



Final Report

A Stacked Value Chain Analysis Study of Smoked Rohu from Kale Township, Sagaing Region, Myanmar

Dawt Hlei Tial, Ram Hlei Thang, Van Cung Lian and Wae Win Khaing
31-May-2020



Implemented by:



A Stacked Value Chain Analysis Study of Smoked Rohu from
Kale Township, Sagaing Region, Myanmar

Final Report

Dawt Hlei Tial, Ram Hlei Thang, Van Cung Lian and Wae Win Khaing

12-Jun-20

Table of Contents

- Abbreviations and Acronyms.....1**
- Acknowledgements.....1**
- Executive summary2**
- Chapter 1. Introduction and Methodology4**
 - 1.1. Introduction 4
 - 1.2. Methodology 4
 - A. Scoping Study..... 7
 - B. A Single Value Chain Mapping 7
 - C. Value Chain Actor KII..... 7
 - 1.3. Literature review 8
- Chapter 2. Results and Discussion.....10**
 - 2.1. Rohu Grow-out Segment..... 10
 - 2.1.1. Fish Farming History, Land Distribution and Capacity 10
 - 2.1.2. Household Assets and Income Sources 13
 - 2.1.3. Rohu Culturing Season and Conduct of Grow-out Farmers..... 15
 - 2.1.4. Harvesting and Sale Routes of Fresh Rohu 16
 - 2.1.5. Potential Economic Benefit of Rohu Farming 17
 - 2.2. Fresh Rohu Trading Segment 17
 - 2.2.1. History and Operation 17
 - 2.2.2. Characteristics of Fresh Rohu Traders 18
 - 2.2.3. Fresh Rohu Trading and Sales Volume 19
 - 2.2.4. Trends and Seasonality of Fresh Fish Trading 20
 - 2.2.5. Cost, Profit and Assets 21
 - 2.3. Rohu Processing Segment 22
 - 2.3.1. Characteristics and Structure 22
 - 2.3.2. Processing Productivity, Seasonality and Preservation 23
 - 2.3.3. Market Structure, Selling Rate and Seasonality 23
 - 2.4. Smoked Rohu Trade and Retail Segment 25
 - 2.4.1. Characteristics and Capacity of Hakha Retail Market..... 26
 - 2.4.2. Actor’s Household Assets 27
 - 2.4.3. Cost and Profit..... 28
 - 2.4.4. Structure of Retail Market and Assess to Value Chain Credit 29
 - 2.4.5. Preservation, Hygiene and Food Safety 29

2.4.6. Smoked Rohu Retail Actors and Social Environment in Hakha 31

2.5. Gender in the Smoking Rohu Value Chain 32

2.6. Technological Changes in the Rohu Value Chain..... 33

2.7. Value Chain Structure, Functions and Credit System 34

2.8. Self-sufficiency and Livelihoods..... 36

2.9. Assess to Development Aids and Transformation of Rohu Culturing Practices..... 36

2.10. The Impact of COVID-19 on the Value Chain 37

Chapter 3. Recommendations38

References40

Appendix 01. Main Study Locations.....42

Appendix 02. KII Consent Form43

Appendix 03. Rohu Farmer Questionnaire44

Appendix 04. Rohu Trader and Wholesaler Questionnaire54

Appendix 05. Processor Interview Questionnaire.....66

Appendix 06. Retailer Interview Questionnaire76

Appendix 07. Labourer Interview Questionnaire.....87

Abbreviations and Acronyms

BA	Bachelor of Arts
BSc	Bachelor of Science
DoF	Department of Fisheries
FAO	Food and Agriculture Organization of the United Nations
GAD	General Administration Department
HH	Household
KII	Key Informant Interview
MMK	Myanmar Kyat
MYSAP	Myanmar Sustainable Aquaculture Programme
Rs	Indian Rupees

Acknowledgements

This consultancy report is an output of the Myanmar Sustainable Aquaculture Programme (MYSAP) which is funded by the European Union (EU) and the German Federal Ministry for Economic Cooperation and Development (BMZ) and implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and the Department of Fisheries.

WorldFish Myanmar is realising MYSAP's inland component under a GIZ grant agreement and in collaboration with sub-contracted implementing partners, including Ar Yone Oo, BRAC Myanmar and Malteser International.

MYSAP Inland contracted the Chinbridge Institute (Center for Research and Social Studies) to conduct the stacked value chain analysis study of smoked rohu in Kale Township, Sagaing Region, Myanmar, using survey methodologies and questionnaire formats adapted from those of the Dakshin Foundation and the Dried Fish Matters programme and the Koninklijk Instituut voor de Tropen (KIT) Royal Tropical Institute. As well as the contracted inputs of the Chinbridge Institute, the WorldFish Myanmar Research Fellow (Value Chains and Nutrition) and the WorldFish Myanmar Social Awareness Officer have provided technical guidance on the survey design, joined the scoping phase of the study and have provided feedback, technical guidance and suggestions to the Chinbridge Institute during report write up and finalization.

The contents of this report are however the responsibility of the authors and do not necessarily reflect the views of the European Union (EU), the German Federal Ministry for Economic Cooperation and Development (BMZ), WorldFish, CGIAR Research Program on Fish Agri-Food Systems or CGIAR.

Executive summary

Rohu is the most captured and cultured fish species in Myanmar, providing livelihoods for hundreds of people in the Sagaing Region alone. In Kale Township of Sagaing region, rohu is processed through a smoking system that employs firewood and sawdust. In the small-scale smoked rohu industry in Kale Township, all actors studied were found to be Chin and Mizo, except in the case of rohu grow-out farmers.

This study was designed to provide a better understanding of the smoked rohu industry, to identify opportunities for improving current practices of smoking rohu and to strengthen its value chain, and the socio-economic context of the sector's value chain, with the objective of supporting the sustainable intensification of the aquaculture sector, thereby realizing its potential for food security and sustainable livelihoods.

The study employed a stacked value chain analysis method using both qualitative and quantitative approaches. The study was divided into three phases – a scoping study, mapping of a single value chain, and a value chain actor interview. The findings presented in this report were built upon interviews with 26 people across the value chain, and were aided by 18 people interviewed during the scoping mission, working in different segments of the smoked rohu value chain.

The Department of Fisheries reported that there were a total of 329 farmers with a total area of 319.1 acres of registered fish ponds in Kale Township. There were many ponds less than 1 acre¹ that do not require an aquaculture license.² The fish farming business was also growing in Kale Township, along with a growing number of rohu processed. Seven out of 8 processors in Kale Township were interviewed for this study.

In Kale Township, the quantity of smoked rohu produced per day has been increasing since the business started in 2010. Smoked rohu businesses in Kale Township are classified as home and family businesses, where smoking is done at home, rather than commercial enterprises. It is conservatively estimated that the seven processors interviewed process 1,605 viss of fresh rohu (MMK 3,200 per viss³), creating 401.25 viss of smoked rohu per day, which makes the smoked rohu industry in Kale worth MMK 2 billion per year.

Fish farmers in Kale Township rely mostly on fish farming as their main source of household income, before rice and crop cultivation. Rohu are normally stocked in ponds for about 5 to 6 months and are harvested on average at a size of 6.5 inches because consumers prefer smaller sized (about 6.5 inches) over larger smoked rohu⁴. Rohu farmers supply fresh rohu to processors either through fish traders or directly to processors at the price of MMK 3,200 per viss. Of 1,605 viss of rohu processed by seven smokers per day, 31% are sourced through traders, while the rest (69%) are sourced from grow-out farmers directly by the processors.

¹ 1 acre = 4,046.86 m².

² Under the Union Aquaculture Law (The State Law and Order Restoration Council Law No. 24/89). The Department of Fisheries (Kale Township) reported that they had not received any pond license applications in the last 4 years prior to 12 June 2020.

³ A viss = 1.63 kg. Each viss has 100 tical (16.3 g).

⁴ It was also reported that most of fresh rohu consumed in Kale Township is transported into Kale from other areas like Mandalay and Yangon regions.

The smoked rohu value chain has its own credit system which serves as the key sustaining factor linking farmers and retailers, because farmers rely partly on processors and traders for cash advances for buying fish seed, feed and for family health support. Likewise, wholesalers of smoked rohu rely wholly on processors for their business as they buy smoked rohu on credit and pay back often a week to a month later. Similarly, retailers start and continue their retail business using the same “buying on credit” system. For instance, in Hakha of Chin State, four out of five retailers rely on buying on credit.

Despite the fact that smoking is a traditional method of preserving fish and other meat among Chin and Mizo people, the major market for smoked rohu is not a local market. The vast majority of smoked rohu go to the Mizoram State of India, partly driven by a higher export market wholesale price and consumer demand from the Mizoram State of India. In Chin State and Kale Township, consumers prefer smoked river fish to smoked rohu.

Technological changes, especially access to mobile phone services, have enhanced the capacity of actors across the value chain, which enables timely procurement and delivery of materials and products including fresh rohu. It has also provided an opportunity for smokers to learn smoking methods online. As stated earlier, credit systems - both interest-free advance cash and buying on credit also serve as the key enabler for rohu farmers, wholesalers and retailers.

Although small-scale, the rohu industry in Kale Township is improving in terms of its production rate. With greater supplies of fresh fish becoming available from rohu grow-out farmers in the last few years, the development and specialization of the value chain actors' roles has been tremendously important and particularly for farmers and processors.

This study has identified several areas that MYSAP Inland can consider supporting including a smoker design modification to improve firewood and sawdust fuel efficiency, increase productivity, and enhance product quality, while reducing health risks for operators.

Chapter 1. Introduction and Methodology

1.1. Introduction

Rohu (*Labeo rohita*), which is native to Myanmar, is the most common fish species in rural markets in Myanmar. Myanmar exported US\$ 73.5 million worth of rohu in 2007-2008 (Figure 1 below) mainly to the Middle East and South Asia. The Department of Fisheries hatcheries produced approximately 683 million rohu fingerlings in 2008-2009 (FAO, 2019).

Figure 1 - Top ten fishery exports items (2007-08)
[Source - FAO, 2019]

Rank	Species	Captured/Farmed	Metric tonnes	Value m USD
1	Rohu	Farmed	65 652.15	73.5
2	Hilsa	Captured	17 952.31	39.53
3	Tiger Shrimp	Captured	4 299.18	36.5
4	White Pomfret	Captured	7 903.80	34.02
5	Pink Shrimp	Captured	10 375.55	30.64
6	Live Crab	Captured	12 530.41	27.92
7	Ribbon Fish	Captured	18 895.87	20.16
8	White shrimp	Captured	3 174.44	18.41
9	Live Eel	Captured	7 882.15	17.81
10	Rosy Jew Fish	Captured	6 381.55	15.06

According to Government of Myanmar data, fish smoking is the main fish processing system in the Sagaing region and the sector employed about 783 full-time and 764 part-time workers (Government of Myanmar, 2016).

This report presents the result of a stacked value chain study of the smoked rohu industry in Kale Township, in the Sagaing Region. The township is surrounded by Kalewa and Mingin Township of Sagaing Region in the east, Gangaw Township of Sagaing Region to the south, Mawlaik Township of Sagaing Region on the North, and Hakha, Falam, Tedim and Tonzang Townships of Chin State to the west. For map please see Appendix 01 of this report.

Kale Township has a total of population of 348,573, consisting of 48% males and 52% females. About 37% of the total population lives in urban areas. There are 19 wards and 41 village tracts in Kale Township (Department of Population, Ministry of Labour, Immigration and Population, 2017).

1.2. Methodology

This study was conducted in three major steps: 1) a scoping study, (2) mapping of a single value chain, and 3) a value chain actor interviews. The methodology employed in this study was adopted from Dried Fish Matters (DFM) with thanks for their permission to apply the methodology in this study. Value chain actor questionnaires were also adopted questions from a similar methodology developed for Bangladesh, designed and kindly shared by the KIT Royal Tropical Institute. For the scoping and the mapping of a single value chain, a total of 18 (9 women) fish farmers, traders, processors, wholesalers, retailers and enablers were interviewed in Kale Township, Sagaing Region, and Hakha, Falam and Rihkhawdar of Chin State during the scoping phase from 08-13 March 2020.

The third phase of the study, was in-depth mobile phone interviewing of value chain actors, conducted from 8-27 May, 2020. Mobile phone interviews were conducted because of Government of Myanmar restrictions on travel and a ban on face to face meetings during the COVID-19 lockdown. Each person interviewed was requested to provide their consent for the interview and agreement on how the data would be used and shared⁵. The study staff found a number of limitations with the study methodology, and mobile phone interviewing in particular. Firstly, anonymity provided by separation in the phone interview seems to have minimized the respondents' desire to answer questions and made getting information more difficult. For instance, respondents were sometimes reluctant to give details about their business. Secondly, some actors in the value chain were a bit fearful of answering interview questions even after the objective and reason for the study had been explained by the interviewer. As result, a number of people contacted, particularly farmers and labourers, refused the interview request. The only people willing to accept a mobile phone interview were retailers, but even so, the anonymity generated by the phone interview hindered communication and building of a relationship that would normally occur with coming face to face with the interviewers. Thirdly, actors in the smoking rohu industry value chain do not routinely keep records, and some processors, did not for example have the mobile phone number of fresh rohu suppliers. Likewise, processors were unsure from how many farmers they normally sourced fresh rohu for smoking. Given that the number of fresh rohu suppliers for smoking industry in Kale Township is unknown, Chinbridge was unable to interview a representative number of fresh rohu suppliers. Finally, the number of labourers interviewed for the study was low, partly because the majority of labourers did not own phones and most that did, when contacted by mobile phone, refused to be interviewed.

⁵ See Appendix 02 for the KII consent form.

Figure 2. Semi-structured Key Informant Interview Respondent List

KII No.	Value Chain Actor Role	Gender	Location	Type	Interview Tool
KII-1	Farmer	Male	Nat Gyi Kone	Semi-structured	Phone
KII-2	Farmer	Female	Nan Za Lu	Semi-structured	Phone
KII-3	Farmer	Male	Kyauk Htike	Semi-structured	Phone
KII-4	Farmer	Female	Bungdaw (Aung Thi	Semi-structured	Phone
KII-5	Farmer	Female	Bungdaw (Aung Thi	Semi-structured	Phone
KII-6	Farmer	Female	Kyar Inn	Semi-structured	Phone
KII-7	Farmer	Male	Pin Khun Lay	Semi-structured	Phone
KII-8	Farmer	Male	Htauk Kyant	Semi-structured	Phone
KII-9	Retailer	Female	Hakha	Semi-structured	Face-to-Face
KII-10	Retailer	Female	Hakha	Semi-structured	Face-to-Face
KII-11	Retailer	Female	Hakha	Semi-structured	Face-to-Face
KII-12	Retailer	Female	Hakha	Semi-structured	Face-to-Face
KII-13	Retailer	Female	Kale	Semi-structured	Phone
KII-14	Processor	Male	Pyin Khon Lay	Semi-structured	Phone
KII-15	Processor	Male	Nat Gyi Kone	Semi-structured	Phone
KII-16	Processor	Male	Nat Gyi Kone	Semi-structured	Phone
KII-17	Processor	Male	Nat Gyi Kone	Semi-structured	Phone
KII-18	Processor	Female	Htauk Kyant	Semi-structured	Phone
KII-19	Processor	Female	Pyin Khon Lay	Semi-structured	Phone
KII-20	Processor	Male	Min Hla	Semi-structured	Phone
KII-21	Fresh Fish Trader	Male	Nat Gyi Kone	Semi-structured	Phone
KII-22	Fresh Fish Trader	Female	Kale	Semi-structured	Phone
KII-23	Wholesaler/Retailer	Female	Hakha	Semi-structured	Face-to-Face
KII-24	Smoked Fish Trader	Male	Kale	Semi-structured	Phone
KII-25	Labourer	Male	Kale	Semi-structured	Phone
KII-26	Labourer	Female	Kale	Semi-structured	Phone
KII-27	Enabler	Male	Kale		Phone
KII-28	Enabler	Male	Hakha		Phone

In Kale Township, there are 8 processors, with about 6 full-time paid workers in the rohu smoking value chain. Key Informant Interviews (KIIs) were conducted with 7 processors and 2 workers from different smoking units. The exact number of rohu farmers in Kale Township remains unknown but it is estimated that a processor can source fresh rohu from more than 20 villages, while there are some villages with conservatively 15 or more households farming rohu. KIIs were conducted with 8 rohu farmers from 7 villages in Kale Township and with 5 smoked rohu retailers in Kale and Hakha which was believed to be at least 50% of the total number of retailers.

A. Scoping Study

A literature review was first conducted to inform the study approaches and methods. The scoping mission team included one lead researcher and two research assistants, and was supported by two WorldFish advisors. This scoping study involved both scoping and the mapping of a single value chain and was used to examine wider and larger perspectives, while a single value chain was mapped to follow the fish and as a more specific value chain case study.

This phase was intended to document:

- a) The history of the industry and its development, and,
- b) Allow estimation of the number of smoking units operating in Kale Township, the quantity of smoked rohu exported from Myanmar per month across the year, and the final destination and the production output per month across the year.

The scoping phase started with the existing entry points, and later spread out by following the fish to identify the structure of the smoked rohu value chain (the types and numbers of actors involved and their main locations), their conduct (the behaviour of actors as they buy, make and sell), and their performance (issues related to equity, well-being, gender, food safety). This phase involved key informant interviews (KIIs), and was intended to inform the sampling methodology, sample size and questionnaire design for the in depth interview phase.

B. A Single Value Chain Mapping

A single value chain was also mapped. For the single value chain mapping, a case study approach was used by following the fish to gather both quantitative data (*assets, economic, buying, processing and selling*) and qualitative data (*structure, food safety measures, history, socio-economy, labour relations, gender, political economy, challenges and issues*).

C. Value Chain Actor KII

The sample size for key informant interviews (KII) and the construction of questionnaires was informed by the findings generated through the previous two steps of the study. The interviews were conducted by a research team of 6 people (4 women) consisting of one lead researcher, three assistant researchers and 2 interviewers.

The interviews of value chain actors used both qualitative and quantitative approaches with the semi-structured interview method carried out through both face-to-face and phone interview methods. Building upon the findings of the first two phases, this final phase focused on:

- a) The history of the rohu smoking industry, its development and smoked rohu production capacity;
- b) The demographics of the key actors across the value chain;
- c) The livelihoods and economic situation of the key actors across the value chain; and,
- d) Hygiene, sanitary and food safety aspects of rohu smoking, packaging, storage and transportation of products.

1.3. Literature review

In recent years, the fishery sector in Myanmar has attracted development workers, analysts and government and private sector investment. Since early 2015, numerous publications have been issued on fisheries in general, and fishery value chains in particular. A glance at recent development literature on the fisheries sector shows that most value chain studies of the fishery sector have been conducted using livelihoods, food security, gender equality and export potential lenses (Myanmar Fisheries and Aquaculture Research Symposium Proceedings, 2018; Soe, et al., 2020) (Belton, et al., 2015). However, existing literature in Myanmar or English languages on the fishery sector in Myanmar has little information on fish smoking. This is despite 34% of fish consumption nationally being dried and other processed fish products (Belton & Aung Hein, 2015), with dried fish being a particularly important animal source of food in upland areas of Myanmar (Belton, et al., 2015; Eric Baran, 2018; Food and Agriculture Organization of the United Nations, 2003).

Three key knowledge developments in recent literature can be categorized as (a) the fishery sector, livelihoods and food security, (b) gender in the fishery sector and (c) profitability and high export potential of fishery products.

The fishery sector in Myanmar makes an important contribution to domestic livelihoods and food security in two key ways – fish is a major animal protein source and is therefore crucial for nutrition and it generates significant employment (Belton & Aung Hein, 2015). According to a 2019 World Bank report, the fishery sector in Myanmar contributes roughly 2% of the country's gross domestic product, 50% of the animal protein consumed and 6% of employment (World Bank, 2019). However, there is much work to be done, especially with regard to the livelihoods of fishers in Myanmar. Although literature describes the livelihoods of farmers of Myanmar, there is a lack of comprehensive data on poverty levels among fish farming communities in Myanmar (Government of the Republic of the Union of Myanmar, 2016). In Myanmar's Mon State, fishing is ranked fifth of five major household income sources behind agricultural production (24%), non-agricultural activities (22%), non-farm business (18%), wage labour (14%), and fishing (11%) (Aung Hein, 2016). Farming has been the predominant source of income and employment for people in Myanmar for the last two decades (Belton, Filipski, & Hu, 2017).

Another key development in the studies of the fishery sector in Myanmar is the role played by women at various stages along fish value chains. According to one source, 77% of the respondent fishers stated that women in their households were fully involved in the sector at various stages, including the farming, harvesting and selling of fish products (Thitsar, 2012; Salagrama, 2015; Aregu, et al., 2017). Venkatesh Salagrama stated that “women are generally well represented at all stages of the fishery value chains and their role in the various activities is very important” (Salagrama, 2015, p. 14). The key barriers for women in the fishery sector within Myanmar have been discussed and are well recognized, including that of structural and social norms (Salagrama, 2015; Chan, et al., 2018; International Labour Organization, 2015).

Thirdly, literature shows that the exporting fish from Myanmar can be profitable with the steady increase in export volumes over the last two decades up to a peak of 560,000 tons of fishery products in 2017-2018 (Ko, 2018; Soe, 2008; Eric Baran, 2018).

Dried fish are essential for the food security of upland areas in Myanmar, and other processed fish products account for the largest source of fish consumed, with the demand for dried fish being reportedly high and profitable (Salagrama, 2015; Food and Agriculture Organization of the United Nations, 2003; International Labour Organization, 2015; Belton, et al., 2015; Eric Baran, 2018). The authors of the report believe that the majority of dried fish in Myanmar are sourced from the marine capture sub-sector, and the inland capture sub-sector, rather than from aquaculture of farmed fish. Currently, there is very little literature in any language on dried fish value chains in Myanmar, including smoking. However, in Sagaing region alone, the main fish processing system is smoking with firewood, with about 783 full-time and 764 part-time workers (Government of Myanmar, 2016).

A number of studies demonstrate that there is increasing demand in Myanmar for farmed fish, but that there are significant challenges to meeting this demand, including availability of fish seed and limited water supply. Meanwhile between 1980 and 2018, marine fish resources of Myanmar declined by 80% (Aung, 2019; WorldFish, 2018). Similarly there has been a dramatic decline in fish catch from many major rivers in Myanmar, including the Ayeyarwady River (Aung E. C., 2017). Despite the above, export volumes of fishery products have continued to increase over time (Ko, 2018). With rising demand for farmed fish there has been an increase in the number of small, medium and larger farms culturing fish and prawns in Myanmar, attracted by the potential profit from fish production. The indigenous Indian major carp species rohu (*Labeo rohita*) is the major cultured freshwater fish species in Myanmar, contributing 70% of total farmed fish production in Myanmar (Belton & Aung Hein, 2015).

Fish farming is a promising and expanding sub-sector in Kale Township, in part stimulated by the availability of fish seed from government and private hatcheries. In neighbouring upland areas like Tedim and Hakha, fish culture is still in its infancy and is constrained by the availability of inputs for pond culture, including fish seed (Degen, 2016; WorldFish, 2018). The dramatic decline in captured fish supply, the scarcity of flatland and the high cost of pond construction are major constraints to the development of aquaculture farming and are the main reasons why fish consumption in Chin State is low (Frissard & Pritts, 2018). The growing demand for farmed fish from Kale by neighbouring upland Chin State offers economic and livelihood opportunities for fish farmers and fish processors in Kale Township to produce, process, add value to and to transport fish products to the Chin State.

Chapter 2. Results and Discussion

2.1. Rohu Grow-out Segment

The Department of Fisheries reports that there are a total of 329 farmers with a total area of 319.1 acres of registered fish ponds in Kale Township.

Figure 3 - Farmer HHs Demography

Farmers	Gender		Age	Ethnicity	Highest educational attainment	Marital status	Place of Origin
	Male	Female					
Farmer A	M		60	Chin	BSc in Geography	Married	Mizoram
Farmer B		F	33	Burmese	Middle School	Married	Local
Farmer C	M		27	Burmese	High School	Single	Local
Farmer D		F	30	Chin	High School	Single	Chin State
Farmer E		F	60	Chin	Middle School	Widow	Chin State
Farmer F	F		38	Chin	High School	Married	Chin State
Farmer G	M		35	Chin	BA in Zoology (2nd year)	Married	Local
Farmer H	M		41	Chin	High School	Married	Local

The above table (Figure 3) shows the demographic of the grow-out rohu farmers selected for in depth KII. Eight grow-out farmers were interviewed being 4 males and 4 females of which 2 were single, 5 married and 1 a widow. Six of the respondents were ethnic Chin and two were Burmese. The highest educational attainment by respondents ranged from middle school to undergraduate level. Four farmers out of 8 respondents had migrated to Kale Township from the Chin State and Mizoram.

Interviews suggest that women-headed households are also actively involved in fish farming, despite facing more challenges than male-headed households (this is discussed in more detail in the conclusion section of this report). Out of 8 respondents, four were migrants, 3 had migrated from Chin State and one was from Mizoram State of India, in search of better perceived livelihoods options in Kalay Myo. The grow-out farmers interviewed ranged in age from as young as 27 to 60.

2.1.1. Fish Farming History, Land Distribution and Capacity

A total of 8 rohu grow-out farmers from seven villages in Kale Township were interviewed for this study; one farmer each from Nat Gyi Gone, Nan Za Lu, Kyauk Htike, Kyar Inn, Pin Khun Lay, and Htauk Kyant villages and 2 farmers from Buongdaw village. The following table (Figure 4) shows the fish farm land area operated, the production capacity of each respondent, and the number of years each had been farming fish.

Figure 4 - Pond Distribution and Production Capacity in Study Areas

Measurement		Farmer A	Farmer B	Farmer C	Farmer D	Farmer E	Farmer F	Farmer G	Farmer H	Total
Pond Owned	acre	4	3	6	4	2	1	3	3	26
Pond Rented	acre	0	0	0	0	0	0	0	0	
All operational farm land	acre	3	3	4	2	1	1	1	3	18
Length of operation	year	7	10	8	16	20	7	5	6	
Rohu harvested (in 2019)	viss	700	400	500	300	100	60	300	200	2560
Other Fish Species	viss	300	300	400	100	70	--	100	50	1320

Four of the 8 farmers owned only a single fish pond, 2 farmers had 3 ponds, 1 farmer had 2 ponds and 1 farmer had 4 ponds. The area of pond land ranged between 1 and 6 acres. Some fish farmers bought land with an existing pond and so saved on fish pond excavation costs. The area of farm land owned by the grow-out farmers ranged from 1 to 4 acres. Six out of 8 farmers had land other than pond land while all of them had a house. None of the farmers interviewed had rented any fish ponds.

Interviewed farmers had been growing fish for 5 to 20 years with only 3 of the 8 interviewed having cultured fish for 10 or more years. Four of 8 farmers that migrated from Chin State and Mizoram to Kalay Myo started fish farming after relocating. The farmers reported harvesting between 60-700 viss of rohu in 2019, while the production of other fish species including common carp and silver barb ranged between 50 to 400 viss.

Figure 5 below, shows the estimated number of households in seven villages engaged in rohu grow-out farming, the size of villages (in terms of household and population) and the estimated farmer households (HHs) (%) compared to total village size. It was learned that a large number of farmers were culturing rohu for smoking. Of an estimated 128 households culturing fish, 101 of them sold rohu to smokers.

Figure 5 - HHs Engage in Culturing Rohu in Study Areas

	Estimated Number of HHs Engage in Culturing Rohu		Average Number of HHs Culturing Rohu for Smoking		Estimated Total HHs in the Villages	Estimated Total Population in the Villages
	HHs	%	HHs	%		
Nat Gyi Gone village	20	6%	20	6%	335	1,775
Nan Za Lu village	10	5%	3	1%	215	800
Kyauk Htike village	10	1%	10	1%	795	3,746
Buongdaw Village (Aung Thit Sa Ward)	30	37%	30	37%	82	300
Kyar Inn	20	4%	n/a	n/a	540	2,500
Pin Khun Lay	20	7%	20	7%	300	1,500
Htauk Kyant	18	2%	18	2%	1,022	4,621
Total	129		101.53637		3289	15242

According to the respondents, there is little or no market for rohu fish farmers if they want to sell in bulk in the main wet market. However, because the production of rohu smoking is expanding, grow-out farmers are encouraged to culture rohu to meet the demand of smoked

rohu processors. Most of the villages, 5 out of 7, were producing rohu to supply fish smokers. The highest number of households engaged in rohu culture was found in Buongdaw village (Aung Thit Sa Ward), which also produced rohu fingerlings/fry too. Most fish farmers interviewed mentioned purchasing rohu fingerlings from Buongdaw village.

Respondents were culturing rohu in an integrated farming system with livestock like chickens and pigs or rice-fish farming. Most farmers were culturing rohu in polyculture with other fish species, including common carp and silver barb to provide extra income.

Figure 6- Labour

Farmers	Farm Nature	Farming Labour				Labour Purpose	Harvest Labour				Labour Purpose	Total Labour Force
		Female	Age	Male	Age		Female	Age	Male	Age		
Farmer A	family farm			1	=>20	operation	0		5	=>20	Harvesting	6
Farmer B	family farm	2	=>20	3	=>20	operation	3	<20	7	2<20+5=>20*	Harvesting	15
Farmer C	family farm	1	=>20	5	=>20	operation	3	=>20	10	=>20	Harvesting	19
Farmer D	family farm	3	=>20	1	=>20	operation	3	=>20	7	3<20+4=>20	Harvesting	14
Farmer E	family farm	2	=>20	0	=>20	operation	2	=>20	10	=>20	Harvesting	14
Farmer F	family farm	1	=>20	1	=>20	operation	1	=>20	1	=>20	Harvesting	4
Farmer G	family farm	3	=>20	3	=>20	operation	7	=>20	2	=>20	Harvesting	15
Farmer H	family farm	1	=>20	1	=>20	operation	3	1>20 + 2=>20	1	=>20	Harvesting	6

*2<20+5=>20 means there are 2 people below the age of 20 and 5 people who are 20 or older than 20.

The table above (Figure 6) shows the usage of cash/ family labourers needed during fish pond operation. Typically only family labour was used except for pond harvesting, with daily fish pond operations being done by one to two people, often with the husband and wife sharing the tasks. The wife was more likely to prepare the fish feed and feed the fish. In women-headed households, however, women were responsible for the entire feeding process, including buying, preparing and actual feeding. The farming labourers indicated in Figure 6 show the number of household workers and temporary workers mainly for harvesting along with their age group. Temporary workers are often close relatives of pond owners. Harvesting was conducted by men, while the women cooked food for the paid labourers. Only 1 of 8 respondents mentioned the participation of women in pond harvesting together with her husband. The following table shows the gender division of labour for major rohu fish farming activities.

Figure 7. Division of Labour

Women	Men
- Cooking for labourers during harvesting	- Handling fish net
- Preparation of feeds	- Pond preparation and renovation
- Feeding	- Fish seed stocking
- Purchasing feeds and fertilizers	- Harvesting
- Market negotiation with traders/wholesalers	
- Weighing of harvested fishes	

The daily labour price ranged from MMK 3,000 to MMK 4,000 being MMK 3,000 for someone from within the same village and MMK 4,000 for labour hired in from a neighbouring village. Paid labourers were hired during harvest seasons only, while women also participated, and they were paid equally. If relatives help with fish harvest they are usually given fish or some form of free lunch. The mechanism for hiring labour whether paid or unpaid is informal. Three farmers did not hire labourers during harvest, but instead asked relatives to assist for 1 viss of fish per person. The highest labour cost reported was by a woman headed household because she was a widow and had to hire more labourers for harvesting.

2.1.2. Household Assets and Income Sources

The following table (Figure 8) shows the fixed and variable cost of assets owned by farmers. Pond construction was the highest reported total investment cost and ranged from MMK 400,000 to MMK 1.4 million, followed by digging of groundwater wells, buying water pumps, and motorbikes. Respondents had forgotten or did not know the price of some assets, either because they did not keep financial records or had inherited assets from their parents. One rohu farmer reported buying 1 acre of land for MMK 20 million, which was the highest single reported investment.

Figure 8 - Farmers' Assets

	Items	Number	Ownership	Time Acquired/Built	Cost (MMK)	Lifespan (year)
Farmer A	pond	4	owned	2013	1,400,000	7
	water pump machine	1	owned	2017	500,000	3
	house	1	owned	--	--	--
	agricultural land	1 acre	owned	--	--	--
	fish net	1	owned	--	--	--
Farmer B	pond	3	owned	2019	550,000	1
	fish net	1	owned	--	--	--
	hapa	3	owned	--	--	--
	groundwater well	1	owned	2010	300,000	10
	agricultural land	4 acres	owned	--	--	--
	house	1	owned	--	--	--
Farmer C	pond	6	owned	2012	--	8
	house	1	owned	--	--	--
	water pump machine	1	owned	2015	150,000	5
	solar	1	owned	2015	250,000	5
	agricultural land	--	owned	--	--	--
	motor cycle	1	owned	2019	850,000	1
Farmer D	pond	4	owned	2004	1,200,000	16
	house	1	owned	--	--	--
	agricultural land	2 acres	owned	2001	400,000	19
	solar	1	owned	2004	300,000	16
	motor cycle	1	owned	2013	660,000	7
Farmer E	pond	2	owned	2000	--	20
	hapa	1	owned	--	--	--
	house	1	owned	--	--	--
Farmer F	pond	1	owned	2013	--	7
	fish net	1	owned	--	--	--
	house	1	owned	2013	6,000,000	7
	agricultural land	4	owned	2012	--	8
	Troller	1	owned	2015	1,600,000	5
	motor cycle	1	owned	2011	700,000	9
Farmer G	house	1	owned	--	--	--
	pond	3	owned	2018	400,000	2
	groundwater well	1	owned	2019	1,200,000	1
	Land	1 acre	owned	2018	20,000,000	2
Farmer H	pond	3	owned	2014	650,000	6
	agricultural land	1 acre	owned	--	--	--
	house	1	owned	--	--	--

The following table (Figure 9) details the main income sources of the eight interviewed farmers from the seven villages. The data demonstrated that fish farming was the main source of income of 4 respondents (50%), followed by rice plantations (3 farmers), and only one farmer who was operating a tractor. Fish culture was the only source of income for 2 of the 8 farmers interviewed. These farmers were women-headed households, and according to the

interview, each household had only 3 members being the grandmother, the daughter and the grandchild.

The table also shows that fish farming was the second main source of income for the other 4 respondents. Other secondary and tertiary income sources included rice and crop cultivation, and chicken and pig farming.

Figure 9 - Major Income Sources of Household Studied

	1st Main Income Source	2nd Main Income Source	Third Main Income Source	Fish Pond Ownership (in acre)
Farmer A	fish farming	rice plantation	crop cultivation	3
Farmer B	rice plantation	fish farming	crop cultivation	3
Farmer C	rice plantation	fish farming	chicken farming	4
Farmer D	fish farming	n/a	n/a	2
Farmer E	fish farming	n/a	n/a	1
Farmer F	troller	fish farming	rice and crop cultivation	1
Farmer G	fish farming	chicken farming	pig farming	1
Farmer H	rice plantation	fish farming	crop cultivation	3

2.1.3. Rohu Culturing Season and Conduct of Grow-out Farmers

Rohu culturing season varies from farmer to farmer and one location to another. The differences in cultural period and conduct are influenced by a number of factors, such as the affordability of feed, availability of fish seed and access to water. The following diagram (Figure 10) shows an example of how rohu culturing is practiced in some of the study areas.

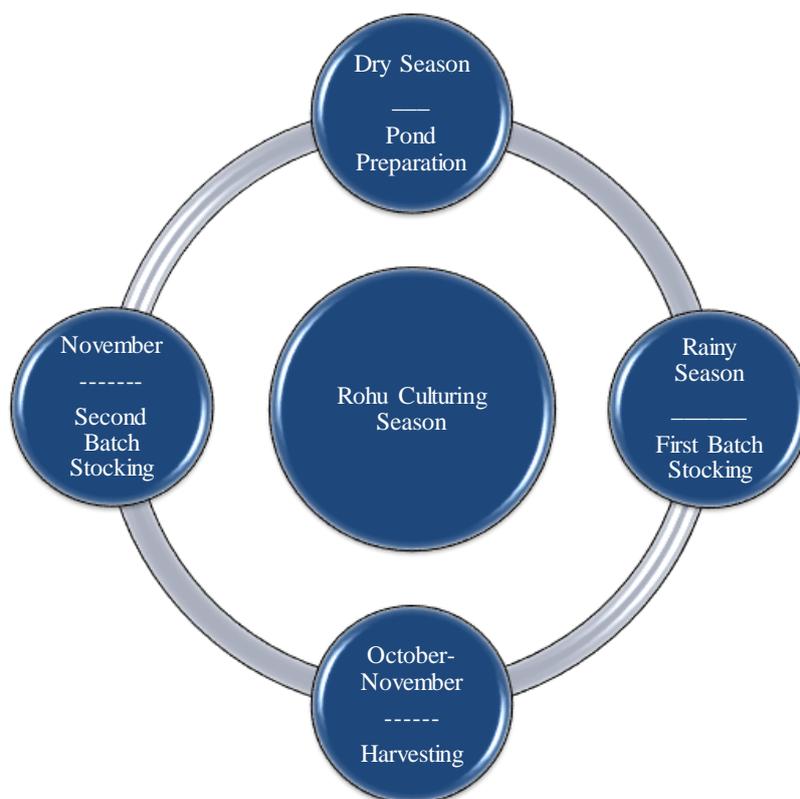


Figure 10 - Rohu Cultural Season

The fish farming practices were generally fairly similar, but varied slightly due to the differences in the availability of key operational inputs namely water, fish seed, fertilizer and fish feed. Farmer A stated that a shortage of water was the main challenge to increasing annual production. He also mentioned that he has been trying to dig a deep tube well, and that if it functions well, he will be able to culture 2 fish cycles per year instead of 1. The women headed households cited limited cash as a constraint to purchasing fish seed, fertilizer and fish feed. Moreover, Farmer E mentioned that because they had no male household members, they had to hire 2-3 labourer to carry and apply fertilizer to the pond which was an additional cost. As a result of these challenges, women-headed households were only able to harvest one crop of rohu per year.

2.1.4. Harvesting and Sale Routes of Fresh Rohu

Rohu produced for smoking are harvested after only 5-6 months of culture when they are on average 6.5 inches in length. According to farmers, the processors prefer small and good-looking rohu, rather than larger fish, because they are easy to process and smoked rohu consumers prefer smaller sized fish.

Farmers decide when to harvest, set the exact harvest date, and make an arrangement with the rohu traders via phone 2-3 days in advance. Normally ponds are drained from late at night, so that the fish can be harvested early the next morning. After netting the rohu are placed into jute sacks and immediately transported usually by rickshaw or motor-cycle to the smokery. In some cases, grow-out pond owners will hold harvested rohu in a hapa in the pond alive until traders or smokers come to take them away. A delay in picking up harvested rohu, unless holding the live rohu in a blue nylon hapa in the pond can result in the rohu dying.

Many grow-out rohu farmers do not own a fishing net to harvest their pond and so usually borrow from their relatives free of charge. Farmers in Kale have poor access to goods from Yangon and Mandalay which are the only places where fishing nets can be ordered.

Figure 11 below shows that 4 of the grow-out farmers interviewed sold all their rohu through wholesalers or traders, 2 sold direct to smokers and the other 2 sold their fish to a mixture of retailers, wholesalers or traders and smokers. The rohu selling price ranged from MMK 2,400 to MMK 3,200 per viss, with women-headed households reporting the lowest selling price. One woman farmer reported that because she used limited feed and fertilizer inputs because she could not afford it, the rohu were smaller in size and not as good-looking as rohu from other producers. Therefore, she usually received a lower price.

Figure 11 - Trade and Sell

Farmers	Wholesaler or Trader	Retailer	Process or	Price per viss	Labour Cost	Fresh Rohu Production (2019)
Farmer A	--	--	100%	MMK 3,200.00	MMK 3,500.00	700
Farmer B	100%	--	--	MMK 3,200.00	1 viss of fish/head	400
Farmer C	100%	--	--	MMK 3,200.00	1 viss of fish/head	500
Farmer D	100%	--	--	MMK 3,000.00	1 viss of fish/head	300
Farmer E	100%	--	--	MMK 2,400.00	MMK 3,500.00	100
Farmer F	70%	30%	--	MMK 3,200.00	--	60
Farmer G	--	--	100%	MMK 3,200.00	MMK 3,000.00	300
Farmer H	--	20%	80%	MMK 3,200.00	MMK 3,000.00	200

A fishing net costs about MMK 40,000, while fish seeds cost about MMK 5 per fry, MMK 30 for advanced fry, and between MMK 50 to MMK 100 for fingerling sized seed.

Loss of fresh fish are often reported by farmers mainly because of two reasons such as delay in harvesting and high temperature. While rohu are harvested mainly within 5 to 6 months of stocking in the pond, culturing for more than 6 months requires significantly more investment in pond inputs like feed and fertilizer. Consequently, rohu survival was normally lower if they were cultured for longer than 6 months. In addition to this, a continuing supply of water for the pond is a challenge for farmers in Kale Township. In the dry season when water is less available and temperatures are higher, rohu mortality was greater.

2.1.5. Potential Economic Benefit of Rohu Farming

The number of rohu grow-out farmers in Kale Township has increased to meet the increased number of rohu smokers and their smoked rohu output and the rising number of retailers in Chin State.

Local grow-out farmers believe that rohu is the most economically beneficial species for smoking because it has less fat content in the flesh, which means that it smokes better than other fish species. Additionally, smokers in Kale Township only smoke rohu.

With an increased number of smokers in Kale Township and retailers in Chin State there is a strong demand for fresh rohu from grow-out farmers.

2.2. Fresh Rohu Trading Segment

2.2.1. History and Operation

This section presents the trading history and operation of the fresh rohu trade in Kale Township. The following table (Figure 12) gives details of rohu trading operations, such as the length of business, operation hours, daily sales volumes and customer relations.

The 3 respondent fresh fish traders had traded fresh fish for between 8 to 28 years. They worked from a minimum of 8 to a maximum of 12 hours per day, seven days per week, all year round. Fresh fish traders sourced their fish directly from grow-out farmers. They sourced rohu from a number of villages including Nat Kyi Gone, Bungdaw, Nat Chaung, Hakhalay, etc.

Resposndents	Trader 1	Trader 2	Trader 3
Operation Length (in years)	12	8	28
Operation hours per day	8	12	n/a
Working days during last month	30	30	n/a
Daily Sell (in viss)	400	100	150
Regular Customer (retailers)	15	8	--
Regular Customers (Smokers)	5	0	--

The traders reported selling from 100 to 400 viss of rohu daily. The difference in the amount of sales appeared to relate to the number and nature of regular customers they have. For instance, Respondent A had 5 regular customers who were rohu smokers, plus 15 fresh fish retailers, while Respondent B had only 8 regular customers, who were retailers and not rohu smokers.

Fresh rohu traders had been involved in different professions before they started fish trading. Respondent A previously traded vegetables before she started fish trading, whereas Respondent B farmed rice before trading fish. The respondents switched to fish trading because they, believed that this would yield more income than their previous businesses. The nature and activities of fresh fish traders is discussed in further detail in the section below.

2.2.2. Characteristics of Fresh Rohu Traders

This section discusses the characteristics, capacity and nature of business transactions of fresh rohu traders in Kale Township. Fresh fish trading is not confined to any particular ethnicity, gender or religion. People of different genders, ethnicities and religions were involved in fresh fish trading. Figure 13 below presents the characteristics and capacity of the 3 sampled fresh fish wholesale traders in Kale Township. A total of 3 wholesale fresh fish traders were identified in Kale Township and all of them were interviewed for this study.

Trader	Market	Gender	Age	Chilren	Ethnicity	Religion	Education	Year Started	Average daily sell (in viss)	Average weekly sell (in viss)	Average Monthly Sell (in Viss)
Res A	Kale	Female	50	4	Chin	Christian	Primary	2008	400	2800	12000
Res B	Kale	Male	42	3	Burman	Buddhist	Primary	2012	100	700	3000
Res C	Kale	Female	--	--	Chin	Christian	--	1992	150	1050	4500
Total									650	4550	19500

Two of the 3 fresh fish traders sampled in Kale were ethnic Chin and 1 was Burma. The respondent traders all had their own regular suppliers. For example, most fish farmers in Buongdaw reported they were regular suppliers to Respondent C, whereas most fish farmers from Nat Gyi Gone were regular suppliers to Respondent A. One respondent reported having up to 100 regular suppliers across Kale Township.

The reported trading volume varied from 100 to 400 viss per day. As Figure 13 shows, one trader sold a total of 400 viss of fresh fish (all species, including rohu) per day, while another two traders sold 100 viss and 150 viss each. In total the three traders were selling an average of 650 viss of fresh fish per day to processors and fresh fish retailers.

Typically fresh fish traders get up at about 02.00 hours and travel to the fish pond in the village that is being netted, collect the fish and bring them to Kale early in the morning for the retail market. Traders normally work without paid staff, but they hire some paid workers when they have to catch large quantities of fish. In such cases, hired workers were paid between MMK 5,000 to MMK 10,000 per worker per day.

One respondent reported that she no longer went to the villages herself. She reported that she agreed arrangements by mobile phone with the grow-out farmers and fish farmers transported the fish to her house. When the fish arrived she called her regular customers to collect the fish. Those traders that went to the villages themselves, brought the fish back by motor-bike to Kale and sold it at Kale market where regular customers (retailers) would buy the fish.

As seen in Figure 13 above, 2 of the 3 wholesale fish traders interviewed were women and the male trader also works with his wife who takes an important role in selling and dealing with retailers. Of the 23 regular customers mentioned by 2 of the 3 traders above, all but 2 of them were women.

Fresh fish wholesale trading was the only source of income for fresh fish traders interviewed in Kale. None of those interviewed had any other business or income source other than fish trading. Traders usually worked alone, except on occasions when greater quantities of fish than normal were traded, when they hired a local motor-bike carrier and paid MMK 10,000. Though fish trading was the main income source for the family for the traders interviewed, only one trader had a family member assisting in fresh fish trading.

One wholesale trader, with 5 people in the household including himself, wife and three children, categorized his business as medium sized, because the business was stable and generated sufficient income to sustain the family. Another trader declined to categorize her business, reporting that she had to work every single day to provide enough food for her family. The fresh fish traders considered their businesses as a reliable livelihood profession.

2.2.3. Fresh Rohu Trading and Sales Volume

This section presents rohu market characteristics in Kale Township. Some traders sell fresh rohu to the smoking industry and other species to the retailer market. There are a variety of species traded by fresh fish traders including rohu, common carp, silver barb, catla, mrigal and grass carp. The following table (Figure 14) shows the amount and percentage of rohu sold daily in Kale Township.

	Fresh Rohu	Other Species
Trader 1	330	70
Trader 2	60	40
Trader 3	100	50
Total	490	160

As seen in Figure 14, the average daily quantity of rohu sold was 490 of 650 viss (75.4%) of the total fish sold by the 3 sampled fresh fish traders in Kale Township, which would mean that the 3 sampled traders sold around 14,700 viss of rohu are sold in a month. There are typically 3 fresh fish wholesale traders in Kale Township, so if the 3 sampled traders were representative of the traders, then an estimated 490, 14,700 and 176,400 viss of fresh rohu is sold per day, month and year respectively in Kale Township. The second most sold fish species was common carp, followed by other fish species such as silver barb, bighead carp, mrigal and grass carp.

Smokers in Kale sourced fresh rohu both directly from fish farmers and through fresh fish traders. Around 69% of fresh rohu were sourced directly from fish farmers and 31% from fresh fish traders. The fact that processors and consumers prefer smaller size of rohu (average 6.5 inches of fresh rohu) makes culturing rohu less susceptible to water shortage, because rohu can be harvested in less than 6 months.

2.2.4. Trends and Seasonality of Fresh Fish Trading

Figure 15 below shows the key seasonality trends of fish traded during the year. Fresh fish, including fresh rohu sales are higher around the second and third months of the year because students are writing their exams and they are given fish by their parents believing it will increase their brain capacity during these months. Fresh fish sales, on the other hand, are lower during October and November because the availability of captured wild river fish is lower during these months. It can thus be said that seasonality of fresh fish trading depends both on consumer behaviour and other possible factors like the availability of wild caught fish.

Trader	High (Months)	Reasons	Low (Month)	Reasons
Trader 1	February, March	Because students are writing exam	Sept, Oct	Because of availability of river fish
Trader 2	February, March	Because students are writing exam	Oct, Nov	Because of availability of river fish
Trader	High (Day)	Reasons	Low (Day)	Reasons
Trader 1	Sunday	Because people eat meat on Sunday (It is like Chin way of life)	Monday	Because people say they still have leftover meats
Trader 2	Sunday	Because people stay together at home and eat meat	--	--

It was also reported that sales of meat including fish is higher on Sunday because there are many Christians in Kale. “Sunday is meat eating day, it is like the Chin’s way of life, you know”, reported one respondent. Fish sales are relatively steady for other days of the week except Monday, which is usually lower because some families still have leftover meat and fish from Sunday. This finding also confirmed the importance of consumer behaviour or culture.

2.2.5. Cost, Profit and Assets

This section presents the costs and profits of fresh rohu trading in Kale Township. The operational costs of fresh rohu trading are relatively high, though it seems to be a reliable livelihood option. Figure 16 below shows the estimated cost and net profit of a fresh rohu trader in Kale. The cost is estimated only for rohu, though studied traders also trade other fish species in addition to rohu.

Figure 16 - Estimated Costs and Profits of A Fresh Rohu Trader in Kale				
	Cost Per Mont		Cost Per Year	
Transportation	MMK	50,000	MMK	600,000
Plastic Bag	MMK	180,000	MMK	2,160,000
Gift for deliverer	MMK	90,000	MMK	1,080,000
Phone Bill	MMK	60,000	MMK	720,000
Fish buying cost	MMK	29,700,000	MMK	356,400,000
Total Operation Cost	MMK	30,080,000	MMK	360,960,000
Fish Selling Price	MMK	34,650,000	MMK	415,800,000
Net Profit	MMK	4,570,000	MMK	54,840,000

Figure 16 shows that operational costs for a fresh rohu trader are just above MMK 30 million per month. This means that fresh fish trading is a high running cost profession which only a few people can afford, because it also requires provision of credit to fresh fish suppliers, retailers and smokers (this is discussed in more detail in the next section). The net profit, however, is relatively high at an estimated MMK 4.57 million per month, compared to other public office, or non-governmental organization professions.

Interestingly, it was reported that fresh fish trading can be conducted without costly assets like land, buildings, and heavy machines. One respondent reported that he has only a motor-bike to operate his business. The fish were brought directly to the market from the ponds and were not stored for long. Fresh fish wholesale traders sampled in this study were generally not keeping fish for longer than half a day. Ice was not used among sampled rohu farmers, traders and processors. Usually, all fish were sold before about 13.00 hours each day. Traders did not experience loss due to poor storage or any other causes during storage.

Fresh fish wholesale traders in Kale see the business as more profitable than their previous professions. It was reported, however, that trading is costly and access to low interest credit would be required for further business expansion.

2.3. Rohu Processing Segment

2.3.1. Characteristics and Structure

Table 17 shows that all 7 smokers sampled were either Mizo or Chin, and all were Christians. Two of the 7 had no schooling at all, and secondary schooling was the highest education level achieved by the 7 sampled smokers.

Processor	Age	Gender	Ethnicity	Religion	Education	Family Size
Processor A	50	Male	Mizo	Christian	6th Standard	4
Processor B	60	Female	Mizo	Christian	5th Standard	6
Processor C	41	Female	Mizo	Christian	3rd Standard	5
Processor D	42	Male	Chin	Christian	5th Standard	6
Processor E	73	Male	Mizo	Christian	No Schooling	12
Processor F	38	Female	Chin	Christian	9th Standard	4
Processor G	46	Male	Mizo	Christian	No Schooling	6

Figure 18 below presents the work force breakdown by age, ethnicity and religion in the rohu smoking units in Kale Township. There were a total of 33 workers (17 women) consisting of 6 hired workers (4 women) and 27 unpaid household workers (15 women) across the 7 smoking units. Only 3 of the 7 smoker units hired paid workers, while the other 4 relied entirely on household members⁶. The hired workers were paid between MMK 5,000 to MMK 8,000 per day.

Processor	Unpaid Household Workers				Average Daily Working Hours	Monthly Working Days	Paid Hired Workers				Average Daily Working Hours	Average Monthly Working Days	Total Labour Force
	Female	Age	Male	Age			Female	Age	Male	Age			
Processor A	1	=>20	1	=>20	19	24	1	=>20	2	=>20	12	20	5
Processor B	2	=>20	2	=>20	9	28	0		1	=>20	9	10	5
Processor C	2	=>20	1	=>20	18	24	1	=>20	1	=>20	11	n/a	5
Processor D	2	=>20	2	=>20	16	22	0		0		0	0	4
Processor E	3	=>20	3	=>20	18	29	0		0		0	0	6
Processor F	1	=>20	1	=>20	12	24	0		0		0	0	2
Processor G	4	=>20	2	=>20	15	26	0		0		0	0	6

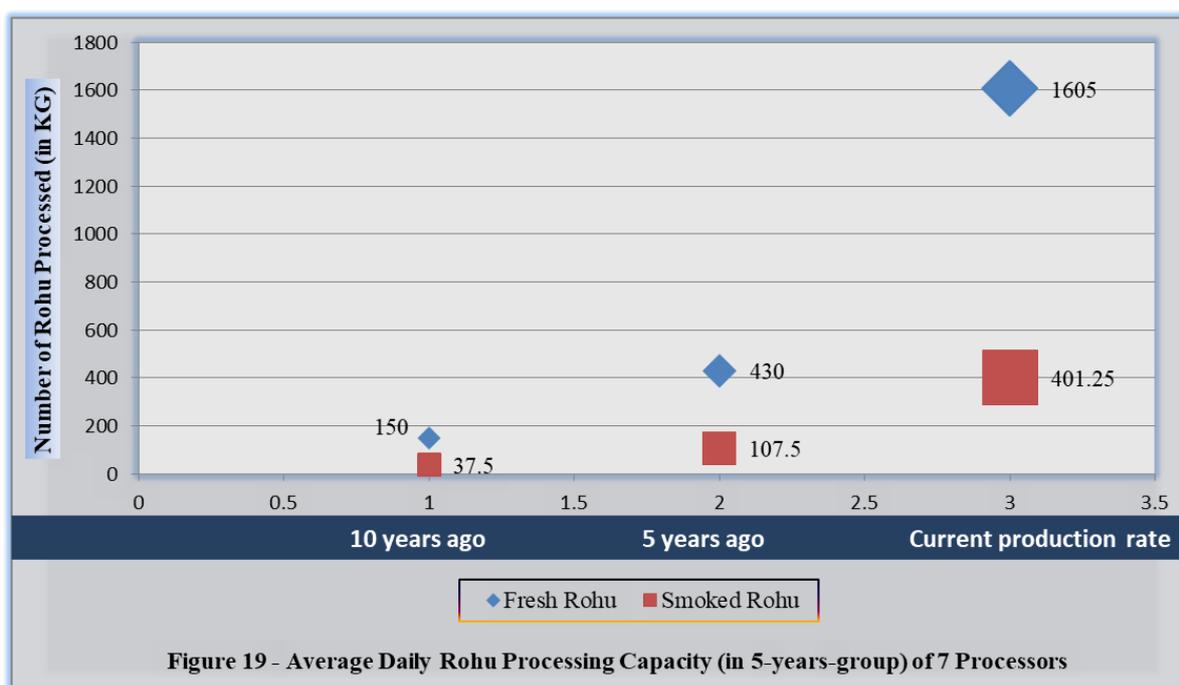
The working hours of household workers ranged between 9 hours to 19 hours per day, with an average of 15.3 working hours per day. However, the hired workers' working hours ranged between 9 to 12 hours per day, with an average of 5 hours per day, i.e. 10.4 hours lower than household members worked.

⁶ According to government data, fish smoking sub-sector in the Sagaing region employs about 783 full-time workers and 764 part-time workers (Government of Myanmar, 2016).

2.3.2. Processing Productivity, Seasonality and Preservation

Smoked rohu production was relatively steady throughout a year, with slightly higher production reported between October and March. The production rate dropped slightly in the rainy monsoon season when the availability of fresh rohu was lower. In some cases, both the smoked rohu sale rate in Hakha and the production rate in Kale peaks in December, and this is partly because there are more regional and religious, mainly Christian festivals at this time of year.

Figure 19 below shows the average daily fresh and smoking rohu production rates of the 7 sampled processors in Kale Township over the last ten years.



There has been an increase in the production of smoked rohu in the last five years. The rohu export market price seems to have been the key driver for increased smoked rohu production in Kale Township. The vast majority, that is 95%, of smoked rohu are exported to the Mizoram State of India through Rihkhawdar Town in Falam Township of Chin State and Tamu Town in Tamu Township of Sagaing Region.

In Kale Township, smoking rohu started in 2010 with just one smoker, then another in 2012, 2 new smokers in 2013, and 2 more started up in 2017. The most recent smoking station was opened in 2019. All smokers worked as farmers before they started their rohu smoking businesses.

2.3.3. Market Structure, Selling Rate and Seasonality

According to some smokers, the production amount of smoked rohu stays relatively stable throughout a year. All processors reported that fresh rohu availability dropped in the rainy monsoon season. In contrast, the production rate in winter peaks in December with more festivals and consumers.

Rohu smoking is done in homes, not at commercial sites, and is a family-based business. Across the 7 smoking stations, smokers in Kale sourced an estimated average of 1,605 viss of fresh rohu daily. Fresh rohu traders sourced 31% of fresh rohu to smokers, while farmers directly sourced 69% of fresh rohu directly to smokers.

Figure 20 below shows the smoked rohu market segment structure and daily market value of rohu production in Kale Township.

Figure 20 - Smoked Rohu Market Composition and Market Value			
	Total Smoked Rohu Produce (across 7 processing stations)	Export Market	Local Market
Rohu Produced	401.25	381.25 viss	20 viss
Rohu Produced (%)		95%	5%
Value	--	MMK 6,100,000	MMK 280,000

A conservative estimate total of 401.25 viss of smoked rohu are produced daily basis by 7 processors, of which an estimated 95% goes to Mizoram State of India and a conservative estimate of 5% (20 viss of smoked rohu daily) are sold in local markets (about 4% in Hakha and 1% in Kale).

The following table (Figure 21) details the cost structure of the smoked rohu industry, along with gross profit and net profit. The gross profit and net profit calculation is based on the export market sale price.

Figure 21 - Cost Distribution of Rohu Processing (in MMK)									
Daily Operation Cost		Processor A	Processor B	Processor C	Processor D	Processor E	Processor F	Processor G	Average Cost Share % (all processor)
Input Cost	Firedwood	4,583	5,357	6,250	4,545	3,793	2,083	6,346	0.63%
	Transport of Firewood	250	1,071	1,250	273	207	125	1,154	0.08%
	Sawdust and Sawdust Transport	6,250	7,500	8,167	9,545	6,517	3,500	8,077	0.94%
	Dried Fish Packaging	0	0	0	0	0	0	0	0.00%
	Personal Transport	167	286	333	364	138	667	308	0.04%
	Phone Bill	208	357	208	227	172	625	385	0.04%
Fresh Rohu and	Labour	18,000	10,000	8,000	-	-	-	-	0.68%
	Daily Fresh Rohu Processing Rate (in viss)	275	300	200	225	350	30	225	
	Fresh Rohu Cost	880,000	960,000	640,000	720,000	1,120,000	96,000	720,000	97.58%
Expenses and Profit	TOTAL Operation Cost	909,458	984,571	664,208	734,955	1,130,828	103,000	736,269	Export Market Sell Rate = MMK 16,000/viss
	Average Daily Smoked Rohu Production (in viss)	69	75	50	56	88	8	56	
	Daily Gross Income (Export Market Rate)	1,100,000	1,200,000	800,000	900,000	1,400,000	120,000	900,000	Local Market Sell Rate = MMK 14,000/viss
	Estimate Net Income	190,542	215,429	135,792	165,045	269,172	17,000	163,731	

On average, as shown in Figure 21 above, buying the fresh rohu was 97.58% of total daily running costs, followed by sawdust, labour and firewood cost at 0.94%, 0.68% and 0.63% respectively.

Total daily operation costs for the smoking units ranged from a minimum of MMK 103,000 to a maximum of MMK 984,571, with an average operation cost of MMK 751,898 per day. Fresh rohu was typically bought at the price of MMK 3,200 per viss and on average, 4 viss of fresh rohu were required to produce one viss of smoked rohu. This means that 1 viss of smoked rohu costs MMK 12,800 for the fresh fish raw material alone, and excluding other expenses like firewood and sawdust and labour.

An estimated total of 401.25 viss of smoked rohu are produced by 7 smokers daily. The smoking units operate six days a week Monday to Saturday and are off on Sunday, meaning that the 7 sampled smokers in Kale Township produce an estimated 2,407.5 viss of smoked rohu per week which is equivalent to 125,190 viss of smoked rohu per year, worth MMK 2 billion, assuming 95% is exported to India.

2.4. Smoked Rohu Trade and Retail Segment

The domestic smoked rohu retail market is small in size and capacity, and is dominated by females, where selling is done through door-to-door marketing and selling at public markets. Hakha, the capital of Chin State, is the main domestic consumption market. In Hakha, smoked rohu retailing businesses emerged as early as 2015, while the smoked river fish retail business has been operating for decades, if not centuries, as fish smoking is a traditional way of preserving fish for Chin people. Retailing of both fresh rohu and smoked rohu began in Hakha in 2015.

In Falam, the nature of the smoked rohu retail market is changing, where there is only one retailer selling door-to-door. The Falam retailer previously sourced smoked rohu from Kale through traders. The retailer started a home-based small smoking unit in late 2019 and now smokes an average of 150 viss of fresh rohu daily.

2.4.1. Characteristics and Capacity of Hakha Retail Market

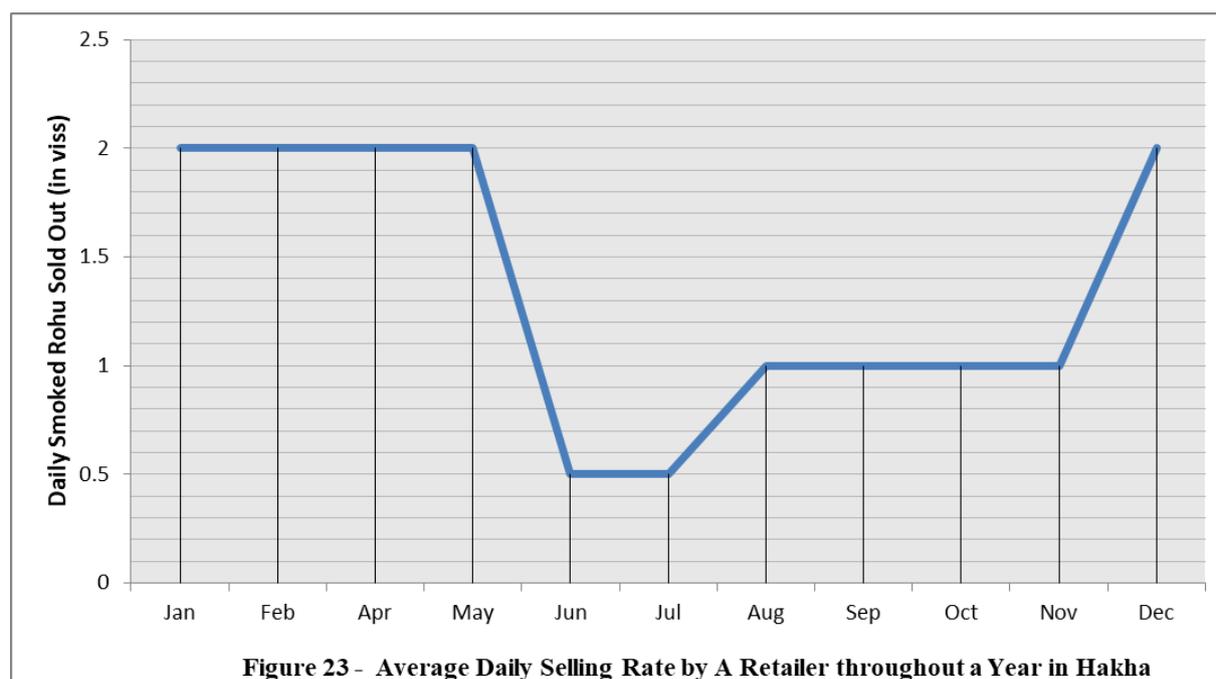
The following table (Figure 22) shows provides data on retailers including education, and average daily, weekly and monthly smoked rohu sales quantities.

Figure 22 - Characteristics and Retail Capacity

Retailers	Market	Ethnicity	Religion	Gender	Age	Family Details	Family Size	Education	Business Established Year	Average daily sell (in viss)	Average weekly sell (in viss)	Average Monthly Sell (in viss)
Retailer 1	Kale	Chin	Christian	female	22	single	4	high school	2015	4	25	100
Retailer 2	Hakha	Chin	Christian	female	48	married	7	primary school	2012	0.5	3	12
Retailer 3	Hakha	Chin	Christian	female	48	married	4	primary school	2017	1	3	12
Retailer 4	Hakha	Chin	Christian	female	38	married	7	primary school	2016	1.5	6	25
Retailer 5	Hakha	Chin	Christian	female	43	married	6	primary school	2015	2	9	35
Sub-total (Kale Market)										4	25	100
Sub-total (Hakha Market)										5	21	84
Grand Total (Kale + Hakha)										9	46	184

There are conservatively an estimated 7 or more smoked fish retailers and 1 smoked rohu retailers in Hakha and Kale respectively of which 4 and 1 were sampled.

All retailers known in Hakha were women, with between 4-7 household members. Those sampled in Hakha had only primary school education and had been selling fish for between 3 to 8 years. It is estimated that the 4 sampled retailers in Hakha sell about 5 viss of smoked rohu daily, while one other wholesaler who also sells smoked rohu at local markets sells about 2 viss daily directly to consumers. The number of retailers in Hakha is believed to be 7 or more people, according to one retailer and from this, it is estimated that an average of about 15 viss of smoked rohu are sold daily in Hakha. All the smoked rohu sold in Hakha according to informants was sourced from only two Kale smokers.



Retailers interviewed reported that more smoked rohu was consumed during the dry winter and summer seasons and that consumption dropped during the monsoon season. This seasonality differences are largely due to the nature of how smoked rohu and other smoked fish retail businesses are conducted in Hakha. For instance, in Hakha, retailers sell smoked rohu carried in bamboo baskets by going door-to-door, which is particularly difficult during the monsoon season.

2.4.2. Actor’s Household Assets

Given that the quantity of smoked rohu sold per day (see Figure 23) and household income contribution data (Figure 24), it can be noted that retailers in Hakha are from low-income families that all migrated from villages to Hakha for economic livelihoods reasons. Although retailers are satisfied with the income contribution of their smoked rohu retailing business, they would prefer that their children took up another livelihoods option that was less difficult than the door-to-door retail business.

Figure 24 - Household Income and Asset of Actors in Smoked Rohu Retail Market

Retailers	Location	Smoked Rohu Retail Business	Other Business	House (quantity)	Agriculture Land	Gender on a person on assests registration
Retailer 1	Kale	65%	35%	1	no	husband
Retailer 2	Hakha	40%	60%	1	1 acre	husband
Retailer 3	Hakha	50%	50%	1	no	husband
Retailer 4	Hakha	40%	40%	1	no	husband
Retailer 5	Hakha	30%	60%	1	yes	husband

Interestingly, while the quantity of smoked rohu sold daily was low in Hakha, the interviewed retailers reported that the sale of smoked rohu contributed between 30 to 50% of total family income. However, this income was probably generated by a combination of both smoked river fish and smoked rohu sales.

Figure 24 shows that major household assets like house and land were registered in the husband’s name for all five sampled retailers. In Chin society, there are few examples of family assets being registered in the spouse’s name because traditionally sons inherit major family assets such as house and agricultural land (Sakhong 2003, 64-69; Vumson 1988). Daughters are entitled to receive a share of movable properties like mother’s jewellery and clothing as gifts. Generally, the house, fields, tithes if the father is a chief, will be inherited by the eldest son or by the youngest son and cattle are divided among the sons (Carey and Tuck 1932). Such customary law among Chin has attracted criticism from gender rights activists. For instance, Ninu (Women in Action Group), in their research on customary law criticized the exclusion of women from inheritance as a discriminatory practice against women, which makes women second class family members (Ninu, 2017).

2.4.3. Cost and Profit

The following table (Figure 25) shows an estimate of wholesale and retail prices in Kale and Hakha along with an estimate of gross profit. River fish are preferred by consumers and these sell quickly. However river fish are not available in the market year round, while the smoked rohu is.

Figure 25 - Average Wholesale and Retail Prices					
	Market	Wholesale price (per viss) in MMK	Retail price (per viss) in MMK	Wholesaler gross profit per viss	Retailer gross profit per viss
Dried Chin Hill River Fish	Kale	30,000	40,000		MMK 10,000
Smoked rohu	Kale	14,000	16,000	MMK 2,000	MMK 2,000
Dried Chin Hill River Fish	Hakha	28,000	30,000		MMK 2,000
Smoked rohu	Hakha	17,500	22,500	MMK 5,000	MMK 5,000

Smoked river fish caught in Chin State are sold in Kale at MMK 40,000 per viss, which is MMK 10,000 higher than the Hakha retailer price. In Hakha, the smoked river fish retail price was MMK 30,000 per viss compared to MMK 22,500 for smoked rohu, i.e. there is a price differential of MMK 7,500 per viss for smoked Chin Hill river fish, because the taste of wild fish is highly preferred among customers.

Smoked rohu retails in Hakha at MMK 6,500 more per viss than in Kale. This reflects the wholesale price of smoked rohu being MMK 14,000 per viss in Kale, compared to MMK 17,500 per viss in Hakha and because of the transportation costs.

Figure 26 - Average Monthly and Annual Expenses and Profit of Rohu Value Chain Actors in Hakha

Estimated Expenses and Profit of a Wholesaler in Hakha				
Descripton		Monthly		Yearly
Retail shop	MMK	125,000	MMK	1,500,000
Phone Bill	MMK	10,000	MMK	10,000
Transportation	MMK	20,000	MMK	240,000
Smoked Rohu Unloading	MMK	3,000	MMK	36,000
Smoked Rohu Buying Price	MMK	2,250,000	MMK	27,000,000
Total Operation Cost	MMK	2,408,000	MMK	28,786,000
Gross Profit (from smoked rohu)	MMK	2,625,000	MMK	31,500,000
Net Profit Generated	MMK	217,000	MMK	2,714,000
Estimated Expenses and Profit of a Retailer in Hakha				
Description		Monthly		Yearly
Phone Bill	MMK	10,000	MMK	120,000
Bamboo Basket	MMK	417	MMK	5,000
Smoked Rohu Buying Price	MMK	420,000	MMK	5,040,000
Total Operation Cost	MMK	430,417	MMK	5,165,000
Gross Profit (from smoked rohu)	MMK	540,000	MMK	6,480,000
Net Profit Generated	MMK	109,583	MMK	1,315,000

Figure 26 above shows a conservatively calculated net profit margin of both a wholesaler and retailers in Hakha. Wholesalers make an average of MMK 217,000 per month from smoked rohu business, while a retailer on average makes MMK 109,583. Retailers sell less smoked rohu in the rainy monsoon season. However while the annual profit presented in Figure 26 is based on conservative numbers, a retailer made at least MMK 1,315,000 profit per year from retailing smoked rohu. Four retailers were interviewed in Hakha and each of them had a household income contribution from fish retailing ranging from 30-50% of total household income.

In addition to variable costs, the Hakha municipal government sometimes requests taxes worth MMK 5,000 for a year per retailer on an irregular ad hoc basis, according to one retailer. An interview with a member of Hakha Municipal government revealed that the municipality is expanding its taxation coverage, but that taxing door-to-door retailers is unlikely to happen, unlike the taxing of fixed business premises like a restaurant.

2.4.4. Structure of Retail Market and Assess to Value Chain Credit

Of the 5 retailers interviewed for this study, 4 sourced smoked rohu on credit system with no interest charged. All of them sourced from traders or wholesalers. For instance, 1 retailer said *“I take all smoked rohu without having to pay the price before selling it. I repay the price within a month.”* One out of 5 retailers didn’t use the value chain credit system, but paid the price in cash in full when she took smoked rohu from a wholesaler.

Retailers take smoked rohu from wholesalers or traders on interest free credit and only repay the wholesalers or traders after they have sold the smoked rohu. The two parties operate on trust without any formal agreement for the credit. Repayment is normally done within a few days to within a month of taking the smoked rohu.

The interest-free credit system and flexible repayment conditions allow people to start a smoked rohu retail business with almost zero financial investment, in an environment where smoked rohu and other dried fish retailed in the market are perceived as being relatively profitable, at least among the current sampled 4 retailers in Hakha. The system has also created the potential for future growth in smoked and dried fish retail business in Hakha. A wholesaler said that *“the fish business compared to the past 5 or 10 years is growing and I believe that the fish business will be growing in the future too.”*

2.4.5. Preservation, Hygiene and Food Safety

Fresh rohu were laid out on a mat on the ground under a house or in an open space leaving them in the sun. The fish innards are removed by unpaid relatives who sell them for human consumption. The smoking stations studied were all highly vulnerable to contamination by animals like dogs, cats, rats and mice, insects and by the workforce if good personal hygiene practices are not followed. The smoking stations and their surrounding environments also had poor sanitation. Consequently, flies were abundant and it is highly likely that flies leave unwelcome eggs on both fresh and smoked rohu product.

After removal of the fish innards by hand, the fish were not cleaned with potable water before being placed in a single layer of fish on a wire meshed rack on a metal frame which was

placed into the smoking oven. The smoking process can take several hours depending on the fuel (wood and sawdust mix) and the fish size, during which time the fish are turned by hand several times to achieve the required moisture content.

People interviewed stated that smoked rohu can be preserved for more than a month, if it is kept in a dry place. One wholesaler kept smoked rohu up to a few weeks or a month, while other retailers kept it in their possession for typically only a week. Once the smoked rohu were sold, buyers store a portion of the smoked rohu for more than a week, as they do not normally consume the smoked rohu all at once.

Smoked rohu was usually stored in a plastic bag or a bamboo basket. Retailers also used bamboo baskets when selling door-to-door.



Chin Bamboo Basket

People use traditional methods for extending the shelf life of smoked rohu without the addition of any preservatives. There are two common ways that retailers and wholesalers extend the shelf life of smoked rohu. First, retailers and wholesalers sun dry the smoked rohu

and, secondly, they hang the smoked rohu high above a cooking fire to further reduce the moisture content.

According to 1 interviewee who lost 1 viss of smoked rohu in the last one month prior to the interview because of mould, smoked rohu can easily spoil if it is not stored properly. During the rainy season, a wholesaler in Hakha risks loss of smoked rohu due to product spoilage and contamination. Spoiled and contaminated smoked rohu product can cause diarrhoea, according to a retailer. So, when choosing rohu from a wholesaler, retailers normally look for smoked rohu with good appearance for sale.

The smoking process reduces the moisture content of the fresh fish, which is why typically 4 viss of fresh rohu are needed to produce 1 viss of smoked rohu. Reducing the moisture content of the smoked product decreases the risk that fungus, moulds and bacteria will grow on the smoked rohu. If the moisture content is reduced to less than 10% the likelihood of contamination and spoilage is significantly reduced. Rohu which is insufficiently smoked and has too high a moisture content will be prone to mould, fungus and bacterial infection.

2.4.6. Smoked Rohu Retail Actors and Social Environment in Hakha

Retailing smoked river fish and rohu contributes about 40-50% of total family incomes in Hakha. Four interviewed retailers migrated from their respective villages to Hakha as early as 2012 with a dream to raise children with a better education. Two of those interviewed were highland farmers, and two others were traditional Chin cloth weavers before moving to Hakha. On moving to Hakha they changed livelihood and began selling smoked river fish and rohu and found it to be more profitable. For instance, a respondent said that *“before I moved to Hakha, I weaved. I started this retail business because it is more profitable than weaving.”*

While the fish retail business has improved household income and resilience, the actual income generated from retailing fish is still relatively low at an estimated MMK 109,000 per month. The fact that retailers can contribute up to 65% of their total household income, shows that there can be very few alternative livelihoods options available in the area and that households are reliant on more than one livelihoods option to survive. A retailer, who also serves as a wholesaler for the majority of retailers in Hakha, said *“our family livelihood is not at risk because this business generates enough income to put food on the table.”*

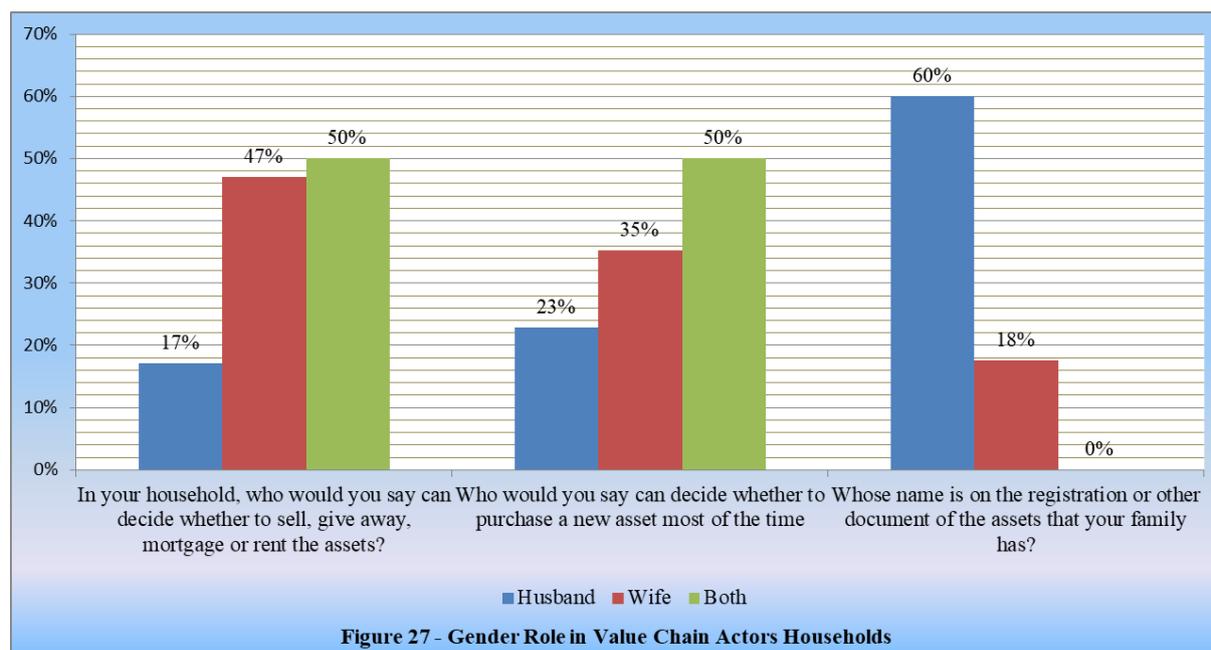
Although the smoked rohu retailers in Hakha chose this profession, they will not recommend it as a career choice for their children, partly because of society's perception of retailers. For instance, one retailer said *“I don't want my children to do the same job I'm doing because people are disrespectful and disregard us while we are selling to a house”*. Another respondent said *“the most difficult thing in this retail business is that when some people communicate and talk to us in a very disrespectful way”* while selling the fish.

However, as it has been noted, the smoked rohu retail business in Hakha has been steadily growing since 2015, with both an increased number of retailers and increased numbers of people consuming smoked rohu, according to a retailer in Hakha.

2.5. Gender in the Smoking Rohu Value Chain

Figure 27 shows the overall power relationship between men and women in the sector-wide smoked rohu value chain. Interestingly, it demonstrates that, despite the fact that the names of men are used for household asset registrations and other legal documents, women either with their spouse, or more often than their spouse or partner, decide whether to sell, give away, mortgage or to rent household assets.

Figure 27 below, was generated through an interview with 24 respondents (16 females) including 8 farmers (4 females), 5 female retailers, 7 processors (4 females), 3 traders (2 females) and 1 female trader.



While men prepare, renovate, and clean ponds and harvest fish, the women were also involved in one way or another, including fish grading, weighing, keeping records and cooking for labour. Likewise, women also play a significant role in preparing fish feed and feeding fish, purchasing feeds and fertilizers, and negotiating with traders, wholesalers and processors. In addition to this, interviews with 8 farmers from 7 villages show that there men and women comprised 58% and 42% respectively of the total labour force across the 8 rohu grow-out farms. Men are often hired for harvesting purposes because, as 1 female respondent from Bungdaw village reported, harvesting requires going into the pond and heavy physical work and lifting, which is more difficult for women, saying that “men labourers need to be hired during harvesting season, but the others activities can be handled by ourselves.”

There are 3 regular fresh fish wholesale traders in Kale Township who supply fresh fish to retailers in the markets and sometimes to smokers. Two of the 3 are women and the man also works with his wife. It can thus be said that the fresh fish trading segment of the rohu value chain is dominated by women.

In the Kale Township smoking units 17 of 33 people working in the sub-sector were women. These included 27 unpaid household members (15 females and 12 males) and 6 paid hired labour (2 females and 4 male). Four of the sampled 7 smoking units were operated by

women. One processor has three hired workers and paid them MMK 6,000 per person per day. Another processor with two hired workers paid them MMK 5,000 per person per day, while another one processor paid a hired worker MMK 8,000 per day. Both women and men were paid equally.

Unlike any other segments in the value chain, the retail market was entirely women dominated at least among the 5 sampled retailers and their income from fish retailing was contributing 30% to 65% of their total household income.

The gender roles of actors across the smoking rohu chain show the heterogeneous nature of different roles played by men and women in different stages and segments of the value chain. Women largely dominated smoked rohu trading and retail, processing was nearly evenly shared by women and men, while men were more dominant in rohu culture and harvesting.

2.6. Technological Changes in the Rohu Value Chain

This section discusses the technological transformation aspects across the smoking rohu value chain, from farm technology, to the structure of the trading segment, and the structure of smoked rohu storage and traditional retailing systems.

Access to mobile services has provided actors across the value chain with real time communications and gives timely procurement and delivery of materials and products including fresh rohu. This also provides processors with the opportunity to learn smoking methods using online platforms like YouTube, while giving an easier way to reach customers for all value chain actors, including retailers. A retailer, for instance, often receives phone calls from customers whenever they would like to buy smoked rohu.

Changes in smoking methods from using charcoal to firewood have also reduced labour costs and working hours, and enhanced production capacity. When charcoal was used for smoking, the fish were smoked in a below ground level oven or in a cooking pit which was then covered with mud, a process which took more physical effort and the smoking took longer. Using firewood and sawdust instead of charcoal, the fish are now spread out on wire meshed chain link fence material on a metal frame and a sheet of corrugated iron is used to cover the fish during smoking. Smokers interviewed report that this technical improvement has increased both the production capacity and product quality and appearance.

However, the current smoking process is still labour intensive and requires long working hours up to 19 hours per day for household members in particular, with the average working day being 15.3 hours across 7 smoking units studied.

Rohu smoking units also need to consider their environmental impact. On average, about 2.28 tons of firewood were used by each processor per month. The seven sampled processors, therefore, used about 16 tons of firewood every month or 191.5 tons of firewood annually. In addition to firewood, an average of 25 rickshaw loads of sawdust was used every month by each of the 7 sampled processors. Given that a rickshaw load of sawdust is equivalent to 5.5 large rice bags full of sawdust, the seven fish smokers used 962 rice bags of sawdust each month and over 11,500 bags of sawdust annually.

any signed contracts, but is rather based on trust and long-standing value chain relationships. However, this credit system usually facilitates an informal verbal agreement, where farmers who take a cash advance then sell their fish to their creditor at a pre-determined price.

The buying-on-credit system occurs in both the retail and wholesale market, where wholesalers purchase fish from processors on credit. Similarly, retailers purchase smoked rohu from either processors or wholesalers on credit and repay after selling the smoked rohu one week to up to a month or even longer, later. The majority of actors in the smoked rohu (and other fish species) retail market run their business by buying on credit.

Therefore, it should be noted that the credit system in the smoking rohu value chain serves as the key enabler for fish farmers, wholesalers and retailers. The small-scale rohu smoking value chain is strengthened therefore by the credit provision system.

Smokers source fresh rohu both from fish traders (31%) and directly from farmers (69%). The sampled 7 smokers produced 401.25 viss of smoked rohu per day, with individual smoker processing capacity ranging from 30 viss to more than 300 viss of fresh rohu per day. Except for one smoker who produced 30 viss of fresh rohu per day, all other 6 smokers processed a conservative average distribution of 262.5 viss of fresh rohu in a single working day. The smoking operations are conducted Monday to Saturday, with Sunday being a day off.

The relationship between processors and smoked wholesalers is more complex than that of traders, farmers and processors. Although smoked rohu goes directly to a wholesaler in many cases, there is often a collecting agent or a trader between a processor and a wholesaler. Traders or smoked rohu collecting agents may also connect directly with retailers, but more interviews are needed to verify this. In most cases, wholesalers supply several dried fish species products to retailers.

The biggest price mark-up along the smoked rohu value chain appears to be for products destined for the export market with smoked rohu selling at MMK 16,000 i.e. a MMK 2,000 mark up. In Kale, the wholesale price of smoked rohu was MMK 14,000 and the retail price is MMK 16,000 per viss. In Hakha, the wholesale price is MMK 17,500 and the retail price is MMK 22,500 per viss.

Smoked rohu in Hakha is much more expensive compared to the Kale local market because there are often intermediaries between the processors and wholesalers and transportation costs. While smoked rohu at wholesale is MMK 14,500 in Kale, in Hakha the wholesale price is MMK 17,500 per viss.

India is the single dominant export market for smoked rohu. The vast majority - estimated to be 95% - of smoked rohu are exported to Mizoram State of India through Rihkhawdar Town in Falam Township of Chin State and Tamu Town in Tamu Township of Sagaing Region. The remaining 5% of smoked rohu produced in Kale Township is sold and consumed in Kale and Hakha. A study of the retail market shows that the consumption rate in Hakha is about 27% higher than in Kale. About 5 and 2 viss of smoked rohu were sold by four retailers and a wholesaler per day in Hakha. One retailer was identified in Kale who sold 4 viss of smoked rohu per day. It is believed that Chin are the main ethnic group consuming smoked rohu in

Kale and Hakha. For this reason, processors prioritize targeting the export market, and mainly Mizoram State, India.

Additionally, the scoping mission found that several MYSAP Inland direct beneficiary households were producing rohu in their small-scale ponds and were well-connected to rohu smokers. Small-scale ponds, unlike large-scale ponds, were connected to rohu smokers mainly through fresh fish traders. Larger pond owners were more likely to network directly with smoking units.

2.8. Self-sufficiency and Livelihoods

Like many fish farmers, fish trading and smoking provided a major income source for interviewed processors and retailer households. Of 5 sampled retailers (all women) fish selling contributed between 30% to 65% of household income, while all 7 interviewed processors reported that smoking rohu was their main source of household income and their key livelihoods option.

When respondents were asked if they would be happy for their children to carry on with their current profession, 5 out of 8 rohu grow-out farmers replied, “Yes”, 3 farmers were “neutral” to the question and 1 farmer replied, “No”. Five out of 5 retailers said they wished that their children would take up another business option, and 5 out of 7 processors and 4 out of 4 traders said, “No” to the question. Many value chain actors perceived their profession as only being suitable for uneducated people. Actors reported that they chose their profession for economic necessity, but did not want their children to follow their example. The main exception were the grow-out fish farmers. In brief, the main reason for dissatisfaction with their profession for their children was the perception of how others in society perceived their profession, rather than their own perception of their profession.

Interestingly, religion also seems to have served as a factor when choosing fish trading as a profession. Fish trading is seen as a good profession among ethnic Chin, many of whom are Christian, while a Buddhist respondent said *“it is good only for young people, but not suitable for elderly people because it is not a blessing profession according to religion”*. While Buddhist can eat meat, it is a sin in Buddhism to be responsible for the death of an animal or a fish.

2.9. Assess to Development Aids and Transformation of Rohu Culturing Practices

Five out of 8 farmers interviewed have had access to development support in the form of technical support from Ar Yone Oo and MYSAP Inland staff. The development actors have had a significant role in changing rohu culturing practices. The study indicated that there have been changes in rohu culture practices due to development assistance at least in the study areas.

For instance, the use of lime for improving pond quality and awareness raising on the benefits of improved nutrition, including eating fish by consumers, using animal fertilizer to enhance the availability of natural food for fish, was introduced to farmers through Ar Yone Oo staff providing MYSAP Inland extension and training services in the study area.

Before technical support from Ar Yone Oo, rohu grow-out farmers in Kale Township were only feeding rohu rice bran. A farmer said only *“after five years of culturing rohu we started to know that adding animal fertilizer enhances the availability of natural food for fish and water quality.”*

Farmer C mentioned taking credit from the government Money Lender (but did not remember the exact name), which most farmers use to meet their rice plantation costs. Farmer B mentioned the credit loan scheme of the NGO (Ar Yone Oo), with an interest rate of MMK 2.3 per month, and how she was responsible for taking out this loan for her household and deciding how the money was to be used. This credit was used mainly to buy fish feed. Most fish farmers are unwilling to take loans, but they are able to and do take loans or borrow cash/in-kind from relatives, friends and organizations such as Ar Yone Oo.

Two of the 8 sampled fish farmers reported that they were able to access in-kind support from Ar Yone Oo. The items supported included fish fingerlings and feed. Government intervention and support for fish farming was reported to be very limited with only two fish farmers mentioning that they had had a surprise informal visit by Department of Fisheries staff.

To date, other than grow-out farmers, none of the sampled value chain actors including processors, traders, wholesalers and retailers interviewed had received any technical or financial development support. Similarly, with the exception of grow-out farmers, the smoked value chain actors had had little or no involvement with the government. The government does not record the quantities of smoked rohu produced, nor does it check product quality.

2.10. The Impact of COVID-19 on the Value Chain

The COVID-19 pandemic has and is impacting across the smoked rohu value chain, from farmers to retailers. COVID-19 has had significant impacts on the value chain. A farmer, for example, said that *“due to COVID-19 pandemic, the fish cannot be harvested and there is difficulty in providing water and too much organic matter kills the cultured fish,”* saying that he has already lost 1 viss of rohu.

All 7 sampled processors reported that they have stopped operating due to the COVID-19⁷. One smoker said that he stopped operating for two months until 8 May 2020. Consequently, fish pond owners were unable to sell their rohu and had to delay pond harvesting. Due to the delay in harvesting during the hot season, one farmer reported losing 200 viss of fish from his pond.

Additionally, retailers reported a sharp decline in the sale quantities of all fish species including smoked rohu, during the COVID-19 pandemic. People were no longer going out very much, according to one Hakha wholesaler.

⁷ In early March 2020, the Tamu-Moreh border gates were closed due to the COVID-19. See <https://www.irrawaddy.com/news/burma/indian-govt-shuts-key-border-trade-gate-myanmar-coronavirus-fears.html>

Chapter 3. Recommendations

A. Improved Smoking Technologies: The rohu smoking value chain faces four key challenges: (1) delayed rohu harvesting, (2) ensuring that the smoked rohu has a sufficiently low moisture content before storage, (3) inappropriate storage systems for smoked rohu, and (4) spoilage of fresh and smoked rohu due to inclement weather.

A simple low cost method to ensure that the moisture content of smoked rohu was of acceptable levels would significantly improve product quality and food safety, increase safe product shelf-life and would reduce spoilage.

B. Increasing Support for Farmers: Access to water for ponds seems to be the most pressing challenge for rohu grow-out farmers, along with access to feeds. Although many farmers harvested two rohu crops per year, some farmers reported that they can harvest only once per year due to a lack of water. Therefore, the possibility of growing two or three crops of rohu is highly dependent on water availability. However, accessing water for an individual farmer can be difficult. One farmer, for instance, reported digging 200 feet searching for groundwater, but did not find any. Lack of adequate water in combination with high temperature results in fish mortalities. Therefore, development support to provide better access to water for fish farmers will improve production capacity and the livelihoods of farmers.

C. Continued Technical Support for Farmers: The development aid delivered to rohu grow-out farmers by non-profit organizations like for example Ar Yone Oo, in the form of technical support has proved to be successful in increasing their fish productivity. Rohu culture training support should be continued in villages. Such training will contribute to increased fresh rohu production, better nutrition outcomes and enhanced farmer livelihoods.

D. Developing, Designing and Testing New Smoking Design: An improved smoking kiln design should be investigated to reduce smoking time, improve product quality, food safety, reduce spoilage, be more fuel efficient, give cost savings and could reduce the potential harmful effects of smoke on the operators and environmental impact.

Development actors can help processors by piloting a number of smoking systems. For instance, the Chorkor oven popular in Ghana, has received positive feedback. It is *“based on traditional materials but incorporates features to improve smoking characteristics, fish handling, fuel efficiency and safer, healthier operation”* (Hall, 2007, p. 60).

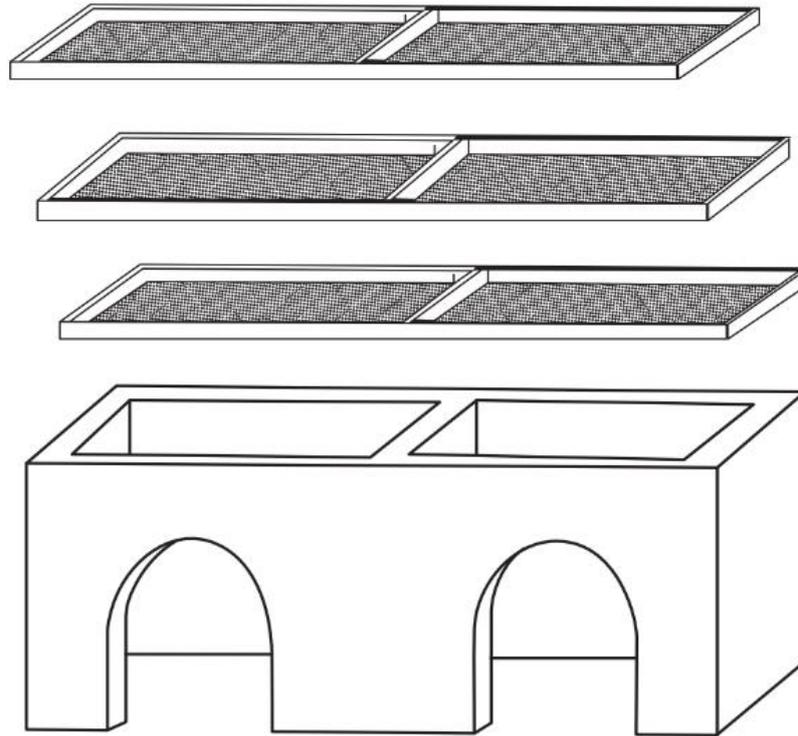


Figure 29. Chorkor Oven

George M. Hall (2007, p.62) highlighted the benefits of the Chorkor oven⁸ as follows:

1. Repetitive handling of the fish was reduced, which led to a less tedious process than that previously employed.
2. The quality of the fish was improved both in terms of uniform smoking and physical condition, which was reflected in a higher market price.
3. The trays could be filled completely with fish, giving a higher capacity per load.
4. The chimney arrangement trapped smoke and heat, giving a more efficient use of the fuel wood.

⁸ For more details about the Chorkor oven, see George M. Hall, "Preserving by Curing: Drying, Salting and Smoking," in Hall, George M. (edt) *Fish Processing: Sustainability and New Opportunities*. Backwell Publishing, Oxford. 2007. pp .51-76

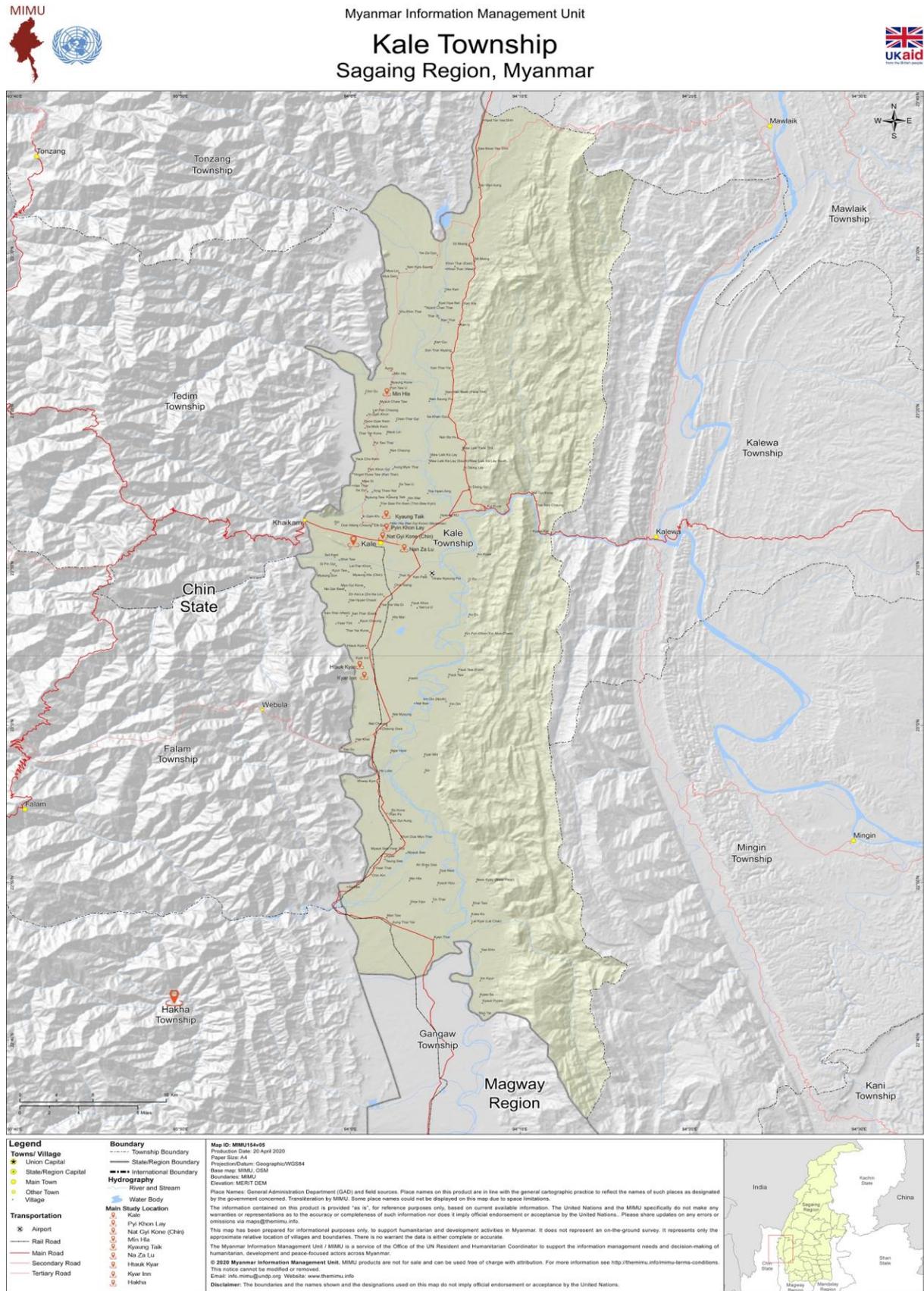
References

- Aregu, L., Rajaratnam, S., McDougall, C., Johnstone, G., Wah, Z. Z., Nwe, K. M., et al. (2017). *Gender in Myanmar's small-scale aquaculture sector*. Penang: CGIAR Research Program on Fish Agri-Food Systems.
- Aung Hein, K. H. (2016). *Revitalized Agriculture for Balanced Growth and Resilient Livelihoods: Towards A Rural Development Strategy for Mon State*. Center for Economic and Social Development, International Food Policy Research Institute and Michigan State University.
- Aung, E. C. (2017, June 21). (Mizzima) Retrieved January 19, 2020 from Mizzima: <https://www.mmmtimes.com/news/myanmar-fish-resources-fall-sharply-past-38-years-research.html>
- Aung, M. M. (2019, December 05). (Myanmar Time) Retrieved January 19, 2020 from Myanmar Time: <https://www.mmmtimes.com/news/myanmar-fish-resources-fall-sharply-past-38-years-research.html>
- Belton, B., & Aung Hein, K. H. (2015). *Aquaculture in Transition: Value Chain Transformation, Fish and Food Security in Myanmar*. Michigan State University.
- Belton, B., Filipski, M., & Hu, C. (2017). *Aquaculture in Myanmar: Fish Farm Technology, Production Economics and Management*. Michigan State University and IFPRI.
- Belton, B., Hein, A., Htoo, K., Kham, L. S., Nischan, U., Reardon, T., et al. (2015). *A Quiet Revolution Emerging in the Fish-farming Value Chain in Myanmar: Implication for National Food Security*. Michigan State University.
- CGIAR Research Program on Fish Agri-Food Systems. (2018). Myanmar Fisheries and Aquaculture Research Symposium Proceedings. *Proceedings: FISH-2018-03*. Penang: CGIAR Research Program on Fish Agri-Food Systems.
- Degen, P. (2016). *Assessment of Access to Fish and Current Capacities of Aquaculture in Selected NOAC Target Villages*. Hakha: MIID.
- Eric Baran, W. K. (2018). *The Ayeyarwady Basin: Ayeyarwady State of the Basin Assessment*.
- Food and Agriculture Organization of the United Nations. (2003). *Myanmar Aquaculture and Inland Fisheries*. Bangkok: Food and Agriculture Organization of the United Nations.
- Frissard, C., & Pritts, A. (2018). *The Evolution of Farming Systems and Diet in Hakha Township, Chin State, Myanmar*. LIFT-GRET.
- Government of the Republic of the Union of Myanmar. (2016). *Myanmar: National Action Plan for Agriculture (NAPA), Working Paper 4: Fisheries and Aquaculture*. Yangon: Government of the Republic of the Union of Myanmar.
- Hall, George M (2007). "Preserving by Curing: Drying, Salting and Smoking," in Hall, George M. (edt) *Fish Processing: Sustainability and New Opportunities*. Blackwell Publishing, Oxford. pp .51-76
- International Labour Organization. (2015). *Value Chain Analysis and Competitiveness Strategy: Freshwater Capture Fisheries*. International Labour Organization.
- Ko, T. K. (2018, April 10). (Myanmar Time) Retrieved April 01, 2020 from Myanmar Time: <https://www.mmmtimes.com/news/fishery-exports-break-20-year-record-could-double-within-two-years.html>

- Lambrecht, Isabel and Mahrt, Kristi (2019), *Gender and Assets in Rural Myanmar: A Cautionary Tale for the Analyst*. IFPRI Discussion Paper 01894. Retrieved 12 June 2020. Available at: <http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/133533/filename/133746.pdf>.
- MYSAP Inland. (2018). *Value Chain Report- Kale Township*. MYSAP Inland.
- Ninu (Women in Action Group) (2017). *Women as the Others: Chin Customary Laws & Practices from a Feminist Perspective*. Ninu (Women in Action Group, Yangon.
- Sakhong, Lian H (2003). *In Search of Chins Identity: A Study in Religion, Politics and Ethnic Identity in Burma*. NIAS Press. Copenhagen.
- Salagrama, V. (2015). *Fisheries Value Chain Assessment: Opportunities for Strengthening the Position of the Small Scale Fishers in the Value Chain*. Network Activities Group.
- Soe, K. M. (2008). *Trends of Development of Myanmar Fisheries: With References to Japanese Experiences*. The Institute of Developing Economies.
- Soe, K. M., Baran, E., Gantham, R., Tezzo, X., & Johnstone, G. (2020). *Myanmar Inland Fisheries and Aquaculture: A Decade in Review, Monograph no.209*. Yangon: Australian Centre for International Agricultural Research, Canberra, & WorldFish.
- Thitsar, M. T. (2012). *Gender Value Chain: Fishery in Pya Pon and Dedaye Townships*. Myanmar Development Research Institute.
- Vumson (1988). *Zo History: With an Introduction to Zo Culture, Economy, Religion and Their Status as Ethnic Minority in India, Burma and Bangladesh*. Vumson, Aizawl.
- World Bank. (2019). *Myanmar Country Environmental Analysis. Fisheries Sector Report*. Washington DC: World Bank.

Appendix 01. Main Study Locations

**Main study locations are highlighted in red location marks.



Appendix 02. KII Consent Form

* Please provide the following information to each interview participants.

1. Self-Introduction: I'm _____ working for Chinbridge Institute for a study of small-scale rohu production in Kale Township.

2. Introduction to Chinbridge Institute: Chinbridge Institute is a registered, an independent and non-partisan research organization. It has conducted a number of studies for development actors, civil society organizations and government department. We aim to provide alternative information for development actors and policy-makers for informed decision-making. Chinbridge Institute fully respects the privacy of our study participants. We keep all personal data participants provided safe and secure. We adhere to a principal of "DO NO HARM" when we carry out this kind of study.

3. Introduction to Project: Chinbridge Institute is conducting a study on the small-scale rohu smoking industry for World Fish, an international organization. This study is conducted (a) to document the small-scale rohu smoking industry in Kale Township including its history, social, economic, nutritional and environmental impacts (negative and positive) along the value and marketing chain and (2) to identify where support from MYSAP Inland and other agencies and institutions could be used to maximize the benefits and to promote improved practices

4. The Benefits of Participating in this Interview: The small-scale rohu smoking industry is thought a growing and promising industry for a number of people in Kale Township. We believe that a better understanding of this industry would be a contribution to the development of the industry. So, participating in this study can be a decent way to contribute to the development of this small-scale rohu smoking industry in Kale Township. The information generated through this study will be used to maximize the benefits and to improve the industry by MYSAP Inland and, possibly other agencies and institutions. We would very much appreciate your participation.

5. Question: Ask potential participant if she/he has questions and give time for him/her to engage through question. In this way, establish rapport relationship with the participant/s. Example question would include: Do you have any question with regard to this project and organization?

6. Getting Consent: This interview can probably take up to 50 minutes. Can you please spare your time for interview? If you are not free right now, we can call you back at your most convenient time.

Accepted	Refused	Name (if accepted)	Date
<input type="checkbox"/> Accepted	<input type="checkbox"/> Refused		

7. Declaration: I, _____ (print name) hereby certified that I clearly explained – according to the best of my knowledge – the purpose of the study to respondent, and the respondent mentioned above agreed to voluntarily participate in the study.

Appendix 03. Rohu Farmer Questionnaire

Rohu Grow-out Farmer Interview Form #01

Details of the business	
Code	
Role of interviewee	
Name	
Location (Village/Township/District/State or Region)	
Phone number	
Gender	
Age	
Ethnicity	
Religion	
Highest level of education completed	
Place of origin. If different from the business location, why and why moved	
Family details: (Married/unmarried, children)	
Respondent's response status (Completed/partial/call-back/postponed/refused/refused to consent/other – specify)	

Name of interviewer/s	
Name of note taker/s	
Date	
Start time of interview	End time of interview
People present	
Questionnaire checked by supervisor	Yes/No
	Name of supervisor

Section 1: History, Asset and operation of Grow-out Farmers

1.1.	When did you start the fish stocking fish seed and/or culturing fish in your village?	
1.2.	How long have households been stocking and culturing rohu (<i>Labeo rohita</i>) in your village? 1.2.1. How many ponds and how many acres of grow-out fish ponds do your family own? 1.2.2. How many ponds and how many acres of grow-out fish ponds do your family rented?	
1.3.	How many households in your village currently culture rohu in grow-out ponds?	
1.4.	Of the households culturing rohu in grow-out ponds, how many sell rohu for smoking?	
1.5.	Where are the rohu seeds bought that are stocked into the grow-out ponds?	
1.6.	Normally at what month or season of the year are the rohu grow-out ponds stocked and when after how many months are the rohu grow-out ponds harvested?	
1.7.	At what size (inches or weight) are the rohu harvested and sold for smoking?	
1.8.	Besides smoking, is rohu also sold fresh and processed in any other way like salting, drying, fermenting, etc?	
1.9.	How do you normally harvest your grow-out pond when selling the rohu for smoking?	
1.10.	Are there different roles for men and women in the each stages of culturing rohu?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	1.10.1. If yes, what are they? Why?	
	1.10.2. If no, why?	
1.11.	In general, describe roles of women and men from farming rohu to harvesting it.	
1.12	In your normal rohu culture season during what months do you prepare the grow-out pond? Stock the rohu?	
	Month	Activity
		Quantity

1.13.	What production of rohu (weight in viss) did you produce last year?		
1.14.	Have your culture practices for rohu changed much in the last 5 or 10 years? If yes, how and why?		
1.15.	Do you prefer culturing rohu over other fish species? 1.15.1. If yes, why? 1.15.2. If no, why not?		
1.16.	Do you or members of your household do any work other than growing rohu in grow-out ponds? When, why? Give details		
1.17.	Do you own a house?	<input type="checkbox"/> Yes <input type="checkbox"/>	
1.18.	If you rent a house, how much do you pay per month?	[_____] MMK	
1.19.	Does your HH or any of its members agriculture land	<input type="checkbox"/> Yes <input type="checkbox"/>	
1.20.	What is the gender of the land owner? How much?	Male.....1 Female...2	_____ acre
1.21.	Does anyone in your household own any fishing equipment? Who/What kinds?		
	Ownership should be considered very broadly to include cases where land is formally titled and registered in one or more household member's name; land that has been purchased, transferred or inherited but is not formally titled (or if the titled not registered in the household's name); land leased from government; and, land where the household believes it has an established right (formal or informal) to use the land, a right that is generally recognized by the community.		
1.22.	Is your HH renting any land for agriculture? (paying in cash)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
1.23.	If yes, how much land is the HH renting? (paying in cash)	Unit_____	_____
1.24.	Is your HH renting any land for agriculture? (paying in kind)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
1.25.	If yes, how much land is the HH renting? (paying in kind)	Unit_____	_____

1.26.	Is your HH leasing out any of its land?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
1.27.	If yes, what is the area of land the HH is leasing out?	Unit _____	_____
1.28.	Did your HH cultivate any other land that was provided free of charge?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
1.29.	If yes, what was the area of that land cultivated free of charge?	Unit _____	_____
1.30.	1.30.1. What is your HH first main source of income?		
	1.30.2. What is your HH second main source of income?		
	1.30.3. What is your HH third main source of income?		

Section 2: Trade - Buy

2.1. What are the main locations that you source each of these species from?					
No.	Source	No.	Source	No.	Source
1		3		5	
2		4		6	

2.2. What type of suppliers do you usually procure these from (e.g. fish seed grower)? Who are they (Male/Female, age, location, ethnicity, economic status)?							
Supplier Demographic							
Type of Supplier	Name	Gender	Age	Location	Religion	Ethnicity	

2.3. How many regular suppliers do you have? How about 5, 10 years ago? Why has this changed? (e.g. suppliers, 1. Fish seed, fish feed)				
Number of regular Supplier	Current situation (in operation)	5 Years Ago	10 Years Ago	Note (reason for changes if any)

Section 3: Trade – Sell

3.1. What type of customers do you usually supply fish to (e.g. traders in other wholesale markets market, local retailers etc.)? Who are they (Male/Female, age, location, ethnicity, economic status)?					
	Female/Male	Age	Location	Ethnicity	Size of the business (Small, Medium, Big)
Wholesaler/trader (local market)					
Retailer (local market)					
Processor					
Other, if any, specify					

3.2. What % of the fish you trade is sold to each type of customer?	
Customer	Sale Proportion by % (Approximate)
Wholesaler/trader	
Retailer	
Trader (Export Market)	
Processor	

3.3. How do you usually organize sales to customers (e.g. sell at auction, make agreement over phone, advance contract)?

3.4. Is any of the fish you sell exported? Give details

Section 4: Assets

4.1. Where did you get capital needed to start fish farming business?

4.2. Is the business a family firm? Yes No

4.2.1. If so, in what capacity are family members involved in the firm?	Female	Male	Other Comments

4.3. Do you have any other businesses (e.g. own boats, drying operations, retail shops)?
 Yes No

4.3.1. If so, in what order did you establish them and why? (Instruction: specify type of business)

4.4. In your household, who would you say can decide whether to sell, give away, mortgage or rent the assets?

4.5. Who would you say can decide whether to purchase a new asset most of the time?

4.6. Whose name is on the registration or other document of the assets that your family has?

4.7. What are the fixed costs of your fish business (Land & buildings, transport, Machinery, equipment, Loan (interest on loans), Permits and taxes)?

Fixed cost (details for each asset is needed)	Number	Rented or owned	When was it acquired/built	Cost of purchase/lease/rent per unit	Lifespan of equipment/asset or length of lease/rental/permit, etc.)	What share do you use for your fish business? (%)

2. House purchase or construction	2	a) Most Important _____
3. Land purchase or rent	3	
4. Purchase of working tools or equipment	4	
5. Food purchases	5	
6. Purchase of agricultural inputs	6	b) Second most Important _____
7. Purchase of animals/ medicine for animals	7	
8. Purchase of other assets	8	
9. Wedding	9	c) Third most Important _____
10. Funeral	10	
11. Health emergency	11	
12. Sending family member to school	12	
13. Other – specify –:	13	
5.1.4. If not, why did you not try to obtain a loan?		
5.2. Would you or anyone in your household be able to take a loan or borrow cash/in-kind from any source if you wanted to? Who would that be? How about 5, 10 years ago? Why has this changed?		
5.3. Would you or anyone in your household be able to take a loan or borrow cash/in-kind from any source if you wanted to? Who would that be? How about 5, 10 years ago? Why has this changed?		

Section 6: Labour

Unpaid household and family labour

6.1. How many unpaid household members (including yourself) worked in your fish farming business in the past month? How many male and female who are lower 20 and over 20?				
How many hours per day does each type of unpaid worker work per day?				
How many days of work was done by each type of unpaid worker in the past 30 days?				
	Male (<20 of age)	Male (=>20)	Female (<20)	Female (=>20)
Total				
Average hours per day				

Working days during last month				
--------------------------------	--	--	--	--

Hired labour (Cash or by-products or in-kind)

6.2. How many male and female workers (lower 20 and over 20 years of age) do you employ (permanent and temporary)? What are their roles? How are workers paid (e.g. daily, monthly, piece rate)? How much are they paid?

Roles	Male <20	Female =>20	Permanent or Temporary (Casual)	Wage rate (MMK)	Wage unit (day/hour/week/month/ other-specify)	Total wage per month

6.3. Where do your workers originate from? How do you recruit them? Where do they live?

6.4. Do they receive wages in advance? Yes No

6.4.1. If so, why and how?

6.5. What do you think are the qualities of good worker?

Section 7: Food safety

7.1. How long does harvested fish usually remain in your possession? What is the maximum length of time? (e.g. hours, days)

7.2. How do you store fish once harvested?

7.3. How do you ensure that the fish you store remains in good condition?
 7.3.1. Do you use ice? Yes No

7.4. Do you experience any product losses during storage? Yes No

7.4.1. If yes, why/how much?

7.5. Do you grade or clean your harvested fish before selling it?

7.6. Do you use any preservatives?

Section 8: Government and association

8.1. Is there any government authority that keeps records of the quantities of fish traded?
8.2. If yes, how do they do it? How do you report? Is the government officer you report man or woman? Are there any differences for different gender/sex?
8.3. If no, do you think it is necessary to keep records? What are the benefits and challenges for keeping records?

8.4. Are you a member of any trading/business association?	<input type="checkbox"/> Yes <input type="checkbox"/> No
8.4.1. If yes, which and why? Is membership compulsory? What is your membership? What is the purpose of the association? How many members do the associations/have? How many women are there in the association? How many men and women in the decision-making level or management committee? What are its activities? What are the association rules? Who leads the association? Does the association mediate disputes? Can you give an example? Does the association/s have any political power or influence – describe?	
8.5. Have you ever received any support or help from government, NGOs or any other organization (give details)?	
8.6. Are there any government regulations, policies, or activities that restrict or cause difficulties for your business (give details)?	

Section 9: Self-efficacy

9.1. Did you choose this profession?	<input type="checkbox"/> Yes <input type="checkbox"/> No
9.1.1. If so, why?	
9.2. What are the key skills necessary to doing this job well?	
9.3. How did you learn these skills?	
9.4. Which aspects of your work do you like? Which aspects do you dislike?	
9.5. What are the most significant changes that have affected your business during past 10 years (positive and negative)? Was it going to be the same for your opposite sex?	
9.6. What do you think the prospects are for your businesses over the next 10 years?	
9.7. What are the biggest challenges that you face when doing business? Is it going to be the same for your opposite sex?	
9.8. Do you consider your livelihood to be risky?	<input type="checkbox"/> Yes <input type="checkbox"/> No
9.9. Why/Why not?	

Final Report

9.10. Is this a choice of employment that you would recommend to others?	<input type="checkbox"/> Yes <input type="checkbox"/> No
9.10.1. If so, why/why not?	
9.11. How do you think people in society generally perceive your profession Is it going to be the same for your opposite sex?	
9.12. Would you be happy for your children to carry on this profession? Is it going to be the same for your son and daughter? Why/why not?	
9.13. Do you consume processed fish?	<input type="checkbox"/> Yes <input type="checkbox"/> No
9.13.1. Why/why not? Which species do you prefer and why?	

Appendix 04. Rohu Trader and Wholesaler Questionnaire

Details of the business	
Code	
Role of interviewee	
Name	
Location (Village/Township/District/State or Region)	
Phone number	
Gender	
Age	
Ethnicity	
Religion	
Highest level of education completed	
Place of origin. If different from the business location, why and why moved	
Family details: (Married/unmarried, children)	
Respondent's response status (Completed/partial/call-back/postponed/refused/refused to consent/other – specify)	

Name of interviewer/s			
Name of note taker/s			
Date			
Start time of interview		End time of interview	
People present			
Questionnaire checked by supervisor		Yes/No	Name of supervisor

Section 1: History and operation of the processors

1.1.	When did you start the fish business? What did you do before that? Why did you decide to start this business?			
1.2.	What are the operation hours? How does your average daily look like? Is there any difference for being a man or a woman?			
1.3.	What are the activities of your fish business? (deal, transport, credit, buy and sell)?			
1.4.	Do you have a shop or an office in the market or somewhere?		<input type="checkbox"/> Yes <input type="checkbox"/> No	
	1.4.1. If so, what are the advantages and disadvantages? Why do you think there is no difference or there is difference?			
	1.4.2. If no, why? Do you want to open one?			
1.5.	Do you keep a record of the quantities of fish traded? <ul style="list-style-type: none"> If yes, how do you keep the record? With a ledger? Is it daily or weekly or monthly? 			
1.6.	What are the percentages of the trade for the last 7 days?			
No.	Day	Species/types	Quantity (%)	Quantity (KG, if known)
1				
2				
3				
4				

5				
6				
7				
1.7.	What is the average daily production of fish traded in the last 5 and 10 years ago?			
	Five year ago			
	Ten year ago			
	Reason for changes over 5/10 years ago			
1.8.	What is the seasonality? Are there any months during the year when trade is particularly high or low? Which months?			
	<input type="checkbox"/> Jan <input type="checkbox"/> Feb <input type="checkbox"/> Mar <input type="checkbox"/> April <input type="checkbox"/> May <input type="checkbox"/> June <input type="checkbox"/> July <input type="checkbox"/> Aug <input type="checkbox"/> Sep <input type="checkbox"/> Oct <input type="checkbox"/> Nov <input type="checkbox"/> Dec			
	<u>1.12.1.</u> <i>If there is, why are these peaks or low months?</i>			
1.9.	Are there any days during the week when trade is particularly high or low?			
	If there is, what is the reason?			
	<input type="checkbox"/> Monday –			
	<input type="checkbox"/> Tuesday –			
	<input type="checkbox"/> Wednesday –			
	<input type="checkbox"/> Thursday –			
	<input type="checkbox"/> Friday –			
	<input type="checkbox"/> Saturday –			
	<input type="checkbox"/> Sunday –			
1.10.	Have there been technological changes since you began to work in this profession that has changed the way your business operates?			
1.11.	Would you categorize your smoking business as small, medium or large? Why?			
	<input type="checkbox"/> small, <input type="checkbox"/> medium <input type="checkbox"/> large			
	<u>Explanation:</u>			

Section 2: Trade - Buy

2.1. What are the main locations that you source each of these species/products from?					
No.	Source	No.	Source	No.	Source
1		12		23	
2		13		24	
3		14		25	
4		15		26	
5		16		27	
6		17		28	
7		18		29	
8		19		30	
9		20		31	
10		21		32	
11		22		33	

2.2. What type of suppliers do you usually procure these from (e.g. traders in this market, fish driers etc)? Who are they (Male/Female, age, location, ethnicity, economic status)?							
Supplier Demographic							
Type of Supplier	Name	Gender	Age	Location	Religion	Ethnicity	

2.3. How many regular suppliers do you have? How about 5, 10 years ago? Why has this changed?				
Number of regular Supplier	Current (in operation)	5 Years Ago	10 Years Ago	Note (reason for changes if any)

2.4. How do you procure fresh fish? [Instruction: Answer can be more than one. In such case, provide details account, including proportion in comment section]	Tick	Categories	Tick	
		own fishing		Buy at auction
		buy from fishers		Advance Contract
		buy from traders		Make informal agreement (e.g. over phone or in-person)
		Other, specify:		Other, specify:

Comments:

2.5. Do you provide credit to any of your suppliers?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Which suppliers	
--	------------------------------	-----------------------------	-----------------	--

2.6. What are the terms of the credit you provide (e.g. amount, duration, interest, requirement to sell to you)? How do you ensure that suppliers who take credit repay their debts?	
--	--

Section 3: Trade – Sell

3.1. What type of customers do you usually supply fish to (e.g. traders in other wholesale markets, local retailers etc.)? Who are they (Male/Female, age, location, ethnicity, economic status)?					
	Female/Male	Age	Location	Ethnicity	Size of the business (Small, Medium, Big)
Wholesaler (local market)					
Retailer (local market)					
Processor					
Other, if any, specify					

3.2. What % of the fish you trade is sold to each type of customer?	
Customer	Sale Proportion by % (Approximate)
Wholesaler	
Retailer	
Trader (Export Market)	

3.3. How do you usually organize sales to customers (e.g. sell at auction, make agreement over phone, advance contract)?
--

3.4. Is any of the fish you sell exported? Give details	
3.5. How many regular customers do you have? How about 5, 10 years ago? Why has this changed?	
3.6. Do you provide credit to any of your customers?	<input type="checkbox"/> Yes <input type="checkbox"/> No
3.6.1. If so, how common is this (e.g. what % of each type of supplier do you provide credit too?) How about 5, 10 years ago? Why has this changed? What are the terms of the credit you provide (e.g. value, form, duration, interest, requirement to buy from you)? How do you ensure that customers who take credit repay their debts?	

Section 4: Assets

4.1. Where did you get capital needed to set up this business?			
4.2. Is the business a family firm? <input type="checkbox"/> Yes <input type="checkbox"/> No			
4.2.1. If so, in what capacity are family members involved in the firm?	Female	Male	Other Comments
4.3. Do you have any other businesses (e.g. own boats, drying operations, retail shops)? <input type="checkbox"/> Yes <input type="checkbox"/> No			
4.3.1. If so, in what order did you establish them and why? (Instruction: specify type of business)			
4.4. In your household, who would you say can decide whether to sell, give away, mortgage or rent the assets?			
4.5. Who would you say can decide whether to purchase a new asset most of the time?			
4.6. Whose name is on the registration or other document of the assets that your family has?			
4.6.1. What is your HH first main source of income?			
4.6.2. What is your HH second main source of income?			
4.6.3. What is your HH third main source of income?			
4.7. What are the fixed costs of your fish business (Land & buildings, transport, Machinery, equipment, Loan (interest on loans), Permits and taxes)?			

Final Report

Fixed cost (details for each asset is needed)	Number	Rented or owned	When was it acquired/built	Cost of purchase/lease/rent per unit	Lifespan of equipment/asset or length of lease/rental/permit, etc.)	What share do you use for your fish business? (%)

4.8. What are the variable costs (Costs that vary with the volume produced. For example, ice, hired transportation service fees, electricity, taxes and duties, phone costs, fuel, repairs)

Variable cost (1 month)	Quantity	Unit	Cost per unit	Total cost for the business last 12 months

Section 5: Access to credit and financial services

5.1. Do you take any loan either from friends, family, moneylenders, buyers, association, bank and other financial institutions in the last 2 years? <input type="checkbox"/> Yes <input type="checkbox"/> No		
5.1.1. If yes, can you tell the interest and the terms? Who makes the decision on getting the loan? Who is the most responsible person to return the loan? Who decide on what to do with the money or item borrowed most of the time ?		
5.1.2. If yes, from whom did you borrow money? (multiple answers possible)		
<ol style="list-style-type: none"> 1. Micro finance credit provider 2. Private Bank 3. Family/Friend 4. Private Money Lender 5. Government Money Lender 6. Farmer's association/ cooperative 7. Pre-sale of product to trader 8. Other (Specify) _____ 		
5.1.3. If yes, rank the three most important uses of loans taken in the last 2 years.	Rank	a) Most Important _____ b) Second most Important c) Third most Important _____
1. Home Improvement	1	
2. House purchase or construction	2	
3. Land purchase or rent	3	
4. Purchase of working tools or equipment	4	
5. Food purchases	5	
6. Purchase of agricultural inputs	6	
7. Purchase of animals/ medicine for animals	7	
8. Purchase of other assets	8	
9. Wedding	9	
10. Funeral	10	
11. Health emergency	11	
12. Sending family member to school	12	
13. Other – specify –:	13	

5.1.4. If not, why did you not try to obtain a loan?
5.2. Would you or anyone in your household be able to take a loan or borrow cash/in-kind from any source if you wanted to? Who would that be? How about 5, 10 years ago? Why has this changed?
5.3. Would you or anyone in your household be able to take a loan or borrow cash/in-kind from any source if you wanted to? Who would that be? How about 5, 10 years ago? Why has this changed?

Section 6: Labour

Unpaid household and family labour

6.1. How many unpaid household members (including yourself) worked in the fish business in the past month? How many male and female who are lower 20 and over 20?				
How many hours per day does each type of unpaid worker work per day?				
How many days of work was done by each type of unpaid worker in the past 30 days?				
	Male (<20 of age)	Male (=>20)	Female (<20)	Female (=>20)
Total				
Average hours per day				
Working days during last month				

Hired labour (Cash or by-products or in-kind)

6.2. How many male and female workers (lower 20 and over 20 years of age) do you employ (permanent and temporary)? What are their roles? How are workers paid (e.g. daily, monthly, piece rate)? How much are they paid?						
Roles	Male <20	Female =>20	Permanent or Temporary (Casual)	Wage rate (MMK)	Wage unit (day/hour/week/month/ other-specify)	Total wage per month

6.3. Where do your workers originate from? How do you recruit them? Where do they live?	
6.4. Do they receive wages in advance?	<input type="checkbox"/> Yes <input type="checkbox"/> No
6.4.1. If so, why and how?	
6.5. What do you think are the qualities of good worker?	

Section 7: Food safety

7.1. How long does fish usually remain in your possession? What is the maximum length of time?	
7.2. How do you store fish?	
7.3. How do you ensure that the fish you store remains in good condition?	
7.3.1. Do you use ice? <input type="checkbox"/> Yes <input type="checkbox"/> No	
7.4. Do you experience any product losses during storage?	<input type="checkbox"/> Yes <input type="checkbox"/> No
7.4.1. If yes, why/how much?	
7.5. Do you grade or clean the fish you store?	
7.6. Do you use any preservatives?	

Section 8: Government and association

8.1. Is there any government authority that keeps records of the quantities of fish traded?	
8.2. If yes, how do they do it? How do you report? Is the government officer you report man or woman? Is there any differences for different gender/sex?	
8.3. If no, do you think it is necessary to keep records? What are the benefits and challenges for keeping records?	

8.4. Are you a member of any trading/business association?	<input type="checkbox"/> Yes <input type="checkbox"/> No
8.4.1. If yes, which and why? Is membership compulsory? What is your membership? What is the purpose of the association? How many members does the associations/have? How many women are there in the association? How many men and women in the decision-making level or management committee? What are its activities? What are the association rules?	

Who leads the association? Does the association mediate disputes? Can you give an example? Does the association/s have any political power or influence – describe?
8.5. Have you ever received any support or help from government, NGOs or any other organization (give details)?
8.6. Are there any government regulations, policies, or activities that restrict or cause difficulties for your business (give details)?

Section 9: Self-efficacy

9.1. Did you choose this profession?	<input type="checkbox"/> Yes <input type="checkbox"/> No
9.1.1. If so, why?	
9.2. What are the key skills necessary to doing this job well?	
9.3. How did you learn these skills?	
9.4. Which aspects of your work do you like? Which aspects do you dislike?	
9.5. What are the most significant changes that have affected your business during the past 10 years (positive and negative)? Was it going to be the same for your opposite sex?	
9.6. What do you think the prospects are for your businesses over the next 10 years?	
9.7. What are the biggest challenges that you face when doing business? Is it going to be the same for your opposite sex?	
9.8. Do you consider your livelihood to be risky?	<input type="checkbox"/> Yes <input type="checkbox"/> No
9.9. Why/Why not?	
9.10. Is this a choice of employment that you would recommend to others?	<input type="checkbox"/> Yes <input type="checkbox"/> No
9.10.1. If so, why/why not?	
9.11. How do you think people in society generally perceive your profession Is it going to be the same for your opposite sex?	
9.12. Would you be happy for your children to carry on this profession? Is it going to be the same for your son and daughter? Why/why not?	
9.13. Do you consume processed fish?	<input type="checkbox"/> Yes <input type="checkbox"/> No
9.14. Why/why not? Which species do you prefer and why?	

Appendix 05. Processor Interview Questionnaire

Details of the business			
Code			
Role of interviewee			
Name			
Location (Village/Township/District/State or Region)			
Phone number			
Gender			
Age			
Ethnicity			
Religion			
Highest level of education completed			
Place of origin. If different from the business location, why and why moved			
Family details: (Married/unmarried, children)			
Respondent's response status (Completed/partial/call-back/postponed/refused/refused to consent/other – specify)			

Name of interviewer/s			
Name of note taker/s			
Date			
Start time of interview		End time of interview	
People present			
Questionnaire checked by supervisor	Yes/No	Name of supervisor	

Section 1: History and operation of the processors

1.1.	When did you start the smoking fish business? What did you do before that? Why did you decide to start this business?		
1.2.	What are the operation hours? How does your average daily look like? Is there any difference for being a man or a woman?		
1.3.	What are the activities of your fish business?		
1.4.	How do you process the fish? How long does each process take place?		
1.5.	Where do you process the fish? Do you want to process in the specific (business or processing) zone?		
1.6.	Do you keep a record of the quantities of fish processed? <ul style="list-style-type: none"> ● If yes, how do you keep the record? With a ledger? Is it daily or weekly or monthly? 		
1.7.	What do you use to process fish (species, sawdust, firewood, etc?)		
1.8.	Do you buy all of your inputs?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
	1.8.1. If yes, What are the qualities you are looking for?		
	1.8.2. If no, how do you get the inputs? Producing yourself? Another business/es?		
1.9.	What are the percentages of dried rohu produced in the last 7 days?		
No.	Day	Quantity (%) in the last	Note (e.g. production – Viss/day)
1			
2			
3			
4			
5			
6			
7			
1.10.	What is the average daily production of dried rohu in the last 5 and 10 years ago?		
	Five year ago	Daily Production in Viss:	Reason for Changed:

Final Report

	Ten year ago	Daily Production in Viss:	Reason for Changed:
1.11.	What is the seasonality? Is it the same all year round? Do you produce all months or rest during a certain period? What is the reason?		
	<input type="checkbox"/> Jan <input type="checkbox"/> Feb <input type="checkbox"/> Mar <input type="checkbox"/> April <input type="checkbox"/> May <input type="checkbox"/> June <input type="checkbox"/> July <input type="checkbox"/> Aug <input type="checkbox"/> Sep <input type="checkbox"/> Oct <input type="checkbox"/> Nov <input type="checkbox"/> Dec		
	<u>Detail Description:</u>		
1.12.	How do you know how much to produce each batch? Could you produce as much as you want? If no, why?		
1.13.	Have there been technological changes since you began to work in this profession that has changed the way your business operates?		
1.14.	Would you categorize your smoking business as small, medium or large? Why?		
	<input type="checkbox"/> small, <input type="checkbox"/> medium <input type="checkbox"/> large <u>Explanation:</u>		

Section 2: Trade - Buy

2.1. What are the main sources that you source each of refresh rohu from?					
No.	Source	No.	Source	No.	Source
1		12		23	
2		13		24	
3		14		25	
4		15		26	
5		16		27	

2.2. What type of suppliers do you usually procure for rohu smoking business (e.g. traders in this market, fish driers etc)? Who are they (Male/Female, age, location, ethnicity, economic status)?							
Supplier Demographic							
Type of Supplier	Name	Gender	Age	Location	Religion	Ethnicity	

2.3. How many regular suppliers do you have? How about 5, 10 years ago? Why has this changed?

Supplier	Current (in operation)	5 Years Ago	10 Years Ago	Note
Sawdust				
Firewood				
Fresh Rohu				
Transportation				
Other 1 (specify)				
Other 2 (specify)				

2.4. How do you procure fresh fish? [Instruction: Answer can be more than one. In such case, provide details account, including proportion in comment section]	Tick	Categories 1	Tick	Categories 2
		own fishing		Buy at auction
		buy from fishers		Advance Contract
		buy from traders		Make informal agreement (e.g. over phone or in-person)
		Other, specify:		Other, specify:
Comments:				
2.5. Do you provide credit to any of your suppliers?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Which suppliers	
			<input type="checkbox"/> Sawdust <input type="checkbox"/> Firewood <input type="checkbox"/> Fresh Rohu <input type="checkbox"/> Above all <input type="checkbox"/> Other (specify:	
2.6. What are the terms of the credit you provide (e.g. amount, duration, interest, requirement to sell to you)? How do you ensure that suppliers who take credit repay their debts?				

Section 3: Trade – Sell

3.1. What type of customers do you usually supply smoked fish to (e.g. traders in other wholesale markets market, local retailers etc.)? Who are they (Male/Female, age, location, ethnicity, economic status)?

	Female/Male	Age	Location	Ethnicity	Size of the business (Small, Medium, Big)
Wholesaler (local market)					
Retailer (local market)					
Trader (Export Market)					
Other, if any, specify					

3.2. On average, what % of the fish you trade is sold to each type of customer?

Customer	Sale Proportion by % (Approximate)
Wholesaler (local market)	
Retailer (local market)	
Trader (for Export Market)	
Other 1 – specify – :	
Other 2 – specify - :	

3.3. How do you usually organize sales to customers (e.g. sell at auction, make agreement over phone, advance contract)?

3.4. How many regular customers do you have? How about 5, 10 years ago? Why has this changed?

3.5. Do you provide credit to any of your customers? Yes No

3.5.1. If so, how common is this (e.g. what % of each type of supplier do you provide credit too?) How about 5, 10 years ago? Why has this changed? What are the terms of the credit you provide (e.g. value, form, duration, interest, requirement to buy from you)? How do you ensure that customers who take credit repay their debts?

Section 4: Assets

4.1. Where did you get capital needed to set up this business?

4.2. Is the business a family firm? Yes No

4.2.1. If so, in what capacity are family members involved in the firm?	Female	Male	Other Comments

4.3. Do you have any other businesses (e.g. own boats, drying operations, retail shops)? Yes No

4.3.1. If so, in what order did you establish them and why? (Instruction: specify type of business)

4.4. In your household, who would you say can decide whether to sell, give away, mortgage or rent the assets?

4.5. Who would you say can decide whether to purchase a new asset most of the time?

4.6. Whose name is on the registration or other document of the assets that your family has?

4.7. What are the fixed costs of your fish business (Land & buildings, transport, Machinery, equipment, Loan (interest on loans), Permits and taxes)?

Fixed cost (details for each asset is needed)	Number	Rented or owned	When was it acquired/built	Cost of purchase/lease/rent per unit	Lifespan of equipment/asset or length of lease/rental/permit, etc.)	What share do you use for your fish business? (%)

4.8. What are the variable costs (Costs that vary with the volume produced. For example, ice, hired transportation service fees, electricity, taxes and duties, phone costs, fuel, repairs)

Variable cost (1 month)	Quantity	Unit	Cost per unit	Total cost for the business last 12 months

Section 5: Access to credit and financial services

5.1. Do you take any loan either from friends, family, moneylenders, buyers, association, bank and other financial institutions in the last 2 years? Yes No

5.1.1. If so, can you tell the interest and the terms? Who makes the decision on getting the loan? Who is the most responsible person to return the loan? Who decide on what to do with the money or item borrowed **most of the time**?

5.1.2. If not, why did you not try to obtain a loan?

5.2. Would you or anyone in your household be able to take a loan or borrow cash/in-kind form any source if you wanted to? Who would that be? How about 5, 10 years ago? Why has this changed?

Section 6: Labour

Unpaid household and family labour

6.1. How many unpaid household members (including yourself) worked in the fish business in the past month? How many male and female who are lower 20 and over 20?

How many hours per day does each type of unpaid worker work per day?

How many days of work was done by each type of unpaid worker in the past 30 days?

	Male (<20 of age)	Male (=>20)	Female (<20)	Female (=>20)
Total				
Average hours per day				
Working days during last month				

Hired labour (Cash or by-products or in-kind)

6.2. How many male and female workers (lower 20 and over 20 years of age) do you employ (permanent and temporary)? What are their roles? How are workers paid (e.g. daily, monthly, piece rate)? How much are they paid?

Roles	Male <20	Male =>20	Female <20	Female =>20	Permanent or Temporary (Casual)	Wage rate (MMK)	Wage unit (day/hour/week/month/other-specify)	Total wage per month
A:								
B:								
C:								
D:								
E:								
F:								
G:								

6.3. Where do your workers originate from? How do you recruit them? Where do they live?

6.4. Do they receive wages in advance? Yes No

6.4.1. If so, why and how?

6.5. What do you think are the qualities of good worker?

Section 7: Food safety

7.1. How long does smoked fish usually remain in your possession? What is the maximum length of time for processing? What is the maximum length of time before selling the smoked fish?

7.2. How do you store smoked fish?

7.3. How do you store fresh fish? How long do you keep the fresh fish before processing?

7.3.1. Do you use ice? Yes No

7.4. How do you ensure that the fish you store remains in good condition?

7.5. Do you experience any product losses during storage?

Yes No

7.5.1. If yes, why/how much?

7.6. Do you grade or clean the fish you processed?

7.7. Do you use any preservatives?

Section 8: Government and association

8.1. Are there any government authorities that keep records of the quantities of fish traded?

Yes No

8.1.1. If yes, how do they do it? How do you report? Is the government officer you report man or woman? Is there any differences for different gender/sex?

8.1.2. If no, do you think it is necessary to keep records? What are the benefits and challenges for keeping records?

8.2. Are you a member of any trading/business association?

Yes No

8.2.1. If yes, which and why? Is membership compulsory? What is your membership? What is the purpose of the association? How many members do the associations/have? How many women are there in the association? How many men and women in the decision-making level or management committee? What are its activities? What are the association rules? Who leads the association? Does the association mediate disputes? Can you give an example? Does the association/s have any political power or influence – describe?

8.3. Have you ever received any support or help from government, NGOs or any other organization (give details)?

8.4. Are there any government regulations, policies, or activities that restrict or cause difficulties for your business (give details)?

Section 9: Self-efficacy

9.1. Did you choose this profession?	<input type="checkbox"/> Yes <input type="checkbox"/> No
9.1.1. If so, why?	
9.2. What are the key skills necessary to doing this job well?	
9.3. How did you learn these skills?	
9.4. Which aspects of your work do you like? Which aspects do you dislike?	
9.5. What are the most significant changes that have affected your business during the past 10 years (positive and negative)? Was it going to be the same for your opposite sex?	
9.6. What do you think the prospects are for your businesses over the next 10 years?	
9.7. What are the biggest challenges that you face when doing business? Is it going to be the same for your opposite sex?	
9.8. Do you consider your livelihood to be risky? Why/Why not?	
9.9. Is this a choice of employment that you would recommend to others? Why/why not?	
9.10. How do you think people in society generally perceive your profession Is it going to be the same for your opposite sex?	
9.11. Would you be happy for your children to carry on this profession? Is it going to be the same for your son and daughter? Why/why not?	
9.12. Do you consume processed fish? Why/why not? Which species do you prefer and why?	

Appendix 06. Retailer Interview Questionnaire

Retail Market Interview #04

Details of the business	
Code	
Role of interviewee	
Name	
Location (Village/Township/District/State or Region)	
Phone number	
Gender	
Age	

Final Report

Ethnicity	
Religion	
Highest level of education completed	
Place of origin. If different from the business location, why and why moved	
Family details: (Married/unmarried, children)	
Respondent's response status (Completed/partial/call-back/postponed/refused/refused to consent/other – specify)	

Name of interviewer/s	
Name of note taker/s	
Date	
Start time of interview	End time of interview
People present	
Questionnaire checked by supervisor	Yes/No
	Name of supervisor

Section 1: History and operation of retail business

1.1.	When did you start the smoking fish retail business? What did you do before that? Why did you decide to start this business?
1.2.	What are the operation hours? How does your average daily look like? Is there any difference for being a man or a woman?
1.3.	What are the activities of your retail business?
1.4.	Do you keep a record of the quantities of smoked fish sold? <ul style="list-style-type: none"> ● If yes, how do you keep the record? With a ledger? Is it daily or weekly or monthly? ● If no, do you remember the quantity you sold for a certain period?
1.5.	How many retailers of smoked rohu are there in the place you are operating? How many were there 5, 10 years ago? How many M/F?
1.6.	Do you buy all of your smoked rohu? <input type="checkbox"/> Yes <input type="checkbox"/> No
	1.6.1. If yes, What are the qualities you are looking for?

	1.6.2. If no, how do you get the inputs? Producing yourself? Another business/es?		
1.7.	On average, how many viss of smoked rohu do you usually sell in a day, a week and a month?		
	Daily Selling Rate (viss/day)	Weekly Selling Rate (viss/week)	Monthly Selling Rate (viss/month)
1.8.	What is the average daily selling rate of dried rohu in the last 5 and 10 years ago?		
	Five year ago	Viss:	Reason for Changed:
	Ten year ago	Viss:	Reason for Changed:
1.9.	Have there been technological changes since you began to work in this profession that has changed the way your business operates?		
1.10.	Would you categorize your smoking business as small, medium or large? Why?		
	<input type="checkbox"/> small, <input type="checkbox"/> medium <input type="checkbox"/> large <u>Explanation:</u>		

Section 2: Trade - Buy

2.1. What are the main sources that you source each of smoked rohu from?					
No.	Source	No.	Source	No.	Source
1		3		5	
2		4		6	

2.2. What % for your total business does each of these account for? How about 5, 10 years ago? Why has this changed?		
Current		Comments:
5 years ago		
10 years ago		

2.3. How do the volumes of fish purchased vary by season? Which months are high/low season?

Month	Volume (Viss)	Note

2.4. How do you procure smoked rohu? [Instruction: Answer can be more than one. In such case, provide details account, including proportion in comment section]	Tick	Supplier	Tick	How do you procure?
		Trader		Buy at auction
		Smoker		Advance Contract
		Wholesaler		Make informal agreement (e.g. over phone or in-person)
		Other, specify:		Other, specify:

Comments:

2.5. DO you take any credit? If yes, from who??	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Which suppliers
			<input type="checkbox"/> Trader <input type="checkbox"/> Smoker <input type="checkbox"/> Wholesaler <input type="checkbox"/> Above all <input type="checkbox"/> Other (specify:

2.6. What are the terms of credit you take (e.g. amount, duration, interest, requirement to sell to you)? How do

you ensure that suppliers who take credit repay their debts?	
--	--

Section 3: Trade – Sell

3.1. What type of customers do you usually supply smoked fish to (e.g. household consumers)?
3.2. Do you sell other fish products or fresh fish? If so, please describe:

3.3. How do you usually organize sales to customers? (e.g. door-to-door, at retail market etc)		
3.4. How many regular customers do you have? How about 5, 10 years ago? Why has this changed?		
Current situation		Comments:
5 years ago		
10 years ago		

Section 4: Assets

4.1. Where did you get capital needed to set up this business?			
4.2. Is the business a family firm? <input type="checkbox"/> Yes <input type="checkbox"/> No			
4.2.1. If so, in what capacity are family members involved in the firm?	Female	Male	Other Comments
4.3. Do you have any other businesses (e.g. drying operations)? <input type="checkbox"/> Yes <input type="checkbox"/> No			
4.3.1. If so, in what order did you establish them and why? (Instruction: specify type of business)			
4.4. In your household, who would you say can decide whether to sell, give away, mortgage or rent the assets?			
4.5. Who would you say can decide whether to purchase a new asset most of the time?			
4.6. Whose name is on the registration or other document of the assets that your family has?			
4.7. What are the fixed costs of your fish business (Land & buildings, transport, Machinery, equipment, Loan (interest on loans), Permits and taxes)?			

Final Report

Fixed cost (details for each asset is needed)	Number	Rented or owned	When was it acquired/built	Cost of purchase/lease/rent per unit	Lifespan of equipment/asset or length of lease/rental/permit, etc.)	What share do you use for your fish business? (%)

4.8. What are the variable costs (Costs that vary with the volume produced. For example, ice, hired transportation service fees, electricity, taxes and duties, phone costs, fuel, repairs)

Variable cost (1 month)	Quantity	Unit	Cost per unit	Total cost for the business last 12 months

4.9.	Do you own a house?	<input type="checkbox"/> Yes <input type="checkbox"/>	
4.10.	If you rent a house, how much do you pay per month?	[] MMK	
4.11.	Does your HH or any of its members agriculture land	<input type="checkbox"/> Yes <input type="checkbox"/>	
4.12.	What is the gender of the land owner? How much?	Male.....1 Female...2	____ acre

	Ownership should be considered very broadly to include cases where land is formally titled and registered in one or more household member’s name; land that has been purchased, transferred or inherited but is not formally titled (or if the titled not registered in the household’s name); land leased from government; and, land where the household believes it has an established right (formal or informal) to use the land, a right that is generally recognized by the community.	
4.13.	Is your HH renting any land for agriculture? (paying in cash)	<input type="checkbox"/> Yes <input type="checkbox"/> No
4.14.	If yes, how much land is the HH renting? (paying in cash)	Unit _____ _____
4.15.	Is your HH renting any land for agriculture? (paying in kind)	<input type="checkbox"/> Yes <input type="checkbox"/> No
4.16.	If yes, how much land is the HH renting? (paying in kind)	Unit _____ _____
4.17.	Is your HH leasing out any of its land?	<input type="checkbox"/> Yes <input type="checkbox"/> No
4.18..	If yes, what is the area of land the HH is leasing out?	Unit _____ _____
4.19.	Did your HH cultivate any other land that was provided free of charge?	<input type="checkbox"/> Yes <input type="checkbox"/> No
4.20.	If yes, what was the area of that land cultivated free of charge?	Unit _____ _____
4.21.	4.21.1. What is your HH first main source of income?	
	4.21.2. What is your HH second main source of income?	
	4.21.2. What is your HH third main source of income?	

Section 5: Access to credit and financial services

5.1. Do you take any loan either from friends, family, moneylenders, buyers, association, bank and other financial institutions in the last 2 years? <input type="checkbox"/> Yes <input type="checkbox"/> No
5.1.1. If yes, can you tell the interest and the terms? Who makes the decision on getting the loan? Who is the most responsible person to return the loan? Who decide on what to do with the money or item borrowed most of the time ?

5.1.2. If yes, from whom did you borrow money? (multiple answers possible)

- a. Micro finance credit provider
- b. Private Bank
- c. Family/Friend
- d. Private Money Lender
- e. Government Money Lender
- f. Farmer’s association/ cooperative
- g. Pre-sale of product to trader
- h. Other (Specify) _____

5.1.3. If yes, rank the three most important uses of loans taken in the last 2 years.		Rank	
1.	Home Improvement	1	a) Most Important _____
2.	House purchase or construction	2	
3.	Land purchase or rent	3	
4.	Purchase of working tools or equipment	4	b) Second most Important _____
5.	Food purchases	5	
6.	Purchase of agricultural inputs	6	
7.	Purchase of animals/ medicine for animals	7	c) Third most Important _____
8.	Purchase of other assets	8	
9.	Wedding	9	
10.	Funeral	10	
11.	Health emergency	11	
12.	Sending family member to school	12	
13.	Other – specify –:	13	

5.1.4. If not, why did you not try to obtain a loan?

5.2. Would you or anyone in your household be able to take a loan or borrow cash/in-kind from any source if you wanted to? Who would that be? How about 5, 10 years ago? Why has this changed?

Section 6: Labour

Unpaid household and family labour

6.1. How many unpaid household members (including yourself) worked in the fish business in the past month? How many male and female who are lower 20 and over 20?

How many hours per day does each type of unpaid worker work per day?

How many days of work was done by each type of unpaid worker in the past 30 days?

	Male (<20 of age)	Male (=>20)	Female (<20)	Female (=>20)
Total				
Average hours per day				
Working days during last month				

Hired labour (Cash or by-products or in-kind)

6.2. How many male and female workers (lower 20 and over 20 years of age) do you employ (permanent and temporary)? What are their roles? How are workers paid (e.g. daily, monthly, piece rate)? How much are they paid?

Roles	Male <20	Male =>20	Female <20	Female =>20	Permanent or Temporary (Casual)	Wage rate (MMK)	Wage unit (day/hour/week/month/other-specify)	Total wage per month
A:								
B:								
C:								
D:								

6.3. Where do your workers originate from? How do you recruit them? Where do they live?

6.4. Do they receive wages in advance? Yes No

6.4.1. If so, why and how?

6.5. What do you think are the qualities of good worker?

Section 7: Food safety

7.1. How long does smoked fish usually remain in your possession? What is the maximum length of time for storing before selling out? How long does it take to sell each batch?	
7.2. How do you store smoked fish?	
7.3. How do you ensure that the fish you store remains in good condition?	
7.4. Do you experience any product losses during storage?	<input type="checkbox"/> Yes <input type="checkbox"/> No
7.4.1. If yes, why/how much?	
7.5. Do you grade or clean the fish you sell?	
7.6. Do you use any preservatives?	

Section 8: Government and association

8.1. Is there any government authority that keeps records of the quantities of smoked fish sold or traded?	<input type="checkbox"/> Yes <input type="checkbox"/> No
8.1.1. If yes, how do they do it? How do you report? Is the government officer you report man or woman? Is there any differences for different gender/sex?	
8.1.2.	
8.1.3. If no, do you think it is necessary to keep records? What are the benefits and challenges for keeping records?	

8.2. Are you a member of any trading/business association?	<input type="checkbox"/> Yes <input type="checkbox"/> No
8.2.1. If yes, which and why? Is membership compulsory? What is your membership? What is the purpose of the association? How many members do the associations/have? How many women are there in the association? How many men and women in the decision-making level or management committee? What are its activities? What are the association rules? Who leads the association? Does the association mediate disputes? Can you give an example? Does the association/s have any political power or influence – describe?	
8.3. Have you ever received any support or help from government, NGOs or any other organization (give details)?	
8.4. Are there any government regulations, policies, or activities that restrict or cause difficulties for your business (give details)?	

Section 9: Self-efficacy

9.1. Did you choose this profession?	<input type="checkbox"/> Yes <input type="checkbox"/> No
9.1.1. If so, why?	
9.2. What are the key skills necessary to doing this job well?	
9.3. How did you learn these skills?	
9.4. Which aspects of your work do you like? Which aspects do you dislike?	
9.5. What are the most significant changes that have affected your business during past 10 years (positive and negative)? Was it going to be the same for your opposite sex?	
9.6. What do you think the prospects are for your businesses over the next 10 years?	
9.7. What are the biggest challenges that you face when doing business? Is it going to be the same for your opposite sex?	
9.8. Do you consider your livelihood to be risky? Why/Why not?	
9.9. Is this a choice of employment that you would recommend to others? Why/why not?	
9.10. How do you think people in society generally perceive your profession? Is it going to be the same for your opposite sex?	
9.11. Would you be happy for your children to carry on this profession? Is it going to be the same for your son and daughter? Why/why not?	
9.12. Do you consume processed fish?	<input type="checkbox"/> Yes <input type="checkbox"/> No
9.12.1. Why/why not? Which species do you prefer and why?	

Appendix 07. Labourer Interview Questionnaire

Details of the business			
Code			
Role of interviewee			
Name			
Location (Village/Township/District/State or Region)			
Phone number			
Gender			
Age			
Ethnicity			
Religion			
Highest level of education completed			
Place of origin. If you moved here, why moved			
Family details: (Married/unmarried, children), if you moved here, is your family with you? Who are you with?			
Respondent's response status (Completed/partial/call-back/postponed/refused/refused to consent/other – specify)			

Name of interviewer/s			
Name of note taker/s			
Date			
Start time of interview		End time of interview	
People present			
Questionnaire checked by supervisor	Yes/No	Name of supervisor	

Section 1: General Questions

1.1.	How many individual workers are there in this location that is doing work related to Total [] Male [] Female []		
1.2.	How many workers were there in this location doing work related to smoking fish 5 years ago? Total [] Male [] Female []		
1.2.1	If the number has changed since then, why?		
1.3.	What are their roles? <input type="checkbox"/> Sorting <input type="checkbox"/> Gutting <input type="checkbox"/> Drying <input type="checkbox"/> Smoking <input type="checkbox"/> Cleaning <input type="checkbox"/> Other (specify) –		
1.4.	What are different roles of male and female workers? Describe different roles of women and men in a specific value chain node you are working on?		
1.5.	In your opinion, do you think that there are health hazards associated with work related to smoked fish in this location?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
	1.5.1. If so, why?		
	1.5.2. If no, why not?		
1.6.	How many days per week do you normally work? Weekly working days = []		
1.7.	How are you paid? <input type="checkbox"/> An advance <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Not regular (e.g. piece rate) <u>Details Comment:</u>		
1.8.	How much do you earn per day? [MMK]		
1.9.	What is the average daily or monthly wage or income earned by a man/woman doing the most common type of work here (specify the type of work)?		
	Current	Daily wage	Ave Monthly Salary
	Female		
	Male		
	5 years ago		
	Female		

	Male			
	10 Years ago			
	Female			
	Male			
<u>Comments for Additional Information:</u>				

Section 2: Who has what?

2.1.	Do you own a house?	<input type="checkbox"/> Yes <input type="checkbox"/>	
2.2.	If you rent a house, how much do you pay per month?	[_____] MMK	
2.3.	Does your HH or any of its members agriculture land	<input type="checkbox"/> Yes <input type="checkbox"/>	
2.4.	What is the gender of the land owner? How much?	Male.....1 Female...2	_____ acre
2.5.	Does anyone in your household own any fishing equipment? Who/What kinds?		
	Ownership should be considered very broadly to include cases where land is formally titled and registered in one or more household member's name; land that has been purchased, transferred or inherited but is not formally titled (or if the titled not registered in the household's name); land leased from government; and, land where the household believes it has an established right (formal or informal) to use the land, a right that is generally recognized by the community.		
2.6.	Is your HH renting any land for agriculture? (paying in cash)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
2.7.	If yes, how much land is the HH renting? (paying in cash)	Unit_____	_____
2.8.	Is your HH renting any land for agriculture? (paying in kind)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
2.9.	If yes, how much land is the HH renting? (paying in kind)	Unit_____	_____
2.10.	Is your HH leasing out any of its land?	<input type="checkbox"/> Yes <input type="checkbox"/> No	

2.11.	If yes, what is the area of land the HH is leasing out?	Unit _____	_____
2.12.	Did your HH cultivate any other land that was provided free of charge?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
2.13.	If yes, what was the area of that land cultivated free of charge?	Unit _____	_____
2.14.	4.14.1. What is your HH first main source of income?		
	4.14.2. What is your HH second source of income?		
	4.14.2. What is your HH third main source of income?		

Section 3: Who does what?

3.1.	What type of work do you do here (related smoked fish)? What are your main responsibilities?
3.2.	When did you start doing this kind of work? Why did you start to do this work?
3.3.	Can you please describe a typical working day, starting from the time you get up, to the time you go to bed.
3.4.	What role does your employer have (e.g. fisher, trader)?
3.5.	Is your employer a man or woman? <input type="checkbox"/> Female <input type="checkbox"/> Male
3.6.	Do you have any choice regarding the number of hours/day you work (e.g. if you wanted to could you opt to work for more or fewer hours/days)?
3.7.	How steady/regular is the work? Are there times when you are unable to find enough work (explain details)
3.8.	How many months per year, weeks per month, and hours per day do you usually do work related to smoking fish? A. [] hours per day B. [] days per week C. [] months per year
3.9.	What are the occupations of the other members of your household?
3.10	Do you do any other type of work? If so where, when, and why?

Section 4: Payment

4.1.	How much did you earn during the last complete month that you worked?
4.2.	Do you receive any food or lodging or transport from your employer? Please describe
4.3.	Have you ever been unpaid or underpaid for work that you did? What happened? What did you do in response?
4.4.	If you were offered a different job that you preferred and you wanted to leave this one, would you be able to do so? If no, or yes but with caveats, please explain why.
4.5.	Have you ever experienced any other difficulties while doing this work? Please explain
4.6.	Do you consider the income that you earn from this work sufficient to support you and your family?
4.7.	Have you ever been able to save any of the income you earn from this work? How did you use the money that you saved?

Section 5: Access to credit and financial services

5.1. Do you take any loan either from friends, family, moneylenders, buyers, association, bank and other financial institutions in the last 2 years? <input type="checkbox"/> Yes <input type="checkbox"/> No		
5.1.1. If yes, can you tell the interest and the terms? Who makes the decision on getting the loan? Who is the most responsible person to return the loan? Who decide on what to do with the money or item borrowed most of the time ?		
5.1.2. If yes, from whom did you borrow money? (multiple answers possible)		
<ul style="list-style-type: none"> a. Micro finance credit provider b. Private Bank c. Family/Friend d. Private Money Lender e. Government Money Lender f. Farmer's association/ cooperative g. Pre-sale of product to trader h. Other (Specify) _____ 		
5.1.3. If yes, rank the three most important uses of loans taken in the last 2 years.	Rank	a) Most Important _____
<input checked="" type="checkbox"/> Home Improvement	1	
1. House purchase or construction	2	
2. Land purchase or rent	3	
3. Purchase of working tools or equipment	4	
4. Food purchases	5	

5. Purchase of agricultural inputs	6	b)Second most Important _____
6. Purchase of animals/ medicine for animals	7	
7. Purchase of other assets	8	
8. Wedding	9	c)Third most Important _____
9. Funeral	10	
10. Health emergency	11	
11.Sending family member to school	12	
12.Other – specify –:	13	
5.1.4. If not, why did you not try to obtain a loan?		
5.2. Would you or anyone in your household be able to take a loan or borrow cash/in-kind from any source if you wanted to? Who would that be? How about 5, 10 years ago? Why has this changed?		

5.3.	Are you a member of any labour association?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	5.3.1. If yes, which and why? Is membership compulsory? What is your membership? What is the purpose of the association? How many members does the associations/have? How many women are there in the association? How many men and women in the decision-making level or management committee? What are its activities? What are the association rules? Who leads the association? Does the association mediate disputes? Can you give an example? Does the association/s have any political power or influence – describe?	
5.4.	Have you ever received any received any support or help from government, NGOs or any other organization (give details)?	
5.5.	Are there any government regulations, policies, or activities that restrict or cause difficulties for you (give details)?	

Section 6: Self-efficacy

6.1.	Did you choose this profession?	<input type="checkbox"/> Yes <input type="checkbox"/> No
6.1.1	If so, why?	
6.2.	What are the key skills necessary to doing this job well?	
6.3.	What are the key skills necessary to doing this job well? How did you learn these skills?	
6.4.	Which aspects of your work do you like? Which aspects do you dislike?	
6.5.	What are the most significant changes that have affected your business during past 10 years (positive and negative)? Was it going to be the same for your opposite sex?	
6.6.	What do you think the prospects are for your businesses over the next 10 years?	
6.7.	What are the biggest challenges that you face when doing business? Is it going to be the same for your opposite sex?	
6.8.	Do you consider your livelihood to be risky?	<input type="checkbox"/> Yes <input type="checkbox"/> No
6.8.1.	<u>Why/Why not?</u>	
6.9.	Is this a choice of employment that you would recommend to others?	<input type="checkbox"/> Yes <input type="checkbox"/> No
6.9.1.	If so, why/why not?	
6.10.	How do you think people in society generally perceive your profession Is it going to be the same for your opposite sex?	
6.11.	Do you consume processed fish?	<input type="checkbox"/> Yes <input type="checkbox"/> No
6.11.1	Why/why not? Which species do you prefer and why?	