localized level. In Malaysia, scholarly literature has been done vastly in Peninsular region on poverty eradication and sustainable livelihoods (Kamaruddin & Samsudin, 2014; Lim & Mansur, 2013; Massoud et al., 2016) and distribution of capital assets provide some ideas on rural living conditions of the *kampung* communities (Ghafouri & Khan, 2015) and the marine communities (Masud et al., 2016).

Literature on the riverine communities is done by (Ng, 2016; Samah et al., 2013; Yassin et al., 2011). Literatures especially at Western Sarawak region are limited. Ng's (2016) study which is based on riverine communities at Rajang River examines the perception of riverine communities towards occurrence of disastrous events. Sait et al. (2018) and Sanggin et al. (2016) has elaborated on natural resources management and livelihood strategies used by the local indigenous people in Sarawak.

The multidimensional and diverse nature of riverine livelihoods, vulnerabilities and the institutional processes taken place is explored holistically using the sustainable

livelihood approach. The concept of sustainable livelihood seeks to bring together the critical factors, assets and activities that affect the vulnerability or strength of household strategies (Allison & Ellis, 2001; Ellis, 2000). The crux of this study is therefore to identify the livelihood strategies adopted by the riverine communities and extrapolate these strategies on their resilience towards different vulnerabilities.

1.4 Research Question and Objectives

Livelihood strategies are not only affected by different households and communities having different accessibility to different resources and capabilities, but also by different level of vulnerability and uncertainty due to the changes occurred and might produce different problems and outcomes over time. The study seeks to answer the following question:

What are the livelihood strategies used by the riverine communities to cope with vulnerabilities?

Research Objective

In order to find out the livelihood strategies used by the riverine communities; the following are the objectives of this study:

i. To examine the vulnerabilities experienced by the riverine communities.
ii. To identify the capital assets available to the riverine communities; and
iii. To determine the economic activities and livelihood strategies used by the riverine communities to cope with the vulnerabilities.

1.5 Significance of Study

The scholarly significance of this study stems from its attempt to gain a comprehensive insight and lenses of the livelihoods among the rural riverine communities

which goes alongside with UNDP's work on the ground priorities working towards addressing socio-economic challenges and existing inequalities.

The study uses the sustainable livelihood approach which also contributes to the Sustainable Development Goals to achieve a better and more sustainable future for all. The sustainable livelihood approach places the people at centre stage, exploring the complex nature of vulnerability and diverse capital assets. The approach recognizes the need of knowing livelihoods holistically.

USAID (2018) discusses that the family welfare does not remain the same but oscillate between improving or declining over time. Identification of strengths and weaknesses of capital assets available enables the maintenance of a community welfare. Since agro-ecological conditions, level of vulnerabilities, socio-economic settings and institutional processes vary considerably throughout the world, exploration of local capabilities, available capital resources and economic activities which influences household livelihood strategies should be focused based on context dependent analyses. It is also essential to understand the social-ecological system dynamics with relations of how the resource-dependent communities make a living.

Many facets of the riverine communities' situations are perceived fixed in terms of accessibility and opportunity towards improvements. Findings of this study helps to identify the vulnerabilities and constraints experienced, accessibility and availability to capital assets, and livelihoods of the riverine communities. Thus, the study is useful for relevant authorities and agencies in identifying strengths and weaknesses of livelihoods before providing necessary help towards the sustainable livelihoods of riverine communities.

1.6 Scope and Limitation of the Study

This study goes about the Sustainable Livelihood approach as a basis to understand the livelihood strategies adopted by the riverine communities. There are few components under the approach, the vulnerability context, capital assets, livelihood strategy and livelihood outcome.

This study, owing to the time and resources limitation, limits itself to study climate related, environment degradation, depleting natural resources and socio-economic related issues as a proxy to livelihood vulnerability. The study limits to study five capital assets which are natural capital, financial capital, social capital, natural capital, and physical capital as part of the capital assets available at the study area. The livelihood strategy component in this study is understood from coping strategies and adaptation perspectives.

Although Sadong river comprises of many communities who are fully or partially dependent of the river resources, the study is carried out in Sadong Jaya, which covers three estuarine areas: the upper estuarine, middle estuarine and lower estuarine areas within Sadong Jaya.

1.7 Conceptual Framework

The livelihood of the riverine community at Sadong Jaya is undertaken based on the Sustainable Livelihood approach. The riverine community here refers to the rural community which lives along the Sadong River, specifically in Sadong Jaya. With the limitation considering all the variables of the model in a single study, some adjustments are made according to the objectives. Figure 1.1 shows the conceptual framework of livelihood strategies based on DFID model.

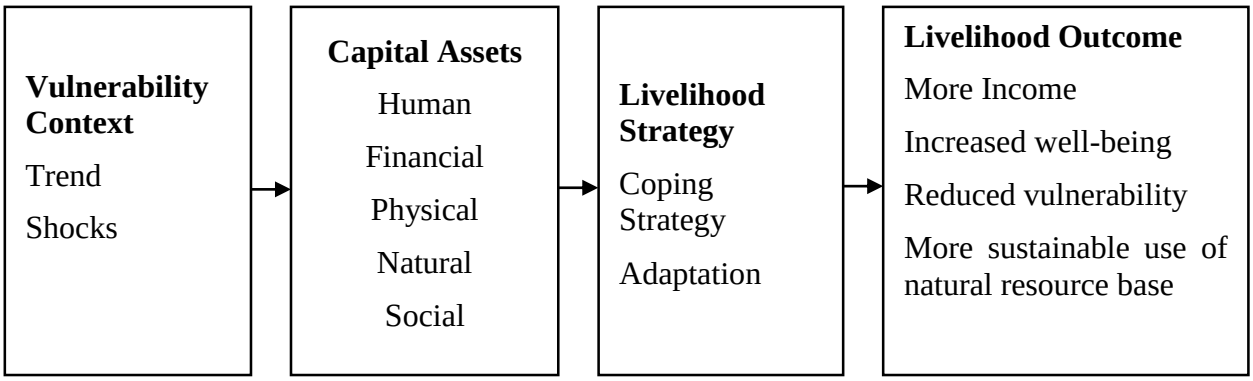

Figure 1.1: Conceptual Framework of Livelivelihood Strategies based on DIFD model

Livelihood strategies are influenced by the availability and accessibility of capital assets and vulnerabilities which determines or shapes the way the riverine communities construct strategies to survive, accumulate, develop or to influence. Vulnerability contexts comprises of trends, shocks and stresses (DFID, 2001). Trends are stress issues which are accumulated and affects the livelihoods in long term, usually predictable while shocks are unpredictable and can be traumatic.

There are many factors which can cause livelihoods to be vulnerable. This study, owing to limitations of time and resources, limits itself to study climate related, environment degradation, depleting natural resources and socio-economic related issues as a proxy to livelihood vulnerability. The riverine communities combine their resources which comprises of five capital assets: natural capital, human capital, financial capital, physical capital, and social capital in many possible ways to sustain livelihoods, which are called livelihood strategies. To name the components studied within the assets:

Natural capital- land size, availability of natural resources such as river or sea resources

Human capital- income earning capabilities, knowledge, skills, and capacity to work such as household size, number of dependents, age, and sex of household head

Financial capital–inflow of money from remittance, income, pensions, and financial assistance

Physical capital- uses of infrastructures such as roads and bridges, water supply, sanitation, accessibility to health centres, schools; type of gears and equipment used for economic activities; housing conditions and access to information

Social capital- networks, mutual understanding, participation in decision-making and relationships at household and community levels

The livelihood strategy component in this study is understood in two ways: coping strategies, which are short term, and adaptation, which are long term. The vulnerability context, capital assets and livelihood strategies are the key elements which leads to the livelihood sustainability of the riverine communities. The component for Policies, Institution and Processes (PIPs) is not considered in-detail as it is beyond the study objectives.

1.8 Organization of the Study

The study is arranged into five chapters. Chapter one provides a brief introduction about the concept of sustainable livelihoods, the problem statement, research objectives and justification of the study. Chapter two outlines the concepts and literatures relevant to the study. Chapter three gives the methodology employed to achieve the objectives of the study. Chapter four describes the findings, discussions and empirical results which answer the research question and research objectives. Lastly, chapter five ends with conclusions and recommendations from the study.

CHAPTER 2

LITERATURE REVIEW

2.1 Overview

This chapter aims to guide the reader in developing the study framework. This is achieved by discussing the factors promoting different livelihood strategies selected by different households. This chapter starts with a critical examination of the concepts within sustainable livelihoods, vulnerability, and resilience. Understanding these concepts were crucial in building a platform for establishing the vulnerability and resilience among the rural community in analysing livelihoods of the rural communities. The chapter also narrates past papers which exhibit the roles of capital assets available in the rural context and coherent with their vulnerability and adaptative capacity. Lastly, the chapter examines the types of livelihood strategies adopted over time as emanating from various studies.

2.2 Sustainable Livelihood Approach

2.2.1 Sustainable Development

One of the greatest challenges at present day development is to sustain environmental integrity alongside community development in the technological era. The issue of sustainability concerns the development with economic aims, often neglecting environmental and well-being of people. The focus on sustainable development was strengthened with the Brundtland Commission Report 1987 at the World Commission on Environment and Development, which conceptualized the sustainable livelihood approach. The term ‘sustainable livelihoods’ was advanced through the promotion about environment protection and poverty alleviation (WCED, 1987). De Haan (2012) emphasized that a

holistic approach to study livelihoods in the analysis for of the complexity of livelihood include not just concerns on poverty levels, well-being and welfare but also applied to issues such as climate change and environment degradation, mobility and migration, quality of space and power relations.

The issue of environmental problems is viewed as socially constructed as different set of indicators are used on different communities and contexts about well-being and quality of life which recognizes issues beyond just economic growth. In Amartya Sen (1990)'s capability approach, one's capability includes freedom of choice to achieve and attain freedom as part of human development process. It does not only inculcate income, but also the capabilities of other assets such as attaining education and proper health, to which indirectly has the capabilities to convert income to other resources into a better way of life itself. Sen (1999) argues that the primary focus of development is not just about monetary increment but also the provision and expansion of the poor's capabilities which includes adequate nutrition, access to healthcare, acquisition of literacy and education and a low chance of premature death. Leach et al. (2012) further expanded Sen's work by arguing there is nothing intrinsic which makes a certain asset an endowment or an entitlement as it depends on the empirical context and on the time, within a cyclical process. An endowment at a time may, in turn, represent entitlement at another time.

Bebbington (1999) discussed that people draw upon in building their livelihoods vary across space, social realities, gender, and ethnic groups. Assets are not just resources people use to build livelihoods (Bebbington, 1999), but also one's capability to attain freedom (Sen, 1999) and act as a basis of power to act which ultimately bring changes in a society (DFID, 1999). Assets are important as they implicate empowerment and change (Bebbington, 1999).

In Dorward et al. (2001)'s asset-function framework, certain livelihood strategies are adopted depending on the availability and demand of a certain resource. The framework argues how different paths of poverty experiences different patterns of change in asset functions, attributes, and holdings and thus, utilizes different sets of livelihood strategies. People can invest and diversify their time and activities to buffer resource availability.

2.2.2 Sustainable Livelihood Framework

The sustainable livelihoods approach uses the sustainable livelihood framework to assess livelihoods of rural people. One of the international development agencies applying the sustainable livelihoods framework is United Kingdom Department for International Development (DFID). The analysis of DFID is looked at a micro-level and later at macro levels to relate with national and international contributions (Ashley & Carney, 1999). DFID's sustainable livelihood approach assumes a crucial step towards sustainable development needs to be taken in enabling people to provide for their own needs and goals. The approach is used for understanding people's livelihoods, strengths, and capabilities rather than their needs. The approach focuses on people and their capabilities as key resources where livelihoods can be improved by identifying rural communities' issues and problems using their capital assets. It then builds upon their definitions of constraints and opportunities while also paying attention to the institutional policies affecting their livelihoods. Figure 2.1 shows the Sustainable Livelihood Framework used by (DFID, 1999).

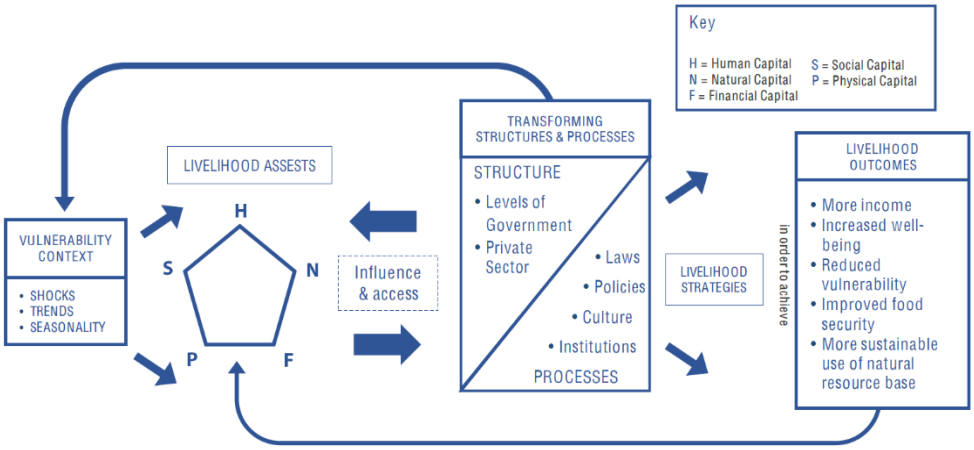

Figure 2.1: Sustainable Livelihood Framework

The sustainable livelihood framework focuses on the diverse ways people attain livelihoods from a range of livelihood outcomes (health, income, reduced vulnerability etc.) based on a range of assets. The framework is used in identifying the types of vulnerability faced, community asset ownership, strategy implemented and outcome focusing on the community's needs (Ashley & Carney, 1999; Chambers & Conway, 1992; DFID, 2007; Ellis, 2000; Scoones, 1998). The livelihoods adopted, which are based on their own preferences and priorities are not only bound to asset-building but are also influenced by types of vulnerabilities including shocks (droughts and floods), trends (change of market prices) and seasonal variations (festive seasons). These livelihoods are also abided to institutional structures (governmental and private sectors) and processes (policies and cultural factors).

The sustainable livelihood approach serves as an analytical model to address different aspects of livelihoods for considerations as a development strategy which seeks to bring together the critical factors, assets and activities that affect the vulnerability or strength of household strategies. The framework is flexible with several core concepts which makes it applicable such as:

1. Being people-centred where livelihoods of people are analysed and their evolvement through time.
2. Cross-sectoral and multidisciplinary approaches making the study a holistic approach.
3. Emphasizing participation and empowerment of various participatory processes at micro (community perspectives) and macro levels (implementation of policies) to identify and pursue aspirations and priorities of the poor.

2.3 Vulnerability and Resilience

2.3.1 Concept

The understanding of the vulnerability and resilience of rural communities has been a subject of concern over the years (Dlamini, 2014). The term vulnerability has been used in variety of disciplines such as sustainable development, environmental health, ecology, human security, climate impacts and adaptation studies (Füssel, 2007). Vulnerability is defined by Adger (2006) as the susceptibility to circumstances of not being able to sustain a livelihood when they have insufficient real income and wealth or breakdown in other endowments.

Resilience is a concept rooted from ecology and sustainable livelihoods (Schipper & Langston, 2015) on how people adapt and respond to changing stresses and shocks that affect livelihood outcomes (Manyena, 2006). The term resilience has been defined by many scholars over the years. Holling (1973) has defined resilience for an ecosystem as the measure of the ability of an ecosystem to absorb changes and still persist. Sharma et al. (2014) defines resilience as the capacity of community to adapt to climate induced stress and to cope in situations of crisis.

The concept of resilience and vulnerability has been interchangeably used with the issues of climate change and risk reduction discourse (Schipper & Langston, 2015). The concept of resilience has been applied and measured at different sectors of vulnerability and climate induced disasters studies (Bahadur et al., 2015; Bhamra, 2015; Frankenberger et al., 2000; Sharma et al., 2014). The use of these concepts has been part of a conscious effort towards a more 'positive' idea of resilience than a tone of 'negative' vulnerability (Schipper & Langston, 2015) or opposites poles of the same equation on a continuum (Manyena, 2006). Despite the overlaps of the concepts, many scholars have highlighted the difference in these concepts using different school of thoughts. Manyena (2006)'s argument viewed as susceptibility of a community affected by a physical phenomenon which signifies a limiting capacity to recover, a low level of disaster resilience. The resilience level can be measured by evaluating the social systems by assessing the opportunities available, and the changes in social inequities from previous trends and new relationships caused by the vulnerability (Alexander et al., 2006; Bhamra, 2015).

Nelson et al. (2014) distinguishes adaptation with resilience where they defined resilience focusing on sustainable, long-term adaptation by identifying adaptation as the process of system learning through time. They described adaptation as an on-going and continuous process of interaction between the natural system and human as they evaluate information from the past and incorporate their norms and values into decision making processes. Bahadur et al. (2015) used adaptive capacity, anticipatory capacity, and absorptive capacity to define resilience which studied the ability of local communities to adapt and to cope with vulnerabilities. These three concepts allow villagers to learn, to reduce and to cope the impact of shocks using available skills, resources, and preparedness.

The efforts to build people's resilience in term of performances depends on the hazard intensity, frequency, and exposure.

2.3.2 Measurement of Livelihoods, Vulnerability and Resilience

Chambers & Conway (1992) explained resilience through the livelihoods lens that livelihood resilience can be improved by improving the livelihoods itself. Resilience can be measured using five livelihood capitals/assets as entry points using indicators such as poverty and food security (Frankenberger et al., 2000). Efforts to develop and assess livelihoods have been executed through various methods over the years. The measurement of human development has been economic using gross domestic product (GDP) and gross national product (GNP). Composite indicators of sustainability such as the Happy Planet Index (HPI) and the Human Development Index (HDI) was then emerged from the onset of financial crisis in 2008 (Fahy & Rau, 2013).

The measurement of resilience depends heavily on what is being measured (Schipper & Langston, 2015). Interestingly, measuring vulnerability and resilience are viewed as a big challenge (Adger, 2006; Turner et al., 2003) as it is complicated to be captured by models and frameworks as there are many dimensions such as economic, social, demographic, political and psychological which are complex and in a state of constant change (Hinkel, 2011; Duryog Nivaran as cited by Twigg et al., 2001). Instead, it requires the identification of measurable 'proxies' to represent the various ways in which livelihood resilience manifests. Studies on vulnerability and resilience has been assessed both qualitative and quantitatively as it exhibits different social contexts, values and thresholds (Adger, 2006). The degree of susceptibility and resilience of socio-economic conditions caused particularly by a climate-related event (Kelly & Adger, 2000) and the social realm of well-being, institutions and social status (Adger, 2006) to study livelihood vulnerability and resilience.

However, quality of life, together with income and expenditure and the conditions they are living in, is also important in the notion of livelihoods (Bebbington, 1999). Livelihoods are also captured more accurately looking at the scale as in population, frequency, intensity and extent of social processes and material outcomes in systems and capturing socio-economic resilience such as measuring disasters and risk, crop diversification and alternate livelihoods nested with multiple linkages (Adger, 2006; Reza & Alatas, 2013).

Many authors have used different indices to assess livelihoods of people. The Livelihood Security Index (LSI) was developed by Lindenberg (2002) which was used by many scholars such as Singh & Hiremath (2010) and Barela et al. (2018). LSI measures progress at family and community level where it assesses the quality of life through identifying the assets and opportunities of people as well as their well-being. The index emerged from measuring the constraints by identifying intrahousehold economic and social dynamics and coping mechanism against poverty and scarcity. The component under the index uses basic livelihood elements such as food and nutrition, education, participation, water, sanitation, income and assets, primary health, and reproductive health.

In 2009, Hahn and his team developed the Livelihood Vulnerability Index (LVI) used to indicate the climate change vulnerability. The LVI can be used as a practical tool using demographic, social and health factors to understand and identify potential areas which are vulnerable. The LVI comprise of seven components of which aggregate data using a composite index.

A Sustainable Livelihood Index (SLI) was developed by Kamaruddin & Samsudin (2014) which was adapted from LVI to assess the ability and preparedness of rural poor in

receiving entrepreneurial projects from the government and the distribution of capital assets among the hardcore poor (Kamaruddin & Samsudin, 2014).

2.4 Vulnerability Context

The livelihoods of individuals, households and communities are vulnerable to stresses and shocks (Chambers & Conway, 1992). According to Conway & Barbier as cited in (Chambers & Conway, 1992), trends are stresses which are typically long-term, cumulative, predictable and usually large-scale while shocks are impacts which are typically sudden, unpredictable and traumatic. Based on (Chambers, 1995), livelihood stresses such as declining wages, labour work available, yields, common property resources and having to go further or spend longer for less, population pressures on resources leading to decline farm size, amenities, returns to labour, ecological change leading to lower bio-economic productivity, physical disabilities are built up gradually over time. Example of shocks involving a community being affected are prosecutions and civil violence, droughts, storms, floods, fires, famines, landslips, epidemics of crop pests or illnesses, collapse of a market while shocks affecting households are sudden deaths in a family, accidents, loss of assets or jobs.

2.4.1 Climate change and Natural Disasters

One of the weaknesses of identifying out of the most vulnerable to climate change is limited to the perception of how communities define vulnerability (Daw et al., 2009). Views of environmental problems can be perceived entangled with cultural traits or 'socially constructed' across communities (Fahy & Rau, 2013; Ng, 2016). Some "disaster" such as flood events can be repetitive, although posed as vulnerability where it can destroy their harvest crops, but it can also act as irrigation to their fields.

Approximately 9 per cent of land area in Malaysia is flood-prone with most areas located in the riverine, estuary and coastal areas exposed to North-east monsoon (Chan, 2005; Junaidi et al., 2018). Monsoon floods and flash floods are the most severe hydro-meteorological natural disasters in Malaysia (Shaluf & Ahmadun, 2006). The adverse impacts magnitude can depend on the activity vulnerability, frequency, intensity, and extent of flooding (Reza & Alatas, 2013). Human induced floods such as disposal of solid wastes into rivers and drainage systems cause constriction and obstruction in rivers. Similar with Sudano-Sahel region, Malaysia also faces recurring series of drought affecting existing cultivation of rainfed lands (Elasha et al., 2005). Flooding events are increasing from time to time and the rural communities rely on their own preparedness to cope with this shock. It happens due to deforestation and changing of climate including monsoon. According to findings from (Khan et al., 2017), some respondents still believe that these events are punishment from God.

Climate change vulnerabilities such as changing resource scarcity and unpredictability such as floods and loss of coastal ecosystem affects different households differently especially those rely only on agriculture and fisheries. Robledo et al. (2012) discusses that households which are highly dependent on forest resources, subsistence rain-fed farming and livestock rearing are exposed to risk from climate change. The risks are higher especially with current processes of unsustainable utilization and exploitation of resources. It is often insufficient to maintain resilient sustainable development and household welfare due to poor management capacity and forest use, poverty, employment, population growth and poor healthcare services contributes to the vulnerability of rural communities towards climate change (Ofoegbu et al., 2017).

Having poor socio-economic conditions reduce the ability of a household to deal with climate-related shocks and stresses (Shah et al., 2013; Thomas et al., 2007). Daw et al. (2009) sees climate change as a short-term threat which has a smaller effect on fisheries compared to other non-climate issues and trends such as overexploitations, changes in markets, demographics, and governance regimes. However, fishermen who rely heavily on weather stability believe that the changing environment poses several problems such as decreasing income, pollution, decreasing marine productivity, unpredictable fishing season, damaged marine habitat, increasing risks associated with fishing operations and limitations in exploring new catching areas (Idris et al., 2018; Mazuki & Man, 2014). Kaushik & Sharma (2015) describes that climate change can cause a rise in temperature which leads to physiological stresses on livestock, reducing their productivity of milk, wool, meat, and affect reproduction success. In some cases, climatic factors such as change in humidity and temperature can potentially affect soil properties which might favour pests infection (Satti, 2012).

Another example is an increase in temperature with seasons of droughts which impact water crisis limiting water supply availability (JBALB, 2018). Shalaby et al. (2011) discussed that water shortage and drought with unsuitable farming technologies and insufficient rain can significantly reduce agricultural resilience among the farmers. Besides that, Lammers et al. in Calicioglu et al. (2019) comments that South Asia and Africa will witness a remarkable increase in population and the usage of resources in the coming years which will increase competition for already scarce water and land resources. An adaptive water management technique and actions (Touza & Zoghby, 2020), together with clean water resources (Bembridge, 1986) is essential to diminish the impacts of climate change which can provide resilience to sustain livelihoods.

2.4.2 Environment Degradation and Depleting Natural Resources

Approximately 2.6 million poor people, their livelihoods and the utilization of natural resources are causing people around the globe to face a wide variety of challenges (UNDP, 2007). Many whose livelihoods depend on the natural resource base are severely affected by environmental degradation such as droughts, floods, and soil erosions (UNDP, 2007; Wilson, 2009). A strong majority depend on their natural resources to support agricultural production to secure food and sustain their livelihoods. Looking at the current rate of consumption, certain resources are to be exhausted as biodiversity and fertile soils are being used up so quickly (Muilerman & Blonk, 2001; Regmi & Weber, 2000). With limited or no access to forest and fishery resources, rural communities continue to face difficulties in coping with vulnerabilities (Ellis & Allison, 2004).

According to Shalaby et al. (2011), climate shocks and anthropogenic activities from lack of responsible resource management and resources exploitations has brought to an ecological degradation (Alam et al., 2017) which deteriorate natural resources including the flora and fauna, land, and water resources. Environmental changes, physical environment damage and pollution such as toxic pollution, water shortages and destruction of fertile land, land inundation (Reza & Alatas, 2013; Shalaby et al., 2011) and loss of loss of biodiversity have contributed to the threatened sustainability of fisheries industry alongside to agriculture industries (Idris et al., 2018).

Indonesia and Malaysia are the biggest palm oil producers in the world. Close to 60 per cent of palm oil expansion in Malaysia itself was from existing cropland or at the expense of forest conversion during the period from 1990 to 2005 (according to Koh and Wilcove as stated by Norwana et al. (2011). This development has uplifted the national economy by few folds. However, it also carried environmental cost (Gomez-Roxas et al., 2005) where not

only many forests are being evacuated as palm oil plantations (Ferdous Alam et al., 2015), the deforestations and other environmental destructive activities have resulted much biodiversity being lost (Bembridge, 1986; Regmi & Weber, 2000; Shalaby et al., 2011). The extensive use of agrochemicals such as pesticides and fertilizers have potentially affected the drinkable water quality and aquatic ecosystem (Calicioglu et al., 2019; Comte et al., 2012; Mercer et al., 2014). Bakar (2009) and Calicioglu et al. (2019) both have emphasized that the increasing dependence on pesticides for managing pests in the agricultural sector is considered a common threat for parallel increase in millennial weeds and pesticide resistance pests which further destruct the environment and food supply.

Fisheries are important engines for economic growth and livelihood activities in rural and remote areas often limited (Daw et al., 2009). Béné et al. (2010) stated that well managed small-scale fisheries can be seen as an entry point for poverty reduction through their role in providing employment, generating revenues and contribution to food security. However, over-exploitation by many fishers has consequently leaded to reduction in the catch, to which, eventually, leading them to poverty. Fishery resources, both biologically and economically have been depleted and overfished through falls in catch per unit effort and decrease in fish sizes caught (Chen. et al., 2018; Kaur, 2017; Khan et al., 2018; Omar et al., 1992).

In the literature discussed by Omar et al. (1992), there has been a lack of coordination between fishery management agencies and other agencies as there has been contradictory of responsibilities. For example, the Department of Fisheries (DOF)'s responsibilities which is to control capacities of fisheries through boat licensing while the Fisheries Development Authority (LKIM) whose task is to promote the socio-economic well-being of the fishing community is expanding capacity of fishing activities.

Gregory & Coomes (2019) discusses that the livelihoods of people on the floodplain faces vulnerabilities over exploitation exacerbated by increasing number of fishers. With existing fishers, fishing activities have been distant (Khan et al., 2018) have been up to 12 nautical miles from the coastline. Since fishermen have fished further, Omar et al. (1992) have discussed that there has been encroachment of fishing grounds and conflicts frequently arise between gear operators from both foreign and local vessels. According to (Khan et al., 2018), younger generation (age less than 30 years) support their livelihoods being involved in other works as they lost interest in fishing due to the decreasing catches, which reduces their income generating capacity.

2.4.3 Lack of interest & Poor Socio-economic Status

The vulnerability of an individual or a community depends on their capacity to respond to external stresses that may have come from outside their local domain, be it environmental, economic or social forces (Daw et al., 2009). Regmi & Weber (2000) discussed that the increasing population pressure together with subsistence farming is viewed as the main agricultural challenge for rural communities continuously being trapped in the poverty cycle. It is estimated that many of these poor people have poor socio-economic status by standard with low literacy rates, low to average per capital annual income, big family size (Hussain et al., 2016), constraints to market goods, inadequate credit facility induced low crop production, lack of appropriate skills and technological use, lacking access to health, sanitation, electricity, and extension advice knowledge (Bembridge, 1986; Kabir et al., 2012; Khan et al., 2017).

Besides poor agricultural practice and limited plot size (Dilipkumar et al., 2017), about 43 per cent smallholder farmers who cultivate crops without direct assistance from any organization experience limited irrigation and poor land development due to limited

modernization accessibility. Bakar (2009)'s study found that herbicides use in Malaysia is relatively high with more than 76 per cent compared to other agro-chemicals indicating weeds as the dominant pests, especially for oil palm industry in the Malaysian agriculture. The statement is supported by findings from Dilipkumar et al. (2017) which states similar findings a large percentage of herbicides is still used without considering their implication on human health and environment.

Low livelihood status such as poverty, illiteracy, low capital assets and low adaptive capacity are drivers that influences vulnerability dimensions in livelihood strategy (Alam et al., 2017). According to UNICEF (2008), the enrolment rates and achievements in rural areas particularly indigenous communities are slightly lower in Sabah and Sarawak. The report showed 72 per cent literacy rate among rural areas in Sarawak. Limited access to education limits the ability to diversify and intensify economic activities especially in agricultural sectors (Shalaby et al., 2011). Similar finding from Bakar (2009) was found where the study discussed on the lack of programmes provided by the education systems in Malaysia specially related to agriculture, forestry, food science, and veterinary medicine.

Low market opportunities, weak systems and institutions also increases the level of vulnerability as the communities lack accessibility to income sources and other facilities (Akther et al., 2017; Khatiwada et al., 2017). Mazuki et al. (2012) discussed that illiteracy affects the fishermen to adapt technologies in terms of language use in tools such as sonar, wireless set and Global Positioning System (GPS). These fishermen are still equipped with traditional gears and the dependency on technology is still low (Mazuki & Man, 2014). As a result, almost all literatures related to agricultural challenges have mentioned the increase migration rates from rural areas and shortage of qualified and skilled labour in rural areas (Bakar, 2009; Bembridge, 1986; Dilipkumar et al., 2017; Shalaby et al., 2011)

2.5 Institutional Roles towards Accessibility and Availability of Assets

Access to the assets and alternate socioeconomic involves negotiations with other stakeholders which are influenced by the policies, institutions and processes (Engie, 2015). These policies, institutions, and processes shape livelihood in such ways that they operate at many levels from a household level to an international level. Thus, leading them access to different capital assets, different livelihood strategies and a variation of decision making. Policies and legislative implementation and other rules involving public sector, private sector and civil society organizations which regulate access to power relations, assets, markets, and culture can affect livelihoods. These institutional processes can either strengthen or constrain the impact of external shocks on vulnerable communities (Daw et al., 2009; Twigg, 2001).

Ellis (1999) emphasized on access in relation to livelihood assets with an individual or household living gains and their choice of income diversification to sustain livelihoods. USAID (2018) highlights those factors promoting the well-being of a household include having availability to social services, market access and access to natural resources. The choice of livelihood strategies and the level of family well-being of the rural households are heavily influenced by the level of, and access to different ownership of livelihood assets (Ellis, 1999; Israr & Khan, 2010; Yizengaw et al., 2015).

According to Kaushik & Sharma (2015), access to irrigation, resilience strategies for agricultural production are based on local conditions, different agro-climatic variations, water availability and landholding sizes. Mazuki & Man (2014) states that access to market is an important aspect for commercial and large-scale fisheries. Bebbington (1999) states that rural industry leads to social differentiation which allows families to link with wider markets and chains of production trough skills and access to the intermediating issue (industrialists, traders, production networks and organizers).

Ellis (1999) and Adger (2006) discussed that securing or maintaining a sustainable livelihood in the face of vulnerabilities are highly dependent on access to various forms of livelihood capital assets. Different capital assets are not only inputs to livelihoods, but also outputs which help to reduce vulnerabilities and form building blocks of livelihoods. (Bebbington, 1999). The asset bases Krantz (2001) describes that livelihood encompasses not only income level, social relations and property rights, but also access to and benefits derived from social and public services such as water supply, education.

2.6 Roles of Capital Assets

Livelihood assets are possessions which are social and material, tangible and intangible enabling communities to have the ability to pursue different livelihood activities (Krantz, 2001). It represents all spheres of materials, services, and opportunities available to people to use in meeting their basic needs, and in mitigating or adapting to disruptive change. The idea of capital asset is well captured by Bebbington (1999) quoted from Giddens that assets should not be understood only as resources that allow poverty alleviation, adaptation and survival but capabilities to be and to act. According to Bhattacharjee (2010), capital assets and capabilities are basic components of livelihood. It represents all spheres of materials, services, and opportunities available to people to use in meeting their basic needs, and in mitigating or adapting to disruptive change.

A livelihood is sustainable if it not only maintains or enhance its capabilities and assets, but also cope and recover from stresses and shocks, while maintaining its natural resource base (Chambers & Conway, 1992; Scoones, 1998). According to Shen (2012), assets can be created and destroyed due to shocks in the vulnerability context within which people live. Assets can reduce vulnerability to shocks making the household more resilient.

However, it can also make the household more vulnerable if they are not protected against the shocks (Twigg, 2001).

A diversified asset base is understood as partly a design to enable to survive shocks to reduce vulnerability and more resilient in the future (Chambers & Conway, 1992; Sharma et al., 2014). The fundamental feature of the sustainable livelihood framework adapted from Scoones (1998) and Salele (2003) follows DFID's capital assets which are human capital, natural capital. financial capital, physical capital, and social capital.

Capital assets serves as an indicator for assessing the livelihood conditions and livelihood strategies of rural households beyond the traditional methods of measurement relying on economic dimensions (Kamaruddin & Samsudin, 2014; Manlosa et al., 2019). Valentin & Spangenberg (2000) discussed that chosen indicators at a local level enables local stakeholders to be unique as each area and regions are different with different sets of sustainability indicators. While financial capital was used as a proxy to measure livelihoods (Abukari, 2014; Onneshan, 2008), Bebbington (1999) argued that the expansion of produced capital together with human capital is used as indicators critical to development and poverty alleviation.

2.6.1 Natural Capital

Natural capital is natural resources (land, soil, water, crops, fishes, livestock) and environmental infrastructures from which are derived for livelihoods. Natural capital also includes forest resources. According to (FAO, 2015, p. 6), a forest is defined as 'land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 per cent or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use.' Over the last 20 years, land conversion from forest to agricultural land which took place rapidly left no forest resources behind (Hon

& Shibata, 2013; Kamlun et al., 2011). A total of 1,555,828 hectors of land in Sarawak is used for palm oil expansion from existing cropland or at the expense of forest conversion. Many of them are smallholders who mix commodity and subsistence crops (NEPcon, 2017).

(Hon & Shibata, 2013) found that loss of forest has largely advocated to issues dealing with the complexities of land ownerships. There are few land ownerships namely: native customary land titles, native area land titles and mixed zone land titles. Native customary land is 'in which native customary rights, whether communal or otherwise, have lawfully been created prior to the 1st day of January 1958 and still subsist as such' (Bian, 2007, p. 1). Native area land are land titles with registered documents owned by natives only. In this context, natives are considered as 'the indigenous groups who inhabit the state, as listed in the schedule to the Sarawak *Interpretation Ordinance* and Article 161A, Clause 6 of the *Federal Constitution'* (Bulan, 2006, p. 46). Mixed zone land are land titles owned by any citizen without restrictions (Bulan, 2006).

According to Md Yassin et al. (2014), the rural folk are surrounded with terrestrial and marine natural resources. A household is expected to have higher farm income if they have more cultivated land and greater proportion of owned land (Nathan & Mohamad, 2014; S. Rahman & Akter, 2014). According to Md Yassin et al. (2011), those who depend on natural capital have negative relationships with their income. They have 'just enough' monthly earnings for needs, hindering them from savings and investments (Md Yassin et al., 2011; Shaffril et al., 2013).

Natural resources provide a household with food, fuel, construction materials and income USAID (2018). For many poor families, they depend on natural resources as an insurance to help them weather calamities. A decrease of natural resource can affect their family welfare. (Boncinelli & Casini, 2014) showed that agricultural-based households still

lack the ability to provide adequate resources to meet a fair level of household well-being. The result of the study showed that agricultural households have a higher well-being in many key issues such as safety, health, environment, and social networks. However, they lack in regards of income and housing.

2.6.2 Financial Capital

Financial capital is the capital base where livelihood is sustained through wages, savings and inflow of money other than earned income (pensions, remittance) (Khatiwada et al., 2017; Liu et al., 2018). According to Reza & Alatas (2013), poor population suffer in every type of disaster and their earning capacity is used to measure their social dimension of vulnerability. Household income plays a significant role in increasing livelihood assets (Kamaruddin & Samsudin, 2014). The absolute poverty rate in rural areas record at 12.4 per cent in 2019 with a mean income of RM5004, while the poverty line income at national level is RM2208 (Department of Statistics Malaysia, 2019a).

The type of income-generating activity undertaken, the employment in the non-farm sector and the income generated is highly dependent on their education level (Nathan & Mohamad, 2014), male headed households, working age family members, economic diversification and type of non-wages activities indulged (Khatiwada et al., 2017). (Rahman, 1999) states about the declining financial impact on elderly head of household as it does not signify greater access to household resources and health status. This is probably due to different implications held with elder people presence as household priorities and decision-making with respect to consumption of health care can be different (UN, 2019).

Market access is an important feature enabling the transaction of a certain community to exchange capital assets. With little market access, villagers spend more money to travel far to buy goods (USAID, 2018). However, Massoud et al. (2016) discussed that farmers are

unable to sell crops when there is an increase in competitiveness when a community produces excess goods.

2.6.3 Physical Capital

Physical capital is ownerships and infrastructures needed to support livelihoods (Scoones, 1998). This includes a safe shelter, availability of roads, affordable modes of transportations, water supply, and sanitation, accessibility to health centres and schools, tools and technology for economic activities and access to information. (Kabir et al., 2012) states having better access to physical capital is considered the most valued element in the society and can indicate the social status of the community.

Findings from Ifejika et al. (2013) showed that riverine communities were able to make use of emerging opportunities to earn additional income provided by infrastructures and development. Access to roads and electricity improves both income and employment opportunities from the non-farm economy (Rahman & Akter, 2014). The utilization of infrastructures such as electricity and connectivity enable the linkage and movement of various factors of production (Khazanah Research Institute, 2018). The use of cellular phones internet indicates the flow of information. (Benet, 2012) states that various significant areas in Sarawak experienced serious water shortages and lack clean water facilities.

According to (Alexander et al., 2006), those who possesses ownership or material equipment have better access to economic opportunities relative to those who work as labourers who have limited access to assets. For example, Malaysian fisheries consist of multi-gears with many landings site (Harlyan & Matsuishi, 2017). However, the fishery sectors data-poor situations (Harlyan & Matsuishi, 2017) and a very low level of techno-innovation within the oil palm plantations (Mohd Nawi et al., 2015).

Few of the gears used by the fisherman are drift nets, cast nets, gill nets, and line fishing (Department of Fisheries, 2018; FAO, 2019). These gears are made of nylon and resources obtained from the surroundings (Sandhya et al., 2019) while the net length and depth largely depend on the locality in which the net is used Gopinath (1950). As for agricultural activities, Traditional farming equipment and tools are carried from generations to generations used for preparing land for cultivation, planting, harvesting and post-harvest (Combis, 2019). For example, the sickle is one of the most used equipment where almost every farming household possess (Mohammed et al., 2018) and the shape and size of used depend on the customs, preferences and cropping patterns (Combis, 2019).

2.6.4 Human Capital

Human capital is a measure of capacity, skills, attributes and knowledge of an individual which influences the productive capacity and earning potential (Goldin, 2014; Khazanah Research Institute, 2018). Human capital is bounded by good health and physical capabilities to work and adapt, knowledge, skills, which includes household size, number of dependents, age of household head (Liu et al., 2018; Nathan & Mohamad, 2014; Yassin et al., 2011). Sen (1997) argued that the human capital development is worth only in terms for contribution to productivity.

According to Md Yassin et al. (2018), elder household heads possess skills through work experience despite lacking in formal education. It enhances people's ability to secure jobs, perform efficiently, enhances ability to engage in discussion, to debate, to influence, to negotiate and to improve quality of lives. In the study of Md Yassin et al. (2018), human capital emerged to be best possessed asset by rural youths. With that being said, Nor & Said (2014) and Xing (2016) elaborated that those aspiring and skilled labour are more likely to migrate to regions which provide better job and self-advancement opportunities.

Economic growth stems from productivity with high labour force and investment in knowledge and innovation which can only be made possible with educated and highly skilled workers. A strong human capital can also be argued as a strong complement to the constant technological change and global competition seen in today's world.

Attention is also given to health level as a form of human capital besides education (Tompa, 2002). Social services such as health facilities, schools, electricity and piped water protect the family welfare by increasing work capacity and labour productivity. Samuel et al. (2017) discussed that poverty struck riverine communities with averagely educated and low-income leaders do not have adequate preparedness or mitigation measures in facing vulnerabilities which often lead to suffering bigger losses. According to Boncinelli & Casini (2014), non-agricultural households have higher 'material' and well-being and better endowed in intangible aspects than agricultural households.

Elasha et al. (2005) indicated that demography information such as family size, age and gender composition of the household determines the household production and consumption. In the South-Eastern Asia region, a household consist of an average of six persons per household (UN, 2019). Nathan & Mohamad (2014) highlights that as the household size increases; the probability of the household participating in the labour force is increased. However, in the case where there are more dependents compared to workers, a higher dependency ratio indicates financial stress and burden on workers to support and provide social services required by children and elderly (UN, 2007).

According to UN (2019), the Asian region tends to have a higher proportion of older household heads (aged above 65 years old). Rahman & Akter (2014) discusses that the age of the household head captures the maturity level in making decisions. Rahman (1999)'s study showed that elderly men still retain ownership of assets and economic power being

able to work outside compared to elderly women who become dependent with limited mobility and less assets. Being said that Rahman (1999) explained that these households which are headed by older generations out of respect as parents in the decision-making process, of which eventually will pass over the mantle of leadership to their sons.

Men still adhere to the traditional role of being the breadwinner while women being the homemaker (Sultana & Mohd Zulkefli, 2012). This is probably since females run household head tend to not sustain as they fail in participating in livelihood options (Qayoom et al., 2016; Rahman & Akter, 2014). The female household head also tend to have weaker social capital and physical capital than men (Yassin et al., 2011).

2.6.5 Social Capital

Social capital is considered as networks, mutual understanding, shared values, and mechanisms for participation in decision-making and leaderships at various levels. According to Yassin et al. (2011), relationship can be developed vertically (patron/client) or horizontally (shared interest shared by individuals). This relationship eventually enhances trust and ability to cooperate and expand access to wider institutions among parties. The rural communities, especially those settled in coastal areas have better social capital with the family (Shaffril et al., 2013). It is also found that males have better social capital than females (Yassin et al., 2011).

Bebbington (1999) said that social capital debate helps in understanding the engagements of different stakeholders in the spheres of civil, market and state society in order to gain access to resources. Social structures which are more ‘vertical’ tend to have limited citizen collective actions as the access to and influence over state and market are far weaker (Bebbington, 1999). According to Rahman & Akter (2014) Rahman & Akter, proximity to regional headquarters influence one to engage in agricultural livelihoods.

Kaushik & Sharma (2015)'s study found that social institutions which often facilitated by formation of common interest groups or self-help groups, can provide crucial support systems especially to women. These supports can be opportunities of a more diverse income base or access to information and credit in events of extreme climate related loses.

Dengerink (2013)'s study pointed out that presence of institutional structures helps to life up other capital assets. The study also shows that unequal NGO support and farmers training by different organization structure led to unequal development and asset outcome. Kaushik & Sharma (2015) described those alternative livelihoods such as handicrafts marketing and development, value added products and small-scale enterprises are often facilitated by formation of groups and social support system which provides access to information and credit. Besides that, extension advisory services through various mediums and available infrastructures allow empowerment among communities (Ifejika et al., 2013). However, as pointed out by Alexander, Chan-Halbrendt, et al. (2006), the re-evaluation of the effectiveness of the relief, rehabilitation to development continuum is important as a program do not always improve the family status but instead, can cause dependence of households to escape crisis from time to time.

Shaffril et al. (2013) and Md Yassin et al. (2011) identifies cultural capital among the rural communities. Based on the two studies, cultural assets are subjective to well-being and impinge on sustainable livelihood of the community due to the availability of cultural activities such as traditional art, games, and food.

2.7 Livelihood Strategies

A livelihood strategy is not only bound to activities that generate income but also provide access to improved livelihood choices, including cultural and social choices that come together to make up the primary occupation of a household (Abukari, 2014; Ellis,

1999). Livelihoods can be acquired from different sectors of the rural economy which together provide livelihood strategies for food and cash (Brown et al., 2006; Rai et al., 2008). Different assets, capabilities, activities, and strategies give different outcomes.

The livelihood strategies incorporated depends on the type of jobs and source of income by the household member, demographic background of the household, spending arrangements (Hassan et al., 2016), education, proximity to road and market and agro-ecological location of the household (Khatiwada et al., 2017), accessibility and capabilities of capital assets owned (Yuerlita et al., 2013). Livelihood goals, perception of well-being and poverty are results of households pursuing their livelihood choices and strategies (Bebbington, 1999; Scoones, 1998).

Scoones (2009) defined livelihood strategies as the combination of activities that individuals engage in based on their available assets. This is achieved by often reducing their reliance on natural capital assets, diversification of household's activities and strong social capabilities (Batterbury, 2001). However, livelihood strategies are affected by different level of vulnerability and uncertainty due to the changes occurred and might produce different problems and outcomes over time (Fubusa, 2010).

Livelihood strategies is described as "adjustments" which can be referred to long-term adaptative strategies and short-term coping strategies. (Devereux, 2001) used several terms to define livelihood strategies such as accumulation strategies, to increase flows of income or stocks of assets; adaptive strategies, to spread risk using income diversification or adjustments; survival strategies, to prevent death and destitution; and coping strategies, to minimise impacts of external shocks. Kaushik & Sharma (2015) states that adaptative strategies building should take account of short, medium, and long-term measures which builds the ability of communities to recover and to cope with unpredictable conditions.

The decision-making process, social networks, and household compositions (Fubusa, 2010; Hatlebakk, 2009) influence a household to adopt a set of adjustments. Although there are many types of strategies, not all are sustainable as they do not ensure the environmental sustainability (Batterbury & Forsyth, 1999). Some adaptations might protect or enhance a certain benefit or resource but might tarnish another resource.

Coping strategies are mechanisms used to coordinate assistance and aids in event of disasters using planned ahead protocols, procedures and measures implemented systematically to achieve effective outputs (Ng, 2016). Fizri et al. (2014) define coping capacities as the ability of a society or organization, system or group to use its resources to manage or address emergencies, conditions or disasters. Ng (2016) mentions that the Department of Social Welfare plays a role in complimenting other agencies in enhancing strategic mechanism and cooperate with local communities and volunteers before, during and after a disaster event. Fizri et al. (2014) discusses that preparedness activities such as campaigns to educate early evacuation and trainings to community in handling equipment and materials during disasters are essential.

Adaptation is an active set of strategies and actions taken by people in reaction to, or in anticipation of, change in order to enhance or maintain their well-being (Daw et al., 2009). Chambers (1995)'s literature states that households cope with stress by reducing consumption or shifting to lower quality materials, accumulating other assets, protecting their asset base for recovery, selling assets, seeking new resources, diversifying source of income, making claims, dispersing family members, or migrating. Shocks and risks adaptation can be anticipated through various risk management strategy such as household livelihood diversification (Gebru et al., 2018).

2.7.1 Diversification of Livelihoods

Diversity is considered as the key to agriculture based sustainable livelihood (Regmi & Weber, 2000). Diversification is not a new concept but is the process by which rural households construct an increasingly variety of assets and activities to improve standard of living and to survive shocks and stresses (Chambers, 1995; Ellis, 1999; Gomez-Roxas et al., 2005). Scoones (1998) observed that livelihoods are composed in multiple, dynamic, and complex set of economic activities. Besides improving standard of living, it is also able to reduce vulnerability from lack of job opportunities, price fluctuation on international market and alleviating poverty (UN, 2014). Ellis & Allison (2004) states that livelihood diversification increases assets beyond human capital, where poverty is reduced by reducing the vulnerability of risks and consumption effects of seasonality.

The sustainable livelihoods framework sees livelihood diversification as an important strategy towards building sustainability and resilience (Scoones, 1998). Hussein & Nelson (1998) refers livelihood diversification as "*attempts by individuals and households to find new ways to raise incomes and reduce environmental risk, which differ sharply by the degree of freedom of choice (to diversify or not), and the reversibility of the outcome*."

As livelihood is greatly dependant on food and income, households choose one or a combination of livelihood strategies from occupation-based activities such as agriculture, agricultural wage employment or salaried profession, and non-agricultural activities to maximize their capabilities and access to assets (Khatiwada et al., 2017; Maniriho & Nilsson, 2018; Nathan & Mohamad, 2014; Rahman & Akter, 2014; Yizengaw et al., 2015). Based on studies done by Zhao et al. (2016) and Zhao et al. (2019), households are divided into pure agricultural type, agricultural-dominant type, non-agricultural-dominant type, and pure non-agricultural type.

Diversification reduces income fluctuation (Haggblade et al., 2010) and provides flexibility to acquire source of income to pay essential goods, school fees, medical/health costs and other necessities (Hussein & Nelson, 1998). Livelihood diversification further leads to income used for investments (Hussein & Nelson, 1998). Households who diversified their economic activities whether market-oriented or subsistence- oriented (Gregory & Coomes, 2019; Utete et al., 2019) are better-off in terms of income compared to those who did not diversify (Nathan & Mohamad, 2014). However, diversification does not always mean that households are better off due to the different capital assets, intensity and extensity of the activity carried out (Yuerlita et al., 2013). Studies from Cherni & Hill (2009) showed that rural communities most of the time do not have a steady income or employment being self-employed (typically farming or fishing) or involved in multiple livelihood activities (trading or casual labour).

Diversification strategies can fail due to adverse institutional environments which prohibits people on the change (Ellis & Allison, 2004) or climate variability (Ofoegbu et al., 2017). Communities who sustain livelihoods by having high dependence on natural resources available are highly sensitive to climate change which reduces their adaptive capabilities. As mentioned above, climatic factors such as change of humidity and temperature can potentially affect soil properties, which in turn affects harvest quality and quantity (Satti, 2012).

The variability of climate change induces many households to incorporate a mixture of modern and traditional practices of irrigating and switching to more climate tolerant plants to deal with effects of climate variability and change (Ofoegbu et al., 2017). Satti (2012) in his study suggested several strategies which deliberately helped improve agricultural harvest. These include sanitation of crops during harvest, tillage operations, monitoring

sowing and harvesting periods, cleaning seed materials, regulating plant population density, providing irrigation practices, crop rotation and weeding.

(Matthews-Njoku & Nwaogwugwu, 2014) narrated that crop farming may have been adopted as a livelihood strategy due to cultural and agronomic practices that have been mastered and developed to suit the local soil and environmental conditions over the years. These include the shifting cultivation patterns (Hon & Shibata, 2013; Kamlun et al., 2011; Olaniyi et al., 2013) which took place due to factors such as high yield capacity (Kamlun et al., 2011). Planting a diversified set of crops as a mean of subsistence where excess supplies of crops are sold are also adopted by many rural (Hamid & Yahya, 2019).

Fisheries are important engines for economic growth and livelihood activities in remote and rural areas where economic activities are often limited. Some rural communities rely fully on fisheries as their livelihoods while some turn it as part of their diversified livelihood strategy (Allison & Ellis, 2001; Blythe et al., 2014). According to Blythe et al. (2014), diversifying livelihoods to fishery is usually considered as a last choice as they it would require more fishing intensification and length fishing trips. This is due to the declining inshore catches where investment in better gears and better preservation methods are most likely required.

Reza & Alatas (2013) have recorded the lack of interest among the youth to work in farming and fisheries sectors due to the filthy and uncomfortable environment induced by these sectors. However, there has been an increasing trend in recreational fishing activities. According to (Arlinghaus et al., 2010), recreational fishing are activities that harvest aquatic animals usually as a means of obtaining food or just a pursuit of pleasure associated with fishing experiences.

Besides diversifying compositions within agriculture and extending diversity via non-agricultural activities are some of the levels of diversification adopted by rural communities (Hussein & Nelson, 1998). For example, diversification into rural enterprises is becoming better known as part of a community's economic activities (Apostolopoulos et al., 2018).

Khatiwada et al. (2017)'s literature reported that the dominant strategy by rural households is income diversification to non-farm activities. In fact, according to Ellis (1999), 60 per cent of rural household income is from non-agricultural sources. The latter is due to households at or below poverty line would benefit if they had the capability to diversity as it enables them to have alternatives for income generation. Kaushik & Sharma (2015) states that diversification into non-agricultural livelihoods is not only an essential short-term coping strategy, but also for resilience of agricultural livelihood systems. Haggblade et al. (2010) discusses that non-farm activities are regarded as the engine of growth for rural areas as it contributes 30 per cent to 45 per cent of rural household incomes in developing countries.

Hussain et al. (2016) concluded that although labouring was found to be the best and simplest way of earning money without investment, most respondents switch over different occupations such as labouring, fruit vending, agriculture, and auto-driving to sustain livelihoods. In fact, younger head of household who has rich resources and access to education, but underdeveloped infrastructure is more likely to choose agricultural livelihoods compared to those with developed infrastructure who choose to live non-agricultural livelihood (Rahman & Akter, 2014).

As mentioned by Blythe et al. (2014), livelihoods tend to diversify in terms of household roles. Meaning to say, husbands hustle through the main economic activities while

wives and children engage in activities to support the head of household. Many livelihood diversification strategies also tend to be gender specific where non-farm employment is skewed in favour of men, and against women (Hussein & Nelson, 1998). Despite the evidence shown in Hussein & Nelson (1998) that diversification activities are often less profitable than those pursued by men, women are still able to participate in non-farm activities. Activities such as food processing and preparation, tailoring, trading, and many services are still dominated by women in the rural context (Haggblade et al., 1989).

2.7.2 Migration

Migration is another form of livelihood strategy forming a central component of livelihood diversification (Hussein & Nelson, 1998). Migration has been a traditional resilience strategy (Kaushik & Sharma, 2015). In 2016, near to 5.5 million household equivalents to 78 per cent of the households in Malaysia are distributed in the urban areas with only 1.5 million households in the rural areas (Khazanah Research Institute, 2018). There are two types of migrations: dispersion of a family member to the urban areas and temporarily or permanently moving to a new area. Bebbington (1999) states that principal livelihood adaptation when agricultural intensification has been limited with absence of other rural employment has been migrating temporarily or permanently. According to Islam (2017), communities migrate when there are no options left due to economical and natural vulnerability such as lack market opportunities to sell goods, rainfall and low level of soil fertility. Similar findings have been found in a study done by Chan (1995) where relocation is perceived as the worst option. This is due to the high expenses further aggravated by political and ethnic sensitivities, besides being breaking cultural and social ties. Reza & Alatas (2013) states that people temporarily or permanently avoid sufferings in the future

due to environmental hazards such as flood and landslides, abandoning their lands and crops to live in a safer environment.

Ellis (1998) states that at least one household member disperses to urban areas in order to facilitate different infrastructure, services, and opportunities and to help extend kin and social networks across communities, towns, and cities. When a household is prompted by low income generating factors and limited employment opportunities from agricultural activities, there is outmigration of family members and households to cities and abroad (Reza & Alatas, 2013).

Gregory & Coomes (2019) states that more natural resources push family member to urban areas and the family member uses the income from natural resources to support the member at urban areas. Several literatures have attempted to explain that the probability of entering the labour market in the urban area is greater due to mobility freedom and acquired skills (Faridi et al., 2009; Mohd Nor & Said, 2014; Xing, 2016).

This finding is verified with most literature related to agricultural constraints mentioning the increase of migration rates from rural area which have significantly caused shortage of qualified and skilled labour in rural areas (Bakar, 2009; Bembridge, 1986; Dilipkumar et al., 2017; Shalaby et al., 2011).

This method minimizes the effects of the exposure of their livelihoods to extreme effects like variations in the weather, diseases, price fluctuation of agriculture commodities and lack of information precipitating market failures. Bebbington (1999) in his literature mentions that households sustain livelihoods by combining remittance sent by migrants and subsistence agriculture for better housing conditions, advanced agricultural technology,

erosion control and any other interventions related indirectly and directly to livelihoods which are natural resource dependant.

2.7.3 Communities Preparedness

Besides diversification and migration, Scoones (1998) listed agricultural intensification where farmers gain more livelihood through agriculture using their own labour or other inputs available and extensification which involves expansion of agricultural for many other purposes such as herding. Bakar (2009) stated that sustainable intensification is more preferred as a general trend in agriculture production as opposed to dependence on land expansion. The latter is due to labour and fertilizer efficiency which is considered as an important subject pertaining to the future of agriculture and its ensuing sustainable development. Some rural communities rely on their own preparedness in facing disasters and shocks (Khan et al., 2017). The ability of a household to sustain their livelihoods is discussed by Chambers (1995) where households are able to handle stress by reducing or shifting consumption to lower quality products, protecting their asset base for recovery, accumulating food and other assets, seeking new resources, selling assets, income diversification, making claims and dispersing or migrating household members. In an article in Benet (2012), various communities in Sarawak turn to expensive bottled water for drinking and contaminated water for bathing and cleaning or rely on rainwater and streams for washing and bathing when experiencing water shortages.

Farrington et al. (1999) discussed that the people carry out different activities to sustain livelihoods from assistance received from government and other agencies in financial and material forms. Kendrick (2005) reported that boat owners and small-scale owners often apply for loans for inputs or working capital in return for an agreement to sell lower market catches. The viability of these interchanging assets depends on the types of vulnerabilities,

their aspirations of not compromising certain livelihood opportunity and also the reliability of markets (Farrington et al., 1999). Ng (2016) reports that riverine communities at Kanowit do not do anything but wait for the arrival of assistance. According to findings from Khan et al. (2017), some respondents still believe that these events are punishment from God. The communities with traditional religion carry out rituals to seek spiritual protection.

CHAPTER 3

METHODOLOGY

3.1 Overview

This chapter focuses on the methodology to answer research objectives of the study, which to examine the vulnerabilities experienced; to identify the capital assets available; and to determine the economic activities and livelihood strategies used by the riverine communities to cope with the vulnerabilities. The first section of the chapter starts with the description of the conceptual framework built. The conceptual framework is established from the review of theoretical and empirical evidence based on past studies relating to sustainable livelihoods. The second section present the research design followed by sampling technique and unit analysis. It is then followed by the research instruments and source of data, followed by data analysis used: a narrative and thematic approach for qualitative data followed by using percentages, cross tabulation, averages, and radar diagrams for quantitative data. The final section is on the ethical considerations applied throughout the study.

3.2 Research Design

The main purpose to a research design is to conceptualize the research problems. Using the sustainable livelihood approach, an ideal research design requires variables to gain an in-depth knowledge of vulnerabilities, capital assets and strategies across riverine communities along the entire river and how different level of institutional processes affect their livelihoods. Since I do not have the luxury to cover all the variables, I choose to find out the vulnerabilities found, the capital assets available and the livelihood strategies adopted by the riverine communities at one portion of the river.

This study entails a cross-sectional mixed method research design. Creswell & Clark (2017) commented that this approach enables a greater degree of understanding formulated than if a single approach is adopted to specific studies. Mixed method is chosen as it adds value in accessing community level livelihoods by increasing validity in the findings using empirical and secondary data sources (Bryman, 2006). According to Creswell & Clark (2017), the convergent parallel design is also known as a triangulation design to obtain complementary but different sets of data on the same topic and carried out at the same time. It provides the ability to allow exploration holistically on the nature and the socio-environmental perspectives of different stakeholders. The mixed method research combines detailed surveys with historical narratives of change. The amount of convergence is investigated to strengthen the conclusions (Walliman, 2016). The data- validation variant is used in this research where the results from the open-ended questions are used to validate or help explain results from the closed-ended questions (Creswell & Clark, 2017).

3.3 Sampling Technique

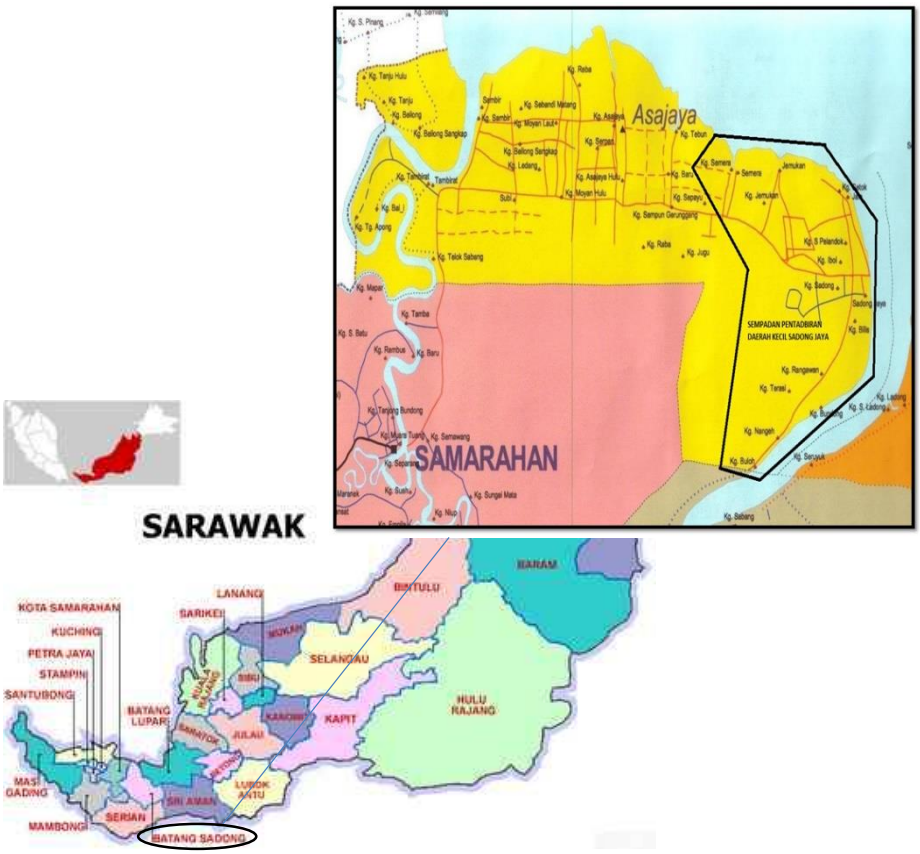

Figure 3.1: Map of Sadong Jaya

Sadong Jaya is located on the left side of lower Sadong River, accessible by road and river transportation (see Figure 3.2). Sadong Jaya has a population of 14,937 people (3146 households) with a majority Malay, Iban and Chinese ethnic groups (As of March 2019, Sadong Jaya Sub-district Office, 2019). There are total of 25 villages in Sadong Jaya. The villages are highlighted in Figure 3.3.

Figure 3.2: Clustering Sadong Jaya

For sampling purposes, I adopted a multistage sampling technique to select my respondents. For the first stage, I clustered Sadong Jaya based on the geographical locations (Alvi, 2016). I divided Sadong Jaya into 3 clusters: lower estuarine, middle estuarine, upper estuarine (refer Figure 3.3).

Second stage involved randomly selecting villages form the clusters. Villages were selected based on the results from "=RAND()" formula used in Microsoft Excel which applies a numeric representation of a value on the village name. From the result applied on each cluster, I selected the even numbers shown. There was a total of 11 villages selected, two villages from cluster 1, four villages from cluster 2, and five villages from cluster 3. The villages in Sadong Jaya are not evenly distributed. Some villages in Sadong Jaya can be big, accommodating up to 218 households with some villages as small as having 25 households. Bigger villages in Sadong Jaya are partitioned into sub-villages, with a village headman appointed at each sub-village.

Stage three involved the selection process of respondents within the villages selected using a systematically random sampling method. Using Yamane (1967)'s formula, the sample size of respondent was determined:

$$n = \frac{N}{1 + N(e)^2} \qquad \text{Equation 3.1}$$

where n is the sample size required for the study, N is the total population from the 12 villages selected, e is the margin of error at 5 per cent (0.05), and 1 is the probability of the event occurring.

The appropriate sampling interval was four based on Alvi (2016) by dividing the total population of households in the 11 villages over the required sample size. A total of 244 households were selected for face-to-face interviews between August and January 2020 as detailed in Table 1 below. The village headmen at the respective villages are first interviewed to get secondary data such as the village profile and background of the village. Then, every consecutive 4 houses are selected as a respondent to be interviewed. Where houses with no one at home, the next house is selected.

Table 3.1: Number of interviews conducted at respective villages at Sadong Jaya.

No	Name of Village	Population	Number of interviews conducted
1	Semera Lot	197	37
2	Jaie	254	44
3	Jemukan Cina	34	7
4	Pelandok ulu/ Jaie Ulu	57	11
5	Iboi Ulu	85	16
6	Sadong Jaya	247	45
7	Sungai Putin	75	12
8	Tanjong Kelaso	83	15

9	Rangawan	218	40
10	Terasi Iban	28	6
11	Senangeh	53	10
	Total	**1031**	**243**

3.4 Unit of Analysis

The study of livelihood strategies of the riverine communities involves strategies taken to sustain livelihoods which comprise of strategies taken from various parties: state administration, the Village Community Management Council, and the villagers at Sadong Jaya. The Sarawak Administrative Officer was selected as the key informant who acted as my gatekeeper to provide me ample information on the general context of Sadong Jaya.

There are two units of analysis which are household heads and the focus group (Freitas et al., 1998). The village headmen of respective villages are selected to be involved in a focus group discussion to obtain information on the livelihoods at a community level.

The household is taken as the unit of analysis as it is an important institutional unit where the key economic and social decisions are made (Boncinelli & Casini, 2014). A household here refers to a group of related or unrelated people who live together and share the use of living essentials and food (Khazanah Research Institute, 2018). The focus on the household unit generates a more comprehensive understanding of the interplay among internal and external processes. For example, assets, production, consumption, livelihood strategies and environmental constraints and opportunities (Bessant, 2006).

3.5 Data Collection

There were two types of data collected from this study, the primary data and secondary data. Primary data included observations, face to face interview sessions and a focus group discussion consisting of both open-ended and closed-ended questions using a

set of questionnaires and interview schedules. Secondary data was drawn from Sadong Jaya Fisheries Department, Sub-District Office, Department of Statistics, Sarawak State Government Portal and Academic journals publications.

There were two sets of instruments prepared for each of the unit of analysis: the Focus Group Discussion (see Appendix 2) and the head of households (see Appendix 3).

3.5.1 Household survey

A household survey was conducted using a set of questionnaires prepared in *Bahasa Malaysia* and translated back to English to ensure that the integrity of the original meaning was uniform. The household survey was pre-tested and revised before the data collection period in August 2019.The household dataset consist of 12 sections labelling A to L.

Section A consist of socio-demographic information of the household consisting of gender of the household head, age of household head, number of years staying at the village, number of family members staying in the house, household size, education attainment of the household head, sex of the household head and socio-demographic information of household members. Section B cover a general source of income undertaking different economic activities, years of experience and income level.

Section C to Section L was guided by the Sustainable Livelihood Framework where variables under each component were adapted into local context. Section C to G cover question of different livelihood option undertaken by the household from fishing, farming, poultry farming, collecting forest resources/ hunting and other activities respectively. The questions under each livelihood option covered different types of fishes/ crops/ livestock/ natural resources and petty trade was involved, sales of the livelihood option engaged, price per unit, gears and equipment used for the activity, skills and hindrances experienced from the activity.

Section H consist of questions regarding the challenges faced by the household in terms of floods, erosions, water conflicts, drought, waste disposal and the impacts of these challenges. Section I covers questions on the residence condition and amenities available such number of rooms, type of toilet, source of electricity, source of water, main fuel type for cooking, land ownership, ownership of computers, radios, television, Internet connection and smartphones. Section J includes any types of assistance received by the household and monthly expenditure while information on the involvement in any association and referrals if the household faces household conflicts, monetary shortage, or natural events in arranged in section K. Section L asks about the perception of community social interaction and capital assets which can be developed in the village.

A draft of questionnaire developed was first pre-tested and improvised before entering the field. This was to ensure that the study is conducted in a similar, structured, and proper manner of each respondent.

3.5.2 Focus Group Discussion

The Focus Group Discussion was guided with a set of interview schedule and conducted in *Bahasa Malaysia.* There were two rounds of Focus Group Discussion held comprising of 6-12 people (Liswanti et al., 2012). According to Freitas et al. (1998), focus group demands more elaboration of the result than individual interview and has high "face validity". Although Focus Group Discussion has disadvantages of having less control over topic discussed, the flow of information was moderated and controlled well according to the time allocated. The Focus Group Discussions were based on the strengths of respective villages and major economic activities carried out by the villagers over time. Challenges faced by the community, accessibility, and availability to capital assets such as healthcare

and education facilities, roads and transportation, migration patterns of the riverine communities at Sadong Jaya were asked.

3.6 Data Analysis

Qualitative data was retrieved from field notes and Focus Group Discussions were transcribed in narrative and thematic manner to provide a descriptive background of the local context and to triangulate data retrieved from the quantitative analysis. The quantitative data were analysed using percentages, cross tabulation, averages, and radar diagrams. The study adapted the Livelihood Vulnerability Index (LVI) (Dendir & Simane, 2019; Hahn et al., 2009), the Sustainable Livelihood Index (SLI) (Kamaruddin & Samsudin, 2014) using Microsoft Excel while a multinomial logit model is facilitated by SPSS version 21.

3.6.1 Vulnerabilities experienced by the riverine communities

The study adopted the method used in Dendir & Simane (2019) and Hahn et al. (2009) to calculate the household livelihood vulnerability. There are seven composite variables under the LVI which includes Socio-Demographic Profile, Health, Food, Livelihood Strategies, Water, Social Network and Natural Disasters and Climate Variability. Each component comprises of 17 indicators which were adopted from Dendir & Simane (2019) (see Table 3.2).

This method uses a balanced weighted average approach where indicators are equally contributed using an index. Since the indicators come in several of measurements and scales, a standardized index was applied using Equation 3.2:

$$IndexS_d = \frac{S_d - S_{min}}{S_{max} - S_{min}} \qquad \text{Equation 3.2}$$

where $S_d$is the observed value for indicator for household i, S_{min} and S_{max} are the minimum and maximum values of an indicator. For variables which were in frequencies, the percentages were recorded.

Once each indicator was standardized, the indicators were averaged using Equation 3.3 to calculate the value of each indicator:

$$\mathrm{M}_d = \frac{\sum_{i=1}^{n} indexS_{di}}{n} \qquad \text{Equation 3.3}$$

where M_d is equivalent to the seven variables for household I comprise of*:* Socio-Demographic Profile (S), Health (H), Food (F), Livelihood Strategies (L), Water (W), Social Network (SN) and Natural Disasters and Climate Variability (C); *index* represents the indicator, indexed by *i*, while *n* represent the number of indicators under the major variables. The values for the vulnerability are measured by calculating the average of each variables using Equation 3.4:

$$LVI_d = \frac{\sum_{i=1}^{7} W_{mi}\, M_{di}}{\sum_{i=1}^{7} W_{mi}} \qquad \text{Equation 3.4}$$

which can be expressed in Equation 3.5:

$$LVI_d = \frac{W_s S_d + W_H H_d + W_F F_d + W_L L_d + W_w W_d + W_{SN} SN_d + W_C C_d}{W_S + W_H + W_F + W_L + W_W + W_{SN} + W_C} \qquad \text{Equation 3.5}$$

where LVI equals the weighted average of the seven major variables. The weights of each component, $W_{mi,}$ were determined by the number of indicators studied under a variable. The LVI was scaled from 0 to be the least vulnerable to 1.0 to be most vulnerable.

Table 3.2: Vulnerability indicators and their unit of measurements.

Variable	Indicators	Unit of Measurements
Socio-Demographic Profile (S)	Dependency ratio	Ratio
	(Ratio of population under 18 years old and over 65 years old to the population between 19 and 64 years old)	
	Percentage of female headed household	%
	(The female is counted as the head if the male is away from home for more than 6 months)	
	Percentage where the head of household has not attended school.	%
Health (H)	Percentage of households without sanitary latrine/ toilet equipped with pump	%
	Percentage of household head sick for 3 days consecutively	%
Food (F)	Average crop diversity index	1/#crops+1
Livelihood Strategies (L)	Average farmland size	acres
	Percentage of households solely reliant on agriculture as main source of income	%
	Percentage of households who are not satisfied with their household surroundings	%
	Percentage of households with family member working in a different community	%
Water	Percentage of households without consistent water supply	%
	Percentage of households that utilize natural water source from river, rain or lake as their water source	%
Social Network	Percentage of households who do not refer to any authority (head of community, sub-district/ district officer, any agencies)	%

	Percentage of households who do not participate in any community events	%
	Percentage of households who are not satisfied being part of the community	%
	Percentage of households who do not receive any kind of support/ help from any agencies	%
Natural Disasters and Climate Variability (C)	Mean standard deviation of monthly average of average maximum daily temperature (years 2010-2020)	°C
	Mean standard deviation of monthly average of average minimum daily temperature (years 2010-2020)	°C
	Mean standard deviation of monthly average precipitation (years 2010-2020)	mm

The composite index of sustainability adopted from Bhattacharjee (2010) is then weighted inverse of the vulnerability then calculated using Equation 3.6 The sustainability index is then:

$$S = \frac{1}{V} \qquad \text{Equation 3.6}$$

The higher the value of vulnerability indicates more vulnerability. Inversely, the greater value of sustainability index indicates a greater degree of sustainability.

3.6.2 Capital assets available to the riverine communities

The study adopted the Sustainable Livelihood Index (LVI) method developed by Kamaruddin & Samsudin (2014) to assess the capital assets owned by the riverine communities. There are five capitals assessed: human asset, physical asset, social asset, financial asset, and natural asset. There are 34 indicators under the five assets which were adapted from various scholars such as Kamaruddin & Samsudin (2014), Yang et al. (2018) and (Manlosa et al., 2019) (see Table 3.3).

The method used to assess capital assets were similar with the methods used to assess vulnerability using a balanced weighted average approach was used where indicators are equally contributed using an index. Equation 3.7 was used to standardize the indicators:

$$IndexS_d = \frac{S_d - S_{min}}{S_{max} - S_{min}} \qquad \text{Equation 3.7}$$

where $S_d$is the observed value for indicator for household i, S_{min} and S_{max} are the minimum and maximum values of an indicator. The aggregated SLI was then constructed for each household by obtaining the average of all five assets with an equal weight. The value of index was scaled from 0 to be the least equipped with an asset to 1 to be most equipped with an asset.

Table 3.3: Capital assets indicators and their unit of measurements

Variable	**Indicators**	**Unit of Measurements**
Socio-Demographic Profile (S)	Percentage of female headed household (The female is counted as the head if the male is away from home for more than 6 months)	1- Yes, 2- No
	Age of household head	Years
	Number of years staying in the village	Years
	Household size (The individuals who stay within a same roof and share a meal are included)	Number
Human Asset	Highest level of education pursued by each member of household (The members of household include family members who are staying away from the household)	1- No education 2-Lower primary education 3- Upper primary education 4- Lower secondary education 5- Upper secondary education

		6- Diploma/ Bachelor's degree/ Master's degree
		7- Others
	Working experience of household head (Changed the orientation of labelling)	1- Not working, 2- Not experienced, 3- Partial experienced, 4- Experienced
	Number of labourers in the household	Number of labourers
	Knowledge/ Skills received form related agencies	1- Yes, 2-No
Physical Asset	Access to treated water	1- Yes, 2-No
	Farm tools owned	Number of farm tools owned
	Housing type	1- Wooden
		2- Wooden and concrete
		3- Concrete
	Number of Bedrooms	1- 1 bedroom
		2- 2 bedrooms
		3- 3 or more bedrooms
	Type of toilet	1- Don't have own toilet
		2- Without flush system
		3- Flush system
	Ownership of computers	1- Yes, 2- No
	Ownership of Radios	1- Yes, 2- No
	Ownership of television	1- Yes, 2- No
	Ownership of Internet connection	1- Yes, 2- No
	Number of mobile phones owned	Number
	Gas/ Electric fuel for cooking	1- Yes, 2- No
Social Asset	Number of organizations involved	Number
	Presence of individuals/ agencies to turn to for household conflicts	1- Yes, 2- No
	Presence of individuals/ agencies to turn to for monetary shortage	1- Yes, 2- No
	Presence of individuals/ agencies to turn to during natural events	1- Yes, 2- No
	Ability to speak out	1- Yes, 2- No

	Degree of satisfaction in the village	1- Very not satisfied 2- Not satisfied 3- Unsure 4- Satisfied 5- Very satisfied
Financial Asset	Income from main occupation	Ringgit Malaysia (RM)
	Income from side occupation	Ringgit Malaysia (RM)
	Income from transfers (financial assistance, remittance)	Ringgit Malaysia (RM)
Natural Asset	Cultivated Land area	acres
	Access to forest	1- Yes, 2- No
	Access to river/ sea resources	1- Yes, 2- No
	Natural resources assistance from agencies	1- Yes, 2- No
	Land rights (Ownership of land certificates)	1- Yes, 2- No

3.6.3 Economic activities and livelihood strategies used by the riverine communities

Narrative type of analysis analysing is used to analyse qualitative data to illustrate and enrich different types of livelihood strategies adopted by the riverine communities. After computing the descriptive data, a multinomial logistic regression adopted from studies in Hua et al. (2017), Zhao et al. (2016) and Zhao et al. (2019) is carried out to help to uncover significant linkage between the five capital assets and different livelihood strategies carried out by the riverine communities. The determinants of household's choice of livelihood strategies where the dependent variable is multi outcome (Y=1……4, if a households is relying on pure agricultural activities, agricultural-dominant activities, non-agricultural-dominant activities, or non-agricultural activities.

3.7 Ethical Considerations

Several ethical considerations were considered before, during and after data collection. Walliman (2016) recommends social researchers to avoid assumptions on

backgrounds, or cultures. Any assumptions and personal thoughts towards the riverine communities during data collection were bracketed. Walliman (2016) suggests that data changing action to meet certain requirements to be avoided to maintain the originality of data obtained. Since the data collection process was conducted in a mixture of local *Bahasa Sarawak* and *Bahasa Melayu*, the researcher interpreted and translated the information into English without changing meanings.

According to Kvale (1996), personal interactions in the interview affects the interviewee and the knowledge of the interviewee affects our interpretation of data. Before carrying out the research, the respondents were kindly approached and humbly invited to be part of the research. USAID (2018) suggested that it is important that researchers ensure that they do not harm the family they are studying by following the following guidelines:

1. Participation does not place subjects at risk of physical or social harm.
2. Privacy and confidentiality of each subject is ensured
3. Subjects are informed about the project in the local language and formally asked whether they consent to participate
4. Subjects have right to refuse to participate at any stage of the study

Sarantakos (2013) suggests that respondents have the right to privacy regarding their private lives, to answer or deny questions they dislike on sensitive issues. The respondents were allowed to disclose only information they were willing to. When the respondent was not aware of his/her, spouse, and offspring(s) age, a personal events or national events were used to establish a timeline. For example, to capture the current age, the year the respondent got married and age at that moment was captured. The model and name of a certain

equipment was recorded to be compared with market price when the respondent didn't know the value or price of item.

As some respondents were unable to estimate their exact size of land acquired, an estimation of a football field size was assumed to be an equivalent of an acre. Compared to the revenue of salaried worker or someone with a fixed wage is easy to obtain, a farmer's or a fisherman's monthly income would be calculated based on how many times they harvest in a month or a year and how much they can sell in a month or harvest. For crops harvested once a year, the monthly revenue is divided by the number of months in a year to get an average.

CHAPTER 4

FINDINGS AND DISCUSSIONS

4.1 Overview

This chapter explores the multidimensional realities of the riverine communities of Sadong Jaya using the Sustainable Livelihoods (SL) framework as an analytical tool. This chapter offers a holistic depiction of the local context and rural livelihoods of the riverine communities. The chapter starts with explaining the local settings such as the orientation and composition of each village. The next section describes the vulnerability context using both a Livelihood Vulnerability Index (LVI) and socioeconomic/historic shocks and trends which are experienced by the riverine communities at Sadong Jaya. The following section outlines the five capital assets which constitutes the livelihood building blocks using Sustainable Livelihood Index (SLI) which can help and hinder productivity and sustainable livelihood. The next section further discusses on the livelihood strategies regarding their livelihood activities and livelihood outcomes at a community level. The final section includes the relationships of livelihood assets and livelihood strategies against the vulnerabilities experienced by the riverine communities of Sadong Jaya.

4.2 Village orientation and compositions

This section is to provide a brief understanding on the research site and the composition within Sadong Jaya. Similar with Dudek & Chmielinski (2015), villages at Sadong Jaya are categorised as peripheral which are under the influence of urbanized centres and are subjects of self-reliant growth. Each village has their own geographical space constituting their own socio-economic environment, human capital compositions and infrastructures for its functioning of a village.

The village orientation in Sadong Jaya can be divided into three types, closely packed, far apart and mixed. Five of eleven analysed villages, Kampung Rangawan, Kampung Senangeh, Kampung Sadong Jaya, Kampung Sungai Putin and Kampung Tanjong Kelaso, are closely packed within the village compound where houses are arranged in order close to each other. The other three villages, Kampung Terasi Iban, Kampung Iboi Ulu and Kampung Pelanduk Ulu are arranged separated and scattered according to their own land size. Houses in the three villages, Kampung Semera Lot, Kampung Jemukan Cina and Kampung Jaie are mixed where the village consists of both closely packed houses and houses far apart from each other. A river, a drainage system or a small road is used to create as a barrier to identify the perimeter of one's land size; and their houses are built within the land area. The distance between one house to the other depends on how big the household owns a land.

The villages are composed according to ethnic groups. Being said that many villages are multi-ethnic which results from matrimony and migration patterns. Kampung Semera Lot is a Malay majority village with a minority of Chinese households; Kampung Sungai Putin is a Malay village with a minority Bugese household, Kampung Pelanduk Ulu is a Bugese village with a few Malays, Jawanese, Iban and Chinese households; Kampung Iboi Ulu is a Bugese village with a minority of Malay households. Kampung Semera Lot, Kampung Sungai Putin, Kampung Pelanduk Ulu and Kampung Iboi Ulu have 197 households, 75 households, 57 households, and 85 households respectively. Kampung Sadong Jaya, Kampung Tanjung Kelaso, Kampung Jaie and Kampung Rangawan are villages with majority Malay households with few Bugese, Jawanese households with 247 households in Kampung Sadong Jaya, 83 households in Kampung Tanjong Kelaso, 254 households in Kampung Jaie and 218 households in Kampung Rangawan.

In Kampung Terasi Iban and Kampung Senangeh consist of all Iban households. Kampung Terasi Iban has 28 *pintu* (units) while in Kampung Senangeh, has a total size of 53 households with few short longhouses and some individual houses within the village. The long houses have about 4-13 *bilik* (units) attached. The individual houses results when family members move out from his long house to build additional lots when there is insufficient space to extend a long house. Among the analysed Chinese village which consist of Chinese households, Kampung Jemukan Cina has a total of 34 households. The number of Chinese villagers has reduced by two third over the years where many believed to have migrated to Kuching. There are two analysed villages which consist of majority Bugese households: Kampung Pelanduk Ulu and Kampung Iboi Ulu.

4.3 Livelihood Strategies

This sub-topic aims to answer the third objective which is to determine the economic activities and livelihood strategies used by the riverine communities to cope with vulnerabilities. The study categorised households according to previous studies from Zhao et al. (2016) and Zhao et al. (2019). Households were divided into pure agricultural type (agricultural income accounting for more than 90 per cent of total income), agricultural-dominant type (non-agricultural income accounting for less than 50 per cent of total income), non-agricultural-dominant type (non-agricultural income accounting for more than 50 per cent), and pure non-agricultural type (non-agricultural income accounting for more than 90 per cent of total income).

It is found that 118 (48.6%) households in Sadong Jaya engage in non-agricultural activities followed by 43 (17.7%) households who are non-agricultural-dominant type households, 42 (17.3%) agricultural-dominant households, leaving the other 40 (16.5%) who resort to only agricultural activities. This finding is aligned with literature found in Ellis

(1999), whereby households below poverty line benefit better with non-farm activities as it enables them to have alternatives for income generation. Figure 4.6 bar chart outlays the type of livelihood strategies engaged by the riverine communities in Sadong Jaya.

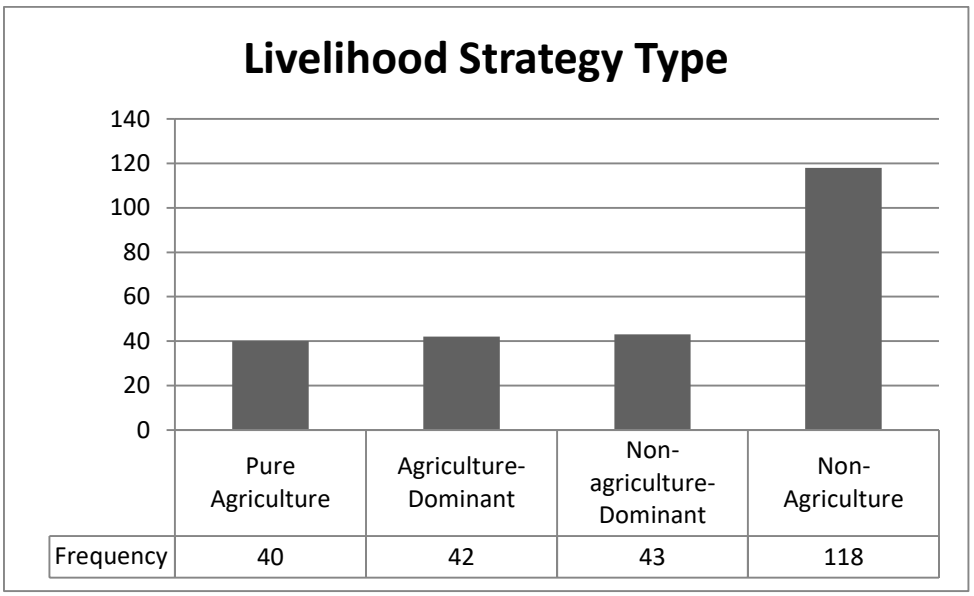

Figure 4.1: Livelihood strategy type of households in Sadong Jaya.

4.3.1 Diversification of Livelihood

Traditionally, economic diversification has been used as a strategy of multiple income source from a single income source as more advancement were accessed and new sectors emerged (Chambers, 1995; Ellis, 1999; Gomez-Roxas et al., 2005). Households in Sadong Jaya engage in between one to five economic activities where majority 125 (51.4%) households depend on at least two economic activities to sustain livelihoods. Table 4.25 shows the number of livelihood strategies adopted by the riverine communities in Sadong Jaya.

Table 4.1: Number of livelihood strategies according to income levels

Number of livelihood strategies adopted	Frequency	Percentage (%)
1	71	29.2
2	125	51.4
3	41	16.9
4	5	2.1
5	1	0.4
Total	**243**	**100.0**

There are two types of livelihood diversification in Sadong Jaya as mentioned by Hussein & Nelson (1998). The riverine communities sustain livelihoods by diversifying compositions within agriculture and extending diversity via non-agricultural activities. These non-agricultural activities include small and medium enterprises (SME)s, working as labourers in farming, construction, manufacturing, and service industries, and officers working in government or private sectors. Other artisanal entrepreneur activities comprise of grocery shop trading, food stalls, confectionary (*kuih* and *kerepek*) manufacturing, fishery products processing, tour guides, homestay, tailoring, hair grooming, knives carving and catering services.

4.3.2 Agriculture

Livelihood diversification takes place at many levels. A natural starting point for poor rural farmers is through changing the composition of their agricultural products they produce Hussein & Nelson (1998). In Sadong Jaya, there are 209 households involved in agriculture. About 153 (63.0%) households are involved in agriculture due to inheritance of land and profession from their ancestors. According to Matthews-Njoku & Nwaogwugwu (2014), crop farming may have been adopted as a livelihood strategy due to cultural and agronomic practices that have been mastered and developed to suit the local soil and

environmental conditions over the years. About 54 (22.2%) households seek agriculture as an interest or opportunity to invest. In Rahman & Akter (2014), they mentioned that proximity to extended social structures might have the influence for one to engage in agricultural livelihoods. Having more frequency in preference with working in the farm, most of these activities are either done alone (107, 51.2%) or with family members (102, 48.8%).

It was found that swamp paddy and coconuts were the main agricultural crops at Sadong Jaya between 1970s and 1980s. Literatures from (Hon & Shibata, 2013; Kamlun et al., 2011; Olaniyi et al., 2013) have narrated the shifting cultivation patterns in Sarawak. These shifts to fruits and vegetable cultivation and a large-scale expansion of oil palm plantations are due to the high yield capacity (Kamlun et al., 2011). According to village headman from Kampung Iboi Ulu, "There are smallholder palm oil activities at every village". These activities are monitored by Malaysia Palm Oil Board (MPOB) with schemes. Besides that, native customary lands are led to agencies such as Federal Land Department Authority (FELDA) and Federal Land Consolidation and Rehabilitation Authority (FELCRA) to manage these palm oil cultivations. Labour work in these lands is handled by Indonesian workers hired by FELDA or FELCRA. By the end of a harvest, landowners will receive an amount as dividends. Apparently, palm oil which are planted within 10-15 years are perceived by the villagers to be most productive to produce high yield.

Although Sadong Jaya is still depending on the traditional methods of agriculture, several methods were used by the farmers to manage their agricultural activities. For example, farmers either borrow or rent other people's land for cultivation. When it is time to harvest, portion of the harvest are given as a gift to the owner in return. Particularly one

younger farmer found in Kampung Jaie have incorporated modern agriculture techniques in their farming activities. He uses, polybags, hydroponic and aeroponic systems of farming techniques. The latter was due to the lack of land resource for farming similar with Shalaby et al. (2011) and Dilipkumar et al. (2017). This certainly show the starting point where livelihood diversification increases assets beyond the human capital which enables to reduce vulnerability among rural communities (Ellis & Allison, 2004). As mentioned by Ofoegbu et al. (2017) where communities who sustain livelihoods with high dependence on natural resources are reduced with their adaptive capabilities, the modern farming techniques go a long way against this statement.

The average farmland of the riverine communities is about only 2.77 acres although the range between farmland for the overall study is between 0.005 acres to 35 acres. While 34 (14.0%) of households possessing have idle land planting nothing, a majority of 154 (73.7%) farmers plants within one and four type of cash crops at their farmlands, similar with what suggested by Nelson et al. (2014). These crops which uses the intercropping methods promote diversity and stability (Satti, 2012) on farm. Many of the observed households plant a wide variety of crops as a mean of subsistence, similar with findings from Bembridge (1986). However, excess supply of fruits and vegetables are sold to the nearest market to generate extra income for buying necessities and household supplies. This finding has been consistent with findings from Hamid & Yahya (2019).

Bananas and coconuts are considered among the most popular crop and easiest to plant as they can withstand high temperature and do not require much maintenance. Vegetables are considered challenging as they require constant attention to fertilize. Less fertile land is managed with the use of fertilizers together with pesticides and herbicides to

maximize harvest (Bakar, 2009; Dilipkumar et al., 2017; Satti, 2012). Besides integrating agro-chemicals usage, crop rotation is considered not only a vital weed management tool (Dilipkumar et al., 2017) but also help enrich soil nutrients (Satti, 2012). These methods apply for various other plants except rice in Sarawak as it is harvested only once a year. Crops especially vegetables are also planted in stages ensuring continuous harvest from time to time.

According to a villager in Kampung Senangeh, paddy plants must be planted in a big area where land is shared among few families. These families then divide their total harvest as paddy if planted in small plots can result in total zero harvest due to pest manifestation. Adopting a sowing and harvesting period (Satti, 2012) is another method used by the riverine communities to combat climate vulnerabilities and pests. For example, sowing periods for the swamp paddy starts around August when monsoon seasons kick off. The rain during the monsoon season provides adequate irrigation for the paddy during vegetative phase and then are harvested in April when monsoon season ends. Fragile plants such as watermelons, loofah and eggplant trees are planted during hot seasons from March to November as they are not flood resistant.

In Sadong Jaya, coconuts, maize, oil palm, chillies, bananas, and paddy are planted in big scales while fruits and vegetables such as loofah, potatoes, watermelon, sweet hook, papaya, crystal, pineapple, lady fingers, cucumber, water gourd, turmeric, pumpkin, lime, durian, guava, rambutan, long beans, sour eggplant, mango, quinea, blackcurrant, jackfruit, Sapodilla, *kailian, kangkun*g, ambarella, *langsat*, and longan are planted in small scales.

Some villagers in Sadong Jaya also breed animals such as chickens and cows for self-consumption. However, only few families in Sadong Jaya carry out this economic activity

in big scales. Most household rear chicken, ducks, and fishes for own consumption while there are birds who are reared to be sold as a hobby. Aquaculture activities include rearing tilapia, *pari*, *sembilang*, *lundu* and *belukang*. Besides that, there are also bird nest collection activities in Sadong Jaya. The bird nest activities are more commonly carried out by Chinese households. The land used is usually borrowed from the local or bought at a price of RM100 thousand per acre. According to the villagers, bird nests collected from the swallow towers can harvest and sold at high price as high as RM seven thousand per kilogram.

4.3.3 Fisheries

Kampung Jemukan and Kampung Semera are coastal villages in Sadong Jaya due to the locality nearer to the coast. According to the village headmen, 30 per cent of the villagers in Kampung Jemukan and 40 per cent of villagers in Kampung Semera are fishermen. Among these fishermen, most are within the age of 40-50 years old with a minority in their 20-30s. In this study, there are 30 (12.3%) households surveyed involved in fishery activities. Of these 30 households, 3 households do not fish at sea or river. They are middle persons who obtain fishes directly from fishermen to be sold at markets. Of the remaining 27 fishermen, 4 (1.6%) fishermen are Zone A fishermen. These fishermen possess official license from the Fishery Department Malaysia which allows them to fish within the distance of five nautical miles and sell their catches to authorized landing sites.

Most of the fishing activities are carried out by the Malay community where 23 (9.5%) of them are Malay, 4 (1.6%) are Chinese and 3 (1.2%) are Iban. 7 (2.9%) are fishermen due to heritage similar with Matthews-Njoku & Nwaogwugwu (2014). The rest 20 (8.2%) fishermen are recreational fishers. Most of the fishermen are accompanied by

family members (8, 3.3%) and relatives/friends (14, 5.8%) while 5 (2.1%) fishermen fish alone.

The fishery activities are conducted in various locations nearby Sadong Jaya. According to the head fishery officer in Sadong Jaya, the perimeter where a fisherman from Sadong Jaya can fish is from Tanjung Po (Muara Tebas) up to Kabong (Sarikei) (Refer Figure 4.10). Normally the fishermen would head out fishing when the tides are low on a fine weather. They return when the tides are high. A typical fisherman would take a day trip by the river or sea. But some can spend up to one to two nights before they return.

According to Omar et al. (1992), a growth in recreational fishing is most likely due to increased leisure time. Similar with the context in Arlinghaus et al. (2010), recreational fishers in Sadong Jaya usually fish nearby their respective houses for self-consumption during their free time. Some prefer to rent boats to fish far away from Sadong Jaya where a wide variety of fishes in the deep sea can be found.

Figure 4.2: Compound of Sadong Jaya Fishermen

Blythe et al. (2014) mentioned that diversifying livelihoods would probably place fishery as a last choice. This is due to the lengthy fishing trips and more intense effort in response to shifting waters to open oceans (which often require better gears and better preservation methods) and declining inshore catches. Almost every fishing household in Sadong Jaya consider agriculture to be a backup due to the lesser access to fishery resources obtained. This also helps to protect the recovering fishery resources in such a way that they give time for younger fishes to grow. According to the fishermen, peak season for fishes is usually during April to May. During monsoon seasons (around December to January), most fishermen would either repair their equipment or carry out other economic activities to ensure continuous supply of income. Instead of catching fishes, some catch prawns and other resources by the river.

As five households (2.1%) have experienced disrupted of fisheries resources from fisheries and nine households (3.7%) have experiences loss of income from fisheries, there are several strategies to save them from the doom of poverty. Three households (1.2%) choose to intensify their other economic activities, five households (2.1%) find other jobs to support their present income while three households (1.2%) have already decided to migrate to somewhere else to sustain livelihoods.

4.3.4 Non-agricultural Activities and Migration

Several studies such as Haggblade et al. (2010) and Khatiwada et al. (2017) have considered non-farm activities as the engine for growth in rural areas. It appears in Sadong Jaya, the phenomenon is similar. Rural enterprises especially, are becoming better known as part of a community's economic activities (Apostolopoulos et al., 2018).

There are 62 households (25.5%) involved in non-agricultural activities in Sadong Jaya, of which 51 households (21. 0%) adopted these activities as their main income sources. Figure 4.11 shows non-agricultural activities carried out among the respondents.

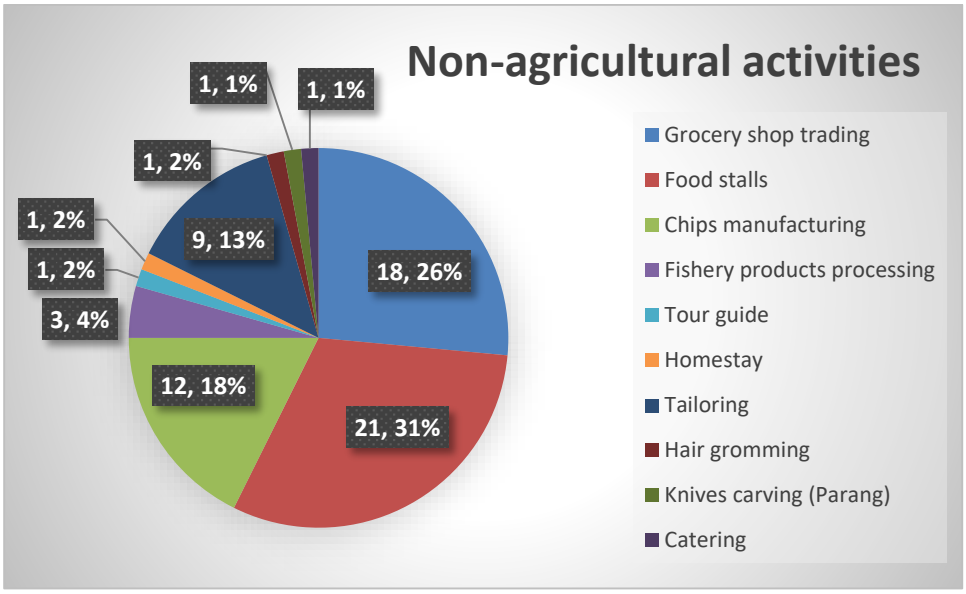

Figure 4.3: Non-agricultural activities carried out by the villagers in Sadong Jaya

Among households who carry out non-agricultural activities, 21 (8.6%) households sell food and drink at stalls while 12 (4.9%) involve in chips manufacturing. These food stalls usually sell light food and snacks such as fried chicken, burgers, fried banana or vegetable fritters, fried noodles, and drinks. All these stalls are opened within their home compounds handled by majority women. In fact, Haggblade et al. (1989) stated that activities such as food processing and preparation, tailoring, trading, and many services are still dominated by women in the rural context. This can be explained with Blythe et al. (2014)'s explanation where women especially engage in several range of activities in supporting the head of household's income.

It is interesting to know that the ingredients used in these snacks such as bananas, vegetables and coconuts usually are either planted themselves or bought from family

members or friends who sell them for a cheaper price. According to a villager, "*These small businesses can help boost my family income. It is not much, but at least, with my family support, it is enough to sustain our monthly expenses.*" Another villager comments that the activity enables them flexibility as they can choose to close the stall in case there are errands to run. Hussein & Nelson (1998) also narrated that these activities pursued by women often are less profitable than those pursued by men, but still enable women to participate as a side income.

There are nine (3.7%) households who carry out tailoring activities. Of the nine households, only two households specialize in embroidery. The peak season for tailoring is during festive seasons especially *Hari Raya Aidilfitri*. A villager has been sewing for many years and due to her aging factors; sometimes she has to reject orders as taking more orders will affect her eyesight. Besides that, 18 (7.4%) households carry out trading as part of their livelihoods. About 11 households sell grocery goods such as instant noodles, junk food, confectionaries, petrol and can drinks at their housing compounds. According to respondent 204, goods are renewed or restocked once or twice a week through a van from Kuching. Besides the grocery shops, a respondent from Sadong Jaya sells *belacan* shrimp paste which his family manufacture from scratch. The shrimps are dried and grinded into a paste before shaping into blocks and packaged. The *belacan* blocks are then transported to various parts of Sarawak to be sold. Three households preserve salted fishes to be sold in their villages. The salted fish and *belacan* activities are conducted in small scales as they are limited due to the unpredictable weather. One respondent processes palm sugar which is sold within his village. According to the respondent, it is a tedious job to produce this sugar as it requires constant monitoring of the temperature and to ensure there are no contaminations throughout

the process. Other activities include being part of the local tourism industry being a tour guide and providing homestay services; being a barber, catering services and knives carving.

Looking at the dynamics of household memberships in Sadong Jaya, the study showed 130 (53.5%) households surveyed have at least one of their family members dispersed or migrated to cities or abroad for work. This finding correlates with several studies where migration has been a traditional resilience strategy for many households (Hussein & Nelson, 1998; Kaushik & Sharma, 2015; Khazanah Research Institute, 2018). These family members migrated out to return only during celebrations or over the weekends. The outmigration is probably due to less income generating activities from farming sectors and limited "glamorous" employment opportunities in Sadong Jaya. The less interest among the youth to work in farming and fisheries sectors due to the filthy and uncomfortable environment induced by these sectors. As a result, almost all literatures related to agricultural challenges have mentioned the increase migration rates from rural areas and shortage of qualified and skilled labour in rural areas (Bakar, 2009; Bembridge, 1986; Dilipkumar et al., 2017; Reza & Alatas, 2013; Shalaby et al., 2011).

The migration pattern has shown through remittance which are sent to about 131 (53.9%) households from children or relatives. Among the respondents, 25 (10.3%) households and 98 (40.3%) households who perceive remittance as their first and second income respectively. from these family members as their livelihoods though the remittance received by the riverine communities at Sadong Jaya are occasional or on a monthly basis in terms of money, food, or necessity supply for the households.

Based on Islam (2017), communities do migrate when there are no options left from economical and natural vulnerabilities. In the context of Sadong Jaya, most riverine

communities do not intend to migrate permanently unless circumstances such as a job placement or when their children insist to move. Similar with Chan (1995), the intention to continue sustain livelihoods at Sadong Jaya is probably due to the cultural and social ties which have been formed for many years.

4.3.5 Mitigation Strategies by the Community Leaders

As Sadong Jaya is constantly getting urbanized with developed infrastructures, villagers are more likely to choose a non-agricultural livelihood. This finding is supported with the study done by Rahman & Akter (2014). Particularly with the completion of Batang Sadong Bridge in 2016 and Batang Samarahan Bridge in 2018 respectively, complemented by better road access, it is obvious that more riverine communities from Sadong Jaya started to have daily commute to their workplace outside the villages mainly to Kuching and Samarahan to seek for employment opportunities. In an interview, a villager commented, "Although they (her sons) travel a distance every day to Kuching, they save a lot of money as they don't need to pay (house) rental in Kuching. They get to eat home-cooked food and stay with me."

The benefit of having accessibility to markets with the construction of Batang Sadong and Batang Samarahan Bridges was highly commended by the riverine communities in Sadong Jaya. A married woman burger seller aged 39 from Kampung Tanjong Kelaso, an upper estuary of Sadong River informed that she managed to secure cheaper input materials for her burger business in the village by getting those materials from the hypermarkets in Kuching after the construction of Batang Sadong and Batang Samarahan Bridge. "*I normally will follow my husband to go to Kuching these days to buy the necessities as the price in Kuching or Kota Samarahan is much more competitive compared to the ones, I get it here*

(in village at Sadong Jaya). I managed to earn net income of RM30.00 daily by doing this small business of selling burger at least to earn some pocket money to support my family", commented by a respondent in Kampung Tanjung Kelaso.

Besides the upgraded transportation options, the drainage systems and watergates built in various areas in Sadong Jaya play an imperative role in protecting the farmlands and houses. The latter is due to the flood-prone geographical area of Sadong Jaya which experiences flood every year especially during monsoon seasons (between November to March), similar with the findings from Junaidi et al. (2018). According to Touza & Zoghby (2020), an adaptive water management techniques and actions can diminish the impacts of climate change which can provide some resilience. Watergates were built surrounding Sadong Jaya to control river and sea water flow into and out of the village. It helps to protect crops besides properties in the house from being destroyed or damaged by the flood. When there is rain, the gates are opened to allow excess water flowing out and when there are high tides, the gates are closed to prevent excess water from flowing in. Drainage systems are built from the river opening into the interior regions and farmlands of Sadong Jaya. During heavy rain falls, the excess rainwater flows through the drainage system. With the construction of this physical watergates, it had reduced the damage caused by the natural disaster.

4.4 Vulnerability Context

This sub-topic aims to answer the first objective of the study which is to examine the vulnerabilities experienced by the riverine communities. There are four main vulnerabilities experienced by the villagers, climate variability, water crisis, environment degradation and poor drainage systems.

4.4.1 Climate Variability-Flood and Drought

There are two identified flood events which take place in Sadong Jaya; tidal floods which are caused by a king tide from the river and sea, and flash floods which are caused by rainwater which is unable to be drained out. Figure 4.1 shows the monthly rainfall amount from year 2010 to 2019.

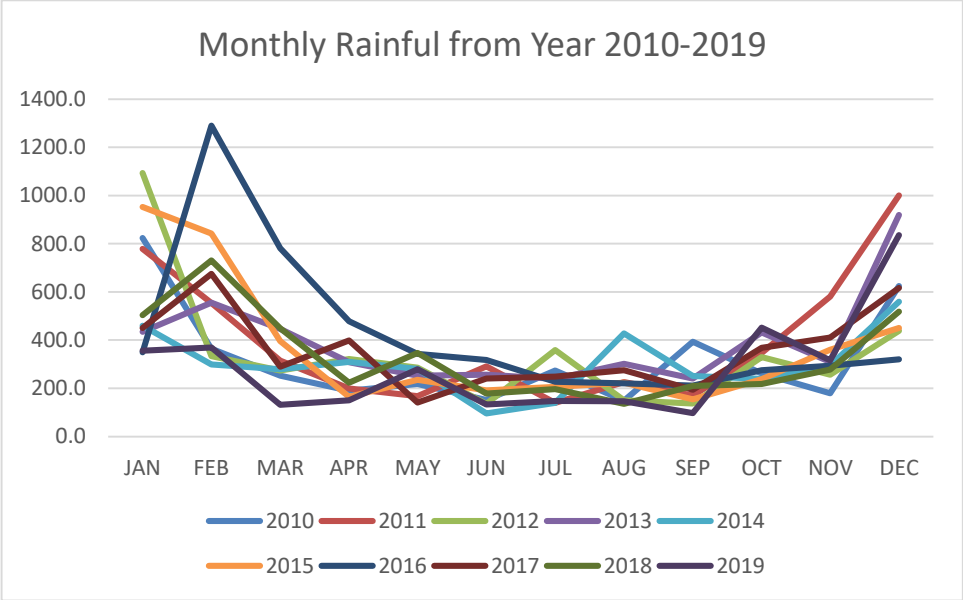

Figure 4.4: Monthly Rainfall form Year 2010-2019

Based on Figure 4.1, the rainy seasons begin roughly from September to March annually. During these rainy seasons, it is expected that many areas, especially farms and houses located by the riverbank to be flooded. "*When it rains consecutively for three to four days, whole Sadong area used to get flooded*", added by headman from Kampung Rangawan. This finding has been aligned with a study done by Chan (1995) where flood-prone with most areas located in the riverine, estuary and coastal areas exposed to North-east monsoon.

Similar with findings from Shaluf & Ahmadun (2006), monsoon floods and flash floods are still perceived as the most severe hydro-meteorological natural disasters in Malaysia. There has been a total of 151 (62.1%) households who experienced flood events

over the past 10 years annually. Similar findings from Fahy & Rau (2013) and Ng (2016) have narrated those environmental problems can be perceived entangled with cultural traits or socially constructed as Malaysians perceive heavy monsoon rainfall, and other natural factors as a common feature in their lives. It is mentioned that the riverine communities usually experience a mild flood where the water level is about one inch to three inches high from ground level. However, in year 2016 (refer to Figure 4.1), Sadong Jaya experienced an unusual high amount of rain which peaked in February at 1290mm. Many villages such as Kampung Pelanduk Ulu, Kampung Tanjong Kelaso and Kampung Terasi Iban experienced a serious flood where water levels were knee-level high from ground.

The worst perceived flood in the past ten years was experienced in year 2011 according to 82 (53.3%) households. The flood was due to the clash of tidal flood and heavy rain occurrence simultaneously. The rain fell non-stop for consecutive seven days where water levels were as high as two metres high from ground. Lowland houses were completely submerged and had to be evacuated to emergency rescue centres. As mentioned in Ofoegbu et al. (2017), coping and adaptation practices seem to be insufficient to maintain resilient sustainable development and household welfare when against climate shocks.

Although the impact of every village and households were rather different, the flood brought devastating effect to the riverine communities. Although there were no casualties, it caused destruction especially to those who live in wooden and/or single storey houses. Examples of the destructions were physical damages to properties such as electronic appliances and furniture, loss of income from agriculture and clean-up cost.

Robledo et al. (2012) discussed that houses with high dependence of forest resources, subsistence rain-fed farming and livestock rearing are exposed to risk from climate change. The situation at Sadong Jaya was similar where leafy plants were destroyed in the flood

while quality of certain harvest was deteriorated for up to six months as the flood water remained stagnant for weeks. Since Sadong Jaya experience flood almost every year, the oil palm industry experiences a drop of 30 per cent to 40 per cent harvest from April to May annually due to the muddy soil from monsoon season. Hence, most agricultural activities are done during the hot seasons.

The hot seasons are roughly from April to August when the amount of rainfall decline. Similar with findings from Elasha et al. (2005) recurring series of drought affecting existing cultivation of rainfed lands and limited water supply is also expected in Sadong Jaya. The average annual rainfall has been fluctuating in the past 10 years where rainfall amount increased from year 2010 to year 2011, year 2012 to year 2013, and year 2014 to year 2016. In 2016 onwards, there has been a gradual decline in the amount of rainfall from 5101.7mm in 2016 to 3414.5mm in 2019. These declining amounts of rain indicated towards a drier and hotter weather in Sadong Jaya. Figure 4.2 and Figure 4.3 show the average annual rainfall from year 2010 to year 2019 and average annual temperature from year 2010 to year 2019.

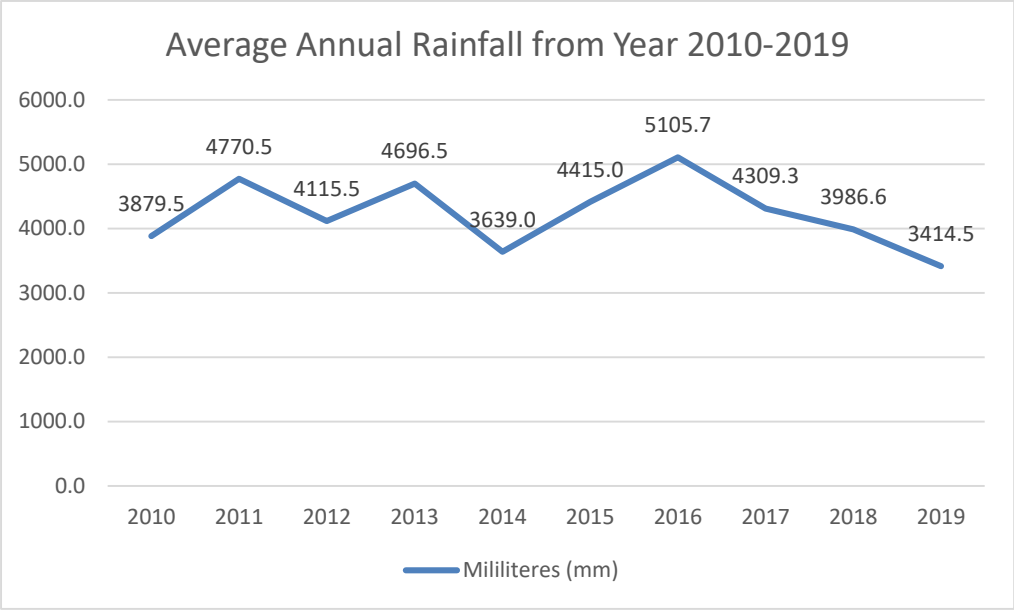

Figure 4.5: Average annual rainfall from year 2010 to year 2019

In the past 10 years, there have been a fluctuation in the average annual temperature with a gradual increase in 0.1°C-0.2°C from year 2010 (27.8°C) to 2018 (28.0°C). In 2019, the average temperature rose from 28.0°C to 28.4°C. About 103 (42.4%) households complained about the drought from between July and September in 2019.

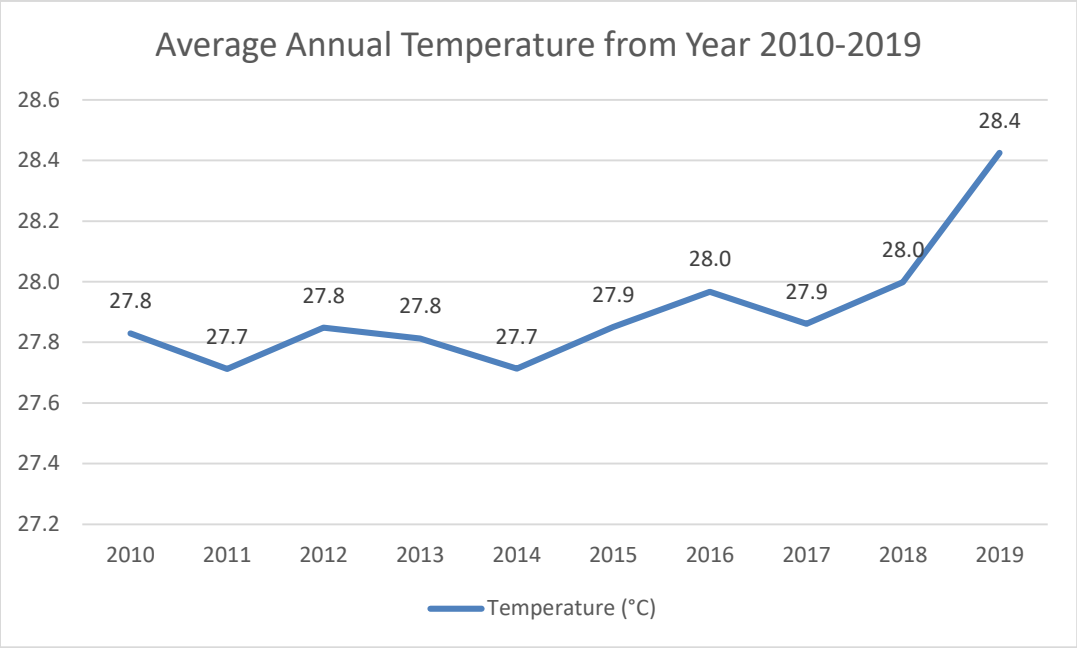

Figure 4.6: Average annual temperature from year 2010 to year 2019

The drought impacts about 99 (40.7%) households to experience health issues such as fever and heaty body especially among the elderly and children. Another 24 (9.9%) households are impacted with poor agricultural harvest where their many of their vegetables and leafy plants wilt. The findings are incline with Shalaby et al. (2011) where water shortage and drought with unsuitable farming technologies significantly reduce agricultural resilience among farmers. The increase in temperature has also led to water crisis where limited supply of water is available (JBALB, 2018). The situation faced was found similar with findings from Kaushik & Sharma (2015) where rise in temperature has led to physiological stresses on livestock, reducing their productivity of milk, wool, meat, and affect reproduction success.

4.4.2 Water Crisis

Water crisis is found to be a long-term issue in Sadong Jaya for over 20 years. Water supply was gradually fully restored in March 2019 after the installation of a high-level water

tank and pipes connected to villages. A clean water resources (Bembridge, 1986) with adaptive water management technique and actions (Touza & Zoghby, 2020) is crucial to provide resilience to sustainable livelihoods. However, it is found that water supply is still limited with the increase in population in Sadong Jaya. According to few headmen interviewed, this is due to more government officers now returning to their respective villages for retirement. This finding is supported with Ofoegbu et al. (2017) and Lammers in Calicioglu et al. (2019)'s literature where population growth leads to rural communities' vulnerabilities to climate change which increases competition for already scarce water and land resources.

As mentioned by Bebbington (1999), a quality life is indeed the notion of livelihoods. The livelihoods of the riverine communities experience stresses (Chambers & Conway, 1992) such as lacking in water supply. There are 170 (70%) households who reported to experience water crisis where 111 (45.7%) households consider year 2018 to be the worst water crisis experienced in the past 20 years. For a whole year in 2018, three villages (Kampung Sungai Putin, Kampung Senangeh and Kampung Tanjong Kelaso) did not receive access of treated water, while some received a cloudy murky water supply with low pressure. The water supply is low especially during festive occasions or peak hours, i.e., morning and evening. This finding supports the finding of Lammers in Calicioglu et al. (2019) which stated the remarkable population growth especially in South Asian region will increase competition for water resources.

Another 125 (51.4%) households were impacted with health issues such as stomach aches, 7 (2.9%) households were impacted with wilting of their crops and 50 (20.6%) households were impacted with difficulties in their cleaning activities such as washing utensils and house cleaning with the lack of water supply. The findings are in line with

Thomas et al. (2007) and Shah et al. (2013). Poor socio-economic conditions do reduce the ability of a household to handle climate- related shocks and stresses.

4.4.3 Environment Degradation

It is found that rubbish burning at their respective compound and rubbish dumping into the river has been a habit of the communities for a long time despite having almost every village being allocated a rubbish dumpsite except Kampung Terasi Iban and Kampung Pelanduk Ulu. These has led to pollution of the rivers in Sadong Jaya. Similar with the context provided in Idris et al. (2018)'s study, environmental changes, physical environment damage and pollution contribute greatly not just the environment in Sadong Jaya but also the sustainability of fisheries.

The findings shows that the riverine communities continue to face difficulties with the depletion of fishery resources and forest resources. "*Sadong Jaya forest is not forest, but they are bushes of trees*", said by a respondent. As most land in Sadong Jaya is converted into residential areas and cash crop plantations, especially oil palm plantations since 1970s to 1980s, there are no forest resources left in Sadong Jaya.

Also, the fishery resources have deteriorated after 96.3 per cent fishermen mentioned their fishery resources depletion as their main challenge in the fishery sector. This is followed by inconsistent weather at 74.1 per cent, high cost and lack of equipment both at 14.8 per cent respectively, high tides (7.4%), animal attacks (7.4%) and aging (3.7%). This finding is inconsistent with Daw et al. (2009) which stated climate change effect minimally to fisheries. Although rated second, climate change is perceived to pose a higher effect on fisheries compared to other non-climate issues after decreasing fishery resources. Table 4.1 shows the main challenges experienced from fishermen at Sadong Jaya.

Table 4.2: Main challenges experienced by the fishermen in Sadong Jaya

Fishery challenges	Frequency	Percentage (%)
Lack of Equipment	4	14.8
High cost of equipment	4	14.8
Decreasing fishery resources	26	96.3
Inconsistent weather	20	74.1
High tides	2	7.4
Animal attack	2	7.4
Age	1	3.7

The depletion of forest resource and fishery resource are due to development projects, rubbish dumping, poisoning and overexploitation of local fishermen and foreign fishermen (refer Table 4.2). This is situation has been explicitly elaborated in Ferdous Alam et al. (2015), Alam et al. (2017), Gomez-Roxas et al. (2005) and Ofoegbu et al. (2017). In their literature, they emphasized on the environmental cost of poor resource management and environmental destructive activities towards the environment.

Table 4.3: Factors contributing to decreasing fishery resources in Sadong Jaya

Factors contributing to decreasing fishery resources	Frequency	Percentage (%)
Development	19	70.4
Rubbish dumping	9	33.3
Local fishermen exploitation	10	37.0
Foreign fishermen exploitation	12	44.4
Poison	3	11.1

Poisoning activities carried out by local fishermen were spotted as it is harmful and kills many species in the water. With the already limited fish resources, more fishermen have

been exploiting more fishery resources, similar with findings from Gregory & Coomes (2019). Depletion of fishery resources is further worsened when trawlers from other areas encroach into Sadong Jaya area using nets with smaller mesh size than the legal size. This finding is consistent with Chen. et al. (2018), Omar et al. (1992), Kaur (2017) and Khan et al. (2018). Although there is existing law such as the Fisheries Act 1985 under Malaysian Fisheries Department to control the fishing activities, the policies are not enforced strictly at Sadong Jaya. Omar et al. (1992) has also reported about the lack of coordination between authorities in managing the fishery sector. As a result, local fishermen had to fish beyond their limit (more than 5 nautical miles) in search for more fishery resources, similar with findings of Khan et al. (2018) and Omar et al. (1992). Béné et al. (2010) explained that over-exploitation by many fishers has consequently leaded to reduction in the catch, to which, eventually, leading them to poverty.

The decrease in fishery resources has resulted in a high demand of fishery proteins. The availability of fishes and price depends on the dry or wet seasons and demands. This results in vendors marking up prices according to the availability of fishes. It is observed that there are no specific fixed regulations on the prices of fishery resources to date. However, the fishes are priced according to their sizes. For example, a grade A toli shad is sold at RM24 per kilogram, grade B is sold at RM18-19 while grade C is sold below RM16.

Besides that, appearances of crocodiles from the headwaters have also been observed. The emergence of crocodiles was first acknowledged around year 2015. These crocodile emergences might be due to the development of oil palm plantations where the use of chemical substances and loss of biodiversity such as monkeys and boars. These have resulted in a rise in crocodile population at downstream river which might no longer be safe for fishermen to carry out fishing activities. The scenario presently is different as crocodiles

were small in sizes and villagers were still able to swim in rivers during 1990s to early 2000s at the downstream river. There have not been any case of death or injury yet, but it does pose a risk as the crocodiles grow larger in size and dangerous day by day. Table 4.3 shows the agricultural challenges faced by farmers at Sadong Jaya.

Table 4.4: Agriculture challenges faced by farmers in Sadong Jaya

Agriculture Challenges	**Frequency**	**Percentage**
No land	24	11.5
Infertile/Unsuitable farmland	48	23.0
Lack workforce	52	24.9
Lack Fund to buy Equipment/Pesticides/Herbicides/Fertilizers	67	32.1
Low quality fertilizers	4	1.9
Difficulty in receiving financial aid	22	10.5
Pest	95	45.5
Low harvest price	52	24.9
Limited market	5	2.4
Competition from farmers planting similar type of crops	15	7.2
Inconsistent weather	57	27.3

Challenges for faced by the farmers are all interrelated as one challenge can incur another challenge towards the farmers in Sadong Jaya. Out of the 209 households who carry out agriculture activities, the biggest challenge faced by the farmers is pest control (45.5%) followed by lack of fund to buy farming equipment and agro chemicals (32.1%). This finding is consistent with Dilipkumar et al. (2017) which mentioned that weeds are the major biological constraints affecting the quantity of production. Other challenges include inconsistent weather at 27.3 per cent, low harvest price and lack workforce at 24.9 per cent, infertile or unsuitable farmland at 23.0 per cent, no land at 11.5 per cent, difficulty in

receiving financial aid at 10.5 per cent, competition from farmers planting similar type of crops, low market, and low-quality fertilizers at 7.2 per cent, 2.4 per cent and 1.9 per cent respectively.

Bakar (2009) found that pesticides use in Malaysia has relatively increased indicating pests especially weeds as the dominant pests in Malaysian agriculture. Besides the locally known *rumput* (grass which refers to weed), there are other types of animal pests identified by the villagers. To name few are rats, birds, squirrels, and insects. Birds, squirrels, and rats appear during the flowering season when the paddy rice and fruits start to ripen. The herbicides and pesticides depend on the farmers' capabilities of purchasing and whether they want to use as using too much can harm the plant and be very harmful upon ingestion. The uses of herbicides and pesticides has apparently reduced the number of sparrows which eat from oil palm and other plants. There are few insects identified by paddy planting farmers and vegetable farmers which are rice green leafhopper (*Nephotettix spp*.), known as *Bena hijau*; various Beetles species (*Oryctes rhinoceros***,** *Apogoniacribricolli*), known by *Kumbang Tanduk* and *Kumbang Kaboi*; and Rice black bug (*Scotinophoracoarctata*), known as *Kutu Beruang*. The rice green leafhopper can be destructive as it causes stunted growth of paddy plant with yellowish dry leaves. Beetles can be destructive as it eats up shoots and leaves, usually attacking oil palm trees and coconut trees. Rice black bugs can chew and rag steams, leaves and fruits of leafy plants in the corn fields, paddy fields and vegetable farms. Golden Apple Snail (*Pomaceacanaliculate*), known as *Siput Gondang Emas* is another destructive pest where these "silent killers" breed very fast and have a very rapid maturation period within 75 days. Despite being able to live for very long in dry soil, these snails can move only wet soil. As the paddy planting season starts from September, monsoon rain

enables the snails to cause massive destruction as they eat off the young seedlings. The increasing dependence on pesticides for pest management

Due to infertile and unsuitable farmland, many crops are unsuitable to be planted (Chien et al., 2017 & Shari & Osman-Rani, 1996). Some crops require fertilizers and consistent monitoring of farm to ensure harvest to be maximized. These require more fund to maintain as they need more money to buy all the required materials. This is also shown in Dilipkumar et al. (2017)'s study where 17 per cent of total mature cultivation costs on weed management on palm oil plantations and 24 per cent to 70 per cent maintenance cost are spent. With the consistent lack of fund to maintain farms, farmers have complained difficulty in receiving farming schemes from relevant agencies. "*Only if there are schemes to help the villagers, otherwise, villagers might stop from farming and find other alternatives*", headmen from Kampung Senangeh. Inadequate institutional support in less developed areas reduce the capacity of smallholder producers with lack of incentives (Bembridge, 1986).

Farmers who have large area of farmland may require hiring of labours to assist in the harvesting and other tasks such as transportation. These hiring of labours and services may cost high amount of expenses incurring towards the farmers. The study found that there has been a declining number of workforces in the agriculture sectors. The finding is similar with Bakar (2009), Bembridge (1986), Dilipkumar et al. (2017) and Shalaby et al. (2011). Based on households who face issues lacking in workforce, the main factor of the declining number is due to the preference of youth working in cities (80.8%), followed by lack of interest among the youth (76.9%), absence of beneficiary (25.0%) and aging farmers (15.4%). As working in the agricultural sector requires the ability to work under uncomfortable environments and hot weather, many younger generations may prefer to work

with fixed wages or in the service sector. Table 4.4 shows the factors of declining workforce at Sadong Jaya.

Table 4.5: Factors of declining workforce in Sadong Jaya

Factors of Declining Workforce	**Frequency**	**Percentage**
Aging farmers	8	15.4
Lack of interest among the youth	40	76.9
Preference of youth working in cities	42	80.8
Absence of beneficiary	13	25.0

Besides discussing family members on migrating to urban areas, Gregory & Coomes (2019) have also discussed on the effects of exposure to price fluctuation of agriculture commodities and the lack of information precipitating market failures. Market price fluctuation is another issue complained by the villagers in Sadong Jaya. As majority households carry out agricultural activities planting commodity crops, fruits and vegetables, many farmers compete to sell their crops. The market price of the crops can drop so low that the villagers sometimes are unable to support their cost of living. Due to lower market price, swamp paddy and coconuts which were once the main commodity crop in Sadong Jaya, is no longer planted by many households. The oil palm activities in Sadong Jaya are monitored by the Malaysian Palm Oil Board (MPOB) with skims. Year-end dividends are given to NCR landowners who let their land to be converted into oil palm plantations. Due to the drop in market price up to RM250 in 2019, landowners no longer receive their annual dividends.

4.4.4 Drainage System

The drainage system has benefited the community in Sadong Jaya by preventing flood and monitoring river water levels. As the gates sizes are small, the flow of water is also small. A relatively lower water levels are observed compared to the water levels 20 years ago as the watergates and bund are built. However, it has degraded the quality of coconuts. "*We used to bring and park our boats in front of our house, as the river was so wide 20 years ago*", commented by Kampung Pelanduk headman. As years have passed, the water became shallow, and some rivers have "died". These have resulted in poor coconut quality in terms of size and quality due to the less salty water exposure in the interior regions of Sadong Jaya due to the shallow water levels.

The drainage systems and rivers are dug and cleaned twice a year to prevent flood and to provide irrigation to cultivation. However, some rivers and drainage systems are clogged due to less investment in cleaning and digging activities. As the cost of these cleaning process is high, some areas can take up to four to five years to get cleaned. According to Kaushik & Sharma (2015), it is important to provide access to irrigation besides other agricultural production according to contextual conditions.

4.5 Livelihood Vulnerability Index (LVI)

The livelihood vulnerability index (LVI) aims to answer the first objective which is to examine the vulnerabilities experienced. The data from this index can identify the main component at which cluster the riverine communities are vulnerable to. Table 1 presents the Livelihood Vulnerability Index (LVI) sub-component values for Cluster 1 (lower estuarine), Cluster 2 (middle estuarine) and Cluster 3 (upper estuarine) in Sadong Jaya as well as the maximum and minimum values for all the clusters combined. The indexed sub-components

and the major components for each cluster are presented in Table 4.5 and Table 4.6 respectively.

Table 4.6: Livelihood Vulnerability Index (LVI) sub-component values d minimum and maximum values for Cluster 1, Cluster 2 and Cluster 3, Sadong Jaya

Main Components	**Sub-components**	**Units**	**Cluster 1**	**Cluster 2**	**Cluster 3**	**Maximum value in all clusters**	**Minimum value in all clusters**
Socio-Demographic Profile (D)	Population size	Number	82	78	83	-	-
	Dependency ratio	Ratio	0.435	0.51	0.399	2.5	0
	Percentage of female headed household	Per cent	17.07	2.56	6.02	100	0
	Average age of FMM	1/Years	0.016	0.017	0.017	0.022	0.013
	Percentage where the head of household has not attended school.	Per cent	14.63	15.38	9.64	100	0
Health (H)	Percentage of households without sanitary latrine/ toilet equipped with pump	Per cent	48.78	50.0	42.17	100	0
	Percentage of household head sick for 3 days consecutively	Per cent	32.93	26.92	20.48	100	0
Food (F)	Average crop diversity index	1/#crop+1	0.504	0.331	0.251	1	0.071

Livelihood Strategies (L)	Average farmland size	acres	1.605	5.32	3.81	36	0
	Average livelihood diversification index	1/#livelihoods	0.358	0.36	0.375	0.5	0.167
	Percentage of households solely reliant on agriculture as main source of income	%	6.10	12.82	16.87	100	0
	Percentage of households who are not satisfied with their household surroundings	%	10.98	2.56	4.82	100	0
	Percentage of households with family member working in a different community	%	52.4	52.6	53.0	100	0
Water (W)	Percentage of households without consistent water supply	%	59.76	67.95	81.93	100	0
	Percentage of households that utilize natural water source from river, rain or lake as their water source	%	36.59	76.92	72.29	100	0
Social Network (S)	Percentage of households who do not refer to any authority	%	89.74	91.13	87.55	100	0

	(head of community, sub-district/ district officer, any agencies)						
	Percentage of households who do not participate in any community events	%	25.6	14.1	7.2	100	0
	Percentage of households who are not satisfied being part of the community	%	6.34	2.89	5.85	100	0
	Percentage of households who do not receive any kind of support/ help from any agencies	%	93.9	97.44	92.77	100	0
Natural Disasters and Climate Variability (C)	Mean standard deviation of monthly average of average maximum daily temperature (years 2010-2020)	°C	32.1			34.1	28.8
	Mean standard deviation of monthly average of average minimum daily	°C	23.7			25.1	22.8

	temperature (years 2010-2020)				
	Mean standard deviation of monthly average precipitation (years 2010-2020)	mm	4233.2	5000	3400

` In overall, the Socio-Demographic Profile shows Cluster 2 with a greater vulnerability than Cluster 1 and Cluster 3 ($D_{Cluster1}$ 0.206; $D_{Cluster2}$ 0.207; $D_{Cluster3}$ 0.19). This is showed by the dependency ratio for Cluster 2 being the highest at 0.51 followed by Cluster 1 at 0.435 and cluster 3 at 0.399. A higher dependency ratio indicates financial stress and burden on workers to support and provide social services required by children and elderly (UN, 2007). The finding shows a mean of 0.4467 (standard deviation: 0.522) for the dependency ratio sub-component. This finding is incline with Nathan & Mohamad (2014) where probability of household participating in labour force increases as the household size increases. However, the percentages of female headed households in Cluster 2 are less than 5% (2.56%), having 14.51 per cent lesser than in Cluster 1 (17.07%) and 3.46 per cent lesser than in Cluster 3 (6.02%). With a low percentage of female headed households. According to Rahman & Akter (2014) and Qayoom et al. (2016), female run households tend to not sustain as they have weaker social capital and physical capital than men and often fail in participating in livelihood options. These female household head in Sadong Jaya are within the age of 45 to 77 who majority are widows and who are living with their children. It is believed that these women are headed by older generations out of respect as parents in the decision-making process, of which eventually pass over the mantle of leadership to their

sons. While a relatively high percentage of household heads have attended formal schools, head of households from Cluster 2 had a higher percentage of 15.38 per cent of not attending any formal school, followed by 14.63 per cent in Cluster 1 and 9.64 per cent in Cluster 3. The study found that most household head possessed between primary to lower secondary education.

The overall Health vulnerability for Cluster 1 (0.409) is higher than Cluster 2 (0.385) followed by Cluster 3 (0.314). Amarty Sen (1990) discussed on one's capabilities of attaining proper health and education, to which indirectly has the capabilities to convert income to other resources for better way of life. In Sadong Jaya, half of households (50%) in Cluster 2 do not own a sanitary latrine/ toilet equipped with a pump. Households which do not have a sanitary latrine/ toilet equipped with pump in Cluster 1 is at 48.78 per cent while in Cluster 3 is 42.17 per cent. It is found that more household heads from Cluster 1 (32.93%) have been sick and not attended work for 3 days consecutively compared to Cluster 2 (26.92%) and Cluster 3 (20.48%). Some households whose head of household have reported sick had health issues such as having high blood pressure, diabetes, and fatigue due to old age. The latter is possibly due to the high number of household heads who are elderly between the age of 51 and above (165, 67.9%).

The overall Food vulnerability of households are captured through the average crop diversity index where the Food vulnerability score for Cluster 1 (0.466) growing 10±0 crops, followed by Cluster 2 (0.276) and Cluster 3 (0.194) growing 8±0 crops and 13±0 crops respectively. The higher vulnerability in Cluster 1 is probably due to the locality factor of Kampung Semera and Kampung Jaie which has more tightly packed village density compared to other villages which have more land acquisition to plant more crops.

Based on the weighted average of Livelihood Strategies component, Cluster 3 showed a greater vulnerability at 0.292 compared to Cluster 1 (0.259) and Cluster 2 (0.276). Based on the livelihood strategy sub-component, Cluster 3 showed a greater vulnerability in terms of livelihood diversity (average livelihood diversification index: Cluster 1: 0.574; Cluster 2: 0.58; Cluster 3: 0.625), households solely reliant on agriculture as main source of income (Cluster 1: 6.1%; Cluster 2: 12.8%; Cluster 3: 16.9%), and percentage of households with at least one family member working away from their community (Cluster 1: 52.4%; Cluster 2: 52.6%; Cluster 3: 53%). Such findings are most probably due to the distance from nearest city which provide more diversity in job opportunities. Based on the sub-components score above, all the clusters employ within 5±1 source of income, with more households employing more diversity in Cluster 1 and Cluster 2. Since there are more variety of source of income from Cluster 1 and Cluster 2, households reliant on agriculture as main income are lesser, especially in Cluster 1. These might be explained by the average farmland size at Cluster 1 of 8±0 acres. Meanwhile, the average farmland size at Cluster 2 and Cluster 3 are 36±0 and 30±0 respectively. Despite the overall high number of satisfactions of household surroundings of 81.6 per cent, households in Cluster 1 reported most unsatisfied with their household surroundings (11%) compared to Cluster 2 (2.6%) and Cluster 3 (4.8%).

Cluster 3 is observed to face greater overall Water vulnerability among other clusters ($W_{Cluster1}$ 0.482; $W_{Cluster2}$ 0.725; $W_{Cluster3}$ 0.771). About 81.9 per cent households in Cluster 3 do not have consistent water supply, followed by 68 per cent in Cluster 2 and 59.8 per cent in Cluster 1. Apparently, Sadong Jaya has been experiencing low water pressure following the increase of population and higher usage, especially during dry seasons (JBALB, 2018). This results in shortage of water throughout the year in 2018. The villagers in Sadong Jaya had to resort on external water supply from Sarawak Rural Water Supply Department

(JBALB) and rainwater for survival. A high number of households in Cluster 2 (76.9%) and Cluster 3 (72.3%) utilize natural water sources from river, rain or lake as their water course, compared to 36.59 per cent households in Cluster 1.

The Social Network sub-component in the LVI were almost equally similar for all the 3 Clusters ($S_{Cluster1}$ 0.539; $S_{Cluster2}$ 0.514; $S_{Cluster3}$ 0.484). About 89.7 per cent households in Cluster 1, 91.1 per cent in Cluster 2 and 87.6 per cent in Cluster 3 did not refer to any authority. The authority in this study refers to the community leaders, assemblymen or any agencies. Being stated that, 97.4 per cent households in Cluster 2 reported of not receiving any kind of support/ help from any agencies, followed by households in Cluster 1 (93.9%) and Cluster 2 (92.8%). The participation of overall communities in all 3 clusters on average is about 1.62 organizations where headmen of villages participate in up to 7 organizations. Households in Cluster 1 have higher number of passive households at 25.6 per cent. In Cluster 2, 14.1 per cent of households are passive households while in Cluster 3, 7.2 per cent are passive households. The most participated community events are *gotong-royong* activities which are almost compulsory for all households. Although majority of households are satisfied being part of the community, a small number of households are left unsatisfied. Cluster 1 showed a higher unsatisfactory level of 6.3 per cent, followed by Cluster 3 of 5.9 per cent and Cluster 2 of 2.9 per cent. The satisfactory indicator is taken into account few indicators: housing condition, daily routines, comfort in communication and meeting with other villagers, willingness in sharing knowledge and experience with other villagers, security level, and willingness of participating in events.

As for the last component, the Natural Disasters and Climate Variability was merged into one single data without grouping into clusters. This was due to the data retrieval which was based on the nearest meteorological station in Paya Paloh (Latitude: 1° 27' N, Longitude:

110° 29' E). Hence, the overall Natural Disasters and Climate Variability component in the LVI is 0.512 for all three clusters. The mean standard deviation of monthly average maximum daily temperature between year 2010 to 2020 was recorded 32.1°C while the mean standard deviation of monthly average minimum daily temperature between year 2010 to 2020 was recorded 23.7°C. The mean standard deviation of monthly average precipitation between year 2010 to 2020 was 42.33.2mm.

Table 4.7: The indexed sub-component values for Cluster 1, Cluster 2 and Cluster 3

Main Components	**Sub-components**	**Cluster 1**	**Cluster 2**	**Cluster 3**
Socio-Demographic Profile (D)	Dependency ratio	0.174	0.204	0.16
	Percentage of female headed household	0.171	0.026	0.06
	Average age of FMM	0.333	0.444	0.444
	Percentage where the head of household has not attended school.	0.146	0.154	0.096
Health (H)	Percentage of households without sanitary latrine/ toilet equipped with pump	0.488	0.5	0.422
	Percentage of household head sick for 3 days consecutively	0.329	0.269	0.205
Food (F)	Average crop diversity index	0.466	0.28	0.194
Livelihood Strategies (L)	Average farmland size	0.045	0.148	0.106
	Average livelihood diversification index	0.574	0.58	0.625
	Percentage of households solely reliant on agriculture as main source of income	0.061	0.128	0.169
	Percentage of households who are not satisfied with their household surroundings	0.11	0.026	0.048
	Percentage of households with family member working in a different community	0.524	0.526	0.53

Water (W)	Percentage of households without consistent water supply	0.598	0.68	0.819
	Percentage of households that utilize natural water source from river, rain or lake as their water source	0.366	0.769	0.723
Social Network (S)	Percentage of households who do not refer to any authority (head of community, sub-district/ district officer, any agencies)	0.897	0.911	0.876
	Percentage of households who do not participate in any community events	0.256	0.141	0.072
	Percentage of households who are not satisfied being part of the community	0.063	0.029	0.059
	Percentage of households who do not receive any kind of support/ help from any agencies	0.939	0.974	0.928
Natural Disasters and Climate Variability (C)	Mean standard deviation of monthly average of average maximum daily temperature (years 2010-2020)	0.623		
	Mean standard deviation of monthly average of average minimum daily temperature (years 2010-2020)	0.391		
	Mean standard deviation of monthly average precipitation (years 2010-2020)	0.521		

Overall, Table 4.7 displayed that Cluster 2 has the highest LVI followed by Cluster 1 and Cluster 3 ($LVI_{Cluster2}$: 0.207; $LVI_{Cluster1}$: 0.206; $LVI_{Cluster3}$: 0.19, respectively). The outcome of the major component calculations was outlined collectively in a radar diagram as shown in Figure 4.7. The scale of the diagram (refer Figure 4.4) ranges from 0 (least vulnerable) from the centre point, extending to 0.8 (most vulnerable) at the outer edge, with a 0.1unit increments. Cluster 1 is more vulnerable in terms of health, food and social network

compared to Cluster 2 and Cluster 3 respectively. Conversely, Cluster 1 scored less vulnerability in terms of water resources and livelihood strategies, followed by Cluster 2 and Cluster 3. Intensity wise, Water security was a critical issue in Cluster 2 and Cluster 3 while Food security was critical in Cluster 1.

Table 4.8: The major component values and LVI for Cluster 1, Cluster 2 and Cluster 3

Main Components	**Cluster 1**	**Cluster 2**	**Cluster 3**
Socio-Demographic Profile (D)	0.206	0.207	0.19
Health (H)	0.409	0.385	0.314
Food (F)	0.466	0.28	0.194
Livelihood Strategies (L)	0.263	0.281	0.296
Water (W)	0.482	0.725	0.771
Social Network (S)	0.539	0.514	0.484
Natural Disasters and Climate Variability (C)	0.512	0.512	0.512
Livelihood Vulnerability Index (LVI)	**0.410**	**0.415**	**0.394**

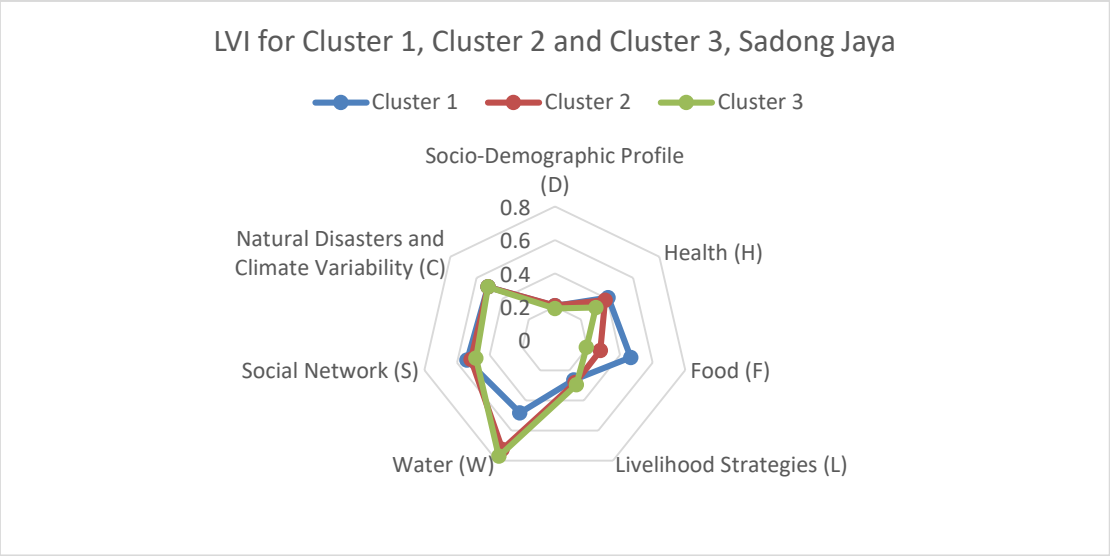

Figure 4.7: Radar diagram of Livelihood Vulnerability Index (LVI)

Based on the composite index of sustainability, the sustainability index for Cluster 1 is 2.439, followed by 2.410 for Cluster 2 and 2.538 for Cluster 3. As the greater value indicates a greater degree of sustainability, Cluster 3 is found to be the most sustainable compared to the other clusters. The latter due to the findings which shows a lower vulnerability score in all components except Water component.

4.6 Capital Assets

This sub-topic aims to answer the second objective which is to identify the capital assets available at Sadong Jaya. According to Krantz (2001), livelihood assets are possessions which enables the communities to have the ability to pursue different livelihood activities in meeting their basic needs and in mitigating or adapting disruptive changes. Indeed, the Sadong Jaya riverine communities depend on the various resources available to sustain livelihoods. These assets can either protect them from being vulnerable (Twigg, 2001), or enable them to survive shocks and more resilient (Chambers & Conway, 1992). There are five livelihood assets discussed namely: natural capital, human capital, physical capital, financial capital, and social capital.

4.6.1 Natural Capital

Natural capital is referred to land resources, forest resources, fishes, livestock, and natural water sources. Natural resources provide food, water, irrigation, fuel, materials for constructions, means of transportation and income, which also act as an insurance to help them weather calamities (USAID, 2018) Villagers at Sadong Jaya still have high dependency on natural capital in sustaining livelihoods. Dependence on the natural resources has been shown in many similar livelihoods such as Bembridge (1986), Béné (2006), Jawol et al. (2018), Katiha et al. (2017), Ofoegbu et al. (2017), Owusu et al. (2017), Regmi & Weber (2000), Sait et al. (2018), Sanggin et al. (2016) and Shalaby et al. (2011).

A small amount of mangrove along the coastal settlements are still found as most are cleared for housing and agricultural purposes. Based on the definition provided by (FAO, 2015, p. 6), there are no forest resources left at Sadong Jaya as forest to agricultural land conversion took place rapidly over the last 20 years (Hon & Shibata, 2013; Kamlun et al., 2011). Similar settings are also found in Sadong Jaya. The loss of forest resources largely advocated to issues dealing with the complexities of land ownerships (Hon & Shibata, 2013).

There are three types of land ownerships identified in Sadong Jaya, namely native customary land, native area land and mixed zone land (Bian, 2007; Bulan, 2006). In general, a total of 134 (55.1%) households have access to land rights. Meaning that a household member has ownership certificates for a particular piece of land. A higher proportion of riverine communities in Sadong Jaya own the native customary land title where 115 (47.3%) households own between 0.1 acres to 25 acres of land; native area land is acquired by 127 (52.3%) households own between 0.25 acres to 36 acres, while 7 (2.9%) households own mixed zone area land between 0.5 acres to 33 acres land. These lands are used for residential, cultivation or left idle.

With having terrestrial and marine natural resources surround (Md Yassin et al., 2014), most land resources are being used for cultivation by farmers and smallholders planting mainly commodity crops such as palm oil, bananas, and coconuts. Other cultivation includes swamp paddy, fruits, and vegetables mainly for own consumptions. A total of 1,555,828 hectors of land in Sarawak is used for palm oil expansion from existing cropland or at the expense of forest conversion. Many of them are smallholders who mix commodity and subsistence crops (NEPcon, 2017; Shalaby et al., 2011). There are two types of smallholders in Sadong Jaya. Independent smallholders who are cultivate crops without external assistance (either private or government), or organized smallholders who are supported by a company or a government state agency in a joint venture which provide technical assistance, agricultural input, or financial support (Dilipkumar et al., 2017). There are also collective smallholders who participate in joint venture schemes with other landowners with customary land rights. In this joint venture, the owner receives a share of profit based on equity and the company leases land use rights with the government acting as a mediator and trustee. The villagers in Sadong Jaya own a total cultivated land area between zero acre and 36 acres of land with a mean of 2.77 acres.

In terms of fishery resources, present catches consist of a wide variety of fishery resources from Batang Sadong and the coast of South China Sea. In this study, a total of 27 (90.0%) villagers involved in fisheries activities over 30 villagers have complained of depleting fishery resources. Fishes such as the toli shad *(Tenualosatoli* or *ikan terubuk),* silver or white pomfret (*Pampus argenteus* or *ikan kilat),* black pomfret (*Parastromateusniger* or *ikan bawal hitam*), fourfinger threadfin *(Eleutheronemarhadinum* or *ikan senangin),* Belanger's croaker *(Johniusbelangerii* or *ikan Panjang),* jellyfish (*Rhizostomeae, Scyphozoaspp*or obor-obor) and tardoore (*Opisthopterus*

Tardoore or *ikan puput*) are seasonal fishes caught after monsoon seasons. Scaly hairfin anchovy *(SetipinnaTaty* or ikan *empirang),* Bombay ducks *(Harpadonbehereus* or *ikan lumek)* are non-seasonal fishes caught all year round.

Although reducing in quantities over the years due to overexploitation, the giant river prawns (*Macrobrachiumrosenbergii* or *udang galah*), bamboo clams (*Solen regularis* or *ambal*), prawns and various edible gastropods have been iconic Sarawakian delicacies loved by many. These fishery resources are 'collected' or 'caught' nearby riverbanks when the tides are high, especially during raining seasons.

4.6.2 Human Capital

Human capital encompasses the skills acquired in labour force through education, study, apprenticeship in a person (Goldin, 2014). They are capacities, knowledge and attributes which influences the earning capacities and productivity (Sen, 1997).

There are five members in a household on average in Sadong Jaya, almost similar with data of six person per household on average in South-Eastern Asia (UN, 2019). There are 222 (91.4%) households which are male headed households while 21 (8.6%) households are female headed households. This shows that women still adhere to the traditional role of women being the homemaker while men being the breadwinner (Sultana & Mohd Zulkefli, 2012).

Table 4.8 describes the age groups of household heads involved in this study. Most household heads are within the age group of 30 and 89 years old with an average of 54.97 years old. It is found that majority (94, 38.75) household heads are within the range of 51 to 60 years old, followed by 57 (23.5%) within the age of 61 to 70 years old and 56 (23.0%) within the age of 41 to 50 years old.

Table 4.9: Age groups of household heads

Age Group (Years old)	Frequency	Per cent (%)
Less than 30	1	0.4
31-40	21	8.6
41-50	56	23.0
51-60	94	38.7
61-70	57	23.5
71 above	14	5.8

According to (UN, 2019), the Asian region tend to have higher proportion of older household heads (aged above 65 years old). In Sadong Jaya, there are 52 (21.3%) households where household heads are of older age. From the households, twelve (4.9%) households consist of household heads who are widow mothers and grandmothers. Rahman (1999) states about the declining financial impact on elderly head of household as it does not signify greater access to household resources and health status. These households are headed by older generations out of respect as parents in the decision-making process, of which eventually pass over the mantle of leadership to their sons. Being said that, elderly men still retain ownership of assets and economic power being able to work outside compared to elderly women who become dependent with limited mobility and less assets Rahman (1999).

Education plays an important role in the foundations of human capital and is often regarded as a major source of employment. The household heads in Sadong Jaya are literate as the mean education level of between upper primary and lower secondary school. About 32 (13.2%) household heads did not have any formal education, 85 (34.9%) attended primary education, 118 (48.6%) attended secondary education and only eight (6.9%) managed to attain tertiary education.

As for the members within a household, the working individuals are between zero and seven members in each household who are in the workforce. About 101 (41.6%) households have a sole breadwinner followed by 135 (55.6%) households having two or more family members generating income in the workforce. The remaining seven (2.9%) households do not have any family member participating in the workforce.

The labour market in Sadong Jaya is limited. Besides being involved in agricultural, fisheries and animal husbandry, many have migrated to bigger cities to find better employment opportunities. This is shown through the migration pattern of family members where 128 (52.5%) households have at least one family member working in different communities. Those who migrated, are majority children of communities who are working in Kuching or other cities. Mohd Nor & Said (2014) and Xing (2016) elaborated that those aspiring and skilled labour are more likely to migrate to regions which provide better job and self-advancement opportunities.

In terms of the amount of expertise, about 169 (69.5%) households heads are semi-skilled where their skills are acquired from working experience of more than 10 years in their respective fields. These fields majority are skills acquired from agriculture and fisheries with only six household heads mentioned that they have more than 10 years' experience of operating businesses. Those who have attended formal training and obtained certificates consist of 25 (10.3%) household heads. These household heads work majority work in public sectors (9 households, 3.7%), followed by labourers (5 households, 2.1%) while the remaining from agriculture, trading, and private sectors. There are 14 (5.8%) household heads who have working experience of less than 10 years, most of whom work in agriculture and labour work. The remaining 38 (15.6%) heads do not work at the period of data collection. The household heads, who are many elder people, indicated that most elder

people possess skills through work experience despite lacking in formal education. This finding has been similar with findings from Md Yassin et al. (2018).

In overall, Sadong Jaya possesses a diversified human capital in various fields. The main economic found in Sadong Jaya is agriculture. Fishing activities are more likely to be found living near the coast/ lower estuarine region of Sadong Jaya. Coastal villages such as Kampung Semera, Kampung Jemukan have more fishermen compared to other villages. Many of these fishermen are recreational fishers who fish for self-consumption during their free time. Other economic activities include small scale businesses and labour work in manufacturing and production industries. Majority of skills are passed down from generations to generations. For example, the skills acquired from 174 (91.1%) in agriculture households, 27 (90.0%) fishing households, 16 (84.2%) in animal husbandry and 44 (69.8%) in other economic activities, are obtained from their parents and family members. Six villagers who carry out other activities, one farmer and fisherman each mentioned that they obtained their skills themselves. There were 7 (2.9%) farmers, 2 (0.8%) fishermen, 3 (1.2%) who rear animals and 8 (3.3%) who carry out other economic activities, acquired their skills from friends or villagers. Nine (3.7%) farmers received formal training and certificates from agencies such as Department of Agriculture (DOA), Malaysian Palm Oil Board (MPOB), Federal Land Consolidation and Rehabilitation Authority (FELCRA) and a private entity whom a respondent failed to recall. There were four respondents who received training in sewing, knitting and language training from *Pusat Latihan Kraftangan Epal Kuching*, *Giatmara* and a community college.

As Sen (1999) has discussed on one's acquisition in literacy and education which includes skill sets, enables them to be more efficient and can enhance the ability to improve quality of life. In the context of Sadong Jaya, agricultural skills and fishing skills are very

important to the riverine communities. Of the 30 fishermen household, 21 (70.0%) have knowledge of knowing the suitable season to catch certain fishes; 24 (80.0%) have knowledge of detecting suitable weather for fishing activities; 29 (96.7%) have knowledge of identifying fish species; ten (33.3%) have knowledge of identifying fish locations; two (6.7%) have skills in making fishing nets; three (10.0%) have skills in repairing fishing nets; two (6.7%) in making boats; five (16.7%) in repairing boats; and seven (23.3%) in processing fishery products for sale. Table 4.9 shows the skills and knowledge acquired by fishermen in Sadong Jaya.

Table 4.10: Knowledge/ Skills acquired by fishermen

Knowledge/ Skills	**Frequency (n=30)**	**Percentages (%)**
Suitable season to catch certain fishes	21	70.0
Detecting suitable weather for fishing activities	24	80.0
Fish species identification	29	96.7
Fish location identification	10	33.3
Making fishing nets	2	6.7
Repairing fishing nets	3	10.0
Making boats	2	6.7
Repairing boats	5	16.7
Processing fishery products for sale	7	23.3

Among the 208 farming households, 158 farmers (82.7%) having knowledge in choosing suitable soil types for cultivation; 158 (82.7%) have knowledge in identifying crop diseases; 178 (93.2%) have knowledge in choosing the suitable fertilizers to use on their cultivation; 171 (89.5%) possess knowledge in the quantity and frequency to use fertilizers; 165 (86.4%) farmers knows how to measure and plot their crop distance; and 163 (85.3%)

have knowledge in using suitable agrochemicals to use for their crops. Table 4.10 shows the knowledge and skills acquired by farmers.

Table 4.11: Knowledge/ Skills acquired by farmers

Knowledge/ Skills	**Frequency (n=191)**	**Percentages (%)**
Suitable soil for cultivation	158	82.7
Identifying crop diseases	158	82.7
Suitable fertilizers to use	178	93.2
Quantity and frequency of fertilizer usage	171	89.5
Distance between each crop	165	86.4
Suitable Herbicides or pesticides to use	163	85.3

A majority of 19 (95.0%) stockmen out of a total 20 households have knowledge in the techniques how to rear livestock. Only one (5.0%) each stockman has knowledge in identifying livestock disease and swiftlet farming. None possessed knowledge in milking and mating seasons. Table 4.11 shows the knowledge and skills acquired by stockmen.

Table 4.12: Knowledge/ Skills acquired by stockmen

Knowledge/ Skills	**Frequency (n=20)**	**Percentages (%)**
Techniques in livestock care	19	95.0
Livestock disease	1	5.0
Milking techniques	0	0.0
Swiftlet farming	1	5.0
Mating seasons	0	0.0

4.6.3 Physical Capital

Physical assets are ownerships or infrastructures necessary to support livelihoods (Scoones, 1998). They comprise of the access and availability of affordable modes of transportations, roads, water supply and equipment used for economic activities. These also include houses, services, and facilities. The situation in Sadong Jaya is similar with Rahman & Akter (2014) who discuss that access to roads and electricity improves both income and employment opportunities from the non-farm economy.

It is worth noting that Sadong Jaya went through a dramatic physical development growth in the 1980s as many infrastructures such as electricity, bridges, watergates, roads connecting one village to another, and proper drainage systems were constructed. Villagers in Sadong Jaya were accessible to electricity since 1980s before they converted from using generators since late 1960s. During those days, electricity was only available from 6pm daily until 6am. Presently, almost all houses have electricity supplied by Sarawak Electricity Supply Corporation (SESCO). Those who do not, are houses where their electricity supply is connected from their parent houses. Based on Kabir et al. (2012), having better access to physical capital indeed is considered the most valued element in society, of which indicates a higher social status compared to other communities.

Physical infrastructures especially roads and bridges have improved and reshaped livelihoods of the riverine communities in terms of accessibility to the market to sell and buy services and goods to improve well-being besides sustaining their economic activities as well as facilitating mobility among villagers to access job markets. There are few markets in Sadong Jaya located in Semera area and Sadong Jaya area. Since there are grocery shops in almost every village, the villagers can now buy necessities within walking distance. The

grocery lorries drop by daily to every fortnight to deliver goods, packaged food, fresh fruits and vegetables. These fresh fruits and vegetable can be picked up from local farmers or delivered from other areas. As for villagers who carry out palm oil or other commodity crops, there are loading stations in almost every village for palm oil cultivators to sell their palm oil fruits.

The riverine communities at Sadong Jaya have relied on river transportation for many years using motorboats and *sampan/ perahu*. Express boats were used to travel to town in 1996. These express boats, which can accommodate 40-70 passengers, were high depending on the tides. Each tides took approximately six hours which were sometimes irregular. The small capacity and limited time gap resulted in a longer waiting time for the villagers to travel to cities, especially during harvest seasons when villagers transport their harvest to the city to sell.

Roads in Sadong Jaya were replaced with tar-sealed roads from 1978 onwards. In year 2000, the roads were slowly extended to farmlands. Bigger roads and a highway were built to connect villages to bigger towns soon after since 2004. The riverine communities started using road transportation instead of river transportation gradually with the completion of Sadong Jaya Bridge in October 2016 an the Samarahan Bridge in June 2018. The accessibilities alleviated by bridges have drastically cut down the travel time from two hours to approximately 45 minutes from Sadong Jaya to Kuching. The shorter travelling time without being restricted by tidal condition and weather have enabled more youths opting jobs in various fields in the city compared to the limited job opportunities available in Sadong Jaya. This finding is in line with Ifejika et al. (2013) where riverine communities are able to make use of the emerging opportunities to gain additional income from these development and infrastructures.

According to Md Yassin et al. (2018), human capital emerged to be best possessed asset by rural youths. This is possibly due to the access to education and training facilities available in Sadong Jaya. There are a total of 11 primary schools (nine national schools and two Chinese schools), three secondary schools, and two training facilities (refer Table 4.12).

Table 4.13: Education and training facilities in Sadong Jaya

Primary schools	*Sekolah Kebangsaan Jemukan* *Sekolah Kebangsaan Iboi/ Pelanduk* *Sekolah Kebangsaan Haji Kelali Semera* *Sekolah Kebangsaan Sungai Buluh/ Senangeh* *Sekolah Kebangsaan Terasi* *Sekolah Kebangsaan Haji Bujang Rangawan Putin* *Sekolah Kebangsaan Ja'ie* *Sekolah Kebangsaan Pendam* *Sekolah Jenis Kebangsaan (Cina) Chung Hua Semera* *Sekolah Jenis Kebangsaan (Cina) Chung Hua Jemukan*
Secondary schools	*Sekolah Menengah Kebangsaan Sadong Hilir (Semera)* *Sekolah Menengah Kebangsaan Sadong Jaya* *Sekolah Menengah Kebangsaan Pesantren Abdul Taib Mahmud*
Training facilities	*Giatmara Jemukan* *Giatmara Batang Sadong* Courses offered in these facilities include automotive technology, motorcycle technology, and fashion and dressmaking.

In year 1984, as development and palm oil plantations took place in a bigger scale, the drainage system, bund and watergates were upgraded in Sadong Jaya. These infrastructures play a big role in protecting farmland and houses in Sadong Jaya. The bund was built stretching form Asajaya coast to the upper estuarine at Sungai Buluh in Sadong

Jaya. The drainage systems were built from the river opening into the interior regions and farmlands of Sadong Jaya while watergates are built at the river mouths in Sadong Jaya.

These watergates were built in two phases, in 1986 and 1990 (refer Table 4.13). It acts as a control to regulate sea water and river water flow in the village. The watergates protect crops and properties from being destroyed or damaged by flood. The number of gates differ according to the width of the river mouth. Excess water is flowed out where gates remain closed during heavy rains and high tides. On other days, the gates are open to provide irrigation to farmlands and daily consumption.

Table 4.14: List of villages with watergates equipped with watergates built in two phases

Villages with watergates in Sadong Jaya	
Phase 1 (1986)	**Phase 2 (1990)**
Kg Semera	Kg Sg Bilis
Kg Jemukan	Kg Sg Putin
Kg Pelanduk	Kg Terasi
Kg Jaie	Kg Sg Buluh

In terms of water supply, the pressure of treated water in Sadong Jaya has been low due to the increasing water demand from increasing population and the distance of the village from the main water treatment plant. This results in the riverine communities being dependent on rainwater and river water to live. Ponds and well water are also used as source of water for daily use. During drought seasons or when water is scarce, the riverine communities rely on the Sarawak Rural Water Supply Department to deliver water sources from houses to houses to survive.

According to Safurah et al. (2013), each health clinic is built to cover 15000 to 2000 people while a community clinic cover from 2000 to 4000 people to provide more comprehensive care. In Sadong Jaya, there are three healthcare centres within the sub-district of Sadong Jaya: *Klinik Kesihatan Semera, Klinik Kesihatan Jemukan* and Klinik Kesihatan Sadong Jaya. Despite that, the villagers are free to visit neighbouring health centres such as public clinics in Simunjan area, Asajaya area, Kota Samarahn area and Kuching area.

According to Harlyan & Matsuishi (2017), Malaysian fisheries consist of multi-gear and many fishers with many landing sites and data-poor situation. Many fishermen at Sadong Jaya use *pukat hanyut* (drift nets) and *jala* (cast nets) with a small number using *rawai* (long line fishing) and *paka* (gill nets) in their fishing activities. These findings are consistent with data found from FAO (2019) and Department of Fisheries (2018). *Jala* is an active fishing method where it is thrown into the water where fishes are abundant, and then pulled back up by the fishermen. *Pukat hanyut* and *paka* are more passive where the *Pukat hanyut* is attached to floats and left onto the sea water while *Paka* has nettings attached to wooden panels and is installed into the seabed. Both *Paka* and *Pukat hanyut* are left for a couple of hours until they are pulled back by the fishermen. *Rawai* has a long rope about five metres where many hooks are attached. A heavy object, usually an anchor is tied to sink the rope and left for a couple of hours before it is pulled back up again.

The fishing gears can be handmade or assembled themselves using similar net-making techniques, or store-bought. The cost of these gears varies from the shape and size. Although many of these gears are bought from local stores, some villagers possess skills in making these gears. According to Gopinath (1950), net length and depth largely depend on the locality in which the net is used. Similar with findings found in Sandhya et al. (2019), most gears used are made of nylon and resources obtained from the surroundings. About 11

(40.7%) fishermen involved in this study use different type of net within the price range of RM10 to RM500 in their fishing activities. These nets are usually repaired or thrown as they can easily get thorn when get stuck onto objects.

Many of the fishermen in Sadong Jaya possess diesel or petrol engine boats for their fishing activities. Boats used in Sadong Jaya are either fibre boats or wooden boats, within the range of 10 to 125 horsepower. There are four fishermen in this study who own boats (two fibre boats and two wooden boats). The boats are handmade themselves which cost them around RM5000 to RM10000, while the engines cost within the range of RM400 and RM25000. The maintenance of these boats and engines depends on the frequency of fishing activities carried out by the fishermen. Usually, the boats are be painted after every trip. Maintenance for the engines depends on the spoilt spare parts which can sometimes cost the fishermen up to RM1000 each time.

Based on the 30 fishermen involved in this study, most are recreational fishermen who fishes at a household level while three involve in fish trading activities, who do not use any equipment. Hook and line fishing is found to be the most common fishing method. The hook and line fishing are a hand line fishing method using a nylon or cotton twine secured to one end of a flexible bamboo rod *(Joran)* and the other with a hook (*Mata kail*) where small fishes, shrimps and worms are attached as bait. *Joran*, where 50.0 per cent respondents owned, are bought within the price range of RM75 and RM400. The gear often does not require any maintenance unless there are parts which are faulty. Most of the time, the *Joran* can last for a very long time except when the nylon string is broken off, a small fee of RM3 per metre of nylon string is charged to replace for a new string. The round barbed hooks are usually in the form of a “J” shape, either store bought or self-made using unwanted metal rods.

About three (11.1%) fishers of the 27 fishers use pot traps in their fishing activities. These traps come in different shapes and sizes depending on the type of fishes to catch and the materials used. *Bento Ketam* and *Bubu* are usually baited with food and have a funnel-shaped entrance where crabs and fishes can enter without having to escape easily. A *bento ketam* is a trap made to catch crabs while a *Bubu* functions to catch fishes. A *bento ketam* normally has a rectangular or semi-sphere wire frame covered and tied with nettings, a float, and strings while a *bubu* normally comes in the shape of a cylinder made using either bamboo or wires. These traps can cost around RM3 to RM50 depending on the quality, shape, and size of the trap. Although the villagers use their bare hands to catch these mollusc species, sometimes, a hoe is used to dig and scrap deeper soil areas. Besides that, buckets are considered as a complimentary equipment used by most of fishermen to contain their catches to bring back home.

As highlighted by Boncinelli & Casini (2014), agricultural households have less "material" well-being in terms of cash income and housing, they are better endowed with intangible well-being like health, environment, safety including the social networks. That is why we could see more than 20 per cent of the households participated in agriculture out of their interest and passion in Batang Sadong to sustain their livelihoods.

As agriculture is one of the major occupations at Sadong Jaya, many farmers inherited and adopted traditional farming techniques. Traditional farming equipment and tools are carried from generations to generations used for preparing land for cultivation, planting, harvesting and post-harvest (Combis, 2019). A variety of tools are used by farmers at Sadong Jaya in their farming activities. These tools are made of wood or different types of metal scrap (blades, files etc) and steel.

Majority of the farmer still use manual tools in their farming activities namely machete, sickle, hoe, sprayer, shovel, bush cutter. *Parang* (Machete) is found to the most common equipment where 138 (66.0%) mentioned using it in their agricultural activities. *Parang* has a straight or slightly convex cutting edge, where the blade is broadest and heaviest at the tip (Mohammed et al., 2018). It can be useful in pruning overgrown stems and weed. The *parang* can be made from many types of wood materials or bamboo materials. This equipment is a very useful equipment and can last for a very long time, making it a very sustainable where some are passed down from generations. Some *parang* are self-made while some are store bought which cost approximately RM20.

According to Combis (2019), the shape and size of sickles used depend on the customs, preferences and cropping patterns. *Pengetam padi*, *pengait*, *lengkuk* and *sabit* are some of the many types of sickles used among the farming communities at Sadong Jaya. These tools average cost between RM7 and RM30. *Pengait* has a sickle attached with a long wooden or plastic rod. The *pengait* are used to pick oil palm fruits and prune taller tree branches or leaves. A *pengait* can be attached to bamboo, wooden or metal rods up to three-metre-long to reach higher branches. *Lengkuk* has a flat and slightly curved surface blade while *Sabit* has a very cursive blade. These tools are commonly used to harvest or prune short-stalked varieties. In addition, some farmers use *lengkuk* to plant seedlings into the soil.

S*ekop* and *sandak* are two different shovels used in land preparation. These tools are used to flatten and even out soil before cultivation. The s*ekop* cost approximately in average RM20. These tools are not maintained as they can last or a very long time. A *kereta sorong* (cart) is also used to collect oil palm fruits and carry from a tree to another tree. To operate the *kereta sorong*, some attach old motor filled with one litre of petrol to reduce energy use in oil palm collection. The *kereta sorong* are made using old wood or bought spending around RM150-

RM200. Besides that, a bush cutter (*Engin rumput)* is used once every year during planting season to prune weeds and overgrown growth. The equipment is uses about one to five litre petrol for about a month. The bush cutter used by the farmers in Sadong Jaya cost around approximately in average RM268.

About 47 (22.5%) respondents mentioned they use fertilizers and agrochemicals such as herbicides or pesticides to produce better harvest. Some of them received these material aids from the Department of Agriculture. Approximately four to five bags of fertilizers consisting of urea, organic and yellow fertilizers are received every four months. The fertilizers, However, the amount received are usually insufficient to maintain. The farmers usually have to purchase additional stock of fertilizers which can cost around RM120 to RM135 for ten kilograms or 50 kilograms of fertilizers while chemicals can cost RM50 for four litre up to RM200 for one gallon. About one to two kilogram of fertilizers and/or approximately 120 litres of chemicals are used for about one acre of land. However, the amount of fertilizers and chemicals used depend on the size of plantation and the condition of a certain crop. According to Mohd Nawi et al. (2015), the use of technovation is still at a very low level at the oil palm plantations. This can be observed in Sadong Jaya from the manual equipment used by the farmers and workers. A knapsack sprayer or motor sprayer is also important tool used as they maintain their cultivation. The knapsack sprayer is worn on the waist and has a tube to enable manual spraying onto the targeted plant while motor sprayer works like a trolley. These sprays averagely are purchased at the price ranging between RM130 and RM200. Pesticides are used twice on short-stem plants; when the leaflets have just sprouted from the seeds to prevent pests from eating the budding, and fruiting period. However, many farmers chose to not spray pesticides on to the fruit to ensure

that the fruit is safe to be ingested. As for palm oil plantations, workers both foreign and local are hired to manually spray the plantation.

Other equipment include gunny sacks, *tuat,tajak, penumbuk padi, raga* and mosquito repellent. Gunny sacks are used to store rice stock to last for the whole year or to sell. These gunny sacks come in various sizes from five kilograms to 50 kilograms. *Tuat* is a wooden frame used to grow crawler plants such as long beans and cucumbers. *Tajak* is a wooden stick with a sharp end used to make holes for paddy planting. After harvesting the paddy, the paddy kernels are pounded using the *Penumbuk padi* (Rice pounder) de-shell into rice. A *penumbuk padi* cost between RM85 and RM180 depending on the size. A *Raga* is a basket made from bemban (*donax grandis*) or nylon. The *Raga* is used to store equipment and/or harvest commonly by the Iban communities from their homes to farm. The mosquito repellent is a preventive tool brought along to the farm used by the farmers to protect themselves from being stung by insects or to kill any nests or insects found at their crops.

There is total 20 respondents involved in animal rearing. Form this figure, 14 respondents own chicken coop (*Reban ayam*) while one respondent each owns a pig cage, a fishpond, a birdhouse, and a bee farm. The chicken coop is mostly made themselves using wooden blocks from their farms. The fishpond is made themselves in front of their house compartment. The water is normally filled with rainwater. A pump to suck honey from bee logs are required at the bee farm while speakers are used to attract birds at the birdhouse. The pump cost around RM100 per pump while speakers can cost up to RM50 per speaker. Ropes are used by those who breed lambs to tie them to trees.

Approximately 62 (25.5%) respondents are involved in other activities. These activities involve 18 grocery trading, 21 operating food stalls selling banana fritters, coconut jelly and confectionaries, nine tailoring, three chips manufacturing, a tour guide, a homestay

operator, a barber and a craft man. Most of this equipment do not require any maintenance unless they get spoilt. The equipment used by these respondents are often equipment which are easily obtain or their used items.

For a grocery trader, racks and shelves are the most essential item they use to store goods. There are two grocers who has freezers to store cold products, while other equipment include refrigerator, table, weighing machine, calculator, and cashier machine. Those who own a restaurant of a food stall, tables and chairs are necessary tools for their businesses. A burger store owner often uses a stove with a burger plate, and a table. The burger plate used are medium sized cost between RM35 and RM120 and can last for a very long period. Most essential item for those who sell fried banana fritters and fried chicken are cauldron, cooking oil, tables, stove, and gas. For the jelly business, the ingredients such as agar powder and flavourings are blended and boiled and put into containers and refrigerated.

The confectionary business includes selling banana crackers and different types of *kuih* such as steamed *lepat pisang*, *kuih drum*, *kuih jala*, *kuih penyaram*, *kuih koci*, *kuih bahulu* and *kuih sepit*. Several equipment such as mixer, large bowl, tongs, moulds, wire mesh, nozzles, stove, steamer, and blender are required. Mixers, blenders are used to blend the ingredients into a fine batter. A mould is used to mould the *kuih bahulu* before putting into the oven to be baked. *Kuih sepit* also uses a mould and put on top of charcoal covered with wire mesh while *kuih drum* are shaped using a ring mould and fried. A nozzle is used for making *kuih jala*to squeeze out batter into different shapes. *Kuih koci* and *lepat pisang* batter are put into banana leaves and steamed. Tongs are used to flip or collect *kuih* or crackers which are cooked.

Dried fish and salted fish processing requires minimum equipment which is a netted frame where fishes are dried while barbers utilize a hair trimmer, grooming scissors where

blades are renewed annually, hair oil and powder; a craft man uses different gears such as the circular saw, grinder, drill, jack saw, and gam in his *Parang* making activities. Sewing machines and embroidery machines and scissors are the main equipment among the tailors. The machines are aids from the Social Welfare Department and *Giatmara*. Some of them bought the machines which cost an average of RM2000. These machines are maintained twice a year using a lubricating oil and chalk. Sometimes, the machine string which cost about RM15 per unit is replaced when it breaks. Two respondents in this study uses the embroidery machine in their tailoring business. These machine cost about RM2500 and is easy to operate as it can work by itself after given instructions. A pen drive which contains files on the embroidery design is inserted into the machine. A catalogue is used to display all the designs available. When an update of design is needed, the tailor brings her pen drive to the centre to update her design files.

4.6.4 Financial Capital

Financial capital is considered as livelihood capital base sustained through savings, wages, inflow of money such as remittance and pensions (Khatiwada et al., 2017; Liu et al., 2018). The diversity of economic activities carried out by the riverine communities have allowed them to obtain financial resources from various sources. In general, the income from main occupation of the villagers is between RM100 and RM6600 with a mean of RM1597.90. Side income of the villagers are within RM0 to RM6000 with a mean of RM558.05. Income from transfers include financial assistance, remittance from family members and pensions. This income received by the villagers are between RM0 and RM3600 with a mean of RM460.40.

According to the national level poverty line income (PLI) at RM2208 (Department of Statistics Malaysia, 2019a), 170 (70.0%) households are still living below PLI while 61

(25.1%) households earn between RM2209 to RM5000. The rest of 12 (4.9%) households earn above RM5000 monthly (refer Table 4.14). According to Table 4.14, riverine communities in Sadong Jaya sustain livelihoods engaging between one to five livelihood strategies from their main occupations, side income and transfers.

Table 4.15: Number of livelihood strategies adopted according to income levels

Number of livelihood strategies adopted	**Income levels**			**Total**
	Below RM2208	**Between RM2209-RM5000**	**Above RM5000**	
1	61 (25.1%)	9 (3.7%)	1 (0.4%)	71 (29.2%)
2	83 (34.2%)	34 (14.0%)	8 (3.3%)	125 (51.4%)
3	23 (9.5%)	16 (6.6%)	2 (0.8%)	41 (16.9%)
4	3 (1.2%)	2 (0.8%)	0 (0.0%)	5 (2.1%)
5	0 (0.0%)	0 (0.0%)	1 (0.4%)	1 (0.4%)
Total	**170 (70.0%)**	**61 (25.1%)**	**12 (4.9%)**	**243 (100.0%)**

According to Table 4.15, a higher number of 118 (48.6%) households are involved in non-agricultural livelihood activities with a gradually decreasing number in non-agriculture dominant (43, 17.7%), agriculture-dominant (42, 17.3%) and pure agriculture (40, 16.5%).

Table 4.16: Livelihood strategies type adopted according to income levels

Livelihood Strategies	**Income Levels**			**Total**
	Below RM2208	**Between RM2209-RM5000**	**Above RM5000**	
Pure Agriculture	28 (11.5%)	11 (4.5%)	1 (0.4%)	40 (16.5%)

Agriculture-Dominant	24 (9.9%)	13 (5.3%)	5 (2.1%)	42 (17.3%)
Non-Agriculture Dominant	27 (11.1%)	15 (6.2%)	1 (0.4%)	43 (17.7%)
Non-Agriculture	91(37.4%)	22 (9.1%)	5 (2.1%)	118 (48.6%)
Total	**170 (69.9%)**	**61 (25.1%)**	**12 (5.0%)**	**243 (100.0)**

The findings somehow contradict with the fact that households who diversified their economic activities are better-off in terms of income compared to those who do not (Nathan & Mohamad, 2014). The findings also show that natural capital dependent households face a negative relationship with income levels (Yassin et al., 2011). The number of livelihood strategies and type of strategies appears no difference in context of Sadong Jaya in regards of income level. This is probably due to the education level (Nathan & Mohamad, 2014) and other factors such as the working age, and type of non-wages activities indulged (Khatiwada et al., 2017).

Despite the dominating non-agriculture type of livelihood strategies adopted by the riverine communities, agriculture is perceived to be the main source of income by 90 (37.0%) households. This is followed by labour work at 25.9 per cent while 5.3 per cent involve in local trading and 1.6 per cent in fisheries. Since infrastructures in Sadong Jaya have drastically improved over the years, many villagers travel to nearby towns and cities to work in the service sector, both government and private. About 4.9 per cent are government workers while 3.7 per cent work in private sectors.

About 10.3 per cent households sustain livelihoods depending on remittance received from their children or relatives. This remittance received are occasional or on a monthly, often in terms of money, groceries, or any necessity supplies for the household. Besides that,

there are also households who depend on government and/or agencies for financial assistance. These include 3.7 per cent who depend on pensions and 1.2 per cent who receive financial aids. The E-Kasih database under the State Welfare Department (JKM) allows relevant agencies such as Fisheries Development Authority of Malaysia (LKIM) to engage with needy communities to provide funding or assistance such as boats, engines, and trawls.

4.6.5 Social Capital

Social capital are mutual understanding, networks, mechanisms, and shared values for participation in decision-making and leaderships at various levels. Dengerink (2013)'s study finds that the presence of institutional structures helps to life up other capital assets. For example, the existence of *E-Kasih* has ease livelihoods of many riverine communities in Sadong Jaya. *E-Kasih* is a database under the State Welfare Department (JKM) which filters and disseminate applications to relevant agencies such as Fisheries Development Authority of Malaysia (LKIM) to such as boats, boat engines and trawls. These services through various mediums and available infrastructures have allowed empowerment (Ifejika et al., 2013) among communities and overall improve living standards in Sadong Jaya.

According to Bebbington (1999), citizens tend to have limited collective actions towards social structures which are more 'vertical' as the influence and access over state and market are far weaker. Villagers are more inclined to seek help on household and financial issues from family members, relatives, and villagers while they seek help from village headmen, politicians, and government agencies on disaster control issues. About 223 (95.9%) respondents refer to their family members on household and financial issues. Relatives are sought after family members on household issues (98, 40.3%) and on financial issues (79, 32.5%). Village headman and government agencies are sought for disaster control

issues where 181 (74.5%) and 65 (26.7%) households respectively. Only 43 (17.7%) households seek politicians on disaster control.

There are several agencies who are involved in the engagement of different stakeholders in Sadong Jaya. In events of disasters, a Disaster Plan is designed and enforced by the district office with collaborations from the Village Community Management Council (MPKK) in an event of disaster such as flood or drought. In flood events which happens almost every year, several departments such as the district office, *Jabatan Kemajuan Masyarakat* (KEMAS), The Malaysian Civil Defence Force (JPAM), Malaysian Armed Force (ATM), Malaysian Fire and Rescue Department (BOMBA), Royal Malaysian Polis, Volunteers Department of Malaysia (RELA), which provided logistics assistance; Social Welfare Department (JKMM) which provided food assistance; Healthy Ministry which provided paramedic care for flood victims.

It was reported that eight villages (Kampung Sungai Bundong, Kampung Terasi Iban, Kampung Sungai Putin, Kampung Sungai Bilis, Kampung Tanjung Kelaso, Kampung Senangeh, Kampung Sungai Buluh and Kampung Rangawan) were affected by drought in March 2018. A drought operation was activated and conducted by the Disaster Operation Committee elected by the village leaders to provide immediate actions to supply water to houses. Sarawak Rural Water Supply Department (JBALB) is responsible for providing water supply multiple times daily which provide primely for drinking and cooking purposes from 10 in the morning until the last village has received water supply.

The Department of Irrigation and Drainage Sarawak is responsible in managing the water which flows into and out of the villages. Besides monitoring the watergates, the department is also in-charged in monitoring the drainage and irrigation systems within Sadong Jaya. The drainage and irrigation systems in Sadong Jaya are cleaned regularly as a

mitigation strategy towards flood events from time to time, once every two months. Despite that, the irrigation and drainage systems within the interior villages are not cleaned thoroughly as the vegetative growth continue to grow, disrupting the water flow.

Department of Agriculture provides farming assistance to certain villagers. Around 21 (8.6%) villages receive farming assistance in terms of seeds, fertilizers, agro-chemicals, and skills. Seeds are on off assistance given to farmers who meet the requirements while fertilizers and agrochemicals are given by phases depending on the type of crops being planted.

Besides that, there are few government bodies which provides financial assistance to the villagers at Sadong Jaya. Old folks at Sadong Jaya who are 60 years old and above are entitled to apply for *Bantuan Warga Emas*, which is a small financial aid given monthly towards old folks. There are households who also receive RM40 rebate from their electricity bills monthly. The Fishermen Association is responsible for holding the fishermen data and attend to their issues. They manage issues and process assistance given by Fisheries Development Authority of Malaysia (LKIM). These assistances are only eligible for pure fishermen who have gone out to sea for a minimum of 120 days. To ensure that there is no misuse of the subsidies, there is a *Ketua Kontek Nelayan (KKN)* or *Ketua Super (KS)* elected in every village who monitors the movements of fishermen. Any fishermen who are found guilty will have their eligibility to receive subsidies and applications revoked. Since 1 January 2019, those possessing *kad nelayan* and/or engine boat license are also eligible to receive an allowance of RM200. Besides that, they are also eligible to receive fishermen insurance for death on water worth RM150 thousand per person inclusive of crewmen. In an event where equipment of fishermen is destroyed from bad weather or big vessels, they can also appeal to bear the cost of repairment. Fishermen who have children are entitled to

receive education funding to study at government institutions for the first semester worth RM500.

At the village level, communications among the villages are made through different methods among the community leaders and villagers. Any announcement or notifications are announced through various methods in the village. Table shows the methods used by several community leaders to disseminate information to their villagers. Table 4.16 shows different method used by the community leaders to deliver messages.

Table 4.17: Different methods used by the community leaders to deliver messages

Village Name	**Methods**
Kampung Senangeh	Speaking through hailer around the village
Kampung Sadong Jaya	Social Network platform (WhatsApp) Weekly announcements in mosque and surau
Kampung Sungai Putin	Announcements from house to house by motorcycle
Kampung Iboi Ulu	Printing and sending notice letters Weekly announcements in mosque and surau Uses a middleman elected from MPKK to deliver letters or notices.

G*otong-royong* is a social activity conducted in every village among the villagers and the community leaders. Designated areas such as the mosque, community centres and houses are cleaned from time to time a year. For example, in Kampung Senangeh, *gotong-royong* are conducted four to six times a year in Kampung Sadong Jaya, and once every month in Kampung Iboi Ulu. For example, in Kampung Senangeh uses hailer around the village, Kampung Sadong Jaya uses social network platform such as WhatsApp groups to disseminate information to the villagers and announcements in the mosque weekly.

4.7 Sustainable Livelihood Index (SLI)

The Sustainable livelihood index (SLI) aims to answer the second objective which is to identify the capital assets available at Sadong Jaya. Table 4.17 shows the Sustainable Livelihood Index (SLI) sub-component values for Cluster 1, Cluster 2, and Cluster 3 in Sadong Jaya as well as the maximum and minimum values for all the clusters combined. The indexed sub-components and major components values for each cluster are presented in Table 4.18 and Table 4.19 respectively while Figure 4.5 shows the radar chart of Capital assets owned by the riverine communities at Sadong Jaya.

Table 4.18: Sustainable Livelihood Index (SLI) sub-component values and minimum and maximum values for Cluster 1, Cluster 2 and Cluster 3

Main Components	**Sub-components**	**Units**	**Cluster 1**	**Cluster 2**	**Cluster 3**	**Max value in all clusters**	**Min value in all clusters**
Human Asset (H)	Highest level of education pursued by head of household	1-No education 2-Lower primary education 3-Upper primary education 4-Lower secondary education 5-Upper secondary education 6-Others 7-Diploma/ Bachelor's degree/	3.67	3.37	3.58	7	1

		Master's degree					
	Working experience of household head	1-Experienced 2-Partial experienced 3-Not experienced	2.32	2.13	2.30	3	1
	Number of labourers in the household	Number	1.69	1.79	2.14	7	0
	Knowledge/ Skills received form related agencies	Per cent	2.4	2.6	4.8	100	0
Physical Asset (P)	Access to treated water	Per cent	59.8	32.1	18.1	100	0
	Farm tools owned	Number	1.77	2.64	3.36	6	0
	Housing Type	1-Wooden 2-Wooden and concrete 3-Concrete	2.37	2.35	2.45	3	1
	Number of Bedrooms	1-1 bedroom 2-2 bedrooms 3-3 or more bedrooms	2.37	2.46	2.76	3	1
	Type of toilet	1-Don't have own toilet	2.57	2.50	2.58	3	1

		2-Without flush system 3-Flush system					
	Ownership of computers	Per cent	11.0	10.3	27.7	100	0
	Ownership of Radios	Per cent	85.4	44.9	86.7	100	0
	Ownership of television	Per cent	97.6	100.0	97.6	100	0
	Ownership of Internet connection	Per cent	8.5	1.3	16.9	100	0
	Number of mobile phones owned	Number	3.32	3.20	3.98	7	0
Social Asset (S)	Number of organizations involved	Number	1.24	1.56	2.16	7	0
	Presence of individuals/ agencies to turn to for household conflicts	Per cent	97.6	98.7	98.8	100	0
	Presence of individuals/ agencies to turn to for monetary shortage	Per cent	97.6	89.7	94.0	100	0
	Presence of individuals/ agencies to turn to during natural events	Per cent	87.8	85.9	95.2	100	0
	Ability to speak out	Per cent	81.7	84.6	86.7	100	0

	Degree of satisfaction in the village	1-Very not satisfied 2-Not satisfied 3-Unsure 4-Satisfied 5-Very satisfied	4.74	4.91	4.75	5	1
Financial Asset (F)	Income from main occupation	Number	1395.20	2288.85	1465.20	6600	100
	Income from side occupation	Number	513.00	1207.70	582.20	6000	40
	Income from transfers (financial assistance, remittance)	Number	801.90	699.50	810.00	3600	50
Natural Asset (N)	Cultivated land area	Number	1.61	5.32	3.81	36	0
	Access to river/ sea resources	Per cent	90.9	100.0	83.3	100	0
	Farming assistance from agencies	Per cent	8.5	6.4	20.5	100	0

In overall, the Sustainable Livelihood Index (SLI) (refer Figure 4.5) for Cluster 2 is the highest compared to the other clusters (0.4611), followed by Cluster 1 (0.4545) and Cluster 3 (0.4543). Among all the five assets, Social Asset (S) scored highest among all other assets (Cluster1: 0.7932; Cluster2:0.7983; Cluster 3: 0.8323) while Financial Asset (F) is scored lowest (Cluster1: 0.1633; Cluster2: 0.2387; Cluster3: 0.1740).

Table 4.19: The indexed sub-component values for Cluster 1, Cluster 2 and Cluster 3

Main Components	Sub-components	Cluster 1	Cluster 2	Cluster 3
Human Assets (H)	Highest level of education pursued by head of household	0.445	0.395	0.430
	Working experience of household head	0.660	0.565	0.650
	Number of labourers in the household	0.241	0.256	0.306
	Knowledge/ Skills received form related agencies	0.024	0.026	0.048
Physical Assets (P)	Access to treated water	0.598	0.321	0.181
	Farm tools owned	0.295	0.440	0.560
	Housing Type	0.685	0.675	0.725
	Number of Bedrooms	0.685	0.730	0.880
	Type of toilet system	0.785	0.750	0.790
	Ownership of computers	0.110	0.103	0.169
	Ownership of Radios	0.854	0.449	0.867
	Ownership of television	0.976	1.000	0.976
	Ownership of Internet connection	0.085	0.013	0.169
	Number of mobile phones owned	0.474	0.457	0.569
Social Assets (S)	Number of organizations involved	0.177	0.223	0.309
	Presence of individuals/ agencies to turn to for household conflicts	0.976	0.987	0.988
	Presence of individuals/ agencies to turn to for monetary shortage	0.976	0.897	0.940
	Presence of individuals/ agencies to turn to during natural events	0.878	0.859	0.952
	Ability to speak out	0.817	0.846	0.867

	Degree of satisfaction in the village	0.935	0.978	0.938
Financial Assets (F)	Income from main occupation	0.199	0.337	0.210
	Income from side occupation	0.079	0.196	0.098
	Income from transfers (financial assistance, remittance)	0.212	0.183	0.214
Natural Assets (N)	Cultivated land area	0.045	0.148	0.106
	Access to river/ sea resources	0.909	1.000	0.833
	Farming assistance from agencies	0.085	0.064	0.205
	Land rights (Ownership of land certificates)	0.720	0.744	0.205

Table 4.20: The major component values and SLI for Cluster 1, Cluster 2 and Cluster 3

Main Components	**Cluster 1**	**Cluster 2**	**Cluster 3**
Human Assets (H)	0.3425	0.3105	0.3585
Physical Assets (P)	0.5547	0.4938	0.5886
Social Assets (S)	0.7932	0.7983	0.8323
Financial Assets (F)	0.1633	0.2387	0.1740
Natural Assets (N)	0.4398	0.4890	0.3373
Sustainable Livelihood Index (SLI)	**0.4545**	**0.4611**	**0.4543**

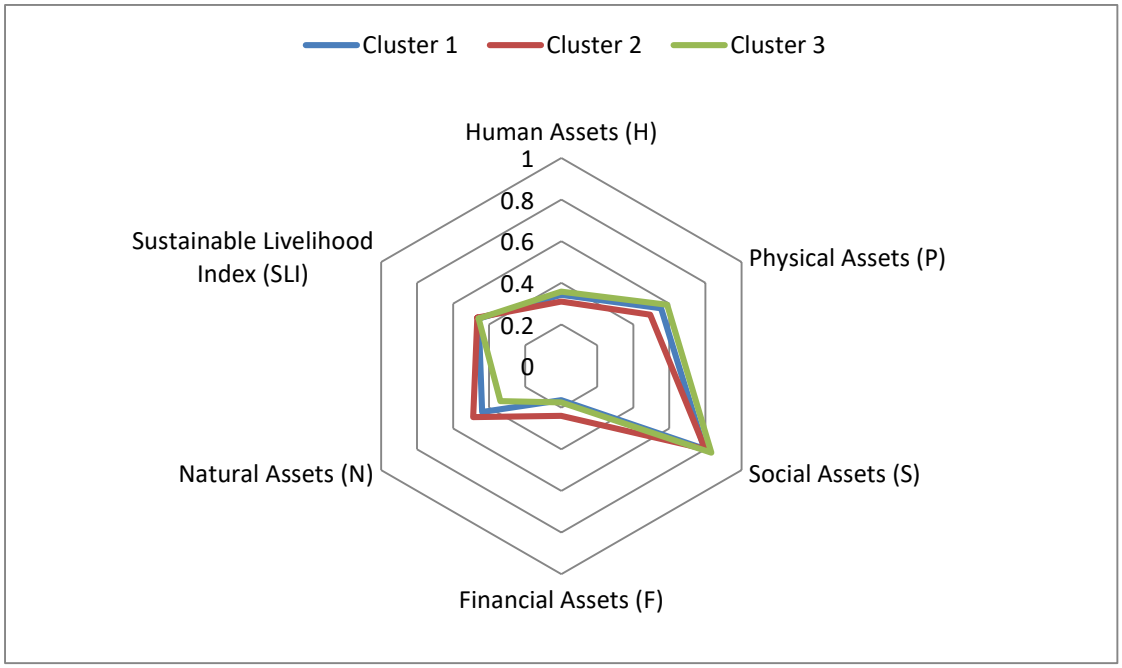

Figure 4.8: Radar diagram of Sustainable Livelihood Index (SLI)

The Human Asset (H) of Cluster 1 is the highest at 0.3425 followed by Cluster 3 at 0.3585 and Cluster 2 at 0.3105. In terms of highest level of education pursued by the head of household, head of households of all three clusters averaged an education level of between upper primary education and lower secondary education. Cluster 1 has the highest average at 3.67 followed by Cluster 3 at 3.58 and Cluster 2 at 3.37. Table 4.20 shows the breakdown of the education level of household heads from all three clusters.

Table 4.21: Education level of household heads

Education level	**Cluster 1**		**Cluster 2**		**Cluster 3**	
	Frequency	**Percentage (%)**	**Frequency**	**Percentage (%)**	**Frequency**	**Percentage (%)**
No education	12	14.6	7	9.0	8	9.6
Lower Primary	5	6.1	8	10.3	7	8.4

Upper Primary	19	23.2	20	25.6	26	31.3
Lower Secondary	16	19.5	19	24.4	16	19.3
Upper Secondary	26	31.7	17	21.8	24	28.9
Certificate / Diploma/ Bachelor's Degree/ Master's Degree	4	4.9	2	2.6	2	2.4

Household heads in Cluster 1 are found to be slightly more experienced in work (2.32) compared to those in Cluster 3 (2.3) and Cluster 2 (2.13). Table 4.21 shows the experience level breakdown of household heads from all three clusters.

Table 4.22: Experience level of household heads

Experience level	**Cluster 1**		**Cluster 2**		**Cluster 3**	
	Frequency	**Percentage (%)**	**Frequency**	**Percentage (%)**	**Frequency**	**Percentage (%)**
Experienced	11	13.4	6	7.7	8	9.6
Partial experienced	50	61.0	63	80.8	56	67.5
Not experienced	4	6.1	2	2.6	5	6.1

Although the number of workforces from a household is highest in Cluster 2 at 7 maximum (7±0), Cluster 2 averages around 1.79 individuals per household. There are more labourers in a household form Cluster 3 where Cluster 3 averages at 2.141 individuals per household (6±0), followed by Cluster 1 where a household maximum has four individuals in the workforce averaging at 1.69 members per household. As for the knowledge or skills received from any related agencies, a relatively high number of villagers (230 households,

94.7%) did not receive any knowledge or skills from agencies. Out of the three clusters, only four households from Cluster 3 and two households each from Cluster 1 and Cluster 2 received knowledge or skills from any related agencies.

The overall Physical Asset (P) in Cluster 3 (0.5696) is higher than in Cluster 1 (0.5335) followed by Cluster 2 (0.4688). Besides having issues in access to treated water ($Water_{Cluster1}$ 59.8%; $Water_{Cluster2}$ 32.1%; $Water_{Cluster3}$ 8.1%), Cluster 3 is found to have more physical assets despite being more interior than Cluster 1 and Cluster 2. In terms of farm tools owned, Cluster 3 had an average of 3.36 tools compared to Cluster 1 (1.77 tools) and Cluster 2 (2.64 tools). The housing type ($House_{Cluster1}$ 2.37; $House_{Cluster2}$ 2.35; $House_{Cluster3}$ 2.45), number of bedrooms ($Bedrooms_{Cluster1}$ 2.37; $Bedrooms_{Cluster2}$ 2.46; $Bedrooms_{Cluster3}$ 2.76) and number of flush toilet system ($Toilet_{Cluster1}$; $Toilet_{Cluster2}$ 2.35; $Toilet_{Cluster3}$ 2.45) in Cluster 3 were skewed towards having more concrete houses with more bedrooms. Table 4.22 shows the housing types and number of bedrooms owned by the riverine communities from all three clusters.

Table 4.23: Housing type, toilet system and number of bedrooms

Housing Type	**Cluster 1**		**Cluster 2**		**Cluster 3**	
	Frequency	**Percentage (%)**	**Frequency**	**Percentage (%)**	**Frequency**	**Percentage (%)**
Wooden	10	12.2	17	21.8	5	6.0
Mixed	32	39.0	32	42.0	36	43.4
Concrete	40	48.8	40	51.3	42	50.6
Number of Bedrooms	**Cluster 1**		**Cluster 2**		**Cluster 3**	
	Frequency	**Percentage (%)**	**Frequency**	**Percentage (%)**	**Frequency**	**Percentage (%)**
1 Bedroom	8	9.8	3	3.8	1	1.2

2 Bedrooms	36	43.9	36	46.2	19	22.9
3 or more Bedrooms	38	46.3	39	50.0	67	77.1
Toilet System	**Cluster 1**		**Cluster 2**		**Cluster 3**	
	Frequency	**Percentage (%)**	**Frequency**	**Percentage (%)**	**Frequency**	**Percentage (%)**
Without flushed	40	48.8	39	50.0	34	41.0
With flush	47	57.3	39	50.0	50	60.0

Ownership of gadgets and electronic devices such as computers, radios, television, and Internet connection owned are shown in Table 4.23. Television is the most owned electronic devices by the villagers in Sadong Jaya. All respondents in Cluster 2 owns a television while in Cluster 1 and Cluster 3 own similar percentages of television at 97.6 per cent. Cluster 3 scored the highest for ownership of computers, radios, and Internet Connection. For ownership of computers, 27.7 per cent households from Cluster 3 owns a computer followed by 11.0 per cent in Cluster 1 and 10.3 per cent in Cluster 2. 86.7 per cent households in Cluster 3 own radios followed by 85.4 per cent and 44.9 per cent in Cluster 1 and Cluster 2 respectively. About 14 (16.9%) households in Cluster 3 owns an Internet line at home followed by seven (8.5%) in Cluster 1 and only one household (1.3%) in Cluster 2. On average, villagers in Sadong Jaya own from 0 to 10 units mobile phones with an average of 3.49 units. Being said that Cluster 3 still owns more units of mobile phones on average compared to other Clusters ($Mobile_{Cluster1}$ 3.32; $Mobile_{Cluster2}$ 3.2; $Mobile_{Cluster3}$ 3.98).

Table 4.24: Ownership of computers, radios, television, and Internet connection according to clusters

Ownership of Computers	**Frequency**	**Percentages (%)**
Cluster 1	9	11.0
Cluster 2	8	10.3
Cluster 3	23	27.7
Ownership of Radios	**Frequency**	**Percentages (%)**
Cluster 1	70	85.4
Cluster 2	35	44.9
Cluster 3	72	86.7
Ownership of Television	**Frequency**	**Percentages (%)**
Cluster 1	80	97.6
Cluster 2	78	100.0
Cluster 3	81	97.6
Ownership of Internet Connection	**Frequency**	**Percentages (%)**
Cluster 1	7	8.5
Cluster 2	1	1.3
Cluster 3	14	16.9

The Social Asset (S) is the highest owned capital asset in Sadong Jaya. In overall, Cluster 3 has highest social asset compared to Cluster 1 and Cluster 2 ($S_{Cluster1}$ 0.7932; $S_{Cluster2}$ 0.7983; $S_{Cluster3}$ 0.8323). Households in Sadong Jaya involve between zero and seven organizations with an average of 1.62 organizations. Cluster 3 has the highest participation in organization with 78 (94.0%) households involved followed by Cluster 2 with 68 (87.2%) households and Cluster 1 with 61 (74.4%) households. Majority of these involvements include village level *gotong-royong* which are conducted from time to time in each village.

Majority villagers at Sadong Jaya has individuals or agencies to turn to if they have issues related to their household or residence. The study found that villagers are more

inclined to seek help on household and financial issues from family members, relatives, and villagers while they seek help from village headmen, politicians and government agencies on disaster control issues. About 80 (97.6%) households from Cluster 1 seek help from individuals or agencies for household conflicts while 77 (98.7%) and 82 (98.8%) households from Cluster 2 and Cluster 3 respectively. More households from Cluster 1 (97.6%) turn to individuals or agencies when they face monetary shortage compared to Cluster 2 (89.7%) and Cluster 3 (94.0%). However, in terms of natural disasters, higher number of households from Cluster 3 (95.2%) have tendency to turn to individual or agencies for help compared to Cluster 1 (87.8%) and Cluster 2 (85.9%). Table 4.24 shows the presence of individuals or agencies to turn to when villagers face household conflicts, monetary shortage or during natural disasters.

Table 4.25: Presence of individuals or agencies to turn to for household conflicts, monetary shortage or during natural disasters according to clusters

Presence of individuals/ agencies to turn to for household conflicts	**Frequency**	**Percentages (%)**
Cluster 1	80	97.6
Cluster 2	77	98.7
Cluster 3	82	98.8
Presence of individuals/ agencies to turn to for monetary shortage	**Frequency**	**Percentages (%)**
Cluster 1	80	97.6
Cluster 2	70	89.7
Cluster 3	78	94.0
Presence of individuals/ agencies to turn to during natural disasters	**Frequency**	**Percentages (%)**
Cluster 1	72	87.8
Cluster 2	67	85.9
Cluster 3	79	95.2

The study also showed a higher number of villagers having ability to speak out to give their opinions or complains. Cluster 3 has the highest number of households at 72 (86.7%) households reporting they voice out their opinion compared to Cluster 1 at 67 (81.7%) households and Cluster 2 at 66 (84.6%) households. The study showed that majority of riverine communities are satisfied living in Sadong Jaya. Cluster 2 is found to have highest households who are very satisfied followed by Cluster 3 and Cluster 1 ($Satisfaction_{Cluster1}$ 0.935; $Satisfaction_{Cluster2}$ 0.978; $Satisfaction_{Cluster3}$ 0.938).

Financial Asset (F) index showed that Cluster 2 scored highest followed by Cluster 3 and then Cluster 1 ($F_{Cluster1}$ 0.1633; $F_{Cluster2}$ 0.2387; $F_{Cluster3}$ 0.1740). As the riverine communities diversify their economic activities, main income from occupation is the highest between RM150 and RM6000 in all clusters. Cluster 2 has higher mean income from main occupation at RM2288.85 followed by Cluster 3 at RM1465.20 and Cluster 1 at RM1395.20. Income from side occupation from all three clusters are between RM40 to RM6000. Cluster 2 has the highest average income from side occupation at RM1207.70 followed by RM582.20 and RM513.00 from Cluster 3 and Cluster 1 respectively. Income from transfers which involve source of income from financial assistance and remittance are between RM50 to RM3600. Cluster 3 has highest average income from transfers at RM810 followed by Cluster 2 (RM801.90) and Cluster 2 (RM699.50).

The Natural Asset (N) from Cluster 2 is the highest with an index score of 0.4611 followed by Cluster 1 at 0.4398 and Cluster 3 at 0.3373. Cluster 2 has a higher score in terms of cultivated land area, access to river and sea resources and land rights. The overall cultivated land owned by the villagers in Sadong Jaya are within zero acres to 36 acres (mean=2.77 acres) while the index score in Cluster 1, Cluster 2 and Cluster 3 is 1.61, 5.32 and 3.81 respectively. Although it is reported that river or sea resources are limited, the study

found that villagers from Sadong Jaya are still accessed to river and sea resources ($Resources_{Cluster1}$ 0.909; $Resources_{Cluster2}$ 1.000; $Resources_{Cluster3}$ 0.833). In terms of farming assistance from agencies, only a small percentage of villagers receive assistance. Cluster 3 has the highest percentage of 20.5 per cent households farming assistance followed by Cluster 1 at 8.5 per cent and 6.4 per cent from Cluster 2. A higher proportion (74.4%) of households from Cluster 2 have ownership of land certificates followed by Cluster 1 (72.0%) and Cluster 3 (20.5%).

4.8 Multinomial Logit Model

The regression aims to link the second and third objectives to find out what are the livelihood strategies used by the riverine communities used to sustain livelihoods using the capital assets available and accessible to them. The results of the multinomial logit analysis of the hypothesized independent variables which affect the livelihood strategies adopted by the riverine communities are provided in Table 4.26. The output of the multinomial regression model reveals that, keeping other factors constant, the odds-ratio in favour of probability in pure agriculture and agriculture dominant livelihood activities decrease by factors of 0.610 and 0.609 respectively as the units of household head highest education level increases by one. Similarly, the interpretation of the odds-ratio is in favour of the probability of the respondents to choose pure agriculture and agriculture-dominant livelihood activities decreases by a factor of 2.136 and 1.596 respectively as the skills level of the household head increases by one unit. This is probably due to having higher education level and skills allowing the villagers to work in higher job opportunities. However, a higher odds-ratio in favour of probability in choosing pure-agriculture was shown with a factor of 1.077 compared to agriculture-dominant with a factor of 3.058 and 1.267 in non-agriculture livelihood activities for every increase in workforce. This is probably due to family members

who have migrated out to cities working in other economic activities, leaving behind other family members who stayed back to work in Sadong Jaya. The model also revealed the odds-ratio in favour for pure agriculture and non-agriculture-dominant livelihood activities to decrease by factors of 0.897 and 1.179 respectively as the respondents receive training assistance from related agencies. This shows that with trainings, the riverine communities can diversify their economic activities to sustain livelihoods.

Besides that, the odds-ratio for treated water indicates that, the probability of households to be involved in pure agriculture and non-agriculture-dominant household decreases by a factor of 1.114 and 1.153 respectively as the riverine communities are accessed to treated water. Also, the odds-ratio for farm tools owned indicated that, the probability of riverine communities involved in pure agriculture and agriculture-dominant livelihood activities to decrease by factors of 6.058 and 3.847 respectively for every increase in one farm tool owned. It is also found that the odds-ratio for households involving in pure agriculture and agriculture-dominant livelihood activities to decrease by factors of 1.065 and 1.280 respectively for having better toilet systems. This is probably due to the increasing purchasing power possessed by the villagers to purchase more tools for their agricultural activities and to upgrade their toilet systems into flushed systems. The model also found that the odds-ratio for households involving in pure agriculture to increase with a factor of 0.809 with better housing type compared to agriculture-dominant (0.941) and non-agriculture-dominant (0.825) activities. This is probably due to riverine communities building more flood resistant houses to prevent from flood events. In addition to that, the odds-ratio in favour of probability in pure agriculture and non-agriculture-dominant households decrease by factors of 0.890 and 0.653 respectively for every increase of number of mobile phones

owned. This can be explained by households consisting of more members working in the agricultural sector.

Adding on, the odds-ratio for help for family conflict indicates that, the probability of households to be involved in pure agriculture and non-agriculture-dominant household decreases by a factor of 1.016 and 18.457 respectively as the riverine communities turn for help from family conflict. This is probably due to the discrete information within the family members who prefer to keep it among themselves. Conversely, the odds-ratio for help for financial conflict and disaster conflict shows higher probability for non-agriculture-dominant households by factors of 0.84 and 0.96 respectively. The odds-ratio for households voicing out for opinions or conflicts, however, indicates that households who involve in agriculture-dominant and non-agriculture-dominant livelihood activities are less likely to voice out for opinions by a factor of 1.113 and 0.640 respectively. Also, the odds-ratio for degree of satisfaction in village shows that, the probability of households to be involved in pure-agriculture and non-agriculture-dominant households decreases by a factor of 1.356 and 1.200 respectively for every increase in degree of satisfaction of riverine communities in the village.

As for the monthly total income of the riverine communities, the odds-ratio indicates that, the probability of households to be involved in agriculture-dominant and non-agriculture-dominant households decrease by a factor of 0.728 and 0.823 respectively for every RM1 increase in monthly total income. In addition to that, the odds-ratio displayed a probability of households involved in pure agriculture and agriculture-dominant households to decrease by a factor of 28.826 and 16.881 respectively. This enables households to further diversify their household income to sustain livelihoods. Moreover, households who are

involved in pure agriculture activities shown to have higher probability by a factor of 0.484 compared to other livelihood activities to receive farming assistance. This is probably due to the institutional processes which provide farming assistance to those who only carry out farming activities. Lastly, the odds-ratio for ownerships of land right certificates indicates that, the probability of households to be involved in pure-agriculture and non-agriculture-dominant households decrease by a 1.156 and 1.513 respectively for every household who has land right ownership certificates.

Table 4.26: Multinomial logit model summary of the relationship between livelihood assets and livelihood strategies

Assets	Household Type	Pure Agriculture				Agriculture-Dominant				Non-Agriculture-Dominant		
		coefficient	P > z	exp(β)		coefficient	P > z	exp(β)		coefficient	P > z	exp(β)
	Intercept	-1.485	.000			-.973	.002			-.974	.000	
Human Assets	HH Highest Education Level	-.495	.102	.610		-.496	.071	.609		-.701	.007	.496
	HH Skills Level	.759	.030	2.136		.468	.147	1.596		.272	.314	1.313
	Workforce	.075	.831	1.077		1.118	.001	3.058		.237	.435	1.267
	Assistance for Training	-.108	.706	.897		-.709	.139	.492		.164	.452	1.179
Physical Assets	Treated Water	.108	.689	1.114		-.247	.309	.781		.142	.550	1.153
	Farm Tools Owned (financial capacity)	1.801	.000	6.058		1.347	.000	3.847		.958	.001	2.606
	Housing Type	-.212	.422	.809		-.061	.812	.941		-.193	.403	.825
	Toilet System	.063	.815	1.065		.247	.353	1.280		.015	.949	1.015
	Number of Mobile Phones Owned	-.117	.741	.890		-.854	.014	.426		-.427	.161	.653
Social Assets	Help for Family Conflict	.016	.940	1.016		.010	.961	1.010		2.915	.	18.457
	Help for Financial Conflict	.378	.125	1.459		.113	.665	1.119		-.175	.545	.840
	Help for Disaster Conflict	-.018	.946	.982		.008	.976	1.008		-.040	.867	.960
	Voice Out for Opinions	-.593	.166	.552		.287	.242	1.333		-.447	.151	.640
	Degree of Satisfaction in Village	.305	.332	1.356		.107	.687	1.113		.183	.468	1.200
Financial Assets	Monthly Total Income	-1.307	.003	.271		-.318	.351	.728		-.194	.548	.823
Natural Assets	Total Land Area (ability to diversify??)	3.326	.000	27.826		2.826	.000	16.881		2.079	.000	7.993
	Farming Assistance	-.725	.007	.484		-.673	.020	.510		-.483	.041	.617
	Ownerships of Land Right Certificate	.145	.605	1.156		.104	.689	1.110		.414	.080	1.513

4.9 Conclusion

This chapter presented the results of the multidimensional realities portrayed by the riverine communities in Sadong Jaya through the Livelihood Vulnerability Index (LVI), Sustainable Livelihood Index (SLI) and multinomial regression model used in the analysis of vulnerabilities, assets and strategies adopted by the riverine communities.

The result shows that climate variability, environment degradation as a result of agriculture and other development activities has negatively impacted the livelihoods at Sadong Jaya. Despite being located at different geographical location of lower estuarine, middle estuarine and upper estuarine, all households in Sadong Jaya are found to have similar traits and challenges. The resource dependent communities who majority engage in agricultural activities as their main income level face challenges primely in pest management where they lack in funding to buy agro-chemicals and equipment.

Water is found to be the most crucial component the riverine communities due to lack of facilities and partly due to the increasing population in Sadong Jaya. Food is found to be another issue besides the declining numbers of labour force in the agricultural sector due to lack of interest.

In spite of being exposed to various stresses and shocks, the riverine communities in Sadong Jaya seem to be able to cope and adapt well with environmental and socio-political changes. Investment particularly in physical capital and human capital as well as endowment of natural capital has enabled them to improve livelihoods in Sadong Jaya. Presence of institutional and social structures have uplifted the riverine communities in terms of financial assistance, consultations, and overall satisfaction to stay in Sadong Jaya.

A high number of households turn to diversification to sustain livelihoods in Sadong Jaya. Though still have high dependency on natural resources, they are resilient in diversifying or expanding their livelihood portfolios by optimizing the use of physical and human capitals available as their strategies to sustain their livelihoods.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The study aims to find out the livelihood strategies used by the riverine communities to cope with vulnerabilities and maintain resilience with asset resources available and accessible at Sadong Jaya. People draw upon their livelihoods across various social realities and space. It is found that the riverine communities have strong social capital and high satisfaction towards livelihoods in Sadong Jaya. The study shows that all households at Sadong Jaya have similar traits and challenges despite initial hypothesis of the study which assumes that there is difference in the accessibility of various capital assets and vulnerabilities experienced among households located at different clusters (upper, middle, and lower estuaries) among riverine communities in Sadong Jaya.

The riverine communities in Sadong Jaya are all subject to vulnerabilities from flood and drought occurrences irrespective of which specific location (lower, middle, or upper estuarine areas) they are from though individual households might have different level of capital assets. Besides that, these riverine communities also face challenges of depleting natural resources and deteriorating environment as a result of agriculture and other development projects. The economic activities and livelihood strategies adopted by the villagers in Sadong Jaya are seen very much dependent on the physical and human capitals complemented with other capital assets, particularly natural capital where they depend on to conduct agricultural and fishery activities.

Water is a crucial component which the riverine communities depend on daily basis be it for cooking, drinking or irrigation to their fields. As water regulation over the years had

prevented flood occurrence, it also made shallow many rivers where some rivers have ‘died’. However, the growing population in Sadong Jaya is interesting to ponder upon against many rural contexts where more communities are migrating to urban areas. The latter is due to individuals returning back to their respective homelands for retirement. These growing population has also caused competition for water resources. The riverine communities are capable to sustain livelihoods with rainwater collections besides depending on their local providers for water supply.

In spite of being exposed to various shocks and stresses due to its geographically disadvantaged location which is prone to flash floods and monsoon floods in particular, the riverine communities in Sadong Jaya seem to be able to cope and adapt well with environmental and socio-political changes. They are resilient in diversifying or expanding their livelihood portfolios by optimizing the use of physical and human capitals available as their strategies to sustain their livelihoods. In fact, the riverine communities in Sadong Jaya have benefited greatly particularly from the infrastructure development initiated by the government.

In summary, investment in physical capital, human capital as well as endowment of natural capital has enabled improved living standards among the riverine communities in Sadong Jaya. Better road connection for the riverine communities in Sadong Jaya as well as existence of Batang Sadong and Batang Samarahan bridges had undoubtedly improved accessibility of the local communities to jobs, goods, and services markets. Besides, watergates built in the villages and its proximity area had reduced the vulnerability of the riverine communities to incur high cost imposed by the damages brought by the flash flood and monsoon flood particularly to their agriculture activities. Accessibility of the riverine communities to various capital assets has indeed empowered the riverine communities in

Sadong Jaya to attain improved well-beings towards more sustainable livelihoods strategies by turning their capabilities into desirable livelihood outcomes.

The existence of education and training facilities in Sadong Jaya allowed the riverine communities, especially the youth to be equipped with necessary skills for better and broader scope of job opportunities. The adoption of a diversified income generating capabilities establish a resilient and better-off livelihood as more family members could expand their opportunities to engage in the workforce. However, these has led to lack of manpower in rural sectors especially in agriculture and fisheries sectors.

In few decades to come, the probability of on-farm job is more likely to decrease as more youths get educated and prefer to move out of the village to seek for alternative employment. Thus, migration to urban areas for education and job employment are more likely to happen more intensely in Sadong Jaya. With a declining manpower for farm activities in Sadong Jaya, food security might be a concern in the years to come. The adoption of technology in farming activities by the new educated young generation might help to sustain the food production activities if agro-preneurship mindset is imparted to the youth population in Sadong Jaya.

5.2 Recommendations

This paper concludes that provision for and accessibility of basic physical assets, educational and training amenities by the riverine communities is crucially imperative as a policy recommendation to ensure that the riverine communities at Sadong Jaya are able to enhance their livelihoods strategies for uplifting their living standards despite them suffering from depleting natural resources. The accessibility of tarred roads and bridges has enabled the riverine communities to improve their income generating capabilities as well as their accessibilities to marketplace and employment opportunities. At the same time, controlled

sea water level from Watergate construction also modifies the soil structure and soil acidity level making coconut unsuitable to grow in the area. Social structures from different authorities and agencies have provided although insufficient incentives for most riverine communities, nevertheless, the riverine communities in Sadong Jaya are able to adapt well by opting for alternative livelihood strategies.

Comprehending the livelihood strategy of the riverine communities is important to identify the sustainability of the local communities at Sadong Jaya. The ever-changing dynamic conditions and the developing rate at Sadong Jaya, though relatively slow compared to other region, the findings of the study could act as inputs for policy makers for future planning and development in Sadong Jaya and even other riverine area to enhance the livelihoods of its people.

As this paper is limited to only focus on the vulnerability context, capital assets and livelihood strategies without engaging in-depth discussion on each livelihood strategy and other aspects such as the institutional processes involved at every level of communities in Sadong Jaya. Hence, a more comprehensive and holistic analysis is thus suggested for future studies to evaluate institutional processes and market potential of the rural sectors which are carried out by the riverine communities in a more extensive manner. It is crucial for the authority and the community to offer initiatives in encouraging a better-balance development at Sadong Jaya in ensuring the sustainability of livelihoods by making the available capital assets as impetus of socio-economic development among riverine communities in particular.

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APPENDICES

Journal Publications

1. **Tan, S. J.,** Wong, S. K. & Abdullah, R. G. (2021). Sustainable livelihood strategies of the riverine communities at Sadong Jaya, Sarawak, Malaysia: Role of capital assets. *Studies of Applied Economics*, 39(1), DOI: https://doi.org/10.25115/eea.v39i1.4271

Jadual Temuduga (Jabatan Perikanan)

1. Apakah senario sekarang di sektor perikanan? Bilakah musim puncak untuk aktiviti memancing?

2. Apakah jenis ikan yang dijumpai pada musim itu?

3. Bagaimana ikan dinilai?

4. Berapakah jumlah nelayan di Sadong Jaya? Desa mana yang mempunyai kebanyakan nelayan?

5. Siapa yang layak memiliki lesen nelayan? Dan apakah prosesnya?

6. Bagaimana tangkapan dikawal?

7. Apakah peralatan yang paling banyak digunakan?

8. Apa bentuk subsidi / faedah yang diberikan kepada nelayan?

9. Cabaran utama dalam sektor perikanan?

10. Apakah prospek masa depan?

Jadual Temuduga (Pejabat Daerah)

1. Sebelum jambatan dibina, bagaimana orang kampung biasa melakukan perjalanan?

2. Apa saja infrastruktur yang ada di Sadong Jaya yang telah membawa perubahan drastik dan memperbaiki atau merosot kehidupan penduduk kampung?

3. Apakah aktiviti ekonomi utama yang dijalankan di Sadong Jaya?

4. Apakah keistimewaan yang terdapat di Sadong Jaya?

5. Apakah senario semasa di sektor pertanian dan perikanan di Sadong Jaya?

6. Apakah tanaman pertanian utama yang terdapat di Sadong Jaya?

7. Apakah cabaran utama yang dihadapi oleh sektor-sektor ini? Apakah langkah-langkah yang diambil untuk memerangi cabaran ini?

8. Bagaimana kesan isu perubahan iklim seperti kemarau dan banjir mempengaruhi penduduk kampung? Apakah intensiti cabaran ini dari semasa ke semasa?

9. Apakah projek pembangunan yang dilakukan sejauh ini dan / atau sedang dalam proses cadangan?

10. Apakah langkah-langkah yang diambil untuk memerangi tantangan perubahan iklim di Sadong Jaya ini?

KOD ID						

BORANG SOAL SELIDIK

KAJIAN STRATEGI KEHIDUPAN MASYAKARAT DI PERAIRAN SUNGAI DI KAWASAN BARAT SARAWAK

NAMA PENEMURAMAH : _____

TARIKH TEMUDUGA : _____

NAMA KAMPUNG/
RUMAH PANJANG : _____

DAERAH : _____

BAHAGIAN : _____

A. LATAR BELAKANG RESPONDEN (KETUA ISI RUMAH (KIR)/ AHLI ISI RUMAH)

1. Nama Responden: _____

2. Status: 1. Ketua Isi Rumah (KIR) 2. Ahli Isi Rumah

3. No Telefon: _____

4. Bangsa:
   [ ] 1. Iban [ ] 2. Bidayuh
   [ ] 3. Melayu [ ] 4. Lain-lain (nyatakan): _____

5. Jantina:
   [ ] 1. Lelaki [ ] 2. Perempuan

6. Umur: _____tahun Tarikh Lahir: _____

7. Taraf perkahwinan:
   [ ] 1. Bujang [ ] 2. Berkahwin [ ] 3. Duda
   [ ] 4. Janda [ ] 5. Balu [ ] 6. Ibu tunggal

8. Tahap persekolahan tertinggi:
   [ ] 1. Tiada Bersekolah
   [ ] 2. Sekolah Rendah Darjah 1, 2, 3
   [ ] 3. Sekolah Rendah Darjah 4, 5, 6
   [ ] 4. Sekolah Menengah Rendah
   [ ] 5. Sekolah Menengah Atas
   [ ] 6. Diploma/ Ijazah Sarjana Muda/ Ijazah Sarjana (Bulatkan)
   [ ] 7. Lain-lain (nyatakan): _____

9. Sudah berapa lama anda tinggal di kampung/ rumah panjang ini?
   _____ tahun

10. Berapa ramai orang yang tinggal di rumah ini (termasuk responden)?
   _____ orang

11. Maklumat ahli keluarga.

No	Hubungan dengan ketua isi rumah (KIR)	Umur	Jantina 1. Perempuan 2. Lelaki	*Taraf perkahwinan	**Taraf pendidikan	Tinggal bersama ? 1. Ya 2. Tidak	***Pekerjaan	****Tahap kemahiran pekerjaan	Pendapatan bulanan (Jika bekerja) (RM)	Sumbangan kepada isi rumah 1. Ya 2. Tidak	***** Kekerapan	Anggaran Jumlah Sumbangan sekali
1.	Responden											
2.												
3.												
4.												
5.												
6.												
7.												
8.												

***Taraf Perkahwinan**: **1**. Bujang; **2**. Berkahwin; **3**. Duda; **4**. Janda; **5**. Balu; **6**. Ibu tunggal*
****Taraf Pendidikan: 1**. Tiada Bersekolah; **2**. Sekolah Rendah Darjah 1,2,3; **3**. Sekolah Rendah Darjah 4,5,6; **4.** Sekolah Menengah Rendah; **5**. Sekolah Menengah Atas; **6**. Diploma/ Ijazah Sarjana Muda/ Ijazah Sarjana; **7**. Lain-lain (Nyatakan)*
*****Pekerjaan: 1.** Bekerja (Nyatakan jenis pekerjaan); **2.** Tidak bekerja; **3.** Pelajar; **4.** Lain-lain (Nyatakan)*
******Tahap Kemahiran pekerjaan**: **1. Mahir:** mendapat latihan rasmi dan bersijil; **2. Separa Mahir:** tiada latihan rasmi tetapi belajar melalui pengalaman lebih 10 tahun; **3. Tak Mahir:** tiada latihan rasmi dan pengalaman kurang 10 tahun*
*******Kekerapan**: **1.** Sebulan sekali; **2.** Setahun sekali; **3.** Tidak tentu; **4.** Lain-lain (Nyatakan)*

12. Bulatkan pada kolum "*No*" ketua isi rumah sekiranya responden bukan ketua isi rumah dalam jadual "*Maklumat Ahli Keluarga*" di atas.

B. AKTIVITI EKONOMI KETUA ISI RUMAH

13. Jika KIR tidak bekerja, sebab dia tidak bekerja:
    [ ] 1. Sakit
    [ ] 2. Sudah bersara
    [ ] 3. Tiada pekerjaan yang sesuai
    [ ] 4. Lain-lain (nyatakan): _____

14. Sumber pendapatan KIR.

Sumber Pendapatan	**Sejak tahun apa?**	**Pendapatan sebulan (RM)**
Pendapatan utama		
Pendapatan sampingan		

C. PENGLIBATAN DALAM AKTIVITI PERIKANAN

15. Adakah anda/ keluarga anda terlibat dalam aktiviti perikanan?
    [ ] 1. Ya [ ] 2. Tidak [terus ke Soalan 33]

16. Apakah yang mendorong anda/ keluarga anda terlibat dalam aktiviti perikanan?
    [ ] 1. Diwarisi [ ] 2. Minat
    [ ] 3. Ikut kawan [ ] 4. Lain-lain (Nyatakan: _____)

17. Di manakah anda/ keluarga anda biasanya menangkap ikan?
    [ ] 1. Sungai [ ] 2. Tepi pantai
    [ ] 3. Laut dalam [ ] 4. Lain-lain (Nyatakan: _____)

18. Dengan siapakah anda/ keluarga anda biasanya pergi menangkap ikan:
    [ ] 1. Pergi berseorangan [ ] 2. Bersama ahli keluarga
    [ ] 3. Bersama saudara mara/ kawan [ ] 4. Bersama majikan
    [ ] 5. Lain-lain (Nyatakan: _____

19. Jenis hasil tangkapan sungai/ laut:

***Jenis hasil sungai/laut**	**Dari?** **1. Hulu sungai** **2. Hilir sungai** **3. Tepi pantai** **4. Laut dalam**	**Hasil tangkapan sekali (kg)**	**Adakah dijual?** **1. Ya** **2. Tidak** **3. Kadang-kala**	****Dijual kepada siapa?**	**Harga seunit (RM)**	**Hasil sebulan (RM)**	**Catatan**

Jumlah							

** Namakan semua jenis ikan termasuk obor-obor, tekuyung, kerang, ketam dan lain-lain.*
******Dijual kepada siapa: 1**. Dijual sendiri di kampung sendiri;**2.** Dijual sendiri di kampung berdekatan; **3.** Dijual sendiri di pasar berdekatan (Namakan pasar tersebut); **4.** Dijual kepada pemborong/ kilang; **5**. Dijual kepada Persatuan Nelayan Kawasan; **6**. Lain-lain (Nyatakan)*

20. Kekerapan anda/ keluarga pergi menangkap ikan:

Musim	**Bilangan Kali Sebulan**	**Bilangan Jam setiap kali**
Hujan		
Panas		

21. Apakah aktiviti yang anda lakukan apabila tidak pergi menangkap ikan?

_____

22. Jenis kelengkapan/peralatan yang dimiliki anda/ keluarga anda dalam menjalankan aktiviti perikanan.

Jenis kelengkapan/ peralatan yang digunakan	***Adakah ia dimiliki sendiri?**	**Kuantiti yang dimiliki (unit)**	**Nilai seunit kelengkapan/ peralatan (Jika disewa, nilai sewa sebulan) (RM)**	**Kos penyelenggaran setiap bulan (RM)**	****Catatan**

** Pemilikan**: 1.** Ya; **2.** Tidak (Disewa); **3.** Tidak (Dipinjam)*
***Catatan: Nyatakan sama ada peralatan tersebut merupakan bantuan yang diterima daripada agensi. Jika ya, nyatakan nama agensi, tahun peralatan itu diterima.*

23. Kemahiran atau pengetahuan anda/ keluarga dalam aktiviti perikanan dan daripada siapa pengetahuan/ kemahiran tersebut dipelajari?

Kemahiran/ Pengetahuan	**1. Ya** **2. Tidak**	***Dari siapa**

1. Mengetahui musim yang sesuai untuk menangkap jenis ikan tertentu.		
2. Mengesan keadaan cuaca.		
3. Mengenali spesies ikan		
4. Mengenalpasti lokasi ikan dan spesiesnya		
5. Membuat jala.		
6. Memperbaiki jala.		
7. Membuat bot.		
8. Memperbaiki bot.		
9. Memproses tangkapan ikan kepada barangan jualan		
10. Lain-lain (Nyatakan: _____)		

**** Dari siapa: 1.*** *Diwarisi keluarga secara turun-temurun;* ***2.*** *Sahabat/ Penduduk kampung;* ***3.*** *Dilatih oleh agensi (Nyatakan)*

24. Apakah cabaran utama yang dihadapi anda/ keluarga anda dalam menjalani aktiviti perikanan? *[Nomborkan no 1 untuk cabaran paling utama diikuti dengan no 2,3,4]*

[ ] 1. Peralatan/ kelengkapan tidak mencukupi
[ ] 2. Kos memperbaiki peralatan/ kelengkapan semakin tinggi
[ ] 3. Sumber sungai/ laut semakin berkurangan
[ ] 4. Cuaca yang tidak menentu
[ ] 5. Lain-lain (Nyatakan: _____)

25. Pada pandangan anda, adakah sumber perikanan semakin berkurangan di:

(i) sungai [ ] 1. Ya [ ] 2. Tidak [Terus ke soalan 31]
(ii) laut [ ] 1. Ya [ ] 2. Tidak [Terus ke soalan 31]

26. Jika sumber perikanan semakin berkurangan, apakah punca pengurangan sumber tersebut? *[Nomborkan no 1 untuk punca paling utama diikuti dengan no 2,3,4,5]*

[ ] 1. Pencemaran air akibat pembangunan pesat di kawasan sekitar
[ ] 2. Pencemaran air akibat pembuangan sampah oleh penduduk di sekitar
[ ] 3. Aktiviti menangkap ikan yang tidak terkawal oleh nelayan setempat
[ ] 4. Aktiviti menangkap ikan yang tidak terkawal oleh nelayan dari luar
[ ] 5. Lain-lain (Nyatakan: _____)

27. Adakah kekurangan sumber perikanan ini memberi kesan kepada keluarga anda?

[ ] 1. Ya [ ] 2.Tidak [Terus ke soalan 30]

28. Jika ya [*untuk soalan 27*], apa kesan itu?

[ ] 1. Sumber makanan keluarga kami terjejas
[ ] 2. Sumber pendapatan keluarga kami terjejas
[ ] 3. Lain-lain (Nyatakan: _____)

29. Jika ya [*untuk soalan 27*], apakah langkah yang anda/ keluarga ambil untuk menangani masalah ini?

[ ] 1. Mempergiatkan lagi aktiviti pertanian/ penternakan/ pemburuan/ pengumpulan hasil hutan dll *[sila bulatkan yang berkenaan]*
[ ] 2. Mencari pekerjaan baru/ sampingan. (Nyatakan: _____)
[ ] 3. Bercadang untuk berpindah keluar dari kampung/rumah panjang ini.
[ ] 4. Lain-lain (Nyatakan: _____)

30. Adakah anda mempunyai cadangan lain untuk mengatasi masalah pengurangan sumber perikanan ini?

---

31. Adakah anda merupakan nelayan yang berdaftar dengan Jabatan Perikanan Malaysia?
[ ] 1. Ya [ ] 2. Tidak [Terus ke soalan 33]

32. Jika anda merupakan nelayan berdaftar, apakah kategori nelayan itu?
[ ] 1. Zon A [ ] 2. Zon B
[ ] 3. Zon C [ ] 4. Zon C2

D. PENGLIBATAN DALAM AKTIVITI PERTANIAN

33. Adakah anda/ keluarga anda terlibat dalam aktiviti pertanian?
[ ] Ya [ ] Tidak [Terus ke soalan 43]

34. Apakah yang mendorong anda/ keluarga anda terlibat dalam aktiviti pertanian?
[ ] 1. Diwarisi [ ] 2. Minat
[ ] 3. Ikut kawan [ ] 4. Lain-lain (Nyatakan:_____)

35. Dengan siapakah anda biasanya pergi ke kebun/ ladang?
[ ] 1. Pergi berseorangan [ ] 2. Bersama ahli keluarga
[ ] 3. Bersama saudara mara/ kawan [ ] 4. Bersama dengan majikan
[ ] 5. Lain-lain (Nyatakan: _____)

36. Jenis tanaman yang diusahakan.

Jenis Tanaman	**Saiz Tanah (ekar)/ Bilangan pokok**	**Bilangan kali Penuaian dalam Setahun**	**Hasil setiap penuaian (kg)**	**Adakah hasil tanaman dijual? 1. Ya 2. Tidak 3. Kadang-kala**	***Jika dijual, ia dijual kepada siapa?**	**Hasil Sebulan (RM)**	**Catatan**
Tanaman komoditi/ industri/buah-buahan (seperti lada hitam, padi, getah, durian dll)							
Tanaman sayur- sayuran							

Jumlah							

***Dijual kepada siapa: 1**. Dijual sendiri di kampung sendiri;**2.** Dijual sendiri di kampung berdekatan; **3.** Dijual sendiri di pasar berdekatan (Namakan pasar tersebut); **4.** Dijual kepada pemborong/ kilang; **5**. Dijual kepada Lembaga Lada Malaysia; **6**. Lain-lain (Nyatakan).*

37. Adakah tanah yang digunakan untuk tanaman di atas dimiliki sendiri?
[ ] 1. Ya, dimiliki sendiri
[ ] 2. Tidak, dipinjam
[ ] 3. Tidak, disewa daripada orang lain dengan sewa sebulan RM_____

38. Jenis kelengkapan/peralatan yang digunakan dalam menjalankan aktiviti pertanian.

Jenis kelengkapan/ peralatan yang digunakan	***Adakah ia dimiliki sendiri?**	**Kuantiti yang dimiliki (unit)**	**Nilai seunit kelengkapan/ peralatan (Jika disewa, nilai sewa sebulan) (RM)**	**Kos penyelenggaran setiap bulan (RM)**	****Catatan**

** Pemilikan**: 1.** Ya; **2.** Tidak (Disewa); **3.** Tidak (Dipinjam)*
***Catatan: Nyatakan sama ada peralatan tersebut merupakan bantuan yang diterima daripada agensi. Jika ya, nyatakan nama agensi & tahun peralatan itu diterima.*

39. Kemahiran atau pengetahuan anda/ keluarga anda dalam aktiviti pertanian ini dan daripada siapa pengetahuan atau kemahiran itu dipelajari.

Kemahiran/ Pengetahuan	**1. Ya 2. Tidak**	***Dari Siapa**
1. Mengenalpasti jenis tanah yang sesuai untuk tanaman.		
2. Dapat mengenalpasti penyakit tanaman.		
3. Mengetahui jenis baja yang sesuai untuk digunakan		
4. Mengetahui jumlah & kekerapan baja digunakan		
5. Mengetahui jarak yang bersesuaian antara tanaman		
6. Mengetahui jenis racun digunakan untuk penyakit/ perosak		
7. Lain-lain (Nyatakan: _____)		

**** Dari siapa: 1.** Diwarisi keluarga secara turun-temurun; **2.** Sahabat/ Penduduk kampung; **3.** Dilatih oleh agensi (Nyatakan).*

40. Berapakah kekerapan anda/ keluarga anda pergi ke kebun/ ladang?

_____kali seminggu; _____jam setiap kali

41. Apakah cabaran yang dihadapi anda/ keluarga anda dalam menjalani aktiviti pertanian?

Cabaran	**1. Ya** **2. Tidak**	**Langkah penyelesaiannya**	**Catatan**
1. Masalah tidak ada tanah			
2. Kekurangan tanah yang sesuai/ subur untuk pertanian			
3. Kekurangan tenaga pekerja			
4. Kekurangan dana untuk membeli peralatan/ racun/ baja			
5. Baja yang tidak berkualiti			
6. Sukar untuk mendapatkan bantuan modal			
7. Serangan penyakit/ perosak			
8. Harga hasil keluaran rendah/tidak menentu			
9. Pasaran yang terhad			
10.Persaingan sengit daripada pengusaha tanaman yang sama			
11.Cuaca yang tidak menentu			
12.Lain-lain(Nyatakan: _____)			

42. Sekiranya anda/ keluarga anda mengalami kekurangan tenaga pekerja, apakah faktor utamanya?
[boleh pilih lebih daripada 1]
[ ] 1. Petani/ Penguasa yang sedia ada sudah tua dan uzur
[ ] 2. Orang muda kurang berminat dalam aktiviti pertanian
[ ] 3. Orang muda lebih berminat untuk bekerja di bandar
[ ] 4. Tidak mempunyai waris untuk meneruskan aktiviti pertanian
[ ] 5. Lain-lain (Nyatakan: _____)

E. PENGLIBATAN DALAM AKTIVITI PENTERNAKAN

43. Adakah anda/ keluarga anda terlibat dalam aktiviti penternakan?
[ ] Ya [ ] Tidak [Terus ke soalan 54]

44. Apakah yang mendorong anda/ keluarga anda terlibat dalam aktiviti penternakan?
[ ] 1. Diwarisi [ ] 2. Minat
[ ] 3. Ikut kawan [ ] 4. Lain-lain (Nyatakan:_____)

45. Dengan siapakah anda/ keluarga anda biasanya pergi reban/ kandang teernakan/ kolam ikan:
[ ] 1. Pergi berseorangan [ ] 2. Bersama ahli keluarga
[ ] 3. Bersama saudara mara/ kawan [ ] 4. Bersama dengan majikan
[ ] 5. Lain-lain (Nyatakan:_____)

46. Jenis ternakan yang diusahakan.

Jenis ternakan	Bilangan ekor (ekor)/ bilangan hasil	Bilangan kali pusingan hasil ternakan diambil dalam Setahun	Hasil setiap pusingan kutipan/ pengambilan (kg)	Adakah hasil ternakan dijual? 1. Ya 2. Tidak 3. Kadang-kala	*Jika dijual, ia dijual kepada siapa?	Hasil sebulan (RM)	Catatan
Ternakan (lembu, kambing, ayam, itik, ikan, burung walit dll)							
Jumlah							

***Kepada siapa: **1**. Dijual sendiri di kampung sendiri;**2.** Dijual sendiri di kampung berdekatan; **3.** Dijual sendiri di pasar berdekatan (Namakan pasar tersebut); **4.** Dijual kepada pemborong; **5**. Dijual ke kilang; **6**. Lain-lain (Nyatakan).*

47. Adakah tanah yang digunakan untuk ternakan tersebut dimiliki sendiri?
    [ ] 1. Ya, dimiliki sendiri
    [ ] 2. Tidak, dipinjam
    [ ] 3. Tidak, disewa daripada orang lain dengan sewa sebulan RM_____

48. Jenis kelengkapan/peralatan yang digunakan dalam menjalankan aktiviti penternakan.

Jenis kelengkapan/ peralatan yang digunakan	*Adakah ia dimiliki sendiri?	Kuantiti yang dimiliki (unit)	Nilai seunit kelengkapan/ peralatan (Jika disewa, nilai sewa sebulan) (RM)	Kos penyelenggaran setiap bulan (RM)	**Catatan

** Pemilikan**: 1.** Ya; **2.** Tidak (Disewa); **3.** Tidak (Dipinjam)*
***Catatan: Nyatakan sama ada peralatan tersebut merupakan bantuan yang diterima daripada agensi. Jika ya, nyatakan nama agensi, tahun peralatan itu diterima.*

49. Kemahiran atau pengetahuan anda dalam aktiviti perusahaan penternakan ini dan daripada siapa anda/ keluarga anda memperolehi kemahiran atau pengetahuan ini.

Kemahiran/ Pengetahuan	**1. Ya 2. Tidak**	***Dari Siapa**
1. Mengetahui cara penjagaan ternakan.		
2. Mengenalpasti penyakit ternakan.		
3. Mengetahui cara memerah susu lembu/ kuda.		
4. Mengetahui cara memikat burung walit.		
5. Mengetahui musim mengawan ternakan		
6. Mengetahui masa sesuai pengutipan hasil ternakan		
7. Lain-lain (Nyatakan: _____)		

**** Dari siapa: 1.*** *Diwarisi keluarga secara turun-temurun;* ***2.*** *Sahabat/ Penduduk kampung;* ***3.*** *Dilatih oleh agensi (Nyatakan).*

51. Apakah cabaran yang dihadapi anda/ keluarga anda dalam menjalani aktiviti penternakan?

Cabaran	**1.Ya/ 2. Tidak**	**Langkah penyelesaiannya**	**Catatan**
1.Masalah tidak ada tanah			
2.Kekurangan tanah yang sesuai/ subur untuk penternakan			
3.Kekurangan tenaga pekerja			
4.Kekurangan dana untuk membeli makanan/ peralatan ternakan			
5.Sukar untuk mendapatkan bantuan modal			
6.Serangan penyakit			
7.Harga hasil keluaran rendah/ tidak menentu			
8.Pasaran yang terhad			
9.Saingan ramai dalam perusahaan penternakan yang sama			
10.Kekurangan kemahiran dan pengetahuan dalam pengendalian ternakan			
11.Lain-lain (nyatakan): _____			

51. Berapakah kekerapan anda/ keluarga anda pergi ke reban/ kandang/ kolam ikan?
_____kali seminggu; _____jam setiap kali

52. Adakah tanah yang sama digunakan untuk tujuan tanaman dan juga ternakan?
[ ] 1. Ya [ ] 2. Tidak [Terus ke soalan 54]

53. Jika ya, berapa ekar tanah yang digunakan untuk tujuan tanaman bersama dengan ternakan?
_____ekar

F. PENGLIBATAN DALAM AKTIVITI PENCARIAN/ PENGUTIPAN HASIL HUTAN

54. Adakah anda/ keluarga anda pernah terlibat dalam aktiviti pencarian/ pengutipan hasil hutan?
[ ] Ya [ ] Tidak [Terus ke soalan 66]

55. Jika ya, adakah anda/ keluarga anda masih terlibat dalam aktiviti pencarian/ pengutipan hasil hutan?
[ ] Ya [Terus ke soalan 58] [ ] Tidak

56. Jika tidak, sejak bila anda/ keluarga anda berhenti dalam aktiviti pencarian/ pengutipan hasil hutan? Tahun _____

57. Mengapa anda/ keluarga anda tidak lagi terlibat dalam aktiviti pencarian/ pengutipan hasil hutan?
[ ] 1. Sudah tua
[ ] 2. Jarak rumah dengan hutan jauh
[ ] 3. Sumber hutan semakin berkurangan
[ ] 4. Lebih senang untuk mendapatkan keluaran tersebut di pasar
[ ] 5. Tidak mengenali jenis hasil hutan yang boleh digunakan
[ ] 6. Lain-lain (Nyatakan:_____)

58. Jika anda masih pergi mencari hasil hutan, dengan siapakah anda/ keluarga anda biasanya pergi ke hutan?
[ ] 1. Pergi berseorangan [ ] 2. Bersama ahli keluarga
[ ] 3. Bersama saudara mara [ ] 4. Bersama kawan
[ ] 5. Lain-lain (Nyatakan: _____)

59. Jenis hasil hutan yang dicari/ dikutip.

Jenis Haiwan/ Tuumbuh - tumbuhan	**Kekerapan pergi ke untuk untuk mencari hasil hutan**	**Hasil yang diperolehi setiap kali ke hutan (ekor/ kg)**	**Adakah hasil hutan dijual? 1. Ya 2. Tidak 3. Kadang-kala**	***Jika dijual, ia dijual kepada siapa?**	**Jika dijual, berapa harga seunit? (RM)**	**Hasil sebulan (RM)**	****Jika tidak dijual, apakah kegunaan sumber tersebut?**	**Catatan**
Haiwan (kijang dll)								
Tumbuh-tumbuhan (bemban, midin dll)								
Jumlah								

Kepada siapa: 1*. *Dijual sendiri di kampung sendiri;2.* *Dijual sendiri di kampung berdekatan; **3.*** *Dijual sendiri di pasar berdekatan (Namakan pasar tersebut); **4.*** *Dijual kepada **p**emborong; **5**. Dijual kepada kilang; **6**. Lain-lain (Nyatakan).*

Jika tidak dijual: 1. *Pembinaan; **2.*** *Sebagai makanan; **3.*** *Kraftangan; **4.*** *Perubatan; **5.*** *Kebudayaan/ Keagamaan; **6.*** *Lain-lain (Nyatakan)*

60. Kelengkapan/peralatan yang digunakan dalam menjalankan aktiviti pencarian/ kutipan hasil hutan.

Jenis kelengkapan/ peralatan yang digunakan	**1. Dibeli 2. Dibuat sendiri**	**Jika dibuat sendiri, diperbuat daripada apa?**	**Siapa yang membuat peralatan ini?**	**Jika dibeli, apakah nilainya? (RM)**	***Catatan**

61. Kemahiran atau pengetahuan anda dalam aktiviti pencarian hasil hutan dan daripada siapa kemahiran atau pengetahuan ini dipelajari?

Kemahiran/ Pengetahuan	**1. Ya 2. Tidak**	***Dari Siapa**
1. Mengenal pasti jenis haiwan/ tumbuhan.		
2. Mengetahui penggunaan hasil hutan.		
3. Mengetahui cara membuat perangkap.		
4. Lain-lain (Nyatakan:_____)		

**** Dari siapa: 1.*** *Diwarisi keluarga secara turun-temurun;* ***2.*** *Sahabat/ Penduduk kampung;* ***3.*** *Dilatih oleh agensi (Nyatakan).*

62. Pada keseluruhannya, adakah sumber hutan semakin berkurangan?
[ ] 1. Ya [ ] 2. Tidak [Terus ke soalan 66]

63. Jika ya, apakah sebab sumber tersebut berkurangan?
[ ] 1. Terlalu ramai orang pergi untuk mencari hasil hutan
[ ] 2. Aktiviti pembalakan yang berlebihan
[ ] 3. Lain-lain (Nyatakan: _____)

64. Adakah kekurangan sumber hutan ini memberi kesan kepada anda/ keluarga anda?
[ ] 1. Ya [ ] 2. Tidak [Terus ke soalan 66]

65. Jika ya, apakah langkah yang telah diambil oleh keluarga anda untuk menangani masalah ini?
[ ] 1. Mempergiatkan lagi aktiviti pertanian/ penternakan/ penangkapan ikan
[ ] 2. Mencari pekerjaan baru/ sampingan
[ ] 3. Bercadang untuk berpindah luar dari kampung/ rumah panjang ini
[ ] 4. Tidak mengambil apa-apa langkah
[ ] 5. Lain-lain (Nyatakan: _____)

G. PENGLIBATAN DALAM AKTIVITI LAIN

66. Adakah anda menjalankan aktiviti ekonomi lain selain daripada perikanan/ pertanian/ penternakan/ pengutipan hasil hutan?
[ ] 1. Ya [ ] 2. Tidak [Terus ke soalan 74]

67. Jika ya, apakah aktiviti ekonomi lain yang anda jalankan?

[ ] 1. Perusahaan sagu
[ ] 2. Pemprosesan gula apong
[ ] 3. Perusahaan kedai runcit
[ ] 4. Perniagaan gerai makan/ minum
[ ] 5. Perusahaan kerepek (pisang dll; nyatakan: _____)
[ ] 6. Pemprosesan hasil perikanan (ikan masin, keropok ikan dll; nyatakan: _____)

68. Apakah yang mendorong anda/ keluarga anda terlibat dalam aktiviti ini?

[ ] 1. Diwarisi [ ] 2. Minat
[ ] 3. Ikut kawan [ ] 4. Lain-lain (Nyatakan:_____)

69. Dengan siapakah anda biasanya melaksanakan perusahaan di atas (Soalan 67):

[ ] 1. Melakukan berseorangan [ ] 2. Bersama ahli keluarga
[ ] 3. Bersama saudara mara [ ] 4. Bersama dengan kawan
[ ] 5. Lain-lain (Nyatakan: _____)

70. Hasil perusahaan.

***Jenis hasil perusahaan**	**Bilangan jam setiap minggu terlibat dalam perusahaan ini (jam)**	**Hasil sebulan (kg)**	**Adakah hasil perusahaan ini dijual? 1. Ya 2. Tidak 3. Kadang-kala**	****Jika dijual, kepada siapa?**	**Hasil sebulan (RM)**	**Catatan**
Jumlah						

**** Namakan semua jenis aktiviti yang dilakukan. 1.*** *Perusahaan sago;* ***2.*** *Perusahaan gula apong;* ***3.*** *Perusahaan kedai runcit;* ***4.*** *Perusahaan gerai makan/minum;* ***5.*** *Perusahaan kerepek (Nyatakan jenis kerepek);* ***6.*** *Pemprosesan hasil perikanan (ikan masin, keropok ikan dll; nyatakan)*
******Kepada siapa: 1****. Dijual sendiri di kampung sendiri;****2.*** *Dijual sendiri di kampung berdekatan;* ***3.*** *Dijual sendiri di pasar berdekatan (Namakan pasar tersebut);* ***4.*** *Dijual kepada pemborong;* ***5****. Dijual kepada kilang;* ***6****. Lain-lain (Nyatakan).*

71. Jenis kelengkapan/peralatan yang dimiliki dalam menjalankan aktiviti perusahaan yang dinyatakan dalam Soalan 67.

Jenis kelengkapan/ peralatan yang digunakan	*Dimiliki sendiri?	Kuantiti yang dimiliki (unit)	Nilai seunit kelengkapan/ peralatan (Jika disewa, nilai sewa sebulan) (RM)	Kos penyelenggaran setiap bulan (RM)	**Catatan

** Pemilikan: **1.** Ya; **2.** Tidak (Disewa); **3.** Tidak (Dipinjam)*
***Catatan: Nyatakan sama ada peralatan tersebut merupakan bantuan yang diterima daripada agensi. Jika ya, nyatakan nama agensi, tahun peralatan itu diterima.*

72. Kemahiran atau pengetahuan anda/ keluarga anda dalam perusahaan ini dan dari siapa anda/ keluarga anda mempelajari kemahiran atau pengetahuan ini.

Kemahiran/ Pengetahuan	1. Ya 2. Tidak	*Dari Siapa

**** Dari siapa: 1.** Diwarisi keluarga secara turun-temurun; **2.** Sahabat/ Penduduk kampung; **3.** Dilatih oleh agensi (Nyatakan).*

73. Apakah cabaran utama yang dihadapi anda/ keluarga anda dalam menjalani perusahaan ini?

Cabaran	1.Ya/ 2. Tidak	Langkah penyelesaian yang telah/ boleh diambil	Catatan
1.Tiada ruang yang sesuai untuk perusahaan			
2.Kekurangan tenaga pekerja			
3.Kekurangan dana/ modal			
4.Sukar untuk mendapat bantuan modal			
5.Persaingan sengit daripada pengusaha lain			
6. Harga hasil keluaran rendah/tidak menentu			
7. Pasaran yang terhad			
8. Kekurangan kemahiran			
9.Lain-lain (nyatakan):……			

H. CABARAN YANG TERDAPAT DALAM KAWASAN KAMPUNG

74. Cabaran utama lain yang dihadapi oleh keluarga anda.

Jenis masalah	**1. Ya 2. Tidak**	**Tarikh Terakhir Berlaku**	**Tarikh Paling Teruk**	**Kekerapan dalam Setahun**	**Penerimaan Bantuan 1. Ya 2. Tidak**	***Siapa Pemberi Bantuan**	****Jenis Bantuan (RM/ unit)**	**Tempoh Bantuan Diberi**
1.Banjir								
2. Hakisan tanah								
3. Kemarau								
4.Masalah air								
5.Pengurusan sisa								
6. Lain-lain (nyatakan) :								

* ***Pemberi Bantuan: 1.*** *Pejabat Daerah;**2**. Jabatan Kebajikan Masyarakat (JKM); **3**. Jabatan Pertanian; **4**. JKKK/ MPKK;**5.** BOMBA; **6**. PDRM; **7.** RELA; **8.** JBALB; **9.** Wakil rakyat; **10.** Lain-lain (nyatakan).*

***** Jenis bantuan: 1.*** *Bantuan makanan/ minuman; **2.** Bekalan Air Bersih; **3.** Tong Air**; 4.** Tong Sampah; **5.** Bantuan wang; **6.** Bantuan Rumah; **7.** Bantuan Benih; **8.** Khidmat nasihat secara percuma; **9.** Lain-lain (Nyatakan)*

75. Kesan cabaran tersebut terhadap keluarga anda. *[Tandakan √ pada petak yang berkenaan]*

Jenis masalah	**Kesan terhadap keluarga anda**						
	Kesan kesihatan	**Kemusnahan tanaman**	**Kematian ternakan**	**Kehilangan ternakan**	**Kemusnahan harta benda**	**Kehilangan nyawa**	**Lain-lain (Nyatakan)**
1.Banjir							
2. Hakisan tanah							
3. Kemarau							
4.Masalah air							

5.Pengurusan sisa							
6. Lain-lain (nyatakan) :							

I. KEADAAN DAN KEMUDAHAN TEMPAT KEDIAMAN

76. Status rumah yang didiami:
[ ] 1. Milik sendiri/ diwarisi dari keluarga
[ ] 2. Rumah sewa
[ ] 3. Tumpang rumah orang
[ ] 4. Lain-lain (Nyatakan: _____)

77. Rumah yang didiami sekarang diperbuat daripada:
[ ] 1. Kayu sahaja
[ ] 2. Kayu dan Konkrit
[ ] 3. Konkrit sahaja
[ ] 4. Lain-lain (Nyatakan: _____)

78. Sila nyatakan kemudahan/ kelengkapan rumah kediaman anda.

Kemudahan	**1. Ada / 2. Tiada**
Struktur atau rekabentuk rumah	
1. Mempunyai bilik tidur berdinding	
2. Mempunyai 1 bilik tidur	
3. Mempunyai 2 bilik tidur	
4. Mempunya 3 atau lebih bilik tidur	
Kemudahan yang terdapat di rumah	
5. Mempunyai tandas curah	
6. Mempunyai tandas tarik/pam	
7. Tiada tandas sendiri	
Bekalan elektrik	
8. Mempunyai sumber bekalan elektrik i. SESCO	
ii. Hydro	
iii. Solar	
9. Menggunakan kuasa motor (*generator set*)	
10. Jika kuasa motor digunakan, berapa jam ia digunakan dalam satu hari?	
11. Menggunakan lampu minyak	
12. Tiada bekalan elektrik 24 jam	
Bekalan Air	
13. Tiada air paip	
14. Menggunakan air sungai	
15. Menggunakan air perigi/ telaga	
16. Menggunakan air hujan/tangki	

17. Mempunyai kemudahan bekalan air paip bersih/ dirawat: i. Paip "*Gravity Fed*" ii. Jabatan Bekalan Air Luar Bandar (JBALB) iii. Lembaga Air Kuching iv. Lain-lain (nyatakan):	
Kelengkapan di rumah	
18. Mempunyai komputer	
19. Mempunyai radio	
20. Mempunyai kemudahan televisyen	
21. Mempunyai talian internet	
22. Mempunyai telefon bimbit (nyatakan berapa)	
23. Menggunakan dapur gas/elektrik	
24. Menggunakan dapur kayu	

79. Apakah jenis pemilikan tanah yang dipunyai oleh keluarga anda?

Status Tanah	**Keluasan (ekar)**	***Jenis Kegunaan Tanah**	**Pecahan Keluasan**
1. *Native Customary Right Land* (NCR, tiada geran)			
2. *Native Area Land* (NAL, ada geran)			
3. *Mixed Zone Land* (MZL, ada geran)			
4. *Temporary Occupation Licence* (TOL, ada geran)			
5. Lain-lain (nyatakan):			

**** Jenis Kegunaan tanah: 1.** Tanaman; **2.** Ternakan; **3.** Tanah terbiar; **4.** Lain-lain (Nyatakan)*

I. BANTUAN YANG DITERIMA DAN PERBELANJAAN ISI KELUARGA

80. Adakah isi keluarga anda menerima bantuan daripada mana-mana agensi kerajaan yang disenaraikan di bawah? Jika ya, nyatakan jenis dan nilai bantuan tersebut?

Agensi perkhidmatan	**Bantuan dan jenis bantuan yang diterima**		**Jumlah bantuan**		**Kekerapan bantuan diterima**
	1. Ya 2. Tidak	***Jenis Bantuan**	**Kuantiti**	**RM**	
1. Pejabat Daerah					
2. Jabatan Kebajikan Masyarakat (JKM)					
3. Jabatan Pertanian					
4. Lembaga Kemajuan Ikan Malaysia (LKIM)					

5. **Lain-lain (nyatakan):					

** Contoh jenis bantuan: khidmat nasihat, latihan, baja, racun, rumah bantuan, benih, mesin dll.*
*** Lain-lain agensi termasuk Jabatan Perikanan, Pertubuhan Peladang Kawasan, RISDA, Lembaga Minyak Sawit Malaysia, Lembaga Lada Malaysia dll.*

81. Anggaran perbelanjaan bulanan isi rumah:

Jenis Perbelanjaan	**Jumlah (RM)**
1. Makanan (Basah/Kering)	
2. Utiliti (Air/Elektrik/Telefon dll)	
3. Pengangkutan (Tambang minyak & penyelenggaraan)	
4. Sewa (rumah/tapak perniagaan/tanah/bot/jentera dll)	
5. Bayaran ansuran (Rumah/pengangkutan spt kereta atau bot/peralatan/pinjaman dari bank, rumah atau kereta dll)	
6. Persekolahan anak-anak (tambang bot/bas/ pakaian/tuisyen/perbelanjaan persekolahan)	
7. Perubatan/kesihatan (ubat-ubatan/rawatan)	
8. Lain-lain (nyatakan):	
JUMLAH PERBELANJAAN	

J. PENGLIBATAN SOSIAL ISI RUMAH

82. Adakah anda terlibat dalam proses membuat keputusan berkaitan dengan apa- apa pembangunan yang dijalankan di kampung ini?

[ ] 1. Ya [ ] 2. Tidak [Terus ke soalan 84]

83. Penglibatan dalam pertubuhan di kampung?

Persatuan/ Aktivti	**1. Ya 2. Tidak**	***Siapa yang terlibat?**	**Adakah anda diberi peluang untuk membuat cadangan dalam persatuan? 1. Ya/ 2. Tidak**
1. Persatuan Pertubuhan Peladang Kawasan			
2. Persatuan Nelayan Kawasan			
3. JKKK			
4. RELA			
5. Persatuan Belia			
6. Koperasi			
7. Aktiviti-aktiviti PIBG			
8. Persatuan Agama			
9. Aktiviti-aktiviti gotong-royong			
10.Lain-lain (Nyatakan): ……			

** Siapa yang terlibat: **1.** Saya; **2.** Suami/ Isteri; **3.** Anak; **4.** Seisi Keluarga; **5.** Lain-lain (Nyatakan).*

84. Siapakah yang akan anda rujuk apabila menghadapi isu kehidupan?

Pihak yang dirujuk	**Isu kehidupan**			
	Isu Rumahtangga	**Kewangan**	**Bencana alam**	**Lain-lain (Nyatakan)**
1.Ahli keluarga				
2.Saudara-mara				
3.Penduduk kampung				
4.Kawan				
5.Ketua kampung				
6.Ahli politik				
7.Agensi kerajaan				
8.Lain-lain (Nyatakan:_____)				

K. MODAL SOSIAL KOMUNITI

85. Sila nyatakan persepsi anda terhadap setiap penyataan mengikut skor tersebut.

5	4	3	2	1
Sangat setuju	Setuju	Tidak pasti	Tidak setuju	Sangat tidak setuju

Penyataan	**Skor**
1. Saya berpuas hati dengan keadaan penempatan saya sekarang.	
2. Saya berpuas hati dengan kehidupan rutin harian saya.	
3. Pendapatan saya cukup untuk menampung kehidupan keluarga saya.	
4. Semangat kekeluargan saya dan ahli keluarga saya erat.	
5. Saya berpuasa hati menjadi sebahagian daripada komuniti kampung ini.	
6. Saya berasa selesa berjumpa dan berkomunikasi dengan penduduk di kampung ini.	
7. Saya selalu berkongsi pengetahuan saya mengenai peluang yang ada dengan ahli komuniti yang lain dalam kampung.	
8. Saya berasa selamat tinggal di kawasan ini.	
9. Saya gemar mengikuti aktiviti keramaian di kampung ini.	
10. Saya kenal majoriti penduduk di kampung ini.	
11. Saya kenal ketua kampung/ tuai rumah ini.	
12. Saya kenal pegawai daerah kawasan ini.	
13. Saya mempercayai majoriti penduduk di kampung ini.	
14. Saya percaya bahawa keputusan yang dibuat oleh ketua masyarakat di kampung saya adalah adil dan saksama.	
15. Saya yakin bahawa wakil rakyat di kawasan ini telah membuat sesuatu yang terbaik untuk pembangunan kawasan ini.	
16. Saya menerima secara positif pembangunan yang dicadangkan di kawasan ini.	
17. Saya bersedia untuk mengubah cara kehidupan saya sekiranya pembangunan baharu yang diperkenalkan menguntungkan komuniti di sini.	
18. Saya dapat mempengaruhi komuniti di sini dalam proses membuat keputusan.	

86. Kemahiran anda secara am.

Kemahiran/ Pengetahuan	**1. Ya** **2. Tidak**	**Catatan**
1. Saya mengetahui pihak yang perlu dirujuk sekiranya ahli keluarga saya ingin melanjutkan pelajaran mereka.		
2. Saya mengetahui pihak yang perlu dirujuk sekiranya ahli keluarga saya ingin mendapatkan latihan untuk satu-satu kemahiran itu.		
3. Saya akan menghubungi pihak hospital sekiranya ada kecemasan kesihatan ahli keluarga saya.		
4. Saya mengetahui pihak yang perlu dirujuk sekiranya ahli keluarga saya ingin mendapatkan bantuan pertanian/ penternakan (bulatkan yang berkenaan).		
5. Saya mengetahui pihak yang perlu dirujuk sekiranya ahli keluarga saya ingin mendapatkan bantuan kewangan untuk sesuatu perusahaan.		
6. Saya mengetahui pihak yang perlu dihubungi sekiranya ada kemalangan di kampung saya.		
7. Saya mengetahui pihak yang perlu dihubungi sekiranya ada bencana alam di kampung saya.		
8. Saya akan menghubungi pihak yang berkenaan sekiranya ada kecemasan di kampung saya.		

**** Catatan:*** *Tuliskan siapa yang mengetahui atau akan melakukan tindakan tersebut sekiranya anda tidak mengetahui atau tidak melakukan tindakan tersebut.*

87. Pada pandangan anda, apakah asset/sumber yang boleh dimajukan di kampung ini?

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88. Apakah bantuan/program/latihan yang diperlukan oleh anda dalam tujuan pembangunan diri dan komuniti sekitar?

Terima kasih kerana mengambil bahagian dalam kajian ini

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