# RESOURCE CHARACTERIZATION AND UTILIZATION OF *Lepironia articulata* (Retz.) Domin AT KG. BERIS TOK KU AND KG. BETING LINTANG, TERENGGANU

SHOMA TANI

FACULTY OF SCIENCE
UNIVERSITI MALAYA
KUALA LUMPUR

2021

# RESOURCE CHARACTERIZATION AND UTILIZATION OF *Lepironia articulata* (Retz.) Domin AT KG. BERIS TOK KU AND KG. BETING LINTANG, TERENGGANU

**SHOMA TANI**

**DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE (ENVIRONMENTAL MANAGEMENT TECHNOLOGY)**

**INSTITUTE OF BIOLOGICAL SCIENCES**
**FACULTY OF SCIENCE**
**UNIVERSITI MALAYA**
**KUALA LUMPUR**

**2021**

**UNIVERSITI MALAYA**

**ORIGINAL LITERARY WORK DECLARATION**

Name of Candidate: **SHOMA TANI**

Matric No: **SOA180001 (17006976/1)**

Name of Degree: **MASTER OF SCIENCE (ENVIRONMENTAL MANAGEMENT TECHNOLOGY)**

Title of Dissertation ("this Work"):

**RESOURCE CHARACTERIZATION AND UTILIZATION OF *Lepironia articulata* (Retz.) Domin AT KG. BERIS TOK KU AND KG. BETING LINTANG, TERENGGANU**

Field of Study: **NATURAL RESOURCE MANAGEMENT**

I do solemnly and sincerely declare that:

(1) I am the sole author/writer of this Work;
(2) This Work is original;
(3) Any use of any work in which copyright exists was done by way of fair dealing and for permitted purposes and any excerpt or extract from, or reference to or reproduction of any copyright work has been disclosed expressly and sufficiently and the title of the Work and its authorship have been acknowledged in this Work;
(4) I do not have any actual knowledge nor do I ought reasonably to know that the making of this work constitutes an infringement of any copyright work;
(5) I hereby assign all and every rights in the copyright to this Work to the University of Malaya ("UM"), who henceforth shall be owner of the copyright in this Work and that any reproduction or use in any form or by any means whatsoever is prohibited without the written consent of UM having been first had and obtained;
(6) I am fully aware that if in the course of making this Work I have infringed any copyright whether intentionally or otherwise, I may be subject to legal action or any other action as may be determined by UM.

Candidate's Signature Date: 5 January 2021

Subscribed and solemnly declared before,

Witness's Signature Date: 5 January 2021

Name:

Designation:

**RESOURCE CHARACTERIZATION AND UTILIZATION OF *Lepironia articulata* (Retz.) Domin AT KG. BERIS TOK KU AND KG. BETING LINTANG, TERENGGANU**

## ABSTRACT

This research focused on how handicrafts could contribute to sustainable community development with natural resource management. This research aims to characterize *Lepironia articulata* as a resource by taxonomy and distribution patterns, examine its utilization through group and semi-structured interviews with ten local residents who got involved in handicraft productions at two selected villages in Setiu Wetlands of Terengganu state and identify their capacity development opportunities by following a guideline provided by United Nations Development Programme. This research clarified that the height of *Lepironia articulata* in Setiu Wetlands was shorter than the records of the other description and the other site in Singapore while the width of stem and the bladeless sheaths were similar to former records. *Lepironia articulata* was utilized sustainably except for the coloring method during the material preparation process. Capacity of producers on information technology and weaving and making handicrafts skills could be further developed with collaboration of multi stakeholders and leadership of the state government.

**Keywords:** Handicrafts; Natural resource management; Sustainable community development; Capacity development

**PENCIRIAN DAN PENGUNAAN SUMBER *Lepironia articulata* (Retz.) Domin DI KG. BERIS TOK KU DAN KG. BETING LINTANG, TERENGGANU**

## ABSTRAK

Kajian ini berfokus pada bagaimana kraftangan boleh menyumbang kepada pembangunan masyarakat yang lestari dengan pengurusan sumber semula jadi. Kajian ini berusaha untuk mencirikan *Lepironia articulata* (Retz.) Domin sebagai sumber secara taksonomi dan kaedah penyebaran, memeriksa pengunaannya melalui wawancara berkumpulan dan separa-struktur dengan sepuluh penduduk yang terlibat dalam pembuatan kraftangan di dua kampung terpilih di Tanah Bencah Setiu, Terengganu, dan mengenalpasti peluang pembangunan keupayaan berdasarkan sebuah garispanduan dari United Nations Development Programme. Kajian ini menjelaskan bahawa ketinggian *Lepironia articulata* di lembah Setiu lebih daripada huraian asal dan tempat yang lain di Singapura walaupun lebar tangkal dan kepanjang daun serupa dengan tempat yang lain. *Lepironia articulata* digunakan secara lestari kecuali cara pewarnaan semasa proses penyediaan bahan. Kapasiti pengusaha tentang teknologi yang informasi dan kemahiran menganyam dan membuat kraftangan dapat lebih dikembangkan oleh kolaborasi dengan pelbagai pihak berkepentingan dan kepemimpinan kerajaan negeri.

**Keywords:** Kraftangan; Pengurusan sumber semulajadi; Pembangunan masyarakat yang lestari; Pembangunan kapasiti

## ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to my supervisors Dr. Pozi Anak Milow and Dr. Jarina Mohd Jani for guidance, support, patience and encouragement throughout this research.

I am grateful to Megat Fadhlul Hazmi bin Megat Ghazali for his helps and supports as an interpreter during the interviews. Also, my warm thanks to Amira Izzaty Horsali for her helps and supports in the surveys.

Last but not least, I would like to express special thanks to Kwansei Gakuin University for the financial support that enabled me to carry out my work successfully.

## TABLE OF CONTENTS

**ORIGINAL LITERARY WORK DECLARATION** ..... **ii**

**ABSTRACT** ..... **iii**

**ABSTRAK** ..... **iv**

**ACKNOWLEDGEMENTS** ..... **v**

**LIST OF FIGURES** ..... **ix**

**LIST OF TABLES** ..... **xi**

**LIST OF SYMBOLS AND ABBREVIATIONS** ..... **xiii**

**LIST OF APPENDICES** ..... **xiv**

**CHAPTER 1: INTRODUCTION** ..... **1**

1.1 Background of Research ..... 1

1.2 Problem Statement ..... 6

1.3 Research Questions ..... 8

1.4 Objectives of Research ..... 8

**CHAPTER 2: LITERATURE REVIEW** ..... **9**

2.1 Biology of *Lepironia articulata* (Retz.) Domin ..... 9

2.2 Contribution of Handicrafts to Environmental Management ..... 11

2.3 Contribution of Handicrafts to the Local Economy ..... 12

2.4 Contribution of Handicrafts to Capacity Development ..... 13

**CHAPTER 3: METHODOLOGY ..... 15**

3.1 Study Sites ..... 15

3.2 Resource Characterization ..... 19

3.2.1 Population Description of *Lepironia articulata* ..... 19

3.2.2 Distribution Pattern of *Lepironia articulata* ..... 19

3.3 Resource Utilization of *Lepironia articulata* ..... 21

3.4 Identification of Capacity Development Opportunities for Local Communities 25

**CHAPTER 4: RESULTS ..... 26**

4.1 Resource Characterization ..... 26

4.1.1 Population Description of *Lepironia articulata* ..... 26

4.1.2 Distribution Pattern of *Lepironia articulata* ..... 28

4.2 Resource Utilization of *Lepironia articulata* ..... 35

4.2.1 Management Method of *Lepironia articulata* ..... 36

4.2.2 Process of Handicraft Production ..... 38

4.2.3 Household Income ..... 47

4.2.4 Awareness and Incentive of Producers toward Handicrafts ..... 48

4.3 Identification of Capacity Development Opportunities for Local Communities 50

**CHAPTER 5: DISCUSSION ..... 51**

5.1 Resource Characterization ..... 51

5.1.1 Description of *Lepironia articulata* ..... 51

5.1.2 Occurrence of *Lepironia articulata* ..... 52

5.1.3 Distribution of *Lepironia articulata* ..... 52

5.2 Resource Utilization of *Lepironia articulata* ..... 55

5.2.1 Management Method of *Lepironia articulata*.....55

5.2.2 Process of Handicraft Production.....57

5.2.3 Household Income.....59

5.2.4 Awareness and Incentive of Producers toward Handicrafts.....60

5.3 Identification of Capacity Development Opportunities for Local Communities 63

**CHAPTER 6: CONCLUSION ..... 66**

**REFERENCES ..... 68**

**APPENDICIES ..... 74**

## LIST OF FIGURES


Figure 1.1 : Median monthly household income by state in 2016……2

Figure 1.2 : Median and mean monthly salaries and wages of employees in Malaysia in 2017……3

Figure 1.3 : Hypothesis of relationships between result and causes……7

Figure 2.1 : General structure of a clone of *Lepironia articulata* (Ikushima, 1978)…9

Figure 2.2 : Growth curves of mean dry weight per culm at Station XIII (upper curve)and Station XI (lower curve) (Ikushima, 1978)……10

Figure 3.1 : Map of Peninsula Malaysia showing the location of Terengganu state15

Figure 3.2 : Map of Besut and Setiu district and other districts in Terengganu……15

Figure 3.3 : Map of communities……16

Figure 3.4 : Map of sites of two villages……17

Figure 4.1 : Plant (KLU 49904) ……27

Figure 4.2 : Plant (KLU 49905) ……27

Figure 4.3 : Plant coverage and value of the plots in the site of Kampung Beting Lintang……28

Figure 4.4 : Distribution of each plot in Kampung Beting Lintang……29

Figure 4.7 : Plant coverage and value of the plots in the site of Kampung Beris Tok Ku……31

Figure 4.8 : Distribution of each plot in Kampung Beris Tok Ku……32

Figure 4.9 : Main role of each actor on conservation of *Lepironia articulata*……36

Figure 4.10 : Process of handicraft production……38

Figure 4.11 : A bundle of *Lepironia articulata* ready for weaving……41

Figure 4.12 : A finished *Lepironia articulata* mat……41

Figure 4.13 : Material for colouring……42

Figure 4.14 : The coloured stems……42

Figure 4.15 : Amount of harvesting per effort (kg)……43

Figure 4.16 : Products produced by KPW……45

Figure 5.1 : Situation after the plants were burned……52

Figure 5.2 : Flow chart on impacts and risks of freshwater ecosystems by climate change……53

Figure 5.3 : Method of cut of plant by a producer……55

Figure 5.4 : Mat made from coloured *Lepironia articulata* material……57

Figure 5.5 : Liquid dye after being boiled by hot water……58

Figure 5.6 : Comparison of mean income……59

Figure 5.7 : Stakeholders for handicraft industry……63

## LIST OF TABLES


Table 1.1 : Rankings of gender gaps by East Asia and the Pacific by World Economic Forum, 2017……5

Table 1.2 : Research questions……8

Table 3.1 : GPS location of the site in Kampung Beting Lintang……17

Table 3.2 : GPS location of the site in Kampung Beris Tok Ku……18

Table 3.3 : The Domin and Braun-Blanquet scales (Sutherland, 2006)……20

Table 3.4 : Data analysis process……22

Table 3.5 : The list of fundamental questions for open coding……23

Table 3.6 : The coding paradigm suggested by Strauss (1987)……24

Table 3.7 : UNDP Capacity Assessment Framework……25

Table 4.1 : Collection data of *Lepironia articulata* (Retz.) in Kampung Beting Beting Lintang and Kampung Beris Tok Ku……26

Table 4.2 : Plant coverage and value of the plots in the site of Kampung Beting Lintang……28

Table 4.3 : The height and number of flowers in the site of Kampung Beting Lintang……30

Table 4.4 : Plant coverage and value of the plots in the site of Kampung Beris Tok Ku……31

Table 4.5 : The height and number of flowers in the site of Kampung Beris Tok Ku……33

Table 4.6 : Demography of producers in Kampung Beting Lintang……35

Table 4.7 : Demography of producers in Kampung Beris Tok Ku……35

Table 4.8 : The procedure of colouring……41

Table 4.9 : Amount and frequency of harvesting plants by producers in Kampung Beting Lintang……43

Table 4.10 : Amount and frequency of harvesting plants by producers in Kampung Beris Tok Ku……44

Table 4.11 : Comparison of price of some products in two villages……46

Table 4.12 : Comparison of income between two villages……47

Table 4.13 : Incentive of producers in Kampung Beting Lintang……48

Table 4.14 : Incentive of producers in Kampung Beris Tok Ku……48

Table 5.1 : Comparison of characteristics of *Lepironia articulata*……51

## LIST OF SYMBOLS AND ABBREVIATIONS

| | | |
|---|---|---|
| B40 | : | Bottom 40 |
| DOSM | : | Department of Statistics, Malaysia |
| GEF | : | Global Environment Fund |
| GGI | : | Global Gender Gap Index |
| GHG | : | Greenhouse Gas |
| IPCC | : | Intergovernmental Panel on Climate Change |
| KPW | : | Kumpulan Perkembangan Wanita |
| MGGI | : | Malaysia Gender Gap Index |
| MoEA | : | Ministry of Economic Affairs |
| M40 | : | Middle 40 |
| SNS | : | Social Networking Services |
| UMT | : | Universiti Malaysia Terengganu |
| UNDP | : | United Nations Development Programme |
| WEF | : | World Economic Forum |
| WWF | : | World Wildlife Fund |

## LIST OF APPENDICES

Appendix A: List of questions for handicraft producers……74

# CHAPTER 1: INTRODUCTION

## 1.1 Background of Research

Terengganu has received remarkable development over the last 30 years after the discovery of the oil and gas reserves. After the oil and gas industry, tourism is the second economic sector in Terengganu that contributes to gross domestic products and positions (Halim, 2012). Also, Terengganu has unique landscapes such as the Setiu Wetlands where there are three river basins and nine interconnected ecosystems. It integrates sand islands, mudflats, mangroves, peat swamp, riparian forest, seagrass beds and sand beaches, and a lagoon filled with both sea and fresh water ecosystem (Salim et al., 2015). According to WWF Malaysia (2016), the features and contexts of Setiu's natural wetland have remarkable ecotourism potential. Ecotourism can generate alternative incomes for local communities, who currently depend almost entirely on the fisheries sector for their livelihood. The Setiu Wetlands are important for the majority of local communities' residents to secure their resources and income (Salim et al., 2015). They run socio-economic activities such as agriculture, aquaculture, timber and non-timber forest products utilization, and fishing. However, the large part of the ecosystem in Setiu Wetlands are regarded as fragile these days since the natural resources are running out (Nakisha & Fauziah, 2003).

Although Terengganu has revenue from the oil and gas industry for economic development, there are currently income gaps between the urban and rural areas. Figure 1.1 indicates median monthly Malaysian household income according to state in 2016. The average monthly income in Malaysia is RM 5,228 (Department of Statistics, 2016). Median monthly household income in Kuala Lumpur is the highest at RM9,073 (Department of Statistics, 2016). Compared to Kuala Lumpur, the household income in rural area such as Terengganu state and Kelantan is much lower.

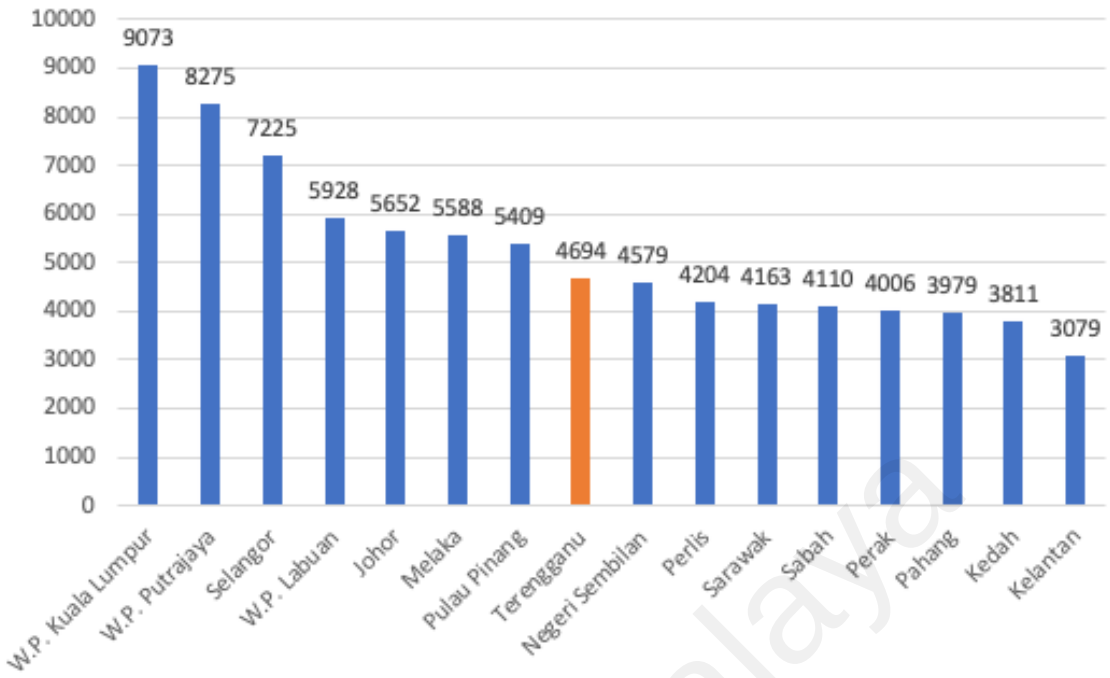


**Figure 1.1: Median monthly household income by state in 2016 (Department of Statistics Malaysia, 2016)**

Figure 1.2 shows median and mean monthly salaries and wages of employees in urban and rural areas in Malaysia in 2017. As it shows, both median and mean monthly salaries and wages in urban areas are higher than that in rural areas. The median monthly salaries and wages in urban areas are 1.61 times higher than that in rural areas, and the mean monthly salaries in urban areas is 1.48 times higher than that in rural areas.

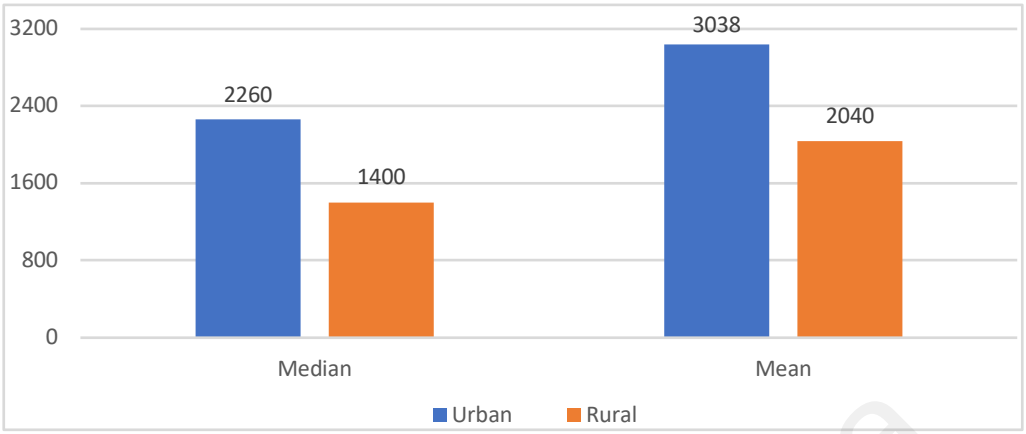


**Figure 1.2: Median and mean monthly salaries and wages of employees in Malaysia in 2017 (Department of Statistics Malaysia, 2017)**

The economic status of local residents in Setiu is still low. According to the result of survey conducted by Halim (2017), incomes of 41% out of 205 households were in the range of RM 301—RM 500 per month and 27% of households earned between RM 501—RM 700 per month followed by 32% of households with income in the range of RM 701—RM 1,000 per month. This showed that most of the household were categorised as 'poor' and 'vulnerable'. In Setiu Wetland, fishing related activities are the most important cash source for the local households, and contribute approximately 25% of household income including renting their boat, being a fisherman's assistant, selling fish to either the resorts or restaurants or through the market, fishing off the shore, seafood rearing, and being a worker at the fish or prawn cage aqua-farms (Halim, 2017).

Table 1.1 shows the ranking of gender gaps in East Asia and the Pacific by the World Economic Forum. The Malaysia Gender Gap Index (MGGI) examined the gap between men and women in four fundamental categories (sub-indexes): Economic Participation & Opportunity, Educational Attainment, Health & Survival and Political Empowerment. MGGI is created by referring to the methodology of the Global Gender Gap Index (GGI) established by the World Economic Forum (WEF) through the latest data available at the Department of Statistics, Malaysia (DOSM). The average score of all four sub-indexes

for Malaysia in 2016 is 0.666 (Department of Statistics, 2017). This indicates that the equality gap between men and women is 66.6 percent (taking into account the weighted by population). The score of 1.00 (100.0%) is defined as no gap between men and women in these four sub-indexes. According to this score, Malaysia ranked the 75th out of 144 countries listed in the Global Gender Gap Index Report (WEF, 2016). This puts Malaysia in the bottom half of the list, suggesting that a research focus on the category of economic participation and opportunity as well as the economic circumstance of women in local communities is relevant to improve the current scenario.

**Table 1.1: Rankings of gender gaps by East Asia and the Pacific by World Economic Forum, 2017 (Department of Statistics Malaysia, 2017)**

| Country | Overall rank | Overall Score |
|---|---|---|
| **Philippines** | 7 | 0.786 |
| **New Zealand** | 9 | 0.781 |
| **Lao PDR** | 43 | 0.724 |
| **Australia** | 46 | 0.721 |
| **Singapore** | 55 | 0.712 |
| **Mongolia** | 58 | 0.705 |
| **Viet Nam** | 65 | 0.700 |
| **Thailand** | 71 | 0.699 |
| **Indonesia** | 88 | 0.682 |
| **China** | 99 | 0.676 |
| **Brunei Darussalam** | 103 | 0.669 |
| **Malaysia** | 106 | 0.666 |
| **Japan** | 111 | 0.660 |
| **Cambodia** | 112 | 0.658 |
| **Korea, Rep.** | 116 | 0.649 |
| **Timor-Leste** | 125 | 0.637 |

The Terengganu state government had depended on revenues from oil and gas production and industry for its development since the 1980s (Islam, 2012). On 4 January 2018, TDM Berhad, which is a state-owned oil palm plantations cultivator, made an agreement with the state government that allowed them to buy 4,515 ha of land for their oil palm plantation expansion plan (The Star Online, 2018). In addition, the state government decided to convert 4,515 ha of land from forest reserve to government land (Puspadevi, 2017). It would be said that this plan was against sustainable development

and affected the ecosystem of Terengganu. Therefore, the state government should consider other ways that help to achieve building a sustainable society.

The Terengganu state government has planned and implemented several actions to transform the tourism industry to be competitive in a global market in cooperation with the State Tourism Department (Halim et al., 2012). According to Halim et al. (2012), actions have been taken to increase the number of tourists by maintaining a natural environment, improving the services rendered in hotels, restaurants, and recreational parks. In addition, Terengganu has a traditional handicraft industry. Some residents have been making weaving products, wood carving, and mats by using local natural resources of Terengganu such as plants called *Lepironia articulata* (locally known as *kercut*), *Pandanus* (locally known as *Mengkuang*), and wood. It was explained that these handicraft products would contribute to increasing income, bridge gender gaps, and enable the state to develop their economy (Halim, 2017).

Research on socio economic development through natural resources in Terengganu is scarce. Therefore, this research would be useful for considering prospects to build a sustainable society in Terengganu.

## 1.2 Problem Statement

The main issue of Terengganu state is that the state's development does not appear to follow the sustainable pathway. As Figure 1.3 shows, there are three main causes suggesting that of the state's unsustainable development.

The first factor is issues directly related to the environment. According to study conducted by WWF Malaysia (2016), mangroves and *gelam* forest in the wetlands area had shrunk by 20% between 2008 and 2011 (WWF Malaysia, 2016). They identified that rubber and oil palm plantation, infrastructure development had destroyed the original vegetation cover (WWF, 2016). The second factor is fragile economic development

status. Given the statement in the former section, the income gap in communities is a crucial issue. The median income of Terengganu state is less than the average of Malaysia. Also, conflict of interests might have affected less economic development of Terengganu (Chudasri, 2013). Third factor is that some of local communities are likely to be excluded from government policies though Malaysian government has implemented a number of economic policies (Sofian et.al, 2017). According to a previous study conducted by Halim (2017), capacity development of women and youths is essential because their economic status is at low level, compared to men, and to other states due to the lack of skills.

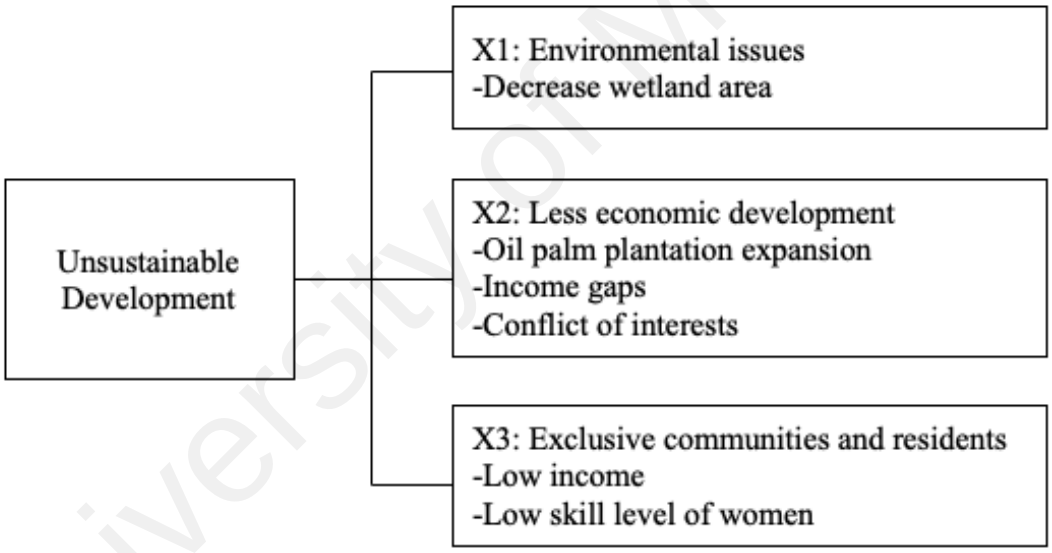


**Figure 1.3: Hypothesis of relationships between result and causes**

## 1.3 Research Questions

Table 1.2 shows the three research questions for this research based on the hypothesis.

**Table 1.2: Research questions**

| No. | Question |
|---|---|
| **1** | Can the existing resource status of *Lepironia articulata* sustain the demand of the handicraft industry in Terengganu? |
| **2** | How can local handicraft production contribute to the conservation of *Lepironia articulata*? |
| **3** | How can the handicraft industry improve the economy of the local communities? |

## 1.4 Objectives of Research

There are three objectives in this research.

1. To characterize *Lepironia articulata* as a resource for handicrafts at two villages located in the districts of Setiu district and Besut in Terengganu.
2. To investigate the utilization and conservation of *Lepironia articulata*.
3. To investigate how local communities, especially women and youths, can develop their capacity through their involvement in handicraft-making activities.

# CHAPTER 2: LITERATURE REVIEW

## 2.1 Biology of *Lepironia articulata* (Retz.) Domin

*Lepironia articulata* is a genus of the sedge family called Cyperaceae discovered by Louis Claude Richard who was a French botanist and botanical illustrator. The order is Poales, and it belongs to Liliopsida class and Magnoliophyta division. There is one species of *Lepironia articulata* identified and ten synonyms (The Plant List, 2013). In Malaysia, *Lepironia articulata* inhabits lakes such as Tasik Bera and Tasik Cini in Pahang, where water level is sufficient, and mud is exposed (Ikushima, 1978). In addition, climate change fed into the dryness of swamp during the dry season, and it caused the burning *Lepironia articulata* (Giesen, 1998). In Terengganu, *Lepironia articulata* grew in swampy areas (Li, 2016).

*Lepironia articulata* is likely to grow fast compared to other plants. Ikushima (1978) described that culms were estimated to emerge every 51−55 days at the earliest time interval and 62−77 days at the latest one. Also, he estimated that *Lepironia articulata* was likely to survive by 207−309 days.

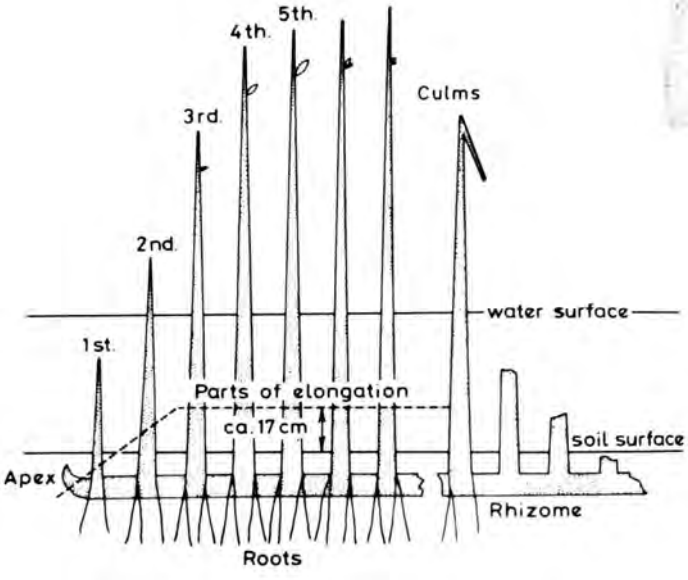


**Figure 2.1: General structure of a clone of *Lepironia articulata* (Ikushima, 1978)**

Ikushima (1978) described that it took around seven months for the culms to mature as Figure 2.2 illustrates the growth curves of mean dry weight per culm.

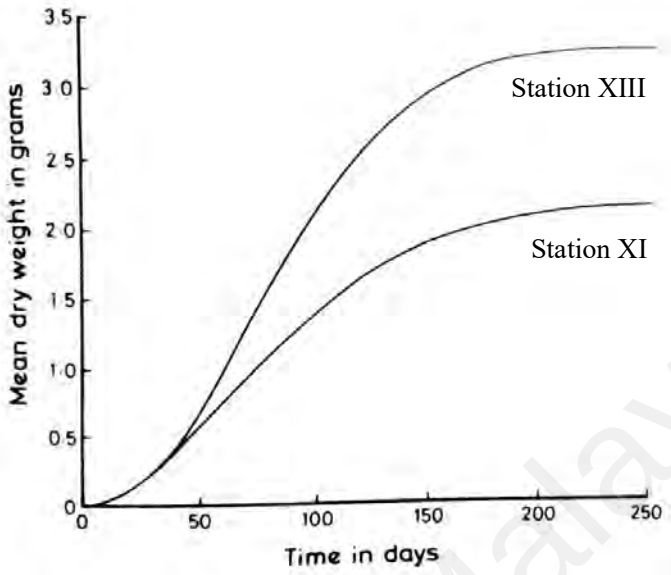


**Figure 2.2: Growth curves of mean dry weight per culm at Station XIII (upper curve) and Station XI (lower curve) (Ikushima, 1978)**

Previous research conducted by Salim et al. (2013) mentioned that *Lepironia articulata*, called as *kercut* in local language, was used as a weaving material and handicraft by the local communities in Terengganu state.

However, the growth of *Lepironia articulata* depends on the condition of the *gelam* forest. Therefore, it is crucial to identify current biological status, dispersion of *Lepironia articulata*, and how it could be affected by water resources or other climate conditions. Also, it is crucial to examine how much resources still inhabit the sites in order for local people to use natural resources for making handicrafts.

## 2.2 Contribution of Handicrafts to Environmental Management

Handicrafts produced from *Lepironia articulata* can contribute to conservation of wetlands. It has shown that the Phu My wetland of Vietnam was maintained by managing *Lepironia articulata* in sustainable ways while local people had been making handicrafts (Tran et al., 2007). Examples of sustainable ways were that indiscriminate harvest techniques were banned, and the volume of harvested raw material was reduced. One of the aspects that this research did not focus on is to clarify processes of how local people made handicrafts by using *Lepironia articulata*. Also, Reddy & Raipally (2014) stated that the traditional handicrafts contributed to make societies more environmentally friendly. It was described that natural resource management and conservation against environmental pollution such as air, water, land and waste pollution were notable characteristics of these traditional crafts (Reddy & Raipally, 2014).

Reuse and recovery of waste was one of the special characteristics in all crafts. Haryati (2020) showed that straws made by *Lepironia articulata* have contributed to reducing the number of plastic products in South Kalimantan province of Indonesia. It was described that this brought about long term benefit especially to the environment since this contributed to reducing wastes (Haryati, 2020). Products made by *Lepironia articulata* has contributed to the preservation of natural ecosystems and the protection of biodiversity while reducing plastic wastes in southern Vietnam (APACO Company Ltd, 2019). As previous research identified that handicrafts had played a key role for wetlands conservation, natural resource management, and waste management, it is therefore clear that handicrafts help in making society sustainable, and consideration should be made in effectively preserving and expanding handicraft production while managing natural resources sustainably.

However, previous studies have not examined whether the production system of these handicrafts would be implemented by sustainable methods, for example without using

any chemicals. Therefore, this research is also valuable to clarify these points in terms of contribution of handicraft production system to conserve the plant and livelihood sustainability.

## 2.3 Contribution of Handicrafts to the Local Economy

Weaving mats and making handicrafts are traditions as well as income resources in the north part of Terengganu state (Salim et al., 2013). Also, handicrafts production has played a key role to secure income for the majority of Setiu villagers, especially women as the secondary source of income (Halim, 2017). This is because many women face circumstances where they seek supplementary income to complement their household incomes.

According to the survey on empowerment of women handicrafts entrepreneurs through Community-Based Tourism conducted by Halim (2017) in Setiu Wetlands, over fifty per cent of 162 respondents had secondary income sources contributing into their household income. Almost forty per cent of the respondents were working as farmers, around thirty per cent of them were working as aquaculturists and there were approximately one fifth of respondents who got involved as handicraft producers. This showed that farming and aquaculture were still an important income source for local people besides fishing. In addition, handicraft served as an important income source in the household. The research showed that the participation and role of women in economic and household activities in Setiu Wetland villages that were related with tourism were seen as a part of the positive impacts.

In addition, another previous research conducted by Jani (2014) stated that villagers who professed to be fishers and were considered as poor under the international framework did not think themselves of poor. According to her insights, the perception toward their status of poverty was not completely correlated with quantitative

circumstances which were income, food, shelter, etc. It can be said that there are conflicts on the way poverty was perceived, where some have been regarded as poor based on the international framework or but were not poor based on the values of local people.

Given the finding of these researches, there is still scope to clarify exact income resources of handicraft producers and how much their income depends on handicrafts.

## 2.4 Contribution of Handicrafts to Capacity Development

Handicrafts have contributed to capacity development of the community. Capacity development refers to the process through which individuals, organizations and societies obtain, strengthen and maintain the capabilities to set and achieve their own development objectives over time (UNDP, 2009). In Phu My, Vietnam, the management of capacity of local people producing handicrafts by harvesting *Lepironia articulata* had been improved as they raised awareness on the importance of the wetland where they harvest *Lepironia articulata* via the "Phu My *Lepironia* grassland conservation and sustainable use" project (Tran, 2010).

It helps to encourage women of poor households to participate in handicraft production in Setiu Wetland, particularly those in fisheries, aquaculture and handicrafts sector. According to Yahaya (1981), persistent poverty and worsening economic conditions urged many women to work outside and to take up various economic activities while continuing to carry out their traditional household duties. The survey conducted by Halim (2014) highlighted some issues and the challenges that the women faced. First, many handicraft entrepreneurs in Setiu could not ensure their production and marketing efficiency due to lack of managerial and technical skills. Second, some of the women entrepreneurs suffered from operational inefficiency in rural areas due to lack of raw materials and traditional production process. Third, they did not have enough capacity to risk assessment because of the lack of technical knowledge and capability to take risk.

Fourth, they lacked business knowledge such as accounting and keeping records, and it affects their operations. This survey also made it clear that thirty per cent of young entrepreneurs used social media to promote their products.

These literature suggest that developing local capacity is one of the crucial areas that the communities need to address (Tran, 2010; Yahaya, 1981; Halim, 2014). Also, they suggest that it could be improved by encouraging the younger generations to be engaged in the process of the handicraft industry (Richard, 2007). In addition, it is crucial to examine how aware local residents are of the natural resources in Setiu Wetlands since there might be less research on their awareness towards the sustainable use of natural resources.

# CHAPTER 3: METHODOLOGY

## 3.1 Study Sites

This research was conducted in two selected villages in the northern part of Terengganu, Malaysia. Figure 3.1 shows the Terengganu state while Figure 3.2 shows Besut and Setiu district.

**Figure 3.1: Map of Peninsula Malaysia showing the location of Terengganu state**


**Figure 3.2: Map of Besut and Setiu district and other districts in Terengganu**

This research was conducted in two villages in Setiu Wetlands where *Lepironia articulata* weaving is practised, i.e. Kampung Beting Lintang and Kampung Beris Tok Ku as shown in Figure 3.3. Kampung Beting Lintang is in the Besut district while Kampung Beris Tok Ku is in the Setiu district.

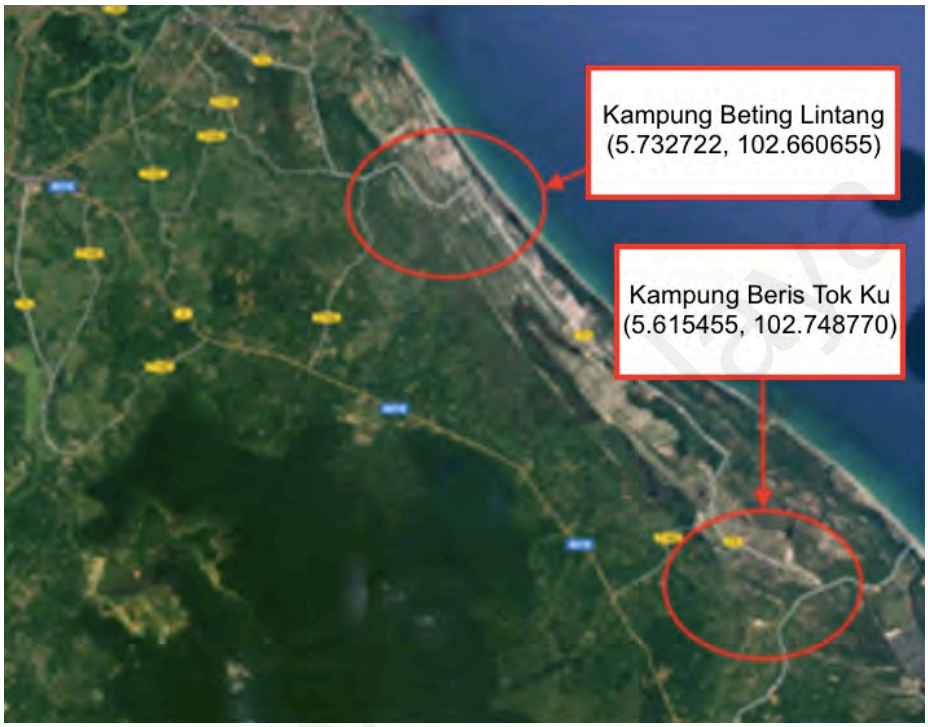


**Figure 3.3: Map of communities**

Both villages are geographically located within the Setiu Wetlands ecosystem that has beautiful coastal landscapes and wetlands. It supports major marine, fresh and brackish ecosystems of wetland (Salim et al., 2015). Most of the natural resources harvested from Setiu Wetlands provide livelihoods of the local people (Salim et al., 2015). It serves as an essential ecosystem for economic activities of the local communities, especially for aquaculture and ecotourism. However, these developments could affect Setiu Wetlands' natural environment and its resources (Salim et al., 2015).

Figure 3.4 shows a map of sites of two villages, and Table 3.1 and Table 3.2 describes GPS location of sites where local producers take *Lepironia articulata* for handicraft productions. For this research, one harvesting site is selected from each village though there are a few harvesting sites in Kampung Beris Tok Ku. Size of the study site in Kampung Beting Lintang is 2,296 $m^2$ (82.1m×27.9m), and that in Kampung Beris Tok Ku is 2,160 $m^2$ (100.0m×21.6m).

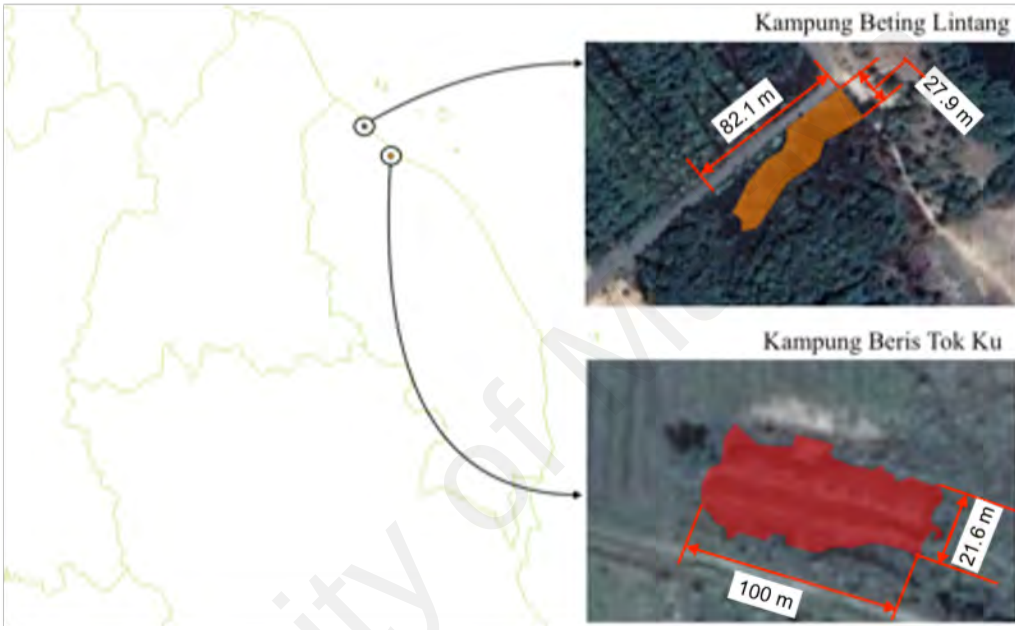


**Figure 3.4: Map of sites of two villages**

**Table 3.1: GPS location of the site in Kampung Beting Lintang**

| Point No. | N | E |
|---|---|---|
| **1** | 5.72951 | 102.66428 |
| **2** | 5.729797 | 102.664688 |
| **3** | 5.729618 | 102.664837 |
| **4** | 5.729319 | 102.664416 |

**Table 3.2: GPS location of the site in Kampung Beris Tok Ku**

| Point No. | N | E |
|---|---|---|
| **1** | 5.59917 | 102.78047 |
| **2** | 5.59898 | 102.78043 |
| **3** | 5.59857 | 102.78164 |
| **4** | 5.598276 | 102.781461 |

## 3.2 Resource Characterization

The resource that is characterized in this study is *Lepironia articulata* that can be found in the selected study sites. The aspects of the resource that are characterized are taxonomy, distribution, and harvest pattern and utilization. The materials and methods for the resource characterization are described below.

### 3.2.1 Population Description of *Lepironia articulata*

The taxonomic description of *Lepironia articulata* was based on specimens found at the study sites. Two samples were collected on 7th April, 2019. Width of stem, length of bladeless sheaths, and size of flowers and fruits were measured. Two samples were also collected and preserved for deposition in the KLU Herbarium which is located at the Rimba Ilmu of the University of Malaya.

### 3.2.2 Distribution Pattern of *Lepironia articulata*

In this study, occurrence of *Lepironia articulata* was determined in each site of the two villages by adopting the quadrat method. Quadrat could be used to measure density, frequency, cover or biomass of plants (Sutherland, 2006). This method was utilized to identify sample areas which were selected at random within the study areas. Sutherland (2006) recommended that vegetation with smaller plants, greater plant density or greater species diversity required smaller quadrats, so this research adopted the size of quadrats which was within $1m^2$ shown in Figure 3.5 and Figure 3.6. Also, multiple quadrats were suggested to ensure a good estimate of species' abundances, so the researcher defined five sampling areas at random in each site. Also, ten samples of the plant were collected from each plot to measure height of the plant and number of flowers.

To estimate the percentage of occurrence in quadrats by observation, the Domin and Braun-Blanquet scales shown in Table 3.3 was referred to identify the area covered by the plant. This research adopted Braun-Blanquet scale as the survey focused on just one species, *Lepironia articulata*. After measuring the percentage of area covered by the plant, maps of its distribution were drawn.

**Table 3.3: The Domin and Braun-Blanquet scales (Sutherland, 2006)**

| Value | Braun-Blanquet | Domin |
|---|---|---|
| + | <1% Cover | 1 Individual, with no measurable cover |
| **1** | 1% - 5% Cover | <4% Cover with few individuals |
| **2** | 6% - 25% Cover | <4% Cover with several individuals |
| **3** | 26% - 50% Cover | <4% Cover with many individuals |
| **4** | 51% - 75% Cover | 4% - 10% Cover |
| **5** | 76% - 100% Cover | 11% - 25% Cover |
| **6** | | 26% - 33% Cover |
| **7** | | 34% - 50% Cover |
| **8** | | 51% - 75% Cover |
| **9** | | 76% - 90% Cover |
| **10** | | 91% - 100% Cover |

### 3.3 Resource Utilization of *Lepironia articulata*

Data on resource utilization was obtained through group and semi-structured interviews. The interviews were carried out during several visits to the study sites between April and August 2019. The interviewees were identified through the snowball sampling technique. These interviewees were ten local women who were involved in handicraft production. The interviews were conducted in homes of the interviewees where the handicraft making and related activities took place. Information on handicraft production process was also gathered through participating in capacity development workshops for the local handicraft makers on 24th and 25th August, 2019. Interview questions focused on five points that were 1) management method of *Lepironia articulata*, 2) process of handicraft production, 3) household income, 4) awareness and incentive of producers, 5) identification of stakeholders and partnerships for capacity development. The list of questions asked in the interview are shown in the appendices. The interview questions were written in English, but it was conducted in a local dialect with help of an interpreter.

After collecting data from the interview with the selected informants, qualitative analysis through NVivo 12 was conducted to clarify findings on above five points. NVivo 12 is a software program for the analysis of qualitative data and helps to analyze qualitative data such as texts, audio, video including interviews, focus groups, surveys, etc. (Kent State University, 2020).

In the analysis, the researcher applied thematic coding method that had been developed by Flick (2009). Flick (2009) identified thematic coding as the method that aimed at developing a theory starting from the distribution of perspectives on a certain issue or process. The text analysis comprised coding statements and narratives in categories, which were developed from the resources. The method elaborated similarities and differences between the groups or individuals identified. The researcher proceeded the following six steps, shown in Table 3.4, for the analysis according to the method.

**Table 3.4: Data analysis process**

| | |
|---|---|
| **1** | Compose short descriptions of each case |
| **2** | Develop a system of categories for the analysis for the single case by using open coding |
| **3** | Analyze single passages in more detail for a further interpretation of the thematic domains by employing coding paradigm |
| **4** | The result of this process was a case-oriented display of the way it specifically dealt with the issue of the study |
| **5** | Analyze and assess the social distribution of perspectives on the issue |
| **6** | Clarify the topical range in the way the interviewees' deal with each theme |

First, short descriptions of each case were composed. In the case descriptions, it included the motto of case, background information of the person, and central topics mentioned by the interviewees with regard to research issues.

Secondly, through the deepening analysis, a system of categories for the analysis for the single case was developed. For this procedure, the researcher used open coding. The open coding aimed at describing data and phenomena in the form of concepts (Flick, 2009). First, data were segmented. A series of meanings figured out expressions by single word or short unit of words in order to put annotations and concepts on them. The next step was to categorize these codes by grouping them divided by phenomena found in the data, which were related to the research questions. Flick (2009) described that the categories formed were connected to codes, which were more abstract than those created at the beginning. Flick (2009) suggested that the result of open coding has been a list of the codes and categories attached to the text. This should have been complemented by the code notes that were composed for describing and clarifying the content of codes and categories, and a great deal of memos, which included remarkable observations on the material and thoughts that were related to the development of the theory (Flick, 2009). The researcher proceeded to open coding, addressing text with the following list of

fundamental questions that Table 3.5 shows. The transcription based on the interview was opened up by asking these questions.

**Table 3.5: The list of fundamental questions for open coding (Flick, 2009)**

| | | |
|---|---|---|
| **1** | What? | What is the issue here? Which phenomenon is mentioned? |
| **2** | Who? | Which persons, actors are involved? Which roles do they play? How do they interact? |
| **3** | How? | Which aspects of the phenomenon are mentioned (or not mentioned)? |
| **4** | When? How long? Where? | Time, course, and location. |
| **5** | How much? How strong? | Aspects of intensity. |
| **6** | Why? | Which reasons are given or can be reconstructed? |
| **7** | What for? | With what intention, to which purpose? |
| **8** | By which? | Means, tactics, and strategies for reaching the goal. |

Third, for a further interpretation of the thematic domains, single passages of the text were analyzed in more detail. Then, the coding paradigm suggested by Strauss (1987, pp 27-28) shown in Table 3.6 was employed as a basic point for deriving the following key questions;

**Table 3.6: The coding paradigm suggested by Strauss (1987)**

| |
|---|
| **1** *Conditions:* Why? What has led to the situation? Background? Course? |
| **2** *Interaction among the actors:* Who acted? What happened? |
| **3** *Strategies and tactics:* Which ways of handling situations, e.g., avoidable, adaptation? |
| **4** *Consequencer:* What changed? Consequences, results? |

Fourth, the result of this process was a case-oriented display of the way it specifically dealt with the issue of the study including constant topics that could be found in the viewpoints across different domains. Fifth, the social distribution of perspectives on the issue under this survey was analyzed and assessed. The developed thematic structure served for comparing cases and groups. Finally, the topical range in the way the interviewees' deal with each theme was clarified after the continuous comparison of the cases on the basis of the developed structure.

## 3.4 Identification of Capacity Development Opportunities for Local Communities

Capacity development of the communities at Kampung Beting Lintang and Kampung Beris Tok Ku was assessed by using the guideline provided by UNDP. UNDP set five steps for the approach of capacity development which are 1) Engage stakeholders on capacity development, 2) Assess capacity assets and needs; 3) Formulate a capacity development response, 4) Implngement the response, and 5) Evaluate capacity development (UNDP, 2009). This research focused on step 2) Assess capacity assets and needs in order to identify opportunities for capacity development by determining which capacities to prioritize for local producers of two villages. The assessment was conducted by focusing on two core issues, which were leadership and knowledge, and two functional capacities, which were engagement of stakeholders and identification of situation and vision as Table 3.7 shows.

**Table 3.7: UNDP Capacity Assessment Framework (UNDP, 2009)**

| | | Functional Capacities | | | | |
|---|---|---|---|---|---|---|
| | | Engage with Stakeholders | Assess Situation & Define Vision and Mandate | Formulate Policies & Strategies | Budget | Evaluate |
| Core Issues | Leadership | ○ | ○ | | | |
| | Knowledge | ○ | ○ | | | |
| | Accountability | | | | | |
| | Institutional Arrangements | | | | | |

# CHAPTER 4: RESULTS

## 4.1 Resource Characterization

### 4.1.1 Population Description of *Lepironia articulata*

Stems of *Lepironia articulata* at the study sites were 100-120 cm tall and 3-5 mm wide. Leaves were reduced to bladeless sheaths at the base of the stems, 5-29 cm long, and dull yellow to brownish. Its flowers were arranged in an inflorescence known as a spikelet. The spikelet occurred singly on each stem, each ovoid to oblong ellipsoid, and 1-5 mm. The fruits were brown nuts that were dorsoventrally compressed, obovate, with longitudinal striations, and 10-20 mm. Data of *Lepironia articulata* collected in the field sites of Kampung Beting Lintang and Kampung Beris Tok Ku is shown in Table 4.1. Figure 4.3 and Figure 4.4 show fruit and stem of the plant collected.

**Table 4.1: Collection data of *Lepironia articulata* (Retz.) in Kampung Beting Lintang and Kampung Beris Tok Ku**

| S/No. | Bar Code No | Collector | Date Collected | Locality |
|---|---|---|---|---|
| 1. | KLU 49904 | S. Tani | 07.Apr.2019 | Kampung Beting Lintang, Besut, Terengganu |
| 2. | KLU 49905 | S. Tani | 07.Apr.2019 | Kampung Beris Tok Ku, Setiu, Terengganu |


**Figure 4.1: Plant (KLU 49904)**


**Figure 4.2: Plant (KLU 49905)**

### 4.1.2 Distribution Pattern of *Lepironia articulata*

Table 4.2 shows the result of the plant coverage and value of the plots in the site of Kampung Beting Lintang. As Table 4.2 shows, the coverage percentage of *Lepironia articulata* in the site of Kampung Beting Lintang was no more than 50 per cent. The result can be interpreted that the plant coverage in plots was sparse to medium level. Figure 4.3 indicates that plant coverage is not sufficient to be described as dense level that is more than 75% of coverage (Sutherland, 2006). The average plant coverage of the plots in the site of Kampung Beting Lintang is 38%. Thus, it is described as medium level (25 to 50%).

**Table 4.2: Plant coverage and value of the plots in the site of Kampung Beting Lintang**

| Plot | Coverage (%) | Value |
|---|---|---|
| 1 | 30% | 3 |
| 2 | 45% | 3 |
| 3 | 25% | 2 |
| 4 | 30% | 3 |
| 5 | 60% | 4 |


**Figure 4.3: Plant coverage and value of the plots in the site of Kampung Beting Lintang**

In addition, *Lepironia articulata* grew sparsely in terms of the pattern of distribution according to Figure 4.4.

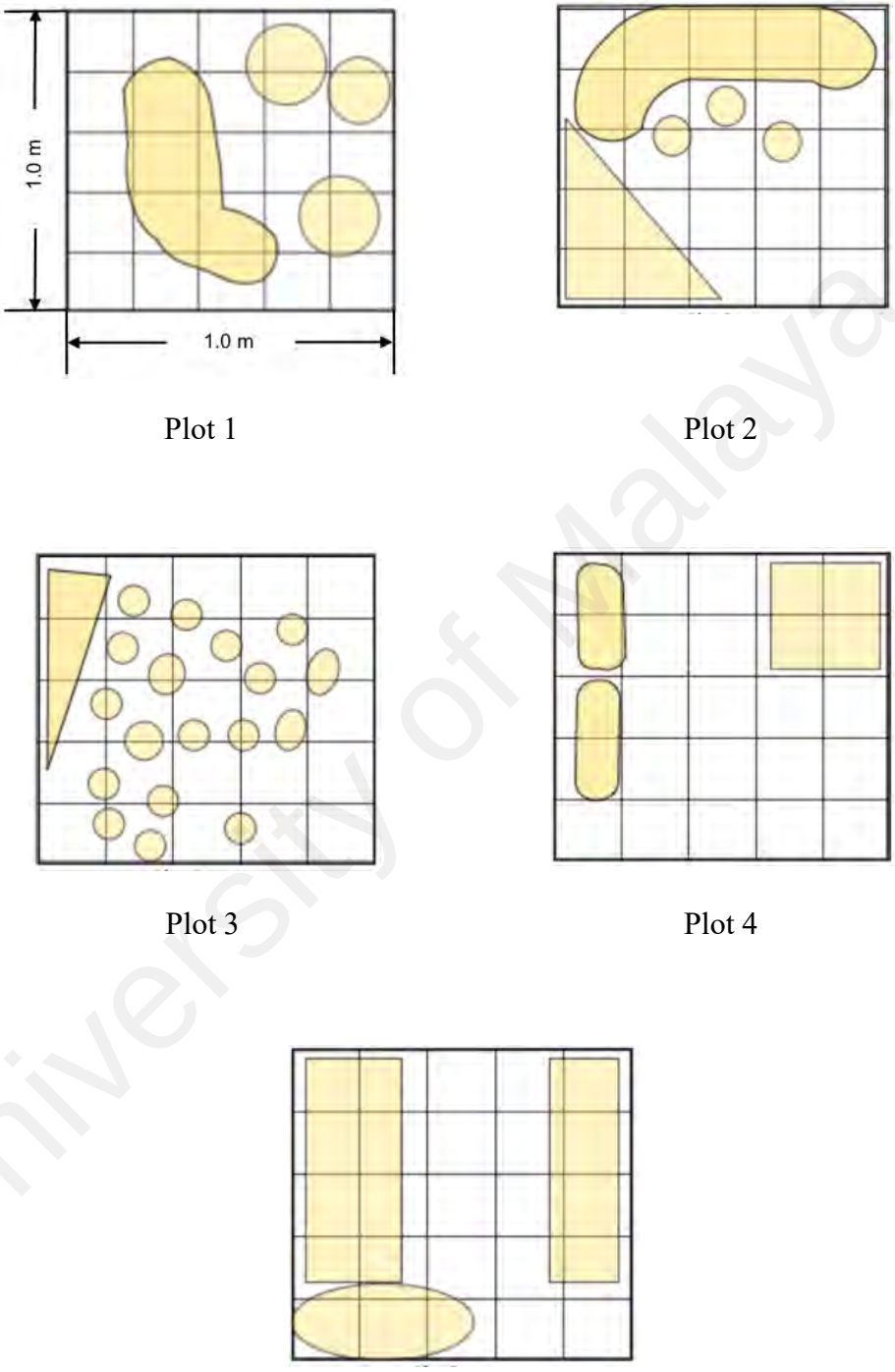


**Figure 4.4: Distribution of each plot in Kampung Beting Lintang**

Table 4.3 shows the result of its height and the number of flowers. The percentage of *Lepironia articulata* with a fresh flower for each plot was 40% (plot 1), 20% (plot 2), 50% (plot 3), 30% (plot 4), and 50% (plot 5).

**Table 4.3: The height and number of flowers in the site of Kampung Beting Lintang**

| | Plot1 | | Plot2 | | Plot3 | | Plot4 | | Plot5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. | Height (cm) | Flower | Height (cm) | Flower | Height (cm) | Flower | Height (cm) | Flower | Height (cm) | Flower |
| 1 | 21.5 | 0 | 138 | 0 | 130.5 | 1 | 117.5 | 0 | 125 | 0 |
| 2 | 61.5 | 0 | 137 | 0 | 128 | 1 | 108.5 | 0 | 124 | 0 |
| 3 | 99 | 0 | 132 | 0 | 123.5 | 1 | 72 | 0 | 121.5 | 0 |
| 4 | 123 | 0 | 129.5 | 1 | 119.5 | 0 | 132 | 1 | 120 | 1 |
| 5 | 123 | 1 | 124.5 | 1 | 116 | 0 | 121 | 1 | 100.5 | 1 |
| 6 | 119 | 1 | 124.5 | 0 | 111 | 0 | 121 | 1 | 104 | 0 |
| 7 | 116.5 | 1 | 81 | 0 | 98 | 1 | 114 | 0 | 95 | 0 |
| 8 | 107 | 0 | 73.5 | 0 | 131 | 1 | 110.5 | 0 | 89 | 0 |
| 9 | 104 | 0 | 45 | 0 | 99 | 0 | 103 | 0 | 78 | 0 |
| 10 | 103 | 1 | 101 | 0 | 78.5 | 0 | 86.5 | 0 | 72.5 | 0 |

The average of its height for each plot was 97.86 cm (plot 1), 108.6 cm (plot 2), 113.5 cm (plot 3), 102.4 cm (plot 4), and 103.0 cm (plot 5). The highest height of plants for each plot was 116.5 cm (plot 1), 138 cm (plot 2), 131 cm (plot 3), 132 cm (plot 4), 125 cm (plot 5).

Table 4.4 shows the plant coverage and value of the plots in the site of Kampung Beris Tok Ku. As it was shown, the coverage of *Lepironia articulata* was quite different between plots. In the plot 1, 65% of plots were covered by *Lepironia articulata* while none of them occupied in the plot 3. It could be described that less than half of plots were generally covered by *Lepironia articulata* too in the site of Kampung Beris Tok Ku.

**Table 4.4: Plant coverage and value of the plots in the site of Kampung Beris Tok Ku**

| Plot | Coverage (%) | Value |
|---|---|---|
| 1 | 65% | 4 |
| 2 | 30% | 3 |
| 3 | 0% | + |
| 4 | 25% | 2 |
| 5 | 40% | 3 |

Figure 4.7 indicates that plant coverage is not sufficient to be described as dense level that is more than 75% of coverage. The average plant coverage of plots in the site of Kampung Beris Tok Ku is 32 %. Thus, it is described as medium level (25% to 50%).

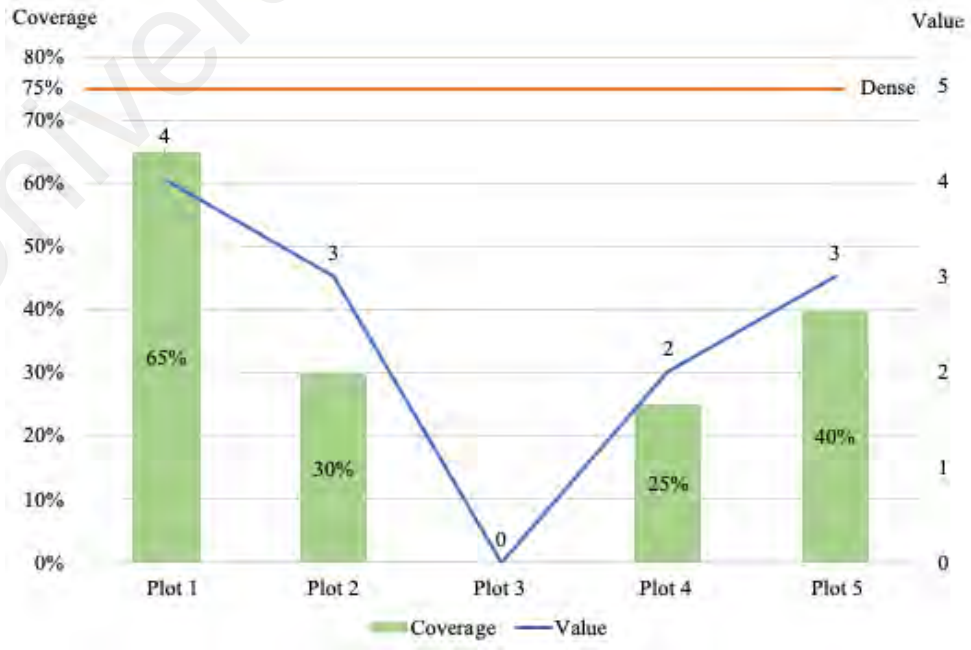


**Figure 4.7: Plant coverage and value of the plots in the site of Kampung Beris Tok Ku**

Figure 4.8 indicates the pattern of the distribution of *Lepironia articulata* in each plot. In the site of Kampung Beris Tok Ku, the pattern of the distribution was different from that of Kampung Beting Lintang in that it seemed gathered near the center of the plot.

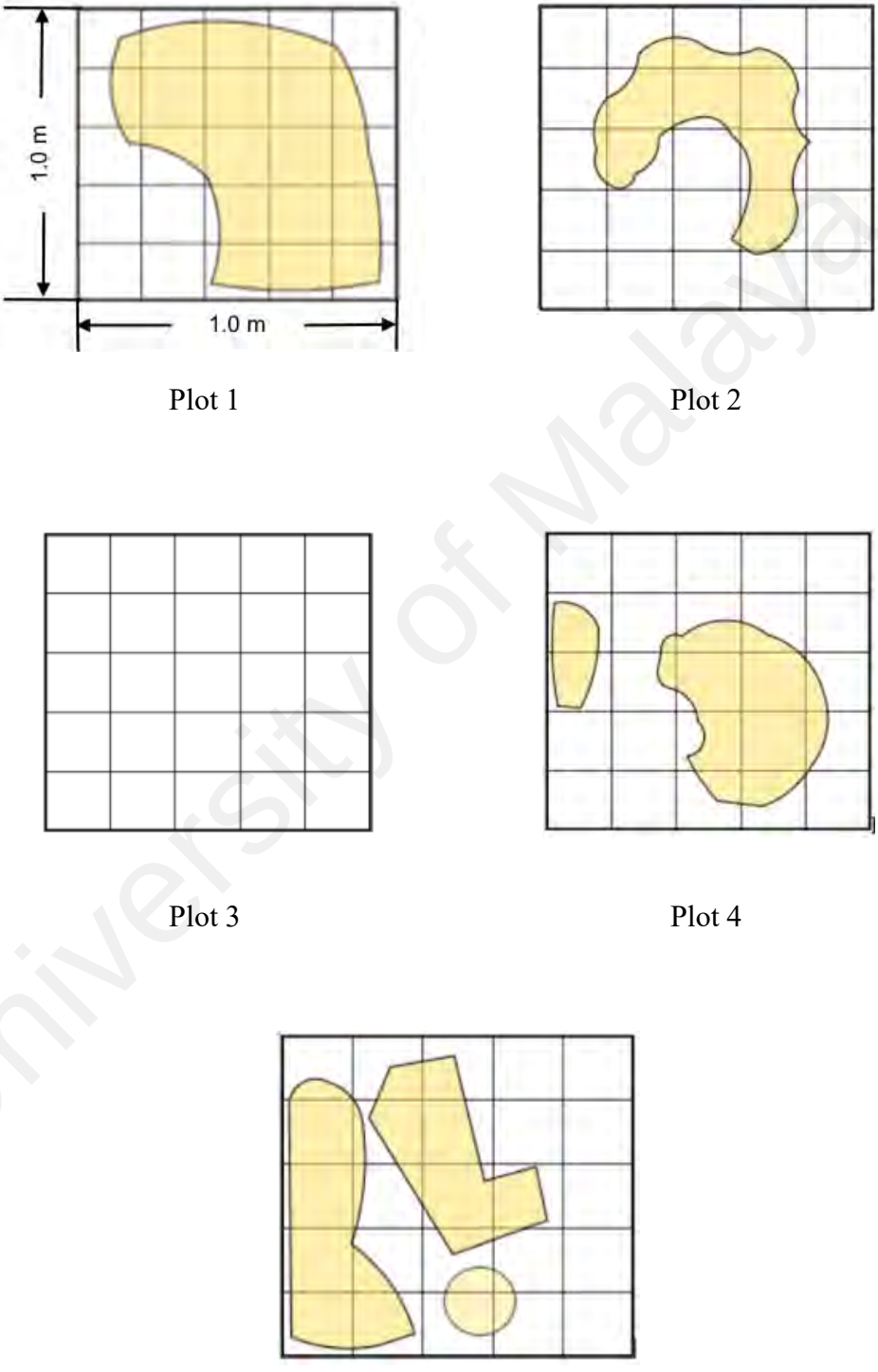


**Figure 4.8: Distribution of each plot in Kampung Beris Tok Ku**

From the visual observation, it was confirmed that there was only *Lepironia articulata* in the site of Kampung Beting Lintang. Also, many parts of the site were dry areas which meant that water resources were scarce in the site during the sampling period. On the other hand, several species other than *Lepironia articulata* were found in the site of Kampung Beris Tok Ku. The scarcity of water resources would be one reason why plot 3 was not covered by *L. articulata*.

Table 4.5 shows the *Lepironia articulata* stem height and number of flowers from the site in Kampung Beris Tok Ku. The percentage of *Lepironia articulata* with a fresh flower for each plot was 20% (plot 1), 30% (plot 2), 0% (plot 3), 60% (plot 4), 40% (plot 5). The average total percentage of *Lepironia articulata* with a fresh flower in five plots in Kampung Betting Lintang is 38%, and that was 30% in Kampung Beris Tok Ku. Therefore, it was estimated that Kampung Beting Lintang had more *Lepironia articulata* with a fresh flower than Kampung Beris Tok Ku.

**Table 4.5: The height and number of flowers in the site of Kampung Beris Tok Ku**

| | Plot1 | | Plot2 | | Plot3 | | Plot4 | | Plot5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. | Height (cm) | Flower | Height (cm) | Flower | Height (cm) | Flower | Height (cm) | Flower | Height (cm) | Flower |
| 1 | 188 | 1 | 144 | 0 | | | 124 | 1 | 167 | 0 |
| 2 | 176.5 | 0 | 124 | 1 | | | 95 | 0 | 159.5 | 0 |
| 3 | 162 | 1 | 122 | 0 | | | 89 | 0 | 160 | 1 |
| 4 | 131.5 | 0 | 81 | 0 | | | 137 | 1 | 147.5 | 1 |
| 5 | 120 | 0 | 138 | 0 | | | 108 | 1 | 130 | 1 |
| 6 | 69 | 0 | 120 | 1 | | | 99.5 | 1 | 123.5 | 0 |
| 7 | 185.5 | 0 | 104 | 0 | | | 76 | 0 | 118.5 | 0 |
| 8 | 150 | 0 | 93.5 | 0 | | | 63 | 0 | 94 | 1 |
| 9 | 101 | 0 | 80 | 0 | | | 109 | 1 | 101 | 0 |
| 10 | 50 | 0 | 140 | 1 | | | 99 | 1 | 63.5 | 0 |

The average of its height for each plot was 133.4 cm (plot 1), 114.7 cm (plot 2), 0 cm (plot 3), 99.95 cm (plot 4), and 119.8 cm (plot 5). The highest height of plants for each plot was 188 cm (plot 1), 144 cm (plot 2), 0 cm (plot 3), 137 cm (plot 4), 167 cm (plot 5). The average in Kampung Beris Tok Ku was 117.01 cm while that in Kampung Beting Lintang was 104.86 cm. The average height of *Lepironia articulata* in Kampung Beris Tok Ku was higher than that in Kampung Beting Lintang.

This result shows that the plant coverages in each site of villages are not very high as it was medium level (25% to 50%). A few producers in Kampung Beting Lintang claimed in interviews that climate change could cause changes of water ecosystem, drought, and dryness that lead to destruction of *Lepironia articulata*. Also, producers in Kampung Beris Tok Ku mentioned that human activities such as littering, and fishpond could affect fragmentation of their sites.

## 4.2 Resource Utilization of *Lepironia articulata*

Table 4.6 and Table 4.7 describe the demography of interviewees. The researcher interviewed four weavers in Kampung Beting Lintang and six weavers in Kampung Beris Tok Ku as samples by using convenience sampling method. This is around half of the full weaver. They are involved in producing handicrafts using *Lepironia articulata*. They were the most accessible during the sampling period.

**Table 4.6: Demography of weavers in Kampung Beting Lintang**

| **Name** | **Producer A** | **Producer B** | **Producer C** | **Producer D** |
|---|---|---|---|---|
| **Age** | 60 | 60 | 58 | 60 |
| **Position** | Producer | Producer | Producer | Producer |
| **Family** | 6 | 6 | 1 | 5 |
| **Experiences** | 50 years | 48 years | 45 years | 48 years |

**Table 4.7: Demography of weavers in Kampung Beris Tok Ku**

| **Name** | **Leader (non producer)** | **Producer A** | **Producer B** | **Producer C** | **Producer D** | **Producer E** |
|---|---|---|---|---|---|---|
| **Age** | 47 | 52 | 57 | 27 | 42 | 65 |
| **Family members** | | 2 | 7 | 8 | 7 | 1 |
| **Occupation** | Teacher, Bridal | Farmer | Farmer | Farmer, prawn grading | Farmer | Farmer |
| **Experience at KPW** | Since 2012 | | | | | |

### 4.2.1 Management Method of *Lepironia articulata*

In order to make sure that the management method of *Lepironia articulata* is sustainable, it is crucial to see if the method of cutting the plant for making handicrafts is implemented by sustainable ways as well as to see if there is scope to increase its population and if there are issues on the ecosystem. Local producers recognized the abundance of *Lepironia articulata* had been decreasing year by year though they cut it in a sustainable way. They assumed in the interview that the plant's population had been decreasing due to human activities such as palm oil plantation and fishpond creation. Considering such circumstances in their site, they had been suggesting the replanting of *Lepironia articulata* in new sites by themselves to increase the plant's population.

According to the interview with producers, two actors, which are Terengganu state government and Universiti Malaysia Terengganu (UMT), had been in charge of managing the population of *Lepironia articulata*, as shown in Figure 4.9. With this circumstance, producers did not recognize how many plants were in site and were not concerned about the abundance of plants at their collection sites.

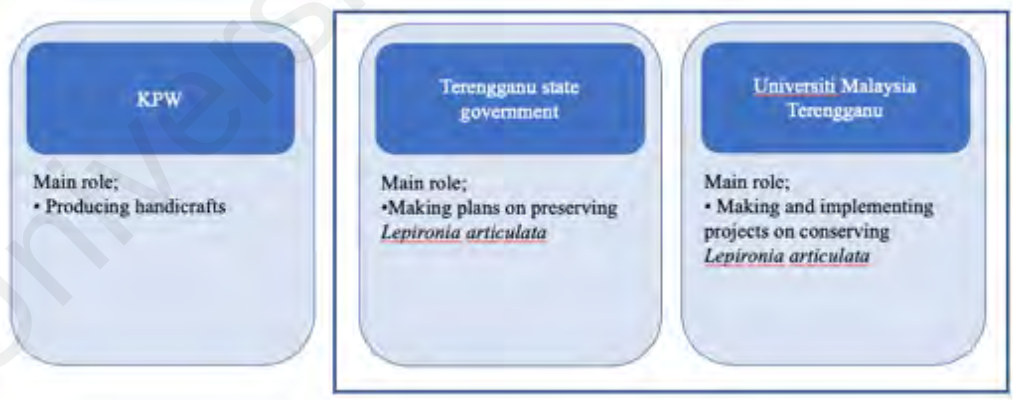


**Figure 4.9: Main role of each actor on conservation of *Lepironia articulata***

As Figure 4.9 shows, Terengganu state government had worked on making and implementing the plan that tries to secure 50 acres of land for *Lepironia articulata* conservation to ensure its sustainability in Setiu district based on the recommendation

made by the Universiti Malaysia Terengganu (UMT). This local IPTA also contributed to conserve *Lepironia articulata* through coordinating and implementing a social entrepreneurship project involving the users from both villages.

### 4.2.2 Process of Handicraft Production

Figure 4.10 illustrates the process of handicraft production from harvesting until the start of weaving as demonstrated by producers in Kampung Beting Lintang. There were mainly six steps: 1) Harvest stem and bind them together for further processing, 2) Cut the top and bottom parts of *Lepironia articulata stem*, 3) Put *Lepironia articulata* stems into a mixture of clay and water for a few seconds, 4) Dry *Lepironia articulata* and remove the out-layer, 5) Pound the *Lepironia articulata* stems slowly to compress them by using a heavy wooden stick and press using both feet to make *Lepironia articulata* fibre soft, 6) Tie the softened stem tightly together (called *Bebak* in local language), 7) Start weaving manually from making initial circle called *knot* in local language.

| No | Process | Photo |
|---|---|---|
| 1 | Harvest stems and bind them together for further processing |  |

**Figure 4.10: Process of handicraft production**

| | | |
|---|---|---|
| 2 | Cut the top and bottom part of *Lepironia articulata* stem |  |
| 3 | Put *Lepironia articulata* into water mixed with clay for a few seconds |  |
| 4 | Dry *Lepironia articulata* and remove the outer-layer at the base of the stem |  |

**Figure 4.10, continued.**

| | | |
|---|---|---|
| 5 | Press the *Lepironia articulata* stems slowly by using the feet to compress them while preventing damage by pounding them using a heavy wooden stick and foot to make *Lepironia articulata* be soft |  |
| 6 | Tie the pounded stem tightly together (called *Bebak* in Malay language) |  |
| 7 | Start weaving manually<br>Firstly, make knot (initial circle) |  |

**Figure 4.10, continued.**

They usually weave five to six mats (see Figure 4.12), from the one bundle (see Figure 4.11).

**Figure 4.11: A bundle of *Lepironia articulata* ready for weaving**

**Figure 4.12: A finished *Lepironia articulata* mat**

Table 4.8 indicates the procedure of colouring. Before weaving mats, producers could also color *Lepironia articulata* in desired colour such as red or green (see Figure 4.14) by using material (see Figure 4.13).

**Table 4.8: The procedure of colouring**

| No | Process |
|---|---|
| **1** | Use substances derived from Paint, called "*sumba"* in local language, which are imported from Thailand or China. |
| **2** | Put s*umba* into hot water in pot |
| **3** | Add slices of *Garcinia atroviridis*, called *asam gelugur* in local language, to make *sumba* colour brighter |
| **4** | Fold *Lepironia articulata* to make it compact |
| **5** | Tie and put *Lepironia articulata* in the pot |
| **6** | Mix and turn it using wooden staff |
| **7** | Press it until all parts of *Lepironia articulata* are colored |

**Figure 4.13: Material for colouring**

**Figure 4.14: The coloured stems**

According to producers, *Lepironia articulata* takes around one month to mature. Table 4.9 and Table 4.10 show the amount and frequency of harvesting plants by producers. Amount of harvesting per effort was calculated by sampling one bundle as shown in Figure 4.15. It indicates producers of both villages harvest plants four to six times per month. For producers in Kampung Beting Lintang, they are likely to harvest plants individually in irregular time for six months in a year. On the other hand, producers in Kampung Beris Tok Ku harvest plants with other producers from January to September for nine months in a year. Thus, producers in Kampung Beting Lintang are likely to harvest less plants than producers in Kampung Beris Tok Ku per year as Table 4.9 and Table 4.10 show.


**Figure 4.15: Amount of harvesting per effort (kg)**

**Table 4.9: Amount and frequency of harvesting plants by producers in Kampung Beting Lintang**

| Producer | A | B | C | D |
|---|---|---|---|---|
| **Amount of harvesting per effort (kg)** | 1.8 | 1.8 | 1.8 | 1.8 |
| **Frequency of harvesting per month** | 5 to 6 | 5 to 6 | 5 to 6 | 5 to 6 |
| **Duration of harvesting season in a year** | 6 | 6 | 6 | 6 |
| **Total amount of plant harvest per year (kg)** | 54~64.8 | 54~64.8 | 54~64.8 | 54~64.8 |

**Table 4.10: Amount and frequency of harvesting by producers in Kampung Beris Tok Ku**

| Producer | A | B | C | D | E |
|---|---|---|---|---|---|
| **Amount of harvesting per effort (kg)** | 9 (1.8x5) | | | | |
| **Frequency of harvesting per month** | 4 to 6 | | | | |
| **Duration of harvesting season in a year** | From January to September (9 months) | | | | |
| **Total amount of harvest per year (kg)** | 324~486 | | | | |

After finishing this material processing phase, the producers could weave the stems into handicrafts, usually mats. The producers of Kampung Beting Lintang usually produce 20 to 30 mats and sacks individually per month. They sell mats without color at around RM 20 to 30 and RM 60 for mats with color to local customers who live in Kuala Terengganu or the neighbouring Kelantan state.

On the other hand, the process of handicrafts production in Kampung Beris Tok Ku is organized by a group called *Kumpulan Perkembangan Wanita* (KPW) while that in Kampung Beting Lintang is operated individually. KPW, established in 2012, is a community-based organization under the Agro-based Industry Program, Department of Agriculture Malaysia. KPW usually produces around 15 kinds of products such as mats, small handbags, and accessary as shown in Figure 4.16. They collect the stem from their site without cutting the roots and bind it with string in the same way as the producers of Kampung Beting Lintang do. They weave three mats per one bundle. After weaving mats, they use the mat to make 20 hats or 16 small bags or other products per mat.




**Figure 4.16: Products produced by KPW**

Table 4.11 shows the price of these handicrafts. The price ranges between RM 13 to RM 28 for bag and accessary, depending on its size, and is at RM 35 on average for mats. It usually takes three to five days to make large bags while taking one to five days for accessory cases, small bags, mats, etc. The producers need to use industrial machines to make the bags from the woven material.

**Table 4.11: Comparison of price of some products in two villages**

| | **Kampung Beting Lintang** | **Kampung Beris Tok Ku** |
|---|---|---|
| **Products** | Price (RM) | Price (RM) |
| **Accessory case** | | 13 |
| **Bag** | | 18~28 |
| **Mat (S/M/L)** | | 32/36/38 |
| **Mat (without color)** | 20~30 | |
| **Mat (with color)** | 60 | |

### 4.2.3 Household Income

With regard to income, interviewees shared their income with the interviewer and explained how handicraft production helped handicraft producers to secure income and how important it was to make their daily life go well.

With regard to their income, Table 4.12 compares the range of income from handicrafts in the two villages. Majority of interviewees had secured their income from two sources which were agriculture and handicrafts. The handicrafts served as the secondary income for them while agricultural products contributed as the main income.

**Table 4.12: Comparison of income between two villages**

| Income (RM) | Kampung Beting Lintang | Kampung Beris Tok Ku |
|---|---|---|
| **Agriculture (per month)** | RM 1,000 | RM 1,000 |
| **Handicrafts (per month)** | RM 200 ~ 900 | RM 500 |
| **Total (per month)** | RM 1,200 ~ 1,900 | RM 1,500 |
| **Total (per year)** | RM 14,400 ~ 22,800 | RM 18,000 |

Income from handicrafts depended on how much orders they received from customers, but producers usually earned RM 500 per month from handicrafts. Producers in both villages earned around RM 1,000 per month from agriculture. Producers in Kampung Beting Lintang usually earned RM 200 to RM 900 from handicrafts per month while producers in Kampung Beris Tok Ku earned RM 500 per month from handicrafts. Therefore, producers in Kampung Beting Lintang generally earned RM 1,200 to RM 1,900 per month as income from agricultural products and their handicraft while those in Kampung Beris Tok Ku earned RM 1,500 per month. Total income in a year was estimated to reach to RM 14,400 to RM 22,800 for producers in Kampung Beting Lintang while it was estimated to reach to RM 18,000 for those in Kampung Beris Tok Ku.

### 4.2.4 Awareness and Incentive of Producers toward Handicrafts

Table 4.13 and Table 4.14 show awareness and incentive of producers toward handicrafts. Through the interview, it was identified that there were interesting differences between two villages.

**Table 4.13: Incentive of producers in Kampung Beting Lintang**

| | **Incentive** |
|---|---|
| **Producer A** | No specific motivation.<br>She enjoyed it and liked to make it. |
| **Producer B** | She liked to weave mats from *Lepironia articulata*, so she kept working. |
| **Producer C** | She liked to weave mats as she had been doing in her childhood |
| **Producer D** | She liked to weave mats as her job as well as *ikan bilis* (anchovy) |

**Table 4.14: Incentive of producers in Kampung Beris Tok Ku**

| | **Incentive** |
|---|---|
| **Producer A** | She was inspired by the KPW leader |
| **Producer B** | The motivation derived from other organizations that produce handicrafts. (Kraftangan Malaysia) |
| **Producer C** | Same as Producer A. |
| **Producer D** | She is a friend of the KPW leader.<br>Chief was looking for those who can join the KPW, so she joined the KPW. |
| **Producer E** | Same as Producer A. |
| **Leader (Not weaver)** | She was inspired by other communities.<br>Therefore, she decided to set up an organization which makes use of *kercut* that is abundant in Kampung Beris Tok Ku. She got the idea from outside (the village) to turn products made from *kercut* into handicrafts |

The producers in Kampung Beting Lintang described that their incentive was derived from their own curiosity and pleasures. For example, producer A mentioned that she enjoyed and liked to make handicrafts. She provided two reasons why she had continued making handicrafts. The first factor would be that it was a traditional activity in the area. She was taught the method to make handicrafts by her grandparents when she was 12 years old. Since then, she had been making handicrafts for over 50 years. Another factor would be that she just followed the demands from the customers. She claimed that she produced the handicrafts when she received requests. These two factors sound passive, but she was smiling when she was talking about her narrative and she looked active when she was weaving mats.

On the other hand, producers in Kampung Beris Tok Ku who acted as a group were more likely to be influenced by others such as other community members or activities hosted by other organizations or communities.

### 4.3 Identification of Capacity Development Opportunities for Local Communities

Interview identified that there was scope for capacity development of producers and young generation by developing the skill on information technology. According to the interview, they faced the issue of decreasing demand of products due to change of customers' lifestyle. Many people were likely to use items that were more modernized and convenient these days. With shrinking demands of products year by year, the amount of their income was also gradually getting smaller.

# CHAPTER 5: DISCUSSION

## 5.1 Resource Characterization

### 5.1.1 Description of *Lepironia articulata*

Table 5.1 shows the comparison of the characteristics of *Lepironia articulata* in Setiu Wetlands with the description provided by Brotonegoro (2003) and *Lepironia articulata* in Singapore. Brontonegoro (2003) summarized the description of *Lepironia. articulata* which occurs in Madagascar, Sri Lanka, China, South-East Asia, Australia, the Caroline islands, New Caledonia, and Fiji. Compared to the description provided by Brotonegoro (2003) and *Lepironia articulata* in Singapore, *Lepironia articulata* in Setiu Wetlands was shorter in height while the width of stem and bladeless sheaths were similar to others. However, the size of fruits in Setiu Wetlands was bigger than other records.

**Table 5.1: Comparison of characteristics of *Lepironia articulata***

| | Setiu Wetlands | Description (Brotonegoro, 2003) | Singapore (Ooi & Ang, 2015) |
|---|---|---|---|
| Height | 100-120 cm | -250 cm | 40-200 cm |
| Width of stem | 3-5 mm | 2-8 mm | 2-8 mm |
| Bladeless sheaths | 5-29 cm | 3-30 cm | 10-30 cm |
| Size of flowers | 1-5 mm | 4-6 × 0.5 mm | 1-4 × 5-15 mm |
| Size of fruits | 10-20 mm | 3-4 × 2-3 mm | 3-4 × 2.5-3 mm |

### 5.1.2 Occurrence of *Lepironia articulata*

At the study sites of Setiu Wetlands, *Lepironia articulata* was the predominant species found. In Malaysia, for example in Tasik Bera of Pahang state, there were four main plant communities and habitats for the species, which were open water vegetation, *Lepironia articulata* and freshwater swamp (Rafidah et al., 2010). They occurred as a mosaic of habitats where *Lepironia articulata* consisted of 32 % of land area (Lim et al., 1982). *Lepironia articulata* occurred on the lake where mud is exposed and flooded. *Lepironia articulata* in Singapore also occurred naturally in swampy areas, marshes and streams near coasts (Ooi & Ang, 2015).

### 5.1.3 Distribution of *Lepironia articulata*

Considering the result of distribution of *Lepironia articulata*, water resources had influence on their growth and prosperity. The plants in the sites where water resources were sufficient were more likely to grow faster and healthier than those in sites where water resources were insufficient.

Climate change and burning could affect water ecosystems, drought, and dryness that lead to destruction of *Lepironia articulata,* as shown Figure 5.1.

**Figure 5.1: Situation after the plants were burned**

A study on climate change vulnerability assessment of Phu My species and habitat conservation area in Viet Nam published by IUCN (2019) showed that main habitats and key species including *Lepironia articulata* in the Phu My wetlands were most vulnerable to droughts that were caused by climate change and frequent harvest. Results of the vulnerability analysis indicates that *Lepironia articulata* is highly vulnerable to climate.

Also, the lack of water resources might be caused by climate change. According to the report published by Jiménez Cisneros (2014), they summarized that climate change negatively impacted water ecosystems by changing streamflow and water quality. This might intensify freshwater-related risks of climate change with increasing greenhouse gas (GHG). Figure 5.2 illustrates how climate change has impacts and raises risks on freshwater ecosystems. As Figure 5.2 illustrates, both climate changes and non-climate changes have impacts on the natural freshwater system. These two factors also have impacts on hydrological changes and formulate the situation where we need to address to apply for adaptive water management. Then, adaptive measures feed into the exposure and vulnerability of human beings and ecosystems to water-related risks.

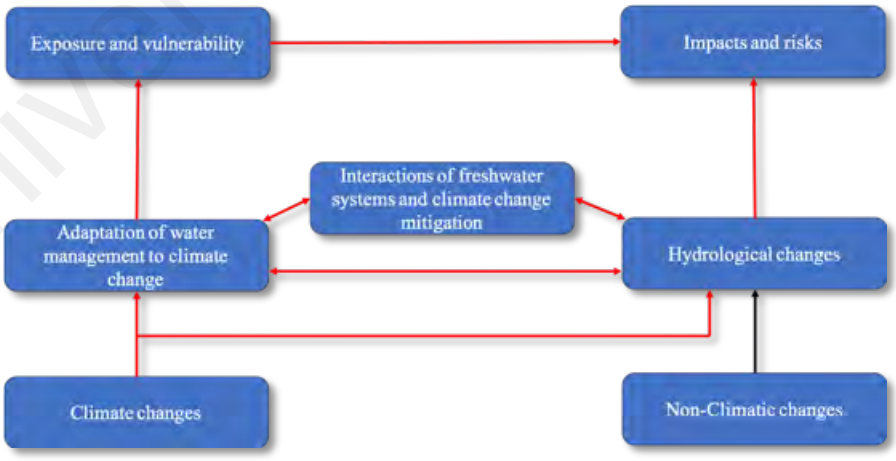


**Figure 5.2: Flow chart on impacts and risks of freshwater ecosystems by climate change**

Furthermore, there is another factor that has impacts on the population of *Lepironia articulata*. According to producers, it takes one month for *Lepironia articulata* stem to mature and become suitable for harvesting if water is sufficient. However, it could be mentioned that the current amount and frequency of harvest by handicraft producers could exceed the capacity of plant reproduction. Based on a botanical study on the growth of *Lepironia articulata* it takes 51 to 77 days for the culm to mature (Ikushima, 1978). As Table 4.11 and Table 4.12 showed, they usually harvest 1.8 kg plants 4 to 6 times per month, and the average total amount of harvesting ranges 54 to 486 kg per year. Indeed, excessive harvesting of *Lepironia articulata* also could affect its sustainability when the population status was medium level as presented in Figure 4.5 and Figure 4.8. In order to maintain or increase the population of *Lepironia articulata*, it is crucial for stakeholders, especially the state government and academic institutions, to help local producers to gain greater awareness on natural resource management and knowledge on the biological cycle of *Lepironia articulata*.

Also, producers in Kampung Beris Tok Ku mentioned that human activities such as littering, and fishpond could lead to fragmentation of the population of *Lepironia articulata*. *Lepironia articulata* in Tasek Bera were also damaged because of human activities such as burning for hunting turtles or clearing navigation paths, and that could affect population and distribution of *Lepironia articulata*. Also, the loss of freshwater swamps and marsh areas could have resulted in the extinction of *Lepironia articulata* in Singapore (Ooi & Ang, 2015).

## 5.2 Resource Utilization of *Lepironia articulata*

### 5.2.1 Management Method of *Lepironia articulata*

In order to maintain the health of the local *Lepironia articulata* ecosystem, it is crucial that producers harvest the resource in a sustainable way. The findings on the whole process show that the harvesting process was carried out in a sustainable way. Figure 5.3 shows when a producer cut the plant at a site. She cut the plant without its roots so that the plant grows new stems again without the need to be replanted by hand.

**Figure 5.3: Method of cut of plant by a producer**

However, given the result of interviews that local producers tries to increase the population of *Lepironia articulata* in new sites by replanting the plant as a solution for the population decline due to human activities, it is still crucial that each actor tackles the conservation issue of *Lepironia articulata* by developing working plans or projects to contribute towards maintaining the ecosystem of the plant.

In order to keep working plans and projects sustainable, it is ideal that they conserve *Lepironia articulata* in further collaboration with other stakeholders. Collaboration of conservation efforts would be enhanced by multi stakeholders engagement (Kellert et al., 2000). It is also suggested that producers themselves also recognize precisely how many and how often they take and collect the plants so that they are aware of the intensity of their harvesting activity. It is also desirable that they recognize how long it takes for the plants to grow by measuring their growth regularly. Both efforts will be useful in order to get to know the adaptation measures that may be necessary for sustainable management of their natural resources.

### 5.2.2 Process of Handicraft Production

The interview described how producers used *Lepironia articulata* in a sustainable way for production of handicrafts and how consumers had used the products from a long time ago.

In terms of production, as it was discussed above, producers cut the stem, leaving its roots under the ground intact, so that the plants could grow again after a short time. After cutting the stems, they are soaked into a mixture of clay and water followed by drying and compressing it using their feet. Of the whole process, the colouring process was however not sustainable as they used chemical dyes. As Figure 5.4 shows, they sometimes colour the stem to create a variety of colourful handicrafts. Dye is originally acquired in powder form, but it is used in liquid form (see Figure 5.5) by boiling it in hot water.

**Figure 5.4: Mat made from coloured *Lepironia articulata* material**

**Figure 5.5: Liquid dye after being boiled by hot water**

Saxena & Raja (2014) has claimed that natural dyes could be sustainable for mainstream textile processing if its availability could be increased to very high levels by biotechnological interventions. Also, natural dyes would be a sustainable option only for small-scale applications and could complement synthetic dyes as an eco-friendly option for consumers and a way of providing livelihood to various stakeholders of the natural dye value chain (Saxena & Raja, 2014).

Therefore, it could be desirable for local producers to utilize dye at minimum level for colouring handicrafts.

### 5.2.3 Household Income

Figure 5.6 shows the comparison of mean income of two villages with that of Malaysia, Terengganu state, and Middle 40 (M40) and Bottom 40 (B40). The figure identifies that the mean income of two villages is approximately one-third that of Malaysia or Terengganu state. It also shows that the mean income of two villages is under B40 in Malaysia.

Considering these findings, it is deduced that local people of two villages are not in the good situation in terms of economic resources or livelihood compared to the Malaysian average.


**Figure 5.6: Comparison of mean income**

Secondly, with regard to the contribution of handicraft production toward income security, one of the crucial roles of handicraft production is to help local people to increase income. In order to capitalize on this opportunity, a villager actually established KPW with the objective to increase income of households in Kampung Beris Tok Ku.

Securing as much income as possible is important for local people to enable their life to go well without any difficulties while a producer claimed that the income was enough for them because they earned income through charcoal production as primary income.

A producer mentioned that income from handicraft production was important as the secondary income for her livelihood to ensure she could go through her life without hardship. A producer also mentioned that she had been willing to increase the amount of production to gain more income.

Referring to these opinions of producers, the conservation and management of *Lepironia articulata* and promotion of handicrafts contributes to secure their income. Also, it can be described that this case study in Setiu Wetlands has similarities with the case of Phu My wetlands in Viet Nam according to a study conducted by IUCN (2019). Both local people's livelihoods depend on agriculture and handicraft businesses which are vulnerable to droughts and floods caused by climate change. Therefore, it is crucial for stakeholders, especially the state government and academic institutions, to promote activities on conservation of *Lepironia articulata* to help local people to secure their income.

### 5.2.4 Awareness and Incentive of Producers toward Handicrafts

There was disparity in awareness and incentive toward handicrafts between two villages. Producers in Kampung Beting Lintang were likely to get involved in the activities by voluntary motivations. They described their incentive derived from passion for handicrafts. Such passion might be due to the lifelong experience of making handicrafts after being taught by their grandparents or parents since their childhood and they really liked it sincerely, from the bottom of their heart. It is supposed that such passion helps them to have a sense of personal identity as well as cultural and social identities.

Meanwhile, producers in Kampung Beris Tok Ku often used the word "being inspired" in the interview. It sounds mechanical. When the researcher asked about their incentive, they answered with confidence as if they had the manual to answer. In addition, they answered questions immediately without taking time to think about it. Also, their answers were quite similar to each other and they used abstract terms, such as "being inspired", which were likely to be quoted in the report published by international organizations. One of the reasons why they answered the specific phrase, such as "being inspired" could be their involvement in the project coordinated by the United Nations Development Programme which exposed them to these terms. Also, the result of interviews might be influenced by the group interview approach adopted in this research. In general, focus groups could provide a range of ideas, feelings, and perspectives that individuals have about certain issues (Rabiee, 2004). It was recommended that interviewees should not know each other to let them express their own views and wide range of response (Rabiee, 2004). Kitzinger (1994) proposed that pre-existing groups which consisted of acquaintances could relate to each other's comments and may be more able to challenge one another. The interviews in this research were conducted by individuals in *Kampung Beting Lintang* and by groups in Kampung Beris Tok Ku. The group interviews could lead to similarity of their responses, as we have noted in this study.

Given the answers by producers in the interview, it will be described that the leader of KPW and other stakeholders such as Kraftangan Malaysia serve as catalysts to encourage them to get involved in the activities in terms of their incentive and motivation towards handicrafts or *Lepironia articulata*. Such cooperation among multi-stakeholders respect and mobilize local traditions and knowledge in community development projects (Tran et al., 2007). Also, this helps local producers to raise their awareness toward land conservation and management (Tran et al., 2007). In addition, in order to raise their awareness toward natural resource management, social learning could play a central role

as it contributed to identify common purpose of natural resource management (Schusler et al., 2003). For example, in the case of natural resource management of the Lake Ontario Islands, social learning was fostered by eight process characteristics, namely open communication, diverse participation, unrestrained thinking, constructive conflict, democratic structure, multiple source of knowledge, extended management, and facilitation (Schusler et al., 2003). Therefore, social learning could be the other process to be incorporated into the case of Setiu Wetlands in order to raise awareness of local producers toward natural resource management.

## 5.3 Identification of Capacity Development Opportunities for Local Communities

Results showed that developing skills on information technology, weaving mats and making handicrafts were possible methods for capacity development of producers and young generation. In order to implement and achieve capacity development, further partnership with multiple stakeholders is crucial. According to interviews with producers of handicrafts, a number of stakeholders had been getting involved in handicraft production. As Figure 5.7 identifies, main stakeholders are government bodies, academic institutions, private sectors, third parties, and local community members.

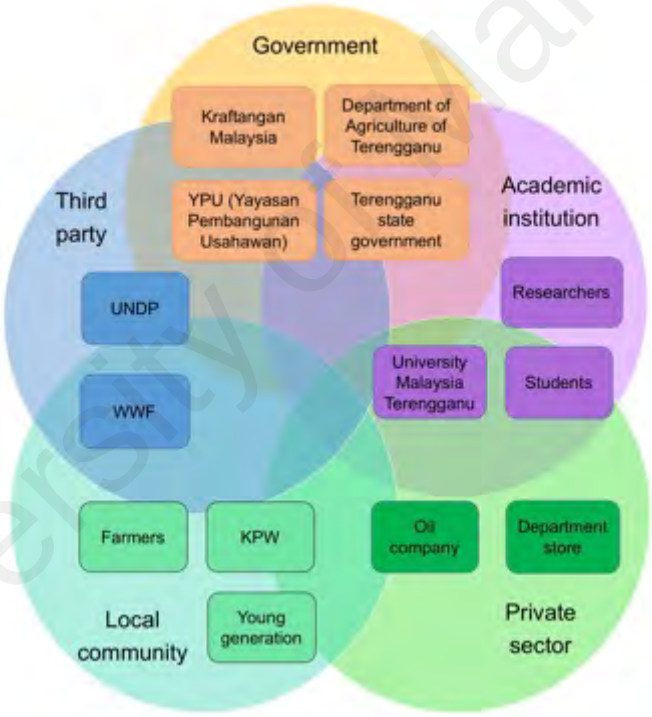


**Figure 5.7: Stakeholders for handicraft industry**

The stakeholders harness plans and projects on conservation of *Lepironia articulata* and capacity development through handicraft productions in collaboration with each other through frequent communication, according to two interviewees. This results in circumstances where every stakeholder recognizes the importance of conserving and managing their natural resources and acknowledges the value of their tradition.

Although local people are usually likely to be marginalized in such projects, local producers in these two villages have a number of opportunities to get involved in this project in a participatory way. In fact, many producers told in the interview that they had opportunities to discuss management of the plant and handicraft production with academic institutions and their customers. Also, they have been supported by the relevant departments of Terengganu state government to develop their capacity of making handicrafts. Non-governmental organizations and other third parties also had supported implementation of projects with local handicraft producers.

Therefore, the engagement of local people in discussion contributes to reinforce the cooperation with stakeholders. Hashagen (2002) claimed that engagement suggested a different sort of relationship. For example, building collaboration with communities enables the government to understand the nature of communities and adapt development structures which are relevant to communities (Hashagen, 2002). Engagement prevents us from making assumptions about communities.

With regard to awareness of the young generation toward traditional knowledge, however, it is not certain if they are willing to get involved in the activities. Although producers are open to and would like to teach the young generation the techniques to make handicrafts, they mentioned that it would depend on the interest of young people, such as their children because they are not sure if children are interested in making handicrafts. Youth engagement and youth development are cross-cutting issues in the 2030 Agenda for Sustainable Development as well, and international agreed frameworks acknowledged that youth could play an important role and have positive impacts for achievement of sustainable development (United Nations Youth Strategy, 2018). Also, Malaysia has issues on labour market conditions that unemployment rate among youth aged 15 to 24, particularly those with tertiary educational attainment remains high, at 10.8% in 2017 (Ministry of Economic Affairs, 2018). Therefore, it would have positive

impacts on achievement of sustainable development and improvement of labour market conditions to have the young generation involved in handicraft production. Also, it could help them to learn the methods, acquire new skills, and get employment and income.

One of the possible methods to increase the demand is that producers launch accounts on Social Networking Services (SNS) to promote their products online if they have knowledge on SNS. Instagram would be the easiest option for them because what they need to do is to just post photos and add some captions or tags to them. In addition, the state government and its institutions can contribute to promote handicrafts and spread markets to other areas of the country.

Also, for the capacity development of the young generation, their capacity could be developed transmission of traditional knowledge on handicrafts. Interview findings clarified that weaving mats and handicraft productions by *Lepironia articulata* were traditional heritages. Producers of Kampung Beting Lintang had been taught methods on how to weave mats or make handicrafts by their parents or grandparents when they were young. Meanwhile, in Kampung Beris Tok Ku, some producers had gained knowledge on weaving mats and making handicrafts via other stakeholders such as the Department of Agriculture of the Terengganu state government. Therefore, the younger generation can acquire these skills, through knowledge transfer by the family or state government.

# CHAPTER 6: CONCLUSION

This research clarified the population status of *Lepironia articulata* at two sites in two selected villages located in Setiu district of Terengganu. Stems of *Lepironia articulata* at the study sites were 100-120 cm tall and 3-5 mm wide. Leaves were reduced to bladeless sheaths, 5-29 cm long. The spikelet occurred singly on each stem, each ovoid to oblong ellipsoid, and 1-5 mm. The fruits were 10-20 mm. The height of *Lepironia articulata* in Setiu Wetlands was shorter than the description provided by Brotonegoro (2003) and the record from Singapore while width of stem and length of leaves were similar to others. The survey showed the distribution of *Lepironia articulata* was at medium level which was 25 % to 50 %. The low rate of distribution could be caused by climate change, especially lack of water resources, and human activities such as fishpond development. Therefore, it is crucial to promote further actions on conservation of *Lepironia articulata* to increase its population up to dense level (more than 75%) to sustain the local handicraft industry.

Results of interviews with handicraft producers clarified that *Lepironia articulata* was utilized to produce handicraft sustainably except for their method of coloring during the material preparation process. However, producers were not aware of the importance of management of *Lepironia articulata* and had less knowledge on the biological system of *Lepironia articulata* such as the speed of its growth. Therefore, it is important for the state government and academic institutions to encourage them to increase their awareness and knowledge on natural resource management.

In order to promote further actions for conservation of *Lepironia articulata*, capacity development of producers and the young generation is important. With engagement and collaboration of multi stakeholders and leadership of the state government, their capacity

on information technology and improving skills of weaving and making handicrafts could be developed.

## REFERENCES


APACO Company Ltd. (2019). *Straws made from grass (Lepironia articulata) – a new solution to replace plastic straws*. Retrieved on 14 October 2019 from http://apaco-vn.com/?p=1919

Azwad, M. N. (2006, June). *Project: Sustainable Management of Setiu Wetlands*. Retrieved on 1 June 2019 from http://www.wwf.org.my/about_wwf/what_we_do/freshwater_main/freshewater_conserving_freshwater_habitats/projects_sustainable_management_of_setiu_wetlands/

British Columbia Ministry of Forests. (1996). *Techniques and procedures for collecting, preserving, processing, and storing botanical specimens.* Province of British Columbia.

Brotonegoro, S. (2003). *Lepironia articulata (Retz.) Domin*. In: Brink, M. & Escobin, R.P. (Editors). Plant Resources of South-East Asia No 17. Fibre plants. Backhuys Publishers, Leiden, Netherlands. pp. 170–172.

Caryl L. Elzinga, D. W. (1998). *Measuring & Monitoring Plant Populations.* Retrieved on June 15 2019 from http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1016&context=usblmpub

Chudasri, D., Walker, S., & Evans, M. (2013). *Directions for Design Contributions to the Sustainable Development of the Handicrafts Sector in Northern Thailand* . Lancaster University.

Connie Rye, E. M. (2017). *Biology.* Texas: OpenStax Rice University.

Department of Statistics, Malaysia. (2017). *Salaries & Wages Survey Report, Malaysia, 2017*. Retrieved on 1 February 2019 from http://www.dosm.gov.my/vl/index.php?r=column/cthemeByCat&cat=157&bul_id=NzFoZURoenJHeFBhdCt0bXJFOWY3dz09&menu_id=U3VPMldoYUxzVzFaYmNkWXZteGduZz09

Department of Statistics, Malaysia. (2017). *Statistics on Women Empowerment in Selected Domains, Malaysia, 2017*. Retrieved on 1 February 2019 from http://www.dosm.gov.my/vl/index.php?r=column/pdfPrev&id=dHNTVHV0My9QK1MxNHBtSnRucVJqZz09

Elzinga, C. L., Salzer, D. W., & Willoughby, J. W. (1998). *Measuring & Monitoring Plant Populations.* U.S. Bureau of Land Management Papers.

Equator Initiative Environment and Energy Group United Nations Development Programme (UNDP). (2012). *Phu My Lepironia Wetland Conservation Project Viet Nam.* Retrieved on 1 August 2019 from http://www.equatorinitiative.org/wp-content/uploads/2017/05/case_1348163843.pdf

Ernst Gabathuler, M. G. (1995). *Sustainable Use of Natural Resources: A Conceptual Approach to Sustainable Management of Natural Resources in the Context of Development.* Development and Environment Institute of Geography, University of Berne.

Flick, U. (2009). *An Introduction to Qualitative Research.* Sage Publications Limited.

Ghazali, N., & Hamzah, A. (2014). *Preserving the Uniqueness Cultural Landscape in Setiu Wetlands.* Universiti Teknologi Malaysia.

Giesen, W. 1998. *The habitats and flora of Tasik Bera, Malaysia: an evaluation of their conservation value and management requirements*. Integrated Management of Tasik Bera Technical Report Series. Kuala Lumpur: Wetlands International-Asia Pacific, pp. 60.

Halim, M. A. (2012). *The Direction of Terengganu Tourism Industry in Sustaining Business Growth: A Conceptual Framework* . Kuala Terengganu: *International Journal of Academic Research in Business and Social Sciences*.

Halim, N. (2014). *Tourism as a Tool for Poverty Alleviation Using Value Chain Analysis: A Case Study of Setiu Wetland, Terengganu, Malaysia.* University of Tasmania.

Halim, N. (2017). *Empower the Women Entrepreneurs through Community Based Tourism Case Study of Women Handicrafts Entrepreneur in Setiu, Malaysia.* Centre for Innovative Planning and Development, Faculty of Built Environment.

Hana Sugiastu Firdaus, N. B. (2018). *Proceeding the 8th Rural Research and Planning Group International Conference: "Innovations of Rural Development For Implementing Sustainable Goals".* Retrieved on 1 April 2018 from ResearchGate: http://www.researchgate.net/publication/328381112_PROCEEDING_THE_8_TH_RURAL_RESEARCH_AND_PLANNING_GROUP_INTERNATIONAL_CONFERENCE_Innovations_of_Rural_Development_For_Implementing_Sustainable_Goals

Haryati, S. (2020). *Turning peat swamp to benefit of creative craftsmen*. Retrieved on 14 January 2020 from https://en.antaranews.com/news/140269/turning-peat-swamp-to-benefit-of-creative-craftsmen?fbclid= IwAR0vkJlBnso1SUwI1WyqnekELNajPDsPe0OA5BiMLFzg4XIdX4GazBJhqxc

Hasanati, S. M. (2018). *Innovations of Rural Development For Implementing Sustainable Goals.* Gadjah Mada University Press.

Hashagen, S. (2002). *Models of community engagement*. Scottish Community Development Centre.

Ikushima, I., Furtado, J.I., & Mori, S. (1978). *The Ecology of a Freshwater Swamp, the Tasek Bera, Malaysia*. The Hague

Islam, A.B.M.S. (2012). *Oil and Gas Energy Potential at Malaysian Seabed and Spar Platform for Deepwater Installation*. *International Journal of Green Energy*, 9(2), 111-120.

Jani. M. J. (2014). *The perceptions of poverty among small-scale fisher-folks in Terengganu, Malaysia.* Dynamiques Internationales.

Jiménez Cisneros, B.E., T. Oki, N.W. Arnell, G. Benito, J.G. Cogley, P. Döll, T. Jiang & S.S. Mwakalila, (2014): *Freshwater resources. In: Climate Change 2014:*

*Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, (pp. 229-269).

Kaewpradit, K., & Keeratiburana, Y. (2013). *Krajood: Creative Economics Development in Communities through Indigenous Handicraft of Southern Thailand. International Journal of Academic Research in Business and Social Sciences*, 3(9), 707.

Kellert, S. R., Mehta, J. N., Ebbin, S. A., & Lichtenfeld, L. L. (2000). *Community Natural Resource Management: Promise, Rhetoric, and Reality*. *Society & Natural Resources*, 13(8), 705-715.

Kent State University. (2020). *Statistical & Qualitative Data Analysis Software:About NVivo*. Retrieved on 15 January 2020 from https://libguides.library.kent.edu/statconsulting/NVivo

Krueger, R. A. (1994). *Focus groups: A Practical Guide for Applied Research*. Sage Publications.

Li, T. C. (2016). *Safeguarding the wetlands of Setiu*. Retrieved on May 3 2019 from Star2.com: https://www.star2.com/./living/living-environment/

Lim, R. P., Furtado, J. I. & Morley, R. J. (1982). *General description of Tasik Bera*. In Tasik Bera- The Ecology of a Freshwater Swamp. ed. Illies, J. Monographiae Biologicae, Vol. 47. The Hague-Boston-London: Dr. W. Junk Publishers, (pp. 7–54)

Mahidin, M. U. (2017). *Malaysia Report of Household Income And Basic Amenities Survey 2016.pdf*. Retrieved on 9 October 2018 from http://www.dosm.gov.my/v1/index.php?r=column/cthemeByCat&cat=120&bul_id=RUZ5REwveU1ra1hGL21JWVlPRmU2Zz09&menu_id=amVoWU54UTl0a21NWmdhMjFMMWcyZz09

Malaysia, W. (2016). *Action now to improve rivers and watershed management or risk dry taps*. Retrieved on 25 September 2019 from http://www.wwf.org.my/?22645/Action-now-to-improve-rivers-and-watershed-management-or-risk-dry-taps

Ministry of Economic Affairs, Malaysia. (2018). *Mid-term review of the Eleventh Malaysia Plan 2016-2020.*

Nakisah, M.A. & Fauziah, A.H. (2003). Setiu Wetlands: Tranquility Amidst Plenty, Kuala Terengganu, Terengganu, Kolej Universiti Sains Dan Teknologi Malaysia.

Ooi, Z. Y. & Ang, W. F. (2015). *Rediscovery in Singapore of Lepironia Ariculata (Retz.) Domin (Cyperaceae).* National University of Singapore.

Puspadevi, S. (2017). *TDM raises stake in Terengganu palm plantation*. The Star Online. Retrieved on 28 February 2019 from http://www.thestar.com.my/business/business-news/2017/02/28/tdm-raises-stake-in-terengganu-palm-plantation#Ff3Ul7RAZ5B5Xiut.99

Rabiee, F. (2004). Focus-group interview and data analysis. Proceedings of the nutrition society, 63(4), 655-660.

Rafidah, A. R. & Kamarudin, S. (2010). *The flora of Tasik Bera, Pahang, Malaysia. Malayan Nature Journal*.

Ramakrishna, S. (2016). *Turn Setiu Wetlands into a state park*. New Strait Times. Retrieved on 17 October 2018 from http://www.nst.com.my/news/2016/10/180834/turn-setiu-wetlands-state-park

Ratner, B. (2009). *The correlation coefficient: Its values range between +1/-1, or do they?*. *Journal of Targeting Measurement and Analysis for Marketing* 17, 139–142 (2009).

Reddy, G. C., & Raipally, A. (2013). *Environmental Friendliness in Manufacturing of Traditional Handicrafts: A New Perspective.* National Institute of Fashion Technology.

Richard, N. (2007). *Handicrafts and employment generation for the poorest youth and women*. United Nations Educational, Scientific, and Cultural Organization Paris.

Salim, J., Husni. U, Junaidi, N., Lammu, R. & Salam, R. (2013). *Natural Vegetation of Bris Soil Ecosystem on Coastal Dune of Terengganu.* Universiti Malaysia Terengganu.

Salim, J., Rohani, F., & Faridah M. (2015). *Setiu: More than a Wetland*. Universiti Malaysia Terengganu

Sammut, G., Eleni, A., George, G., & Jaan, V. (2015). *The Cambridge Handbook of Social Representations* . Cambridge University Press.

Sánchez-Medina, P. S., Corbett, J., & Toledo-López, A. (2011). *Environmental Innovation and Sustainability in Small Handicraft Businesses in Mexico* .

Sarah Elsie Baker, R. E. (2012). *How many qualitative interviews is enough?: Expert voices and early career reflections on sampling and cases in qualitative research.* National Centre for Research Methods.

Saxena, S. & Raja, A. S. M. (2014). Natural dyes: sources, chemistry, application and sustainability issues. In *Roadmap to sustainable textiles and clothing* (pp. 37-80). Springer, Singapore.

Schusler, T. M., Decker, D. J., & Pfeffer, M. J. (2003). *Social Learning for Collaborative Natural Resource Management*. Cornell University.

Shipunov, A. (2018). *How to make herbarium.* Retrieved on 23 July 2019 from http://herba.msu.ru/shipunov/school/biol_448/herbarium/herbarium.pdf

Sivadasan, M. (2009). *Lepironia (Cyperaceae): A New Genus Record for Kerala.* King Saud University.

Sofian, M. A., Shaladdin, M., Wan, A.A., Wan, M.A. (2017). *Coastal Communities in Terengganu: The Impact of Social-Entrepreneurship on Sustainable Livelihood*. *Journal of Global Business and Social Entrepreneurship (GBSE)*, 1 (3), 99-110.

Sutherland, W. J. (2006). *Ecological Census Techniques a handbook.*

Tamblyn, A., Turner, C., & Raines, P. (2006). *Malaysia Tropical Forest Conservation Project Report of the Setiu Wetlands Phase* .

The Office of Chief Statistician Malaysia Department of Statistics, Malaysia. (2017). *Statistics on Women Empowerment In Selected Domains, Malaysia, 2017.pdf.* Retrieved on 6 December 2018 from https://www.dosm.gov.my/v1/index.php?r=column/pdfPrev&id=dHNTVHV0My9QK1MxNHBtSnRucVJqZz09

The Plant List. (2013). *Lepironia articulata* (Retz.) Domin. Retrieved on 1 January 2021 from http://www.theplantlist.org/tpl1.1/record/kew-252230

The Star Online. (2018). TDM receives Terengganu land for expansion plan. Retrieved on 3 January 2019 from http://www.thestar.com.my/business/business-news/2018/01/03/tdm-receives-terengganu-land-for-expansion-plan/

Tran, T. (2010). *Combining biodiversity conservation with poverty alleviation - a case study in the Mekong Delta, Vietnam*. Vietnam National University

Tran, T., Caines, R., & Barzen, J. (2007). *Towards sustainable rural development: combining biodiversity conservation with poverty alleviation - a case study in Phu My Village, Kien Giang Province, Vietnam.* Osaka University Press

Tran, T., Nguyen, T.K.D., Le Xuan, T., & Tran, T.A.D. (2019). Climate Change Vulnerability Assessment Phu My Species and Habitat Conservation Area. Vietnam: IUCN. X + 49pp.

UNDP. (2009). *Supporting Capacity Development: The UNDP Approach.* Retrieved on 1 February 2020 from http://www.undp.org/content/dam/aplaws/publication/en/publications/capacity-development/support-capacity-development-the-undp-approach/CDG_Brochure_2009.pdf

UNDP. (2017). *Phu My Lepironia Wetland Conservation Project Vietnam: Equator Initiative Case Studies Local Sustainable Development Solutions for People, Nature, and Resilient Communities.*

United Nations Youth Strategy. (2018). *Youth 2030 Working with and for Young People*. Retrieved on 15 February 2021 from https://www.un.org/youthenvoy/wp-content/uploads/2018/09/18-00080_UN-Youth-Strategy_Web.pdf

World Economic Forum. (2016). *The Global Gender Gap Report 2016 East Asia and the Pacific.* Retrieved on 15 September 2018 from https://reports.weforum.org/global-gender-gap-report-2016/east-asia-and-the-pacific/

Wunbua, J., Nakhapakorn, K., & Jirakajohnkool, S. (2012). *Change detection and identification of land potential for planting Krajood (Lepironia articulata ) in Thale Noi, Southern Thailand. Songklanakarin Journal of Science and Technology*, 34, 329-336.

WWF Malaysia. (2013). *WWF-Malaysia Lauds Terengganu's Commitment toward the Protection of Setiu Wetlands*. Retrieved on 4 July 2019 from http://www.wwf.org.my/media_and_information/updates__former_newsroom_main_/?uNewsID=16140

WWF Malaysia. (2016, September 25). *Action now to improve rivers and watershed management or risk dry taps*. Retrieved on 25 September 2019 from http://www.wwf.org.my/?22645/Action-now-to-improve-rivers-and-watershed-management-or-risk-dry-taps

Yahaya, J. (1981). *Women in Small-Scale Fisheries of Peninsular Malaysia: An Identification of their Employment Potentials. Paper presented at the Seminar on the "Role of Managers in Cooperative Development"*. Lembaga Kemajuan Ikan Malaysia (LKIM), Kuala Lumpur.