The value chain of Hilisa shad in the Ayeyarwady Delta

January 2015
The value chain of Hilsa shad in the Ayeyarwady Delta

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January 2015
Executive summary

This Hilsa value chain study focused on the economic aspects of Hilsa shad (*Tenualosa ilisha*) trade at each step of the chain, examining market margins at each stakeholder level. Hilsa are a commercially important species in the Ayeyarwady Delta, the supply of which is highly seasonal and targets both domestic and export markets.

This study focused on eight villages in the Ayeyarwady Delta, Myanmar. The methodology was largely based on Making Markets Work for the Poor (M4P) approaches, mapping trade volumes, prices, governance and coordination in both high season (August to November) and low season (December to April). The study identified six main types of value chain actors and carried out 115 questionnaire surveys in total.

Relationships and linkages among the various actors were assessed as social dynamics that influence decision-making along the value chain and shape trade. This analysis revealed that market decisions are intertwined with a traditional interest-free credit system established between fishers and village traders, whose verbal agreements are ‘informal’ yet binding. This relationship results in regular rather than spot purchases, thus highlighting the importance of long-term relationships over purchase price in commercial dealings.

In terms of production, catch volumes differ largely between high and low seasons. In the case of large scale fishers, volume was reported to be five times higher in high season than in low season, while in the case of small scale fishers allegedly volume differences can be as high as 40 times higher in high season.

Price per kg of Hilsa varies in function of both season and size of the fish. In both high and low seasons the initial price of the large-sized fish starts three times higher than that of small-size Hilsa, along the chain price increases differently according to fish size, small-fish mark-up reaches 100% between first and last point of sale, while large-size fish mark-up is less at average 80% between first and last point of sale.

In terms of income derived from the Hilsa trade, absolute values can be compared within the same group of actors according to location and season or across different actors along the chain. In general, daily reported Hilsa income of fishers was highest in Ahkae village due to the large scale of fishing operations; for village traders the highest daily income was reported in Thandi village due to the large-size/value of fish available to trade; township traders report highest income in Pathein Township which is the result of the high trade volume in this overall larger commercial centre; finally, retailers from Dedaye Township reportedly achieve the highest Hilsa income at retail level.

Cost structures were found to vary among the actors and between seasons. Boat engine fuel cost is the highest cost incurred by fishers, transportation costs are the biggest cost for village and township traders, while ice is allegedly the largest cost for Hilsa retail. Overall, the highest average daily costs for Hilsa trade were reported by township traders, while the lowest associated costs are incurred by retailers. The split between fixed and variable costs significantly impacts the level of profit margins between high and low seasons. A comparison of average daily profit margins between the different actors shows that township traders take the highest profit as a result of the high volume they trade, especially in high season.
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Acronyms used

ACIAR Australian Centre for International Agricultural Research
BOBLME Bay of Bengal Large Marine Ecosystem
CPUE Catch per Unit Effort
FAO Food and Agriculture Organization
FGD Focus Group Discussion
FRDN Fishery Research and Development Network
KII Key Informant Interview
NGO Non-Governmental Organisation
UAE United Arab Emirates
1. Introduction

This study aims to ascertain the potential economic and trade impacts that reduced Hilsa stocks may have on local communities.

WorldFish, through the ACIAR\(^1\) funded MYFish\(^2\) project has established the Fishery Research and Development Network (FRDN)\(^3\) in Myanmar that represents Government, NGOs, and universities and aims to carry out small research projects on the fishery sector. Through the FRDN, a total of 22 small-research projects on the Myanmar fishery sector have been funded. Each study represents an insight on the research competency of selected institutions in the fishery sector and an indicator of the R & D capacity building challenges that future investors in the sector will need to address in order to build science and research capabilities. An important caveat is that the FRDN science outputs represent collaborative research involving Department of Fishery (DoF), universities and NGOs, and are led by partner institutions with technical support from WorldFish. The studies represent new research and the partnership approach maintains ownership of the research with the national institutions, and helping to develop a dialogue with Government about the key challenges and opportunities facing the sector.

In 2013, WorldFish, commissioned Dagon University to conduct a small research project on the characteristics and value chain of five fishery products in the Ayeyarwady Delta\(^4\). The value chain study revealed that shrimp paste produced in Naukmee village, Pyapon Township supplies 90% of the Myanmar market and provides the highest net profit for producers. It was recommended that government policy target and support transportation, electricity access and communication technologies improvements to critical fish producer areas to maintain their market competitiveness and sustain product quality and reliable supply critical to marketing functions.

In 2014, WorldFish acquired additional co-funding from the Food and Agriculture Organization of the United Nations (FAO) Bay of Bengal Large Marine Ecosystem (BOBLME) Project, which promotes the sub-regional (Bangladesh, India, Myanmar) collaboration on the assessment and management of Hilsa. Given the nature of the Hilsa life cycle, the impact of excessive fishing on the Hilsa fish and its sustainability as a fishery, and the livelihood dependence of Hilsa fishermen, WorldFish through the MYFish project conducted several small research projects and studies on the Hilsa fishery and fishers of the Ayeyarwady River.

The series of research projects have:

1. Identified the Hilsa spawning grounds, including:
   a. An analysis of Hilsa abundance data using historical data in the Ayeyarwady Delta
   b. Identification of Hilsa inland breeding sites and extent of migration
2. Identified the value chain of Hilsa fish from three agro-ecological zones of the Delta
3. Assessed the livelihoods of Hilsa dependent fishing families in three water regimes of the Delta

The focus of this report is the value chain of Hilsa and is conducted by Dagon University, which examines the market margins for each actor of the Hilsa value chain, including value chain structure,

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\(^1\) Australian Centre for International Agricultural Research (ACIAR).

\(^2\) MYFish project or ‘Improving Research and Development in Myanmar Inland and Coastal Fishery’.

\(^3\) A network of researchers, development practitioners and extension officers from the Department of Fishery (DoF), Myanmar Fishery Federation (MFF), Universities from Yangon and Ayeyarwady, the Food Security Working Group (FSWG) and World Fish.

\(^4\) Han, O. 2014. Characterization of market price and value chain in the fisheries products of Ayeyarwady Delta (Dagon University) for the Myanmar Fishery Research and Development Network (FRDN). MYFish technical report, ACIAR.
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governance, price making and decision-making mechanisms. The particular focus of the research is
the market margins at each step of the chain significance in a total of eight villages in the eastern,
central and western areas of the Ayeyarwady Delta and across the salinity gradient.

There has not been any research conducted on the Hilsa value chain, to establish its basic
parameters, and thus contribute to ascertain the potential economic and trade impacts that reduced
stocks may have on local communities.

The findings of this series of research projects will provide critical information for government,
researchers and practitioners in the strategic planning of effective and practical strategies to
conserve biodiversity that continue to support fisher livelihoods. The aim of the value chain
assessment is to contribute significantly to the formulation of policy and strategic interventions that
sustain Hilsa fish resources for continued supply to the domestic and international markets and
benefit of those within the value chain.

1.1. Objective of the research

This study focuses on the market margins at each step of the Hilsa value chain.

The research aimed to analyse the Hilsa value chain in terms of market margins for each actor of the
chain, including value chain structure, governance, price making and decision-making mechanisms.
The particular focus of the research is the market margins at each step of the chain.

1.2. Geographical scope

The study investigated a variety of villages in the Ayeyarwady Delta.

A total of eight villages were selected based on the water ecology (seasonal brackish water, brackish
water and freshwater) and on location (eastern site, middle site and western sites of Ayeyarwady
Delta).

The Delta is an important area for the Hilsa fishery and a migratory pathway. This is the only region
in Myanmar where Hilsa fishing occurs (Figure 1). The following villages were selected:

Seasonal Brackish water site: 3 villages
  • Dedaye Township, (Thandi, Ahkae and Toe villages)
Brackish water site: 2 villages
  • Pathein Township (Wayarchaung village)
  • Mawgyun Township (Mezali called Linzwe village)
Fresh water sites: 3 villages
  • Hinthada (Taunglonesu village)
  • Kyaiklat Township (Hleseik village)
  • Maubin Township (Kawetkin village)
1.3. Target Hilsa species and catch season

*Tenualosa ilisha* is the focal Hilsa species of this study.

Hilsa species are important commercial fish species in Myanmar and they also make an important contribution to food security and local livelihoods. According to the Myanmar Government and other research on the Hilsa fishery, the population is dropping due to overfishing and lack of management, thus impacting negatively on local livelihoods and food security.

Hilsa species (*Tenualosa ilisha*) are seasonally caught based on their breeding cycle, coming up to the freshwater part of the river system for spawning, and returning to the marine parts for feeding from October and November to March and April annually. Hence, the biological and economic data were assessed for both high and low catch seasons.

Further to this, Hilsa was segregated according to size, which influences its market value and destination. The sizes are determined as: Large - more 1.2 kg (20 cm or more); Medium - 0.8 to 1.2
kg (15cm-20 cm) and Small - less than 0.8 kg (less than 15 cm). It is noted that size at sexual majority is 25.7cm⁵ and so the minimum size for large Hilsa is less than the minimum size of maturity.

It was found that among the three target species of Hilsa, only *Tenualosa ilisha*, was able to be investigated. *Tenualosa toli* is only caught in small amounts in Kawetkin Village of Maubin Township and no information about *Hilsa kelee* was found during this survey. The research results refer only to *Tenualosa ilisha*, the size of which was the main price and market differentiator.

2. Methodology

The *Making Markets Work for the Poor (M4P)* approach was used as part of this study.

The methodology for this research was largely based on the *Making Markets Work for the Poor (M4P)* approach⁶, which offers a comprehensive set of tools for analysing different aspects of the value chain from the perspective of the poor.

2.1. Research trends in value chain

Considering the specific focus of the research, particular attention was paid to the following aspects of the value chain:

1. Mapping of volumes, prices, governance and coordination;
2. Analysis of relationships and linkages and their impact on price setting and decision-making along the chain; and
3. Analysis of costs, profits and incomes along the chain.

2.2. Target survey group

The research target group is composed of the following value chain actors:

- Fishers (small, medium, large)
- Village traders (collectors)
- Township traders
- Retailers
- Agents
- Exporters

2.3. Questionnaire survey

Both qualitative and quantitative data was collected.

A total of 72 fishers, 13 village traders, 12 township traders, 2 wholesalers, 12 retailers and 2 exporters were interviewed, using Focus Group Discussions (FGD) and Key Informant Interview (KII) (Table 1). Both quantitative and qualitative data was collected in order to investigate not only financial dynamics but also relationships and linkages among stakeholders along the chain, which influence price-making and trade decisions.

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⁵ MYFish research to produce a poster on actual fish size at maturity of 14 commercial species produced by DoF in collaboration with University of Yangon.

⁶ For further information see: [http://www.value-chains.org/dyn/bds/docs/detail/681/6](http://www.value-chains.org/dyn/bds/docs/detail/681/6).
Table 1 Interviews conducted at each site

<table>
<thead>
<tr>
<th>Townships</th>
<th>Village</th>
<th>Fishers</th>
<th>Village traders</th>
<th>Township traders</th>
<th>Wholesalers</th>
<th>Retailers</th>
<th>Exporters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dedaye</td>
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<td>-</td>
</tr>
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<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Toe</td>
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</tr>
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<td>Dedaye Township</td>
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<td>-</td>
</tr>
<tr>
<td>Kyaiklatt</td>
<td>Hleseik</td>
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<td>-</td>
<td>-</td>
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<td>-</td>
</tr>
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</tr>
<tr>
<td>Pathein</td>
<td>Wayarchaung</td>
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<td>-</td>
<td>-</td>
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<td>-</td>
</tr>
<tr>
<td>Pathein Town</td>
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<td>-</td>
<td>2</td>
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<td>-</td>
</tr>
<tr>
<td>Hinthada</td>
<td>Taunglonsu</td>
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<td>-</td>
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<td>Hinthada Town</td>
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<td>Maubin</td>
<td>Kawetkin</td>
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<td>12</td>
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<td>14</td>
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</tr>
</tbody>
</table>

Table 2 summarizes the number of Hilsa fishers interviewed according to scale in the surveyed villages, and Table 3 presents the traders surveyed by scale and location of activities.

Table 2 Hilsa fishers surveyed by scale and location

<table>
<thead>
<tr>
<th>Fisher scale</th>
<th>Thandi</th>
<th>Ahkae</th>
<th>Toe</th>
<th>Hleseik</th>
<th>Mezali</th>
<th>Taunglonsu</th>
<th>Wayarchaung</th>
<th>Kawetkin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>3</td>
<td>7</td>
<td>6</td>
<td>2</td>
<td>-</td>
<td>-</td>
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<td>5</td>
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<tr>
<td>Medium</td>
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<td>Small</td>
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<td>2</td>
<td>3</td>
<td>9</td>
<td>5</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 3 Traders surveyed by scale and location

<table>
<thead>
<tr>
<th>Trader scale</th>
<th>Thandi</th>
<th>Ahkae</th>
<th>Toe</th>
<th>Hleseik</th>
<th>Mezali</th>
<th>Taunglonsu</th>
<th>Wayarchaung</th>
<th>Kawetkin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Medium</td>
<td>1</td>
<td>1</td>
<td>2</td>
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<td>2</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>2</td>
</tr>
</tbody>
</table>

3. Overview of value chain

The Hilsa value chain is composed of the following actors: fishers, village traders, township traders, retailers, wholesalers, agents, exporters and consumers.

The most numerous type of stakeholders are the fishers, followed by much smaller numbers of village and township traders and retailers, a few individual agents who link township trade with Yangon, and at the top of the chain are the Yangon wholesalers and exporters.

Township traders are buying Hilsa, other fish species, and shrimps from village traders (collectors) and fishers, sending their purchases to Yangon wholesalers. Before sending it to Yangon, they keep
the fish in cold boxes for three to seven days in low season in order to fill up a truck. In high season, they can collect sufficiently high volumes to send the fish to Yangon every day. Some township traders sell it to township retailers when they get the same selling price as Yangon. In reality, most township traders act as township wholesalers (Figure 1).

Sanpya fish market, located at Kyimyindaing Township in Yangon, is the centre of fish and fisheries products trade. There are about 150 wholesalers in this market and among them five are exporters. Yangon wholesalers are buying all kinds of fisheries products.

![Figure 2 Hilsa value chain distribution channels](image)

All the stakeholders are described in more detail in the sections below.

### 3.1. Fishers

Fishers are divided into three groups according to scale – small, medium and large. These categories are based on ownership of fishing gear, size and number of boats and nets, and labour used. Fishers don’t keep their catch, instead selling it directly to the village traders (collectors). They target species according to the particular seasons. For example, Hilsa is from October to April, Pangasius from January to July. They use the same boat, but different fishing gears according to the target fishery.

#### 3.1.1. Small scale fisher

Those fishers possessing one small boat (500,000 Kyats = US$458) with an engine and a small net are classified as small-scale fishers. Most of small-scale fishers are in Wayarchaung, and Ahkae village has none. Moderate numbers of small scale fishers are in Hleseik and Mezali villages. In Taunglonesu village some fishers have only a small boat without engine and a cheaper net.

#### 3.1.2. Medium scale fisher

Those fishers possessing one moderate-sized fishing boat (1,000,000–2,000,000 Kyats = US$917–$1834) with a net are classified as medium-scale fishers. Medium scale fishers are present in six of the villages surveyed, and not in Taunglonesu and Ahkae villages, where only small or large fishers are present, respectively.

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7 These categories of fishers correspond to the findings of the MMRD livelihood study that Hilsa fishers can be divided into: (1) commercial resident Hilsa fishers; (2) commercial migrant Hilsa fishers that include both large and medium fishers; and (3) subsistence Hilsa fishers that are small.
3.1.3. **Large scale fisher**

Those fishers possessing big, high price boat (over 10,000,000 Kyats = US$9171) are classified as large-scale fishers. Most fishers from Ahkae villages are large scale ones. A few fishers from Thandi and Toe village are also in this category.

3.2. **Traders**

Traders can be categorized into two levels, village and township. Those buying and collecting the catch from fishers in the village are village traders (also called collectors). Some fishers and most village traders sell their fish to the township traders. Both village and township traders purchase fish directly from fishers and keep the fish in iceboxes or cold storage before sending it to Yangon.

3.2.1. **Village traders**

All village traders buy the catch from different fishers in neighbouring villages. Some villages have only one Hilsa village trader because the village is small, for example in Hleseik and Taunglonsu, which are small villages. Normally, there are two or three village traders per village, who sell the small amount of fish they purchase to the township traders. Village traders purchase at the landing sites, especially on the riverbanks of Nga-wun.

3.2.2. **Township traders**

All township traders are located in the townships’ main town and purchase fish from the village traders and some fishers. There are generally five to ten traders in each town, depending on the size of the township. Some traders have three to five branches of collection sites within the town. An average township trader employs nine to ten workers. Small-scale traders have three to five employees. In a few cases, they employ their family members. Some of the largest township traders have as many as 300 employees.

3.3. **Retailers**

The village retailers are fish venders who purchase directly from fishers and sell to local consumers. The township retailers purchase from the township traders in the early morning and sell their fish to consumers in the markets and bazaars in the towns.

3.4. **Wholesalers**

Wholesalers buy a variety of fish from fishers, village traders and township traders. They distribute the fish to retailers directly and transport to exporters.

3.5. **Agents**

There are actors who broker the business between the township traders and the Yangon wholesalers and exporters.

3.6. **Exporters**

The exporters buy all sizes of Hilsa from traders and keep the purchased fish in cold storage. Most exporters do not own the storage, and hire the facilities. The exporters sort the fish by size and those under export size are sold back to other wholesalers in Yangon. Different export markets have different requirements regarding size. For example, China imports only large sized fish; while India imports all sizes. The fish exports are generally done in bulk, not only Hilsa but also other fisheries products, such as freshwater prawn, Pangasius and common perch.

The estimated figures by actor and location are summarized in Table 4. There are an estimated total of 1,347 stakeholders in the Hilsa value chain, representing seven value chain actors, in the surveyed area of which 1,020 are fishers, 22 are village traders, 25 are township traders, 115 are retailers, 10 are agents, 150 are wholesalers and 5 are exporters.
The highest numbers of Hilsa fishers are in Toe Village of Dedaye Township and the least number is in Wayarchaung, Pathein Township.

Table 4 Estimated numbers of key stakeholders involved in the Hilsa value chain per location

<table>
<thead>
<tr>
<th>Township</th>
<th>Village name</th>
<th>No. of fishers</th>
<th>No. of village traders</th>
<th>No. of township traders</th>
<th>No. of retailers</th>
<th>No. of agents</th>
<th>No. of whole-salers</th>
<th>No. of exporters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dedaye</td>
<td>Thandi</td>
<td>100</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Toe</td>
<td>400</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Ahkae</td>
<td>150</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Township level</td>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kyaiklat</td>
<td>Hleseik</td>
<td>70</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Township level</td>
<td></td>
<td></td>
<td></td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mawgyun</td>
<td>Mezali</td>
<td>50</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Township level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hindata</td>
<td>Taunglonsu</td>
<td>40</td>
<td>2</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Township level</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pathein</td>
<td>Wayarchaung</td>
<td>10</td>
<td>2</td>
<td>5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Township level</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maubin</td>
<td>Kawatkin</td>
<td>200</td>
<td>5</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Township level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yangon</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>10</td>
<td>150</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1020</td>
<td>22</td>
<td>25</td>
<td>115</td>
<td>10</td>
<td>150</td>
<td>5</td>
</tr>
</tbody>
</table>

4. Relationship and linkages

Relationships and linkages describe the social dynamics that influence the value chain and trade, including price and decision-making options and systems. This section examines these dynamics between the various actors.

4.1. Fishers and village traders

Fishers mainly sell to the village traders under informal, verbal and binding agreements.

Village traders and fishers have a complex relationship based on long-term business relations and trust. It is comprised of informal, verbal and binding agreements, and in many cases the trader is also a credit provider for the fisher.

Most fishermen from Ayeyarwady Delta are poor and cannot afford to buy their fishing nets, boats and other gear. In order to start fishing they need the investment capital, which they typically take in the form of credit from a village trader.

While the credit is perceived to be ‘an interest free loan’, the fishers are subsequently obliged to sell their fish to their ‘creditor’/village trader, who determines the selling price. Often in such
transactions, the village traders apply discounted prices, which act as a de facto interest charge for the provided credit.

However, while fishers do not have negotiation power regarding the selling price paid by their creditors, village traders have taken a financial risk by lending cash to the fishers. For example, some fishers take credit from multiple collectors and fail to pay the full amount back. Hence, trust between fishers and village traders play an important role in their otherwise informal and mostly verbal contractual arrangements.

As a result most of the trading between fishers and traders is done on the back of long-term relationships, and very few spot sales are made. Spot sales are mostly done with a few of the migrant fishers who sell their catch to whoever is buying at the landing site. In cases where there is no credit relationship, fishers may choose between traders on the basis of price, however the number of traders who purchase at landing sites is limited, thus offering little scope for effective bargaining. Therefore, landing sites with better access and/or closer to commercial centres offer better opportunities for fishers to negotiate a higher price. In addition, the location of the landing site also plays a role in the ability of fishers to bargain, with a landing site nearer to fishing grounds resulting in a fisher being able to land larger volumes on a regular basis and thus bargain with the buyer. In the case of Ahkae village, Dedaye Township, most Hilsa fishers are large scale and the few small-scale fishers sell their catch to the larger scale ones, who then trade directly with Yangon. Therefore, there are no village traders in the local chain.

Some village traders/collectors initially raise the purchase price in order to induce a sale; however, after the fisher becomes a regular supplier the collector drops the price to ‘normal’. Thus, social and family relationships and bargaining skills affect the choice made by fishers regarding their buyers. Many prefer to sell to family members or long-term trading partners in order to reduce risks of payment and in the belief that a ‘fair’ deal is being offered.

Having the first point of sale at the landing site presents a significant cost saving opportunity for the traders, who pass on all subsequent and marketing costs along the other value chain actors. Price at this level is generally determined in a ‘top-down’ manner, with village traders dictating first point of sale prices according to what price they receive from the township trader, and which in turn is based on information from Yangon (mainly information from the Sanpya central market).

Previously, only township traders had the Yangon price and were therefore in a powerful position to manipulate local prices. With the spread of telecommunications and the use of mobile phones by fishers, collectors and township traders, price checks along the chain allow all stakeholders to enquire about prices directly and prior to negotiating, which ensures that they get a fairer ‘market’ deal. Nonetheless, fishers report that despite this information, when the price is falling traders are fast to respond by lowering their offers, but when the price is going up they are hesitant to raise local buying prices as quickly.

4.2. Village traders and township traders

Village traders sell to township traders to whom they have a long-term business relationship.

Village traders choose the township traders that they want to do business with according to the price offered; however, even in these cases long-term business relationships are formed that ensure regularity of supply, reduce transaction costs, and lower perceived risks.

Most suppliers (village traders and some fishers) transport their fish to the township traders, therefore they bear the cost of transport, albeit only a short distance between the villages and townships. There are no middlemen (agents) at this part of the chain with business done directly between the suppliers and buyers.
4.3. Township traders and wholesalers and agents from Yangon

Business relationships between township traders and Yangon agents are long-term and regular, which reduces risk but also limits bargaining options.

Township traders target the markets in Yangon. During the high season, when fish supply is high, they send their stock daily to the wholesalers in Yangon. Some traders use cold storage and try to obtain better prices; however, this is risky due to electricity cuts, which can result in total or at least partial losses of both value and stock. During electricity cuts fish price increases as traders start to use expensive petroleum to prevent fish losses. They also keep fish in an icebox for one or two days, waiting for higher prices.

Most wholesalers operate at the central Sanpya fish market at Yangon. Township traders from various parts of the Ayeyarwady Delta come to sell their fish to the wholesalers of this market. Township traders do not have much bargaining power as their selling price is determined by the agents and wholesalers who are based in Yangon and who dictate purchase prices. Therefore township trader costs are potentially not fully reflected in the price they are offered for the fish by the Yangon traders. Wholesalers are the main price decision makers as they are positioned strongly between the suppliers and demand of both the Yangon and foreign markets.

At this point of sale, fish are categorized according to size into three main groups:

- Large size - for the export market
- Medium size - for local restaurant and supermarkets
- Small size - for local consumers

Wholesalers mainly do business with regular/permanent suppliers, but also use spot suppliers when fish volumes are low. They make their business choice based on the freshness of the fish and in ‘spot’ deals have to be careful of misleading practices such as the use of lead or iron sticks inside the fish for increasing its weight.

Much like at the previous level of the value chain, there is also a credit relationship between the wholesalers and the township traders, which is based on the same rules described between fishers and village traders. Discussions with wholesalers and township traders indicate that due to the dwindling amounts of fish stock available, Hilsa related credit is becoming risky, as many are failing to be repaid due to smaller traded volumes.

In some cases, there are middlemen between the township trader and Yangon wholesaler, known as ‘agents’. These also operate mostly on the basis of regular relationships with suppliers, and charge a fee of 2%, paid in cash, to the township trader and based on purchased volumes.

4.4. Exporters and their suppliers

The main export markets are India and China, which are supplied with most of the large sized Hilsa.

Most exporters are at central Sanpya fish market at Kyimyindaing Township from Yangon. They export to Malaysia, China, Singapore, Dubai, UAE and Bangladesh.

Wholesale traders from Dawei of the Tanintharyi coastal area also supply Hilsa to exporters in Yangon. Exporters make purchases only of export size fish and often send back fish to wholesalers or traders that are under the required size. Most exporters do not own their cold storage and hire the facilities according to needs for a daily charge.

Export trade volumes and frequency of sales vary according to the season. For example, in the low season, it can take up to three days to purchase enough for a single shipment of a 1.5 ton truck. While in high season, as many as one or two trucks a day may be ready for exporting. In 2014, the largest Yangon exporter shipped as much as 2 tons per day and exported as much as 1,200 tons of Hilsa within the three months of high season.
4.5. Retailers and their suppliers
Retailers don’t often have long-term business relationships with their suppliers.
Generally, there are retailers in almost all villages and townships. They sell Hilsa of under export size together with other fish species. Some village retailers are the housewives of fishers selling the catch of their husbands. The township retailers buy Hilsa from the township traders and sell the fish within a day. Sometimes, township retailers also use cold boxes. There is no contract and no credit system between the traders and retailers. Retailers usually take the credit from outside moneylenders despite the high interest rate.

4.6. Consumers
Hilsa is not often bought by local consumers because it is considered an expensive fish.
Most local consumers buy small fish because Hilsa is very expensive (approximately 3 times the price of similar species) compared with other kinds of fish, carps (6000 Kyats/kg = US$5.50/kg), perches (7000 Kyats/kg = US$6.42/kg) and catfish (7000 Kyats/kg = US$6.42/kg).

5. Volume of production and trade
The volumes of production and trade vary significantly between high and low season. High season for Hilsa is from October to February and low season is from March to September.
The section below examines both the volumes of production as well as the percentage of Hilsa traded between various suppliers and buyers, which reinforce the interrelationships between value chain actors and their relative importance to each other.

5.1. Volume of production
Low season catch can be as little as 1.07 kg/day and as high as 21.33 kg/day. High season catch can be as low as 2 kg/day and as high as 77.1 kg/day.
During low season on average a small-scale fisher can catch as little as 1.07 kg of Hilsa per day. The large-scale fishers in Ahkae catch an average of 21.33 kg of Hilsa per day during that period.
During high season on average a small-scale fisher can catch as little as 2 kg of Hilsa per day, while a large-scale fisher in Ahkae catches an average of 77.1 kg of per day (Figure 3).

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8 According to the MMRD livelihood study the majority of ‘small’ scale Hilsa fishers (over 80%) catch between 2-4 viss (3.2–6.4 kg) per day in an average month whilst medium scale fishers catch 30-50 viss (48–80 kg) per day and larger scale fishers more than 50 viss (80 kg).
5.2. Volume of trade

The proportion of the total volume of the trade conducted with each type of buyer or supplier indicates the level of economic importance of each type of linkage.

The volume of daily trade was estimated based on figures provided by each value chain actor. The information is presented according to high or low season as there is not only large variations in volumes but also differences in the trade linkages between actors.

5.2.1. High season

During high season fishers largely sell directly to wholesalers, village traders largely sell to township traders, township traders sell equally to wholesalers, agents and retailers, and as much as 83% of traded fish goes to export.

During high season the volume of Hilsa traded is higher and this stimulates the development of more diversified trade channels. The details of the high season trade, in terms of proportion of trade conducted between each actor at different levels are described in the section below.

The trade importance of suppliers and buyers

In high season, fishers send their fish to village traders and wholesalers directly. Figure 4 shows that the main traded volume goes to the wholesalers, therefore making wholesalers the most important business partner for local fishers during the high season. Predictably, at local level, only 3% of the catch goes to local retail, which is the result of direct access to the resource by most locals.

The fishers from Ahkae village are very large-scale fishers whose catch volume is also high, who send directly to wholesalers from Yangon.

In high season, the village traders send the traded volume to township traders. Figure 5 show that most of the catch is sold on to the township traders. It is interesting to note that, small-sized fish goes mainly to local retail while large fish is sent to township traders to enter the national level market.
For the township traders, the traded fish volume goes more or less equally to wholesalers, agents and retailers. Figure 6 shows that 39% of the Hilsa sold by township traders goes to wholesalers who are regular business partners, and 33% of the traded volume is sold through agents to the wholesalers.

Most of the traded volume of large sized Hilsa goes for export. Smaller sized fish is sold to the domestic market via retailers. Figure 7 show that as much as 83% of traded fish goes to export.

5.2.2. Low season
During low season fishers largely sell to village traders, who sell mostly to a township trader, who sell mostly to the wholesalers via an agent. Wholesalers still largely sell to the export market.

During low season the volume of Hilsa traded is lower and this changes the trade channels. The details of the low season trade, in terms of proportion of trade conducted between each actor at different levels, are described in the section below.

The trade importance of suppliers and buyers
Traded fish volume to the wholesaler by the fisher decreases in low season compared to high season. Figure 8 shows that fishers sell most of their catch to village traders, because it is too small to send to the wholesalers. The fishers do not send the fish to the retailers at all in this season.
In low season village traders sell almost all of the Hilsa to township traders. They don’t sell directly to wholesalers in this season (Figure 9).

During the low season, the main trading channel of the township traders is to wholesalers through agents. No direct trade is found between them. The little volume of small sized fish is supplied to local consumers through retailers (Figure 10).

In low season, the main trading partners for the wholesalers remain the exporters (Figure 11).
5.2.3. **Comparison of volumes traded on a daily and seasonal basis**

The largest seasonal drop is observed in the case of exporters, whose daily volumes during the low season reach as low as 1% of the high season values.

Table 5 below shows the total traded volume per day for each actor in the Hilsa value chain and a comparison of these volumes between low and high season. Traded volumes of Hilsa per day gradually increase through different value chain actors except for retailers.

During high season, exporters reportedly handle as much as 20,000 kg per day while small-scale fishers on average sell 13 kg per day. There is a drop of daily volume handled by all actors between high and low seasons; for fishers low season trade drops to 31% of the its value in high season. The largest seasonal drop is observed in the case of exporters, whose daily volumes during the low season reach as low as 1% of the high season values.

**Table 5 Daily volume of trade by actor in low season compared with high season**

<table>
<thead>
<tr>
<th>Actor</th>
<th>Total kg/day of Hilsa traded in low season</th>
<th>Total kg/day of Hilsa traded in high season</th>
<th>Low season volumes as a percentage of high season</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fisher</td>
<td>4</td>
<td>13</td>
<td>31%</td>
</tr>
<tr>
<td>Village trader</td>
<td>28</td>
<td>112</td>
<td>25%</td>
</tr>
<tr>
<td>Township trader</td>
<td>151</td>
<td>862</td>
<td>18%</td>
</tr>
<tr>
<td>Wholesaler</td>
<td>160</td>
<td>1,440</td>
<td>11%</td>
</tr>
<tr>
<td>Exporter</td>
<td>176</td>
<td>20,000</td>
<td>1%</td>
</tr>
<tr>
<td>Retailer</td>
<td>5</td>
<td>16</td>
<td>31%</td>
</tr>
</tbody>
</table>

### 6. Economic analysis

6.1. **Price**

The price of Hilsa is higher during low season along the entire value chain and large Hilsa starts at almost three times the price of small Hilsa.

The price of Hilsa is higher during low season along the entire value chain because demand outstrips supply due to the decrease in catch. During the high season price is overall lower, with smaller percentage price increases along the chain (Figure 12).

In high season, the highest average price is (13,667 Kyats/kg = US$12.53/kg) between township traders and Yangon wholesalers and lowest is (5,200 Kyats/kg = US$4.77/kg) between fishers and village traders in Taunglonesu.

In low season, the highest average price is (16,667 Kyats/kg = US$15.29/kg) between township traders and Yangon wholesalers and lowest is (5,200 Kyats/kg = US$4.77/kg) between fishers and village traders in Taunglonesu.
Table 6 below, shows the price increase for Hilsa along the value chain, according to size. The data shows that large Hilsa starts at almost three times the price of small Hilsa. It also reveals that a fishers' selling price is 80% of the final retail price of large Hilsa, compared to 50% for small size Hilsa.

Table 6 Prices at each step of the chain according to fish size (Kyats/kg) in high (HS) and low season (LS) (US$ 1 = 1090 Kyats)

<table>
<thead>
<tr>
<th>Fish size</th>
<th>Fishers</th>
<th>Village traders</th>
<th>Township traders</th>
<th>Wholesalers</th>
<th>Retailers</th>
</tr>
</thead>
<tbody>
<tr>
<td>HS</td>
<td>LS</td>
<td>HS</td>
<td>LS</td>
<td>HS</td>
<td>LS</td>
</tr>
<tr>
<td>Small</td>
<td>1,875</td>
<td>2,500</td>
<td>2,188</td>
<td>2,800</td>
<td>2,500</td>
</tr>
<tr>
<td>Medium</td>
<td>4,375</td>
<td>6,200</td>
<td>4,688</td>
<td>6,800</td>
<td>5,313</td>
</tr>
<tr>
<td>Large</td>
<td>7,500</td>
<td>10,000</td>
<td>7,813</td>
<td>10,600</td>
<td>8,438</td>
</tr>
</tbody>
</table>

Table 7 summarizes the percentage price increase at each point of sale, by size, showing that the smaller the size of the Hilsa, the bigger the percentage increases along the chain. Large Hilsa prices are only raised by about 5% on average, while the price tag for smaller sizes increases on average by 13% for medium and 15% for small indicating that domestic demand for small-fish is high.

Table 7 Percentage price increase at each step of the chain according to fish size

<table>
<thead>
<tr>
<th>Fish size</th>
<th>Fisher (price in Kyats)</th>
<th>Village trader</th>
<th>Township trader</th>
<th>Wholesaler</th>
<th>Retailer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>1,875</td>
<td>14%</td>
<td>13%</td>
<td>20%</td>
<td>17%</td>
</tr>
<tr>
<td>Medium</td>
<td>4,375</td>
<td>7%</td>
<td>12%</td>
<td>11%</td>
<td>14%</td>
</tr>
<tr>
<td>Large</td>
<td>7,500</td>
<td>4%</td>
<td>7%</td>
<td>7%</td>
<td>3%</td>
</tr>
</tbody>
</table>
6.2. Income

Income from Hilsa is a function of volume and price and is therefore different between the low and high seasons and depends on the size of the catch.

It is important to note that while income originating from the capture and trade of Hilsa is examined, there is no livelihoods analysis to compare this income to other financial sources. Therefore all the fluctuations and figures are only relevant to the daily income derived from the Hilsa trade and do not amount to total daily income for any of the actors, who are presumed to have a variety of livelihood options based in multiple production and trading activities. However, when compared with the livelihood study on Hilsa dependent fishers, on average Hilsa fisher spend 70% of their time fishing, 15% of time on agriculture and 15% providing casual labour, indicating a high dependence on Hilsa.

Hilsa can obtain prices as much as 10 times higher than other species and is therefore a heavily targeted fishery. During recent years, catch per unit effort (CPUE) has been decreasing (from more than 10 kg catch per day to less than 5 kg per day for a small-scale fisher). As a result, fishers are using smaller meshed nets, in order to catch even the smallest size of fish, many of which have not yet reached maturity.

6.2.1. High season

During the high season, township traders, followed by the village traders, obtain the highest income.

During the high season, township traders, followed by the village traders, obtain the highest income due to an increase of the purchase volume from surrounding villages. During the same period retailers report the lowest income as Hilsa is more easily available locally and consumers in shops dwindle.

With regard to fisher’s income, Figure 13 shows that fishers from Ahkae village have the highest average daily income (539,098 Kyats /day = US$494/day) due to the large scale of their fishing activities. Taunglonesu villagers have the lowest daily income (9,170 Kyats /day = US$8.41), because of their small scale. However, while income for Taunglonesu fishers can be considered as a relatively good income in Myanmar, most fishers are actually poor due to the irregularity of the activity (two or three fishing days in a week) even in the high fishing season. In addition, four months a year are not fishing season.

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Among the village traders (Figure 14), the highest average income (985,013 Kyats/day = US$903/day) is in Thandi village and the lowest (3,280 Kyats/day = US$3/day) is in Taunglonesu. This is the case because all fishers in Thandi sell to local village traders; while in Taunglonesu village traders collect small amounts of primarily low value small size fish.

Among township traders (Figure 15), the highest average income is in Pathein (908,775 Kyats/day = US$822/day) because this is a sizeable city, which is central to large trade volumes accumulated in the Ayeyarwady division. In Dedaye Township, the village traders supply the purchased fish only to the township traders hence they rank second in terms of income. Maubin is very close to Yangon, which means that village traders send directly to Yangon and catch volume is low because it is far from the sea.
Finally, in terms of retailer income (Figure 16), the highest average income (23,654 Kyats/day = US$22/day) is in Dedaye because trade volume is relatively high due to high demand. The lowest (4,100 Kyats/day) is in Mezali, where Hilsa consumers are very few due to low income and purchase power.

Figure 16 Average daily income (Kyats/day) for retailers in high season (US$ 1 = 1090 Kyats)

Figure 17 below shows the comparison of average income by each Hilsa value chain actor during high season. It is evident that township traders make the highest amount of money per day (308,498 Kyats/day = US$283/day) from Hilsa, followed by village traders and fishers. Retailers take a surprisingly low income from Hilsa, however this could be explained by the much higher diversification of products they would usually trade daily.
The value chain of Hilsa shad in the Ayeyarwady Delta

In high season trade volumes are much larger than in low season. The figures examined above demonstrate the monetary value of the Hilsa trade for each actor in the chain. The relatively high daily income values at each step of the chain demonstrate the commercial importance of this fishery.

6.2.2. Low season

During low season, township traders, followed by the fishers, obtain the highest income per kg of Hilsa.

Low season income of fishers has similar patterns to that of high season (Figure 18). Income of fishers from Ahakae is still highest at 214,151 Kyats/day (US$196/day), as the catch volume remains higher than in other places. Thandi fishers have second highest income due to the larger size of the fish caught.

In the case of village traders, Thandi village also has the highest average income (132,833 Kyats/day = US$121/day) because it is located on the Gulf of Motama Sea, and catch volumes are high resulting in a higher trade volume for village traders (Figure 19). Interestingly, income of village traders from Ahkae is comparatively low, as the catch is traded directly with Yangon by the fishers, thus bypassing local markets.
For the case of township traders, the highest income is in Pathein (147,860 Kyats/day = US$135/day) (Figure 20), which is the largest commercial centre of the Ayeyarwady region trading large volumes of Hilsa and has good transport links with Yangon.

Income of retailers in low season differs from the high season income as displayed in Figure 21 and Figure 16.
The value chain of Hilsa shad in the Ayeyarwady Delta

Figure 22 shows that across the value chain the average Hilsa related daily income of actors significantly drops compared to high season (Figure 17). In low season, township traders still make the biggest daily income, followed by fishers and village traders. The lowest daily income from Hilsa is at retailer level.

A comparison between the two seasons shows that fishers suffer a 58% decrease in daily income from Hilsa, between high and low seasons, while village traders and township traders’ daily income is reduced by 80% and 85% respectively. Retailers’ income is reduced by about 67%. Such significant fluctuations highlight the seasonality of the Hilsa fishery, impact on the market value chain structure, and the relative importance of Hilsa in the trade portfolio at all levels.

6.3. Costs

Township traders have the highest costs during both seasons due their higher investments in transportation and labour.

Costs were estimated for each of the value chain actors for both high and low seasons. Both fixed and variable costs were taken into account and a cost allocation method was used to assign appropriate costs to Hilsa, as part of total costs incurred by the activities at each level.
The section below details season related costs incurred each of the studied sites and summarizes those averages per actor, making also a seasonal comparison.

6.3.1. High season

Labour and fuel costs are the highest running costs for fishers.

Among the different villages and fishers, the highest daily costs are incurred by the fishers of Ahkae, which is the result of the large scale of their operations, involving large boats with engines, as well as hired labour (Figure 23).

![Figure 23 Costs per kg incurred by fishers during high season (US$ 1 = 1090 Kyats)](image)

When comparing village trader costs, Kawetkin village traders have the highest costs, as they send the collected fish to Yangon wholesalers directly, due to the close proximity; however, this does result in higher transportation costs that are accumulated at this level of the chain (Figure 24).

![Figure 24 Cost per kg incurred by village traders in high season (US$ 1 = 1090 Kyats)](image)

Township traders’ costs are highest in Kyaiklat and lowest in Maubin (Figure 25). Costs for Kyaiklat traders were highest because traded volume was low. Hence, cost for unit volume was highest. In Maubin Township, traders usually do not buy Hilsa. Fishers and village traders directly sell to Yangon but traded volume was very low in Maubin Township.
Among the retailers, costs are highest in Hinthada Township, and lowest in Maubin (Figure 26). The retailers’ cost was lowest in Maubin because the traded volume of Hilsa was negligible, and hence no costs were incurred.

A comparison of the daily costs for various actors in Figure 27 shows that the daily costs of township traders far surpass the daily costs of any other actor in the value chain.
The costs are broken down per type in order to reveal cost structures by actor. There are eight main costs reported by the fishers (Figure 28). In terms of fixed costs of the initial investment, boats and nets prices are high (500,000 to 10,000,000 Kyats (US$458-9171) for one fishing boat, and 100,000 to 500,000 Kyats (US$92-458) for one net). These costs, however, are not necessarily specific to Hilsa fishing and therefore only a portion of their value has been assigned or allocated to this particular activity.

In the case of village traders, nine types of costs were reported, with transport as the highest one, followed by ice (Figure 29).
Similar costs were reported for township traders, nine types of cost with transport being the highest, followed by labour and then ice (Figure 30).

Finally, at the level of retail, there are nine main costs with ice costs being reportedly the highest (Figure 31).
In order to understand better the cost structures, further breakdown of these costs must be carried out that clearly separates fixed from variable costs.

**6.3.2. Low season**

**Traders appear to have more fixed costs.**

In low season, the cost structures and trends are similar to those of high season. The figures below detail the costs, in each of the study’s research sites and then look at cost composition and structure.

In the case of fishers, the highest costs during low season are in Toe village, followed by Mezali (Figure 32).

![Figure 32 Average costs (Kyat/kg) of Hilsa fishing for fishers in low season](image)

It is interesting to note that the daily cost per kg for village traders are higher in low season due to sending the Hilsa directly to Yangon, surpassing the costs for township traders (Figure 33).
Similarly, the costs of township traders and retailers in high season are also higher than low season due to the low traded volume. These costs are highest in Hinthada and Maubin Townships (Figure 34).

Figure 33 Average costs (kyat/kg) incurred by village traders in low season

Figure 34 Average costs (kyat/kg) incurred by township traders in low season

Figure 35 Average daily costs (kyat/kg) incurred by retailers in low season
Figure 36 shows a comparison of the average daily costs of the Hilsa trade incurred by different value chain actors during the low season. Township traders make higher investments in transportation and labour costs in comparison to other actors.

The costs for low season are broken down per type and by actor in order to demonstrate how costs are distributed. The figures below show that cost structures remain virtually the same between the two seasons.

For fishers labour and fuel are reportedly the highest costs during both seasons (Figure 37).

For the village traders, transport cost is the highest one (Figure 38).
Labour costs are still the highest cost in low season for township traders (Figure 39).

Ice remains the highest cost in low season for retailers (Figure 40).
It is interesting to note that the comparison between low and high seasons reveals that while the absolute value of daily costs drops from high season to low season for all actors, the cost per kg of Hilsa goes up from high to low season across the board. This increase of the costs per kg of Hilsa is expected to negatively impact profit margins, if this increase is not compensated adequately by an increase of the price of Hilsa per kg during low season.

6.4. **Profit margins**

The profit margin of large size Hilsa is higher than that of medium and small sized Hilsa, as the transportation and labour costs are the same for any fish size but the selling and purchase prices are higher in large sized fish.

Profit margins were calculated on the basis of the income and costs data presented above that were calculated both in terms of daily profits margin of Hilsa trade for each actor and location on a kg basis.

6.4.1. **High season**

In high season, township traders make by far the largest daily profits and fishers the lowest.

Figure 41 shows that during high season, Kawetkin fishers make the highest profits when compared to other locations, followed by fishers in Thandi. One of the main reasons is that fishers in these locations sell their catch directly to township traders, and Kawetkin is the nearest to Yangon with direct access to urban markets.
As displayed in Figure 42, Thandi village traders make the highest profit in comparison to village traders in other locations. Kawetkin village traders make almost no profit from the Hilsa trade and sustain economic activities through trade in other fish, as here Hilsa is sold by fishers directly to township traders.

For the township traders, the profit is highest in Dedaye Township and traders in Maubin report zero profit from trade in Hilsa (Figure 43).

Figure 44 displays cost margins reported by retailers in each location. Those in Pathein Township report the highest figures in high season, which can be explained by the overall higher economic level of activity in this area.
When the information on profits per kilogram and the daily volumes sold are combined, the daily profits can be calculated for each actor during high season. Figure 45 demonstrates that daily profits are highest for township traders, followed by village traders. This is mainly due to the large volumes of Hilsa that these actors trade in on a daily basis during that period, which also clearly demonstrates their importance in the movement of Hilsa along the value chain.

6.4.2. Low season
In low season fishers take the highest daily profit from Hilsa in comparison to all other actors in the chain.

A comparison between similar actors across locations shows the same trade patterns during low season as the ones evident during high season and detailed in the section above. In low season, however, the fishers gain the highest daily profit as they incur the lowest costs, while traders have high fixed costs related to storage and transportation which drives profits down due to the lower volume of Hilsa supply (Figure 46).
A comparison of the profits by kilogram between different locations demonstrates the importance of fixed costs when volume of fish varies significantly between seasons (Figure 47). In the low season, Thandi fishers report the highest profit by kilo of Hilsa, which is explained by their lower costs of catch and sale.

Village trader profits in low season vary from one location to the next (Figure 48). Toe village traders report the highest profit per kg, followed by Thandi and Kawetkin. As with fishers, these variations reflect the relationship between cost structures and Hilsa traded volumes. However, as cost structures already examined in this study show no great variation between locations or seasons, the differences in profits per kg can be attributed to the differences in volume of Hilsa traded.
Pathein Township traders have the highest profit, while Deyade Township traders report the lowest profit (Figure 49). Maubin is very close to Yangon, which means that village traders send directly to Yangon and catch volume low because it is far from the sea.

Pathein retailers report the highest profit per kg due to high trade volumes, which is the same in high season (Figure 50). Maubin is very close to Yangon, which means that village traders send directly to Yangon and catch volume low because it is far from the sea.
A comparison between the high and low season profit margins show that while overall profit margins fall, during high season it is the township traders who make the biggest margin, while in low season it is the fishers. The reason for this is the structure of the costs associated with the Hilsa capture and trade and the large variation in volumes caught and traded between high and low seasons.

7. Conclusions

Key Hilsa value chain actors
The key Hilsa value chain actors identified were fishers, village traders, township traders, wholesalers, retailers, agents and exporters. Each of these actors has a specific role to play in the re-sale and distribution of Hilsa within domestic markets, as well as for exports.

Relationships and linkages
Informal, long-term business relationships dominate the value chain, which has a positive impact in reducing transaction risks. It can, however, be potentially negative in constraining the decision-making process away from a ‘perfect competition’ environment, which would allow for decision-making to be based primarily on economic/financial considerations.

Stocks and volumes
There are three Hilsa species in Myanmar and only one species (*Tenualosa ilisha*) is relevant to this study as *Tenualosa toli* is only very occasionally found and *Hilsa kelee* is not recorded at all. These two species have reportedly disappeared from the fishing grounds of the Delta area.

Catch volume of the Hilsa is highest in Ahkae village (77 kg/day/fisher) in high season and can be as little as 1.07 kg/day/fisher during low season among the eight surveyed villages. The fishers from Ahkae village are large-scale and own the largest boats with high-powered engines. Hence, volume of fish trade is high here.

Prices
Price varies according to both size of the fish and the season.
Overall the price in low season is higher than in high season because in low season the production is low and demand is high.
- Large-size Hilsa is, on average, three times as expensive as small-size Hilsa along the chain.
• The price percentage increase along the chain for small Hilsa is much higher than for large Hilsa due to the limited price elasticity of the national market. This is due to a maximum price being set for even the largest fish by the Yangon wholesalers.
• The fishers selling price is 80% of final retail price for large-size Hilsa, and 50% of the final price for small-size Hilsa.
• Export price is twice that of national markets.

Relative income along the value chain
• Daily income from Hilsa changes dramatically between the high and low seasons mainly due to fluctuations in volumes of the catch.
• During the high season daily income is highest for township traders, followed by village traders and fishers. During low season village trader income drops below the average for fishers.
• In terms of absolute values, seasonal income fluctuations for all actors are significant, with income from Hilsa dropping as much as 10 times during low season.

The differences in income among the same types of actors in different locations are the result of differences in the size and volume of the fish caught and traded. Among fishers, daily income is highest in Ahkae; among village traders it is highest for Thandi village; and township traders from Pathein report the highest daily income, all of which reflect the higher volume of trade at this location or part of the value chain.

Costs and cost structures for Hilsa trade
According to the fishers, labour and fuel costs are the highest running costs in both seasons, which are variable costs; however, traders appear to have more fixed costs, which impacts significantly on profit margins when volumes drop during low season.

Profit margins and daily profits
Profit margins change dramatically between seasons in line with volume variations and cost structures. As a result, profit margins for traders on the whole drop and for fishers increase in the transition from high to low season. Also large variations in profit margins per kg are recorded between locations, which are explained by the difference in catch composition (income) and fixed costs.

In high season, township traders make by far the largest daily profits and fishers the lowest; however in low season the situation reverses and fishers take the highest daily profit from Hilsa in comparison to all other actors in the chain.

Destination markets
• The domestic market is the main destination for small-size Hilsa. Majority of large-size Hilsa is destined for export.
• India is the largest foreign buyer in high season, purchasing all sizes of Hilsa.
• China is the second largest buyer, importing only large-size Hilsa and offering a higher price than the domestic market.

8. Recommendations

The recommendations are targeted towards sustaining a viable and vibrant domestic and export market for Hilsa whilst ensuring that the Hilsa resource is sustained and well managed.

Develop a national Hilsa fishery action plan with monitoring, control and surveillance of fishing.

Hilsa are an important commercial species nationally and high demand continues to drive fishing effort as the fish can obtain prices as much as 10 times higher than other species and is a heavily targeted fishery. According to Government and other research on the Hilsa fishery, the population is
dropping due to overfishing and lack of management, and thus impacting negatively on the livelihoods of fishers and those within the supply and value chain that rely on this fish. During recent years, catch per unit effort (CPUE) has been decreasing (from more than 10 kg catch per day to less than 5 kg per day for a small-scale fisher). As a result, fishers are using smaller meshed nets, in order to catch even the smallest size of fish, many of which have not yet reached maturity.

It is recommended that the Union Government together with the Ayeyarwady, Sagaing, Magway and Mandalay regional and State Governments develop a national plan of action for improved management of Hilsa by placing restrictions on the catches and the movement and trade of Hilsa fish and should include:

1. Joint Union and Regional Government monitoring and surveillance programs for coastal, near shore and inland waters to ensure compliance to fishing regulations, in particular the use of small meshed nets (less than 5 cm) in estuary river mouths and main migration channels;
2. Regional and site specific licensing of important Hilsa migration routes and breeding sites to monitor and control the movement and fishing behaviour of commercial migrant Hilsa fishers;
3. Development of Hilsa specific trade regulations designed with all value chain actors (village traders, township traders, wholesalers, retailers, agents and exporters) to control the movement and sale of large (sexually mature) Hilsa during the migration and breeding seasons (April and May);
4. Develop “co-managed Hilsa fishing areas” with licensing controls for commercial and subsistence local fishers with quotas for the harvesting of small and medium sized Hilsa fish for sale within the domestic market during the breeding and migration season (April and May);
5. Undertake regular market and export spot-checks and inspections to control the trade of large Hilsa fish during the breeding and migration seasons (April and May); and
6. Review the level of fines and licensing restrictions for Hilsa fish traders that continue to violate Hilsa trade and closed season restrictions.

Develop a system of research and monitoring that can be used in the adaptive management of Hilsa and key commercial species.

There have been very few studies conducted on the ecology, livelihoods and value chain of Hilsa and other important commercial species and the impacts on coastal and inland fishers, the communities and value chain actors. It is recommended that the Department of Fisheries (DoF) establish a research and monitoring unit and indicators and parameters to monitor the trends in the yields, ecology, trade and livelihoods for Hilsa and other key commercial fish species.

It is recommended that the Union Government together with the Ayeyarwady, Sagaing, Magway and Mandalay region Governments develop a research and monitoring program for Hilsa where the findings inform regulation and improved management of Hilsa and important commercial species including:

1. Identification and monitoring of key sites and periods for breeding and migration along the Ayeyarwady river and other major Delta river and irrigation cannel systems;
2. Development of indicators and monitoring system to assess actual and potential economic and trade impacts on harvesting and marketing restrictions on Hilsa on value chain actors and local fishing communities; and
3. Develop breeding enhancement programmes for Hilsa (*Tenualosa ilisha*) and conservation and protection sites including no fishing zones for the other Hilsa shads (*Tenualosa toli* and *Hilsa kelee*).
Appendix I  The Hilsa value chain in pictures

- Catching the fish from a small boat
- Carrying the fish from fisher to village trader
- Collecting and dividing the Hilsa species by size
- Weighing the Hilsa species
- Township trader choosing the collected Hilsa
- Packaging the fish bought from retailer
The value chain of Hilsa shad in the Ayeyarwady Delta

- The Hilsa species in cooler boxes
- Transport from township trader to wholesaler
- Transporting fish from township trader to Yangon wholesaler
- Focus group discussion with fishers
- Focus group discussion with village traders
- Interviews with retailers
Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand are working together through the Bay of Bengal Large Marine Ecosystem (BOBLME) Project to lay the foundations for a coordinated programme of action designed to better the lives of the coastal populations through improved regional management of the Bay of Bengal environment and its fisheries.

The Food and Agriculture Organization (FAO) is the implementing agency for the BOBLME Project.

The Project is funded principally by the Global Environment Facility (GEF), Norway, the Swedish International Development Cooperation Agency, the FAO, and the National Oceanic and Atmospheric Administration of the USA.

For more information, please visit www.boblme.org