



INLAND MYSAP

Value Chain Report - Kalay



Value Chain Report - Kalay Township

The Myanmar Sustainable Aquaculture Programme (MYSAP) which is funded by the European Union (EU) and the German Federal Ministry of Economic Development and Cooperation (BMZ) and implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH has the following objective:

Support the sustainable intensification of the aquaculture sector, thereby realizing its potential for food security, nutrition and sustainable livelihoods

MYSAP is promoting small-scale aquaculture and improved human nutrition in five townships in the Shan State and the Sagaing and Mandalay Regions of Myanmar in its component INLAND MYSAP. WorldFish Myanmar is implementing INLAND MYSAP under a GIZ grant agreement. The INLAND MYSAP townships are:

- i) Kale (ကလေး - MMR005027) Township, Sagaing Region
- ii) Shwebo (ရွှေဘို - MMR005004) Township, Sagaing Region
- iii) Kengtung (ကျိုင်းတုံ - MMR016001) Township, Eastern Shan State
- iv) Pinlaung (ပင်လောင်း - MMR014009) Township, Southern Shan State
- v) Amarapura (အမရပူရ - MMR010006) Township, Mandalay Region

Mekong Economics Limited, a commercial company was contracted under a service agreement with WorldFish Myanmar to conduct the INLAND MYSAP baseline survey after a tendering process.

The findings of the INLAND MYSAP baseline survey were presented by Mekong Economics Limited at a workshop held in Nay Pyi Taw on 26 June 2018 which was attended by 70 key stakeholder participants including government, NGOs, farmers and donors.

Feedback from key stakeholders has been incorporated into this final version of the INLAND MYSAP baseline survey report for release into the public domain.

The findings of the INLAND MYSAP baseline survey report will be used by the Government of Myanmar, the EU and BMZ, MYSAP and collaborating implementing partners to assess progress towards both programme level and project level objectives and results and programme and project level impact.

For further information on MYSAP please contact the Head of Project Mr Peter Buri (peter.buri@giz.de) and for further information on INLAND MYSAP and/or the baseline survey report please contact: inlandmysap@cgiar.org.

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1. Introduction

In this section, we briefly introduce the intervention and its objectives, and the value chain research that was conducted as part of a baseline study of the INLAND MYSAP project.

Project Description

WorldFish Myanmar in collaboration with the Department of Fisheries (DoF) R&D Division, under the Ministry of Agriculture, Livestock and Irrigation (MoALI), will implement the project 'Improving the production, nutrition and market values of small-scale aquaculture in Myanmar's Shan State, and Sagaing Region' (INLAND MYSAP). INLAND MYSAP will run from 06 April 2017 to 05 May 2020.

The development goal of INLAND MYSAP is to increase the availability and access of fresh water aquaculture products sustainably produced by small-scale aquaculture producers, and to provide nutritious, affordable food and incomes for the poor and vulnerable in Shan State and Sagaing Region. Amarapura Township in Mandalay Region was recently added to the project area.

Value Chain Study

As part of the baseline research conducted for this project, a value chain study was commissioned to understand the constraints facing selected aquaculture value chains and the opportunities for value-chain upgrading and increasing fish consumption. Mekong Economics (MKE), a leading socioeconomic development consultancy in the Mekong region, was contracted following a limited tender process to implement the baseline research, including the value chain study.

The following themes are touched upon, to varying degrees, in the value chain study: (1) production; (2) markets; (3) nutrition; (4) climate resilience; (5) gender equality; and (6) governance. Opportunities for the following are highlighted: (1) livelihoods improvement; (2) product development; (3) processing; and (4) service provision. These will serve to inform the specific contents of the intervention and to steer the project's overall direction.

2. Methodology

The methodology adopted for the value chain research combines quantitative and qualitative tools to answer specific research questions. Concurrently with the value chain study, a survey of households was conducted to obtain baseline values of indicators. Some of the value chain research was able to "piggyback" on the household survey, but mostly relied on separate data collection tools. These consist of: (1) a market survey; (2) key informant interviews; and (3) focus group discussions.

Research Questions

The research questions of this study comprise a single lead question in addition to five sub-questions. They were as follows.

Lead Question: Can aquaculture help to replace fish previously supplied from the wild and if so what is the best way of doing this to improve low-income people's fish consumption?

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Sub-question 1: Are we experiencing an increase in the proportional supply of farmed fish? If so, what are the resulting changes in local fish trade and consumption practices?

Sub-question 2: If there has been an increase in fish from aquaculture in the area, has the price of fish at local markets remained stable, lowered or increased?

Sub-question 3: Are local fish farmers and collectors facing important logistical challenges to supply their products to the market? What are they and how do they address these?

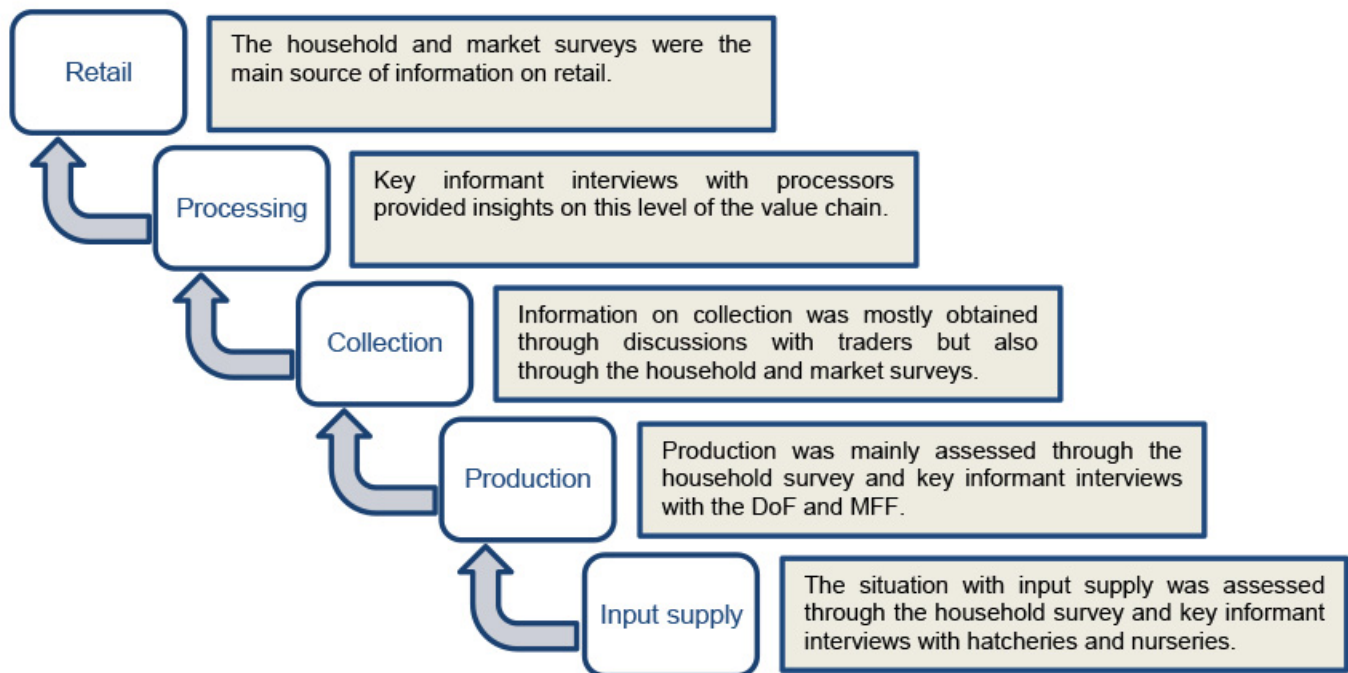
Sub-question 4: How is local fish farming positioned compared to the wild-caught and Yangon-farmed fish supply? What are the main interrelations between these three supply chains?

Sub-question 5: What is the prevalence of fish processing practices and related consumption? Are there interesting prospects for the project to support these?

Research Strategy

The research strategy was to employ mixed (quantitative and qualitative) methods to obtain information along the value chain. The various tools deployed were: (1) a household survey; (2) a market survey; and (3) qualitative interviews with the DoF, the Myanmar Fisheries Federation (MFF), hatcheries, nurseries, processors and traders. For the purpose of this value chain study, a 'trader' was defined as someone who purchases fish from a fish farmer or another trader. While a 'vendor' was defined as someone who sells fish to consumers. Note that traders can also be vendors.

Value chains were evaluated at the following five levels:



The value chain analysis drew a distinction between the following three types of fish species: (1) carp species – namely Indian major carps, being rohu, catla, and mrigal, and Chinese carps, being common carp, silver carp, big head carp and grass carp; (2) tilapia; and (3) small indigenous species (SIS). The following three supply chains were considered, although the focus was on the first of these: (1) locally farmed fish; (2) Yangon-farmed fish; and (3) wild-caught fish. The value chain study was conducted in five townships, with separate reports for each: (1) Kalay (Sagaing Region); (2) Amarapura (Mandalay Region); (3) Kyaing Tong (Shan State); (4) Pinlaung (Shan State); and (5) Shwebo (Sagaing Region).

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Where possible, a triangulation approach was used with multiple sources of information to corroborate data.

Quantitative Tools

The quantitative tools consisted of a baseline household survey and a market survey in the five townships.

Household Survey

The household survey employed a quantitative questionnaire to collect data from 847 households, of which 155 were sampled from Kalay Township. These were split roughly equally between three sets of locations: (1) four wards of the township capital; (2) four production hubs (wards/villages with above-average aquaculture involvement); and (3) four rural villages (those in village tracts).

Market Survey

A market survey was conducted with fish vendors in each township. The sample consisted of randomly-selected vendors in each market, with one major market and two or three minor markets surveyed in each township.

Qualitative Tools

As can be seen in Table 1, the qualitative tools used for the Kalay value chain study consisted solely of key informant interviews (KIIs). A KII is a conversation with a relevant individual conducted by trained staff that usually collects specific information about one person. Semi-structured questionnaires were developed for all qualitative interviews. These are included in the Annexes.

Table 1

Interview format	Stakeholder(s)	Interview date	Interview location
KII	DoF	29/05/2018	Kalay
KII	Private hatchery	28/05/2018	Nat Kyi Kone
KII	Private hatchery	29/05/2018	Bone Taw
KII	Private hatchery	30/05/2018	Nat Kyi Kone
KII	Trader (male)	27/05/2018	Kalay
KII	Trader (male)	28/05/2018	Kalay
KII	Trader (male)	31/05/2018	Htauk Kyant
KII	Trader (male)	01/06/2018	Kalay
KII	Trader (male)	01/06/2018	Htauk Kyant
KII	Trader (female)	01/06/2018	Kalay
KII	Processor (male)	28/05/2018	Nat Kyi Kone
KII	Processor (female)	30/05/2018	Pin Khun Lay

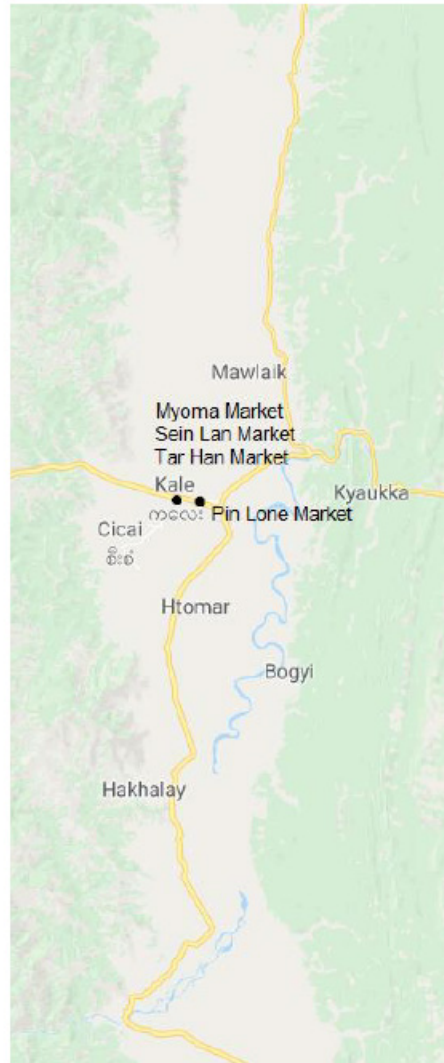
3. Value Chain Map

See Annex A for a value chain map of the fish sector in Kalay Township.

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4. Market Information

Market information was collected from the following four market locations: Myoma (major market), Tar Han (minor market), Sein Lan (minor market) and Pin Lone (minor market). All are urban markets. The following map marks these locations. Randomly selected vendors accounted for roughly 30%, 10%, 75% and 40% of traded volumes at Myoma, Tar Han, Sein Lan and Pin Lone Markets, respectively, on the day of visit. All vendors randomly selected for interview turned out to be female, suggesting that Kalay vendors were usually female.



Fish Sales

Figure 1 compares sales volumes for wild-caught fish and different types of farmed fish across the four markets surveyed. The township total was calculated by summing volumes at the four markets.

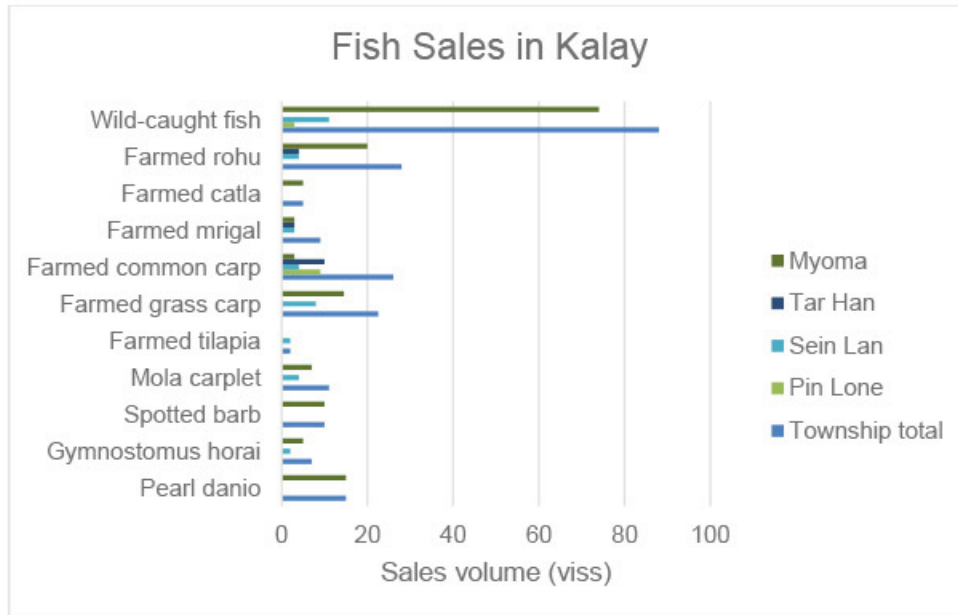


Figure 1

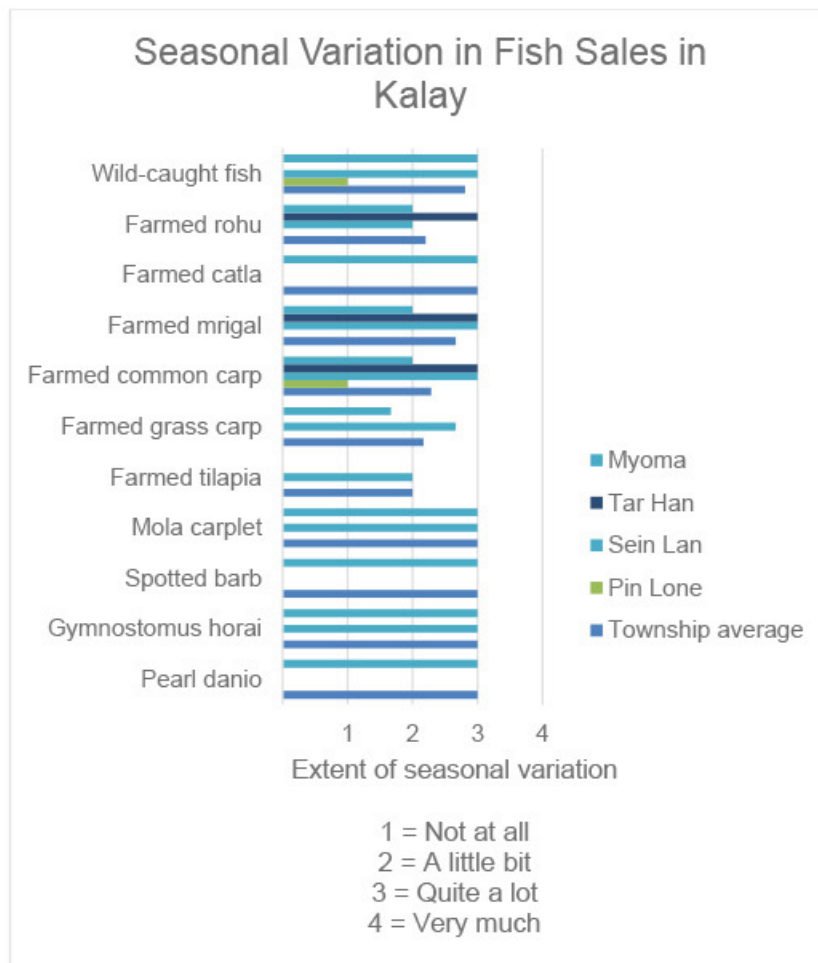


Figure 2

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As can be seen in Figure 1, Kalay markets have a relatively large supply of wild-caught fish. The main wild-caught species in the township were: (1) river catfish; (2) giant river catfish; (3) striped snakehead; (4) catla; (5) grass carp; (6) *Wallago attu*; (7) lesser spiny eel; (8) mola carplet; (9) spotted barb; (10) *Gymnostomus horai*¹; and (11) pearl danio.

The main farmed species that were identified in the market survey were: (1) rohu; (2) some catla; (3) some mrigal; (4) common carp; (5) grass carp; and (6) a little tilapia. Silver barb was also sold, and big head carp was found in the household survey. A mix of locally farmed and Yangon-farmed carp was observed, as well as wild-caught catla and grass carp. Locally farmed tilapia was notably absent; only a single vendor was found selling Yangon-farmed tilapia in Sein Lan Market. Thai silver barb was both locally cultured and imported from Yangon.

In terms of small indigenous species, some vendors sold locally caught mola carplet, spotted barb, *Gymnostomus horai* and pearl danio. Yangon-sourced mola carplet was also observed. No small indigenous species were reported as originating in local farms in the market survey. This was corroborated by the household survey. Nevertheless, the household survey found that 25% of fish farms in Kalay with naturally occurring small indigenous species consumed or sold them.

Seasonal Variation

Figure 2 depicts the extent of seasonal variability in sales of different kinds of fish in Kalay using a four-point Likert-type scale (very much, quite a lot, a little bit, not at all). The township average is a simple average of observations from all four markets. All small indigenous species were reported as exhibiting “quite a lot” of seasonal variation in sales and likely availability as well.

Fish Prices

Figure 3 displays the price of different kinds of fish in each of the four markets surveyed. The price for each market is the simple average across vendors, whereas the township average is the average of observations from all three markets.

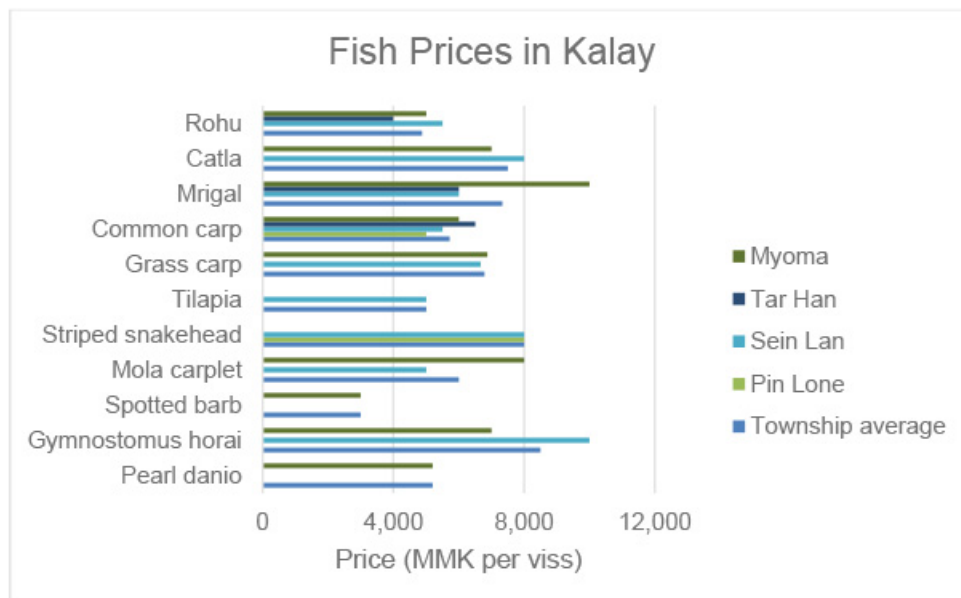


Figure 3

According to some vendors, the price of Yangon-sourced fish has increased in the last year, due to reduced availability as well as increased demand. Indeed, Yangon-sourced rohu was found to be MMK 1,500 to MMK 2,000 higher in price

¹ *Gymnostomus horai* is endemic to Inlay Lake and is becoming increasingly rare. It is an IUCN Red List species.

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than locally farmed rohu. Yangon common carp was also generally more expensive than the locally farmed variety. Catla was found to be MMK 1,000 more expensive when locally caught than when sourced from Yangon. Grass carp was around the same price when sourced from Yangon and when wild-caught, but was cheaper when locally farmed. However, the opposite pattern was observed in the case of mrigal, which was MMK 10,000 when locally farmed and MMK 6,000 when sourced from Yangon. Note that the prices of species in Figure 3 are simple averages that ignore these distinctions.

Seasonal Variation

Figure 4 depicts the extent of seasonal variation in fish prices in Kalay using the same four-point Likert-type scale as Figure 2. *Gymnostomus horai* appeared to exhibit the most seasonal variation in price.

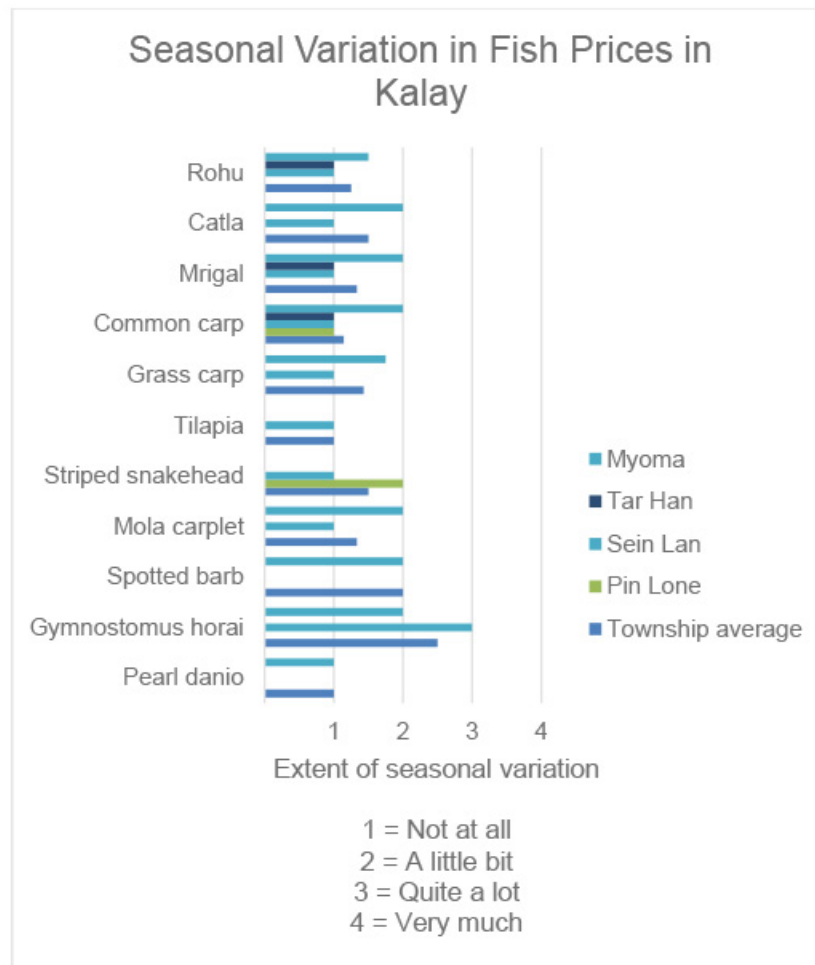


Figure 4

5. Answers to Research Questions

In this section, we seek to answer the research questions underpinning this study.

Lead Question: Replacing Wild-Caught Fish and Improving Fish Consumption

DoF records indicated that there were 293 fish farmers in the township with 843 fish farms. According to the DoF, the market demand for fish is not being fully met by current supply. This is partly a result of substantial decreases in the

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amount of wild-caught fish (including small indigenous species) since floods in 2015-2016. This suggests that the expansion of local fish farming is imperative if consumption levels of fish are to be maintained or increased. There are opportunities to assist processors to meet surplus demand for barbequed fish as well. In terms of demand-side constraints, the DoF suggests promoting awareness of the nutritional benefits of fish in order to increase fish consumption, since Kalay consumers tend to be unaware of these.

The household survey highlighted proximity to water resources and better access to fish seed as factors that would be most helpful for fish farmers in Kalay to expand production (see Figure 5). Indeed, it was noted by the DoF that local fish farms do not have reservoir tanks and, as a consequence, face water shortages in the dry season. Moreover, it was explained by one hatchery owner that production of fish seed has been unable to keep pace with the growing number of fish farms and their increased size.

Another challenge noted by the DoF is poor credit access. In part, this stems from a lack of land ownership documents (La Ya 30), which prevent fish farmers from obtaining commercial loans. It was mentioned that an existing credit support programme, Mya Sein Yaung, is only available in three villages in the township, with limited funds for each. It was also mentioned that fish farmers rely on traditional methods, which can result in problems like excessive algae in fish ponds and poor fish growth due to the use of chicken manure for fish feed.

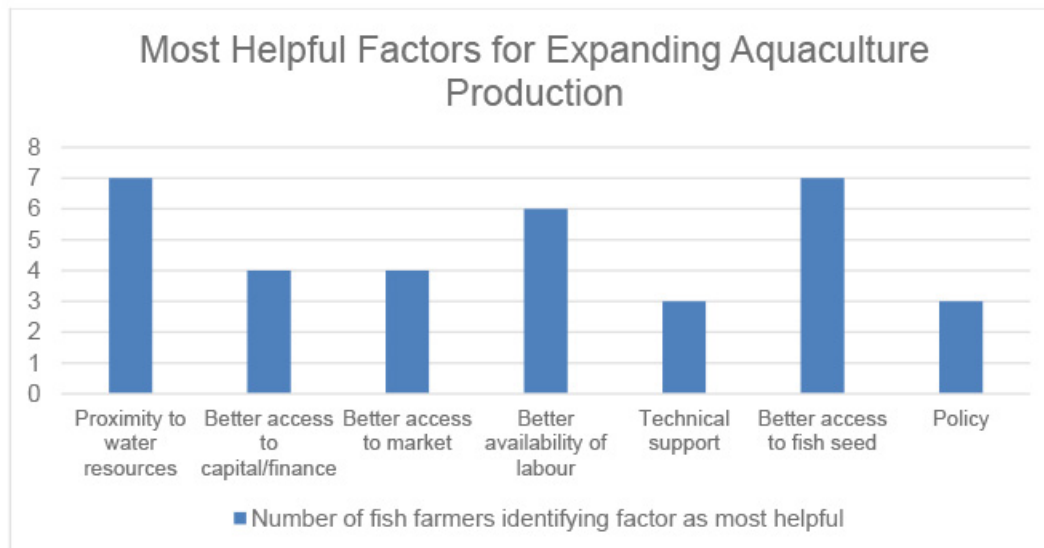


Figure 5

Sub-question 1: Changes in Supply of Farmed Fish

According to the DoF as well as a vendor, the availability of wild-caught fish in the township has been decreasing over the past few years. One trader explains that this has been accompanied by an increase in the supply of locally farmed fish, as there has been an increase in the number of fish farms. Another trader estimates that the amount of Yangon-farmed fish has increased by 50% in the past three years. As such, it can be concluded that there has been an increase in the proportional supply of farmed fish in the township.

The household data showed that the aquaculture production of individual fish farmers in the township has mostly remained the same, but more producers reported increases than decreases for aquaculture in general, rohu and mrigal (see Table 2).

According to the DoF, the increase in the proportion of farmed fish in Kalay has led to increased consumption of farmed fish in recent years, but there is still significant unmet demand for fish. The DoF explains that a large share of sales in local markets is made up of Yangon-farmed fish, due to their abundant supply year-round combined with insufficient local production. It is worth noting that individual sales volumes have mostly decreased due to an increased number of vendors at local markets.

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Table 2

Change in production compared to three years ago (% of responses)	Aquaculture	Fish						
		Rohu	Catla	Mrigal	Common carp	Grass carp	Big head carp	Tilapia
Increased	41%	38%	0%	29%	20%	14%	0%	0%
Decreased	12%	19%	0%	14%	20%	14%	0%	0%
Remained the same	47%	44%	100%	57%	60%	71%	100% (single producer)	100% (single producer)

The household data revealed that the majority of households believe their consumption of both common aquaculture and common wild-caught species has not changed in the past three years (see Figures 6 and 7). However, in line with what was suggested by the DoF, nearly four times as many households reported decreased compared to increased consumption of common wild-caught species, while slightly more households reported increased compared to decreased consumption of common aquaculture species.

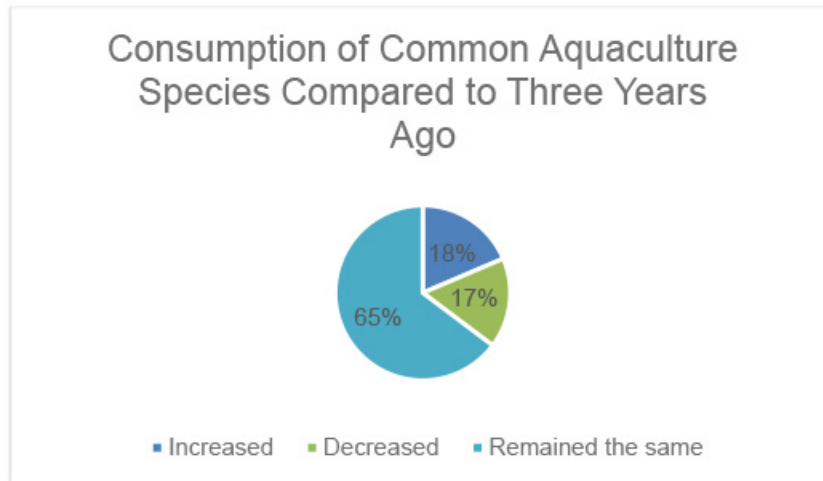


Figure 6

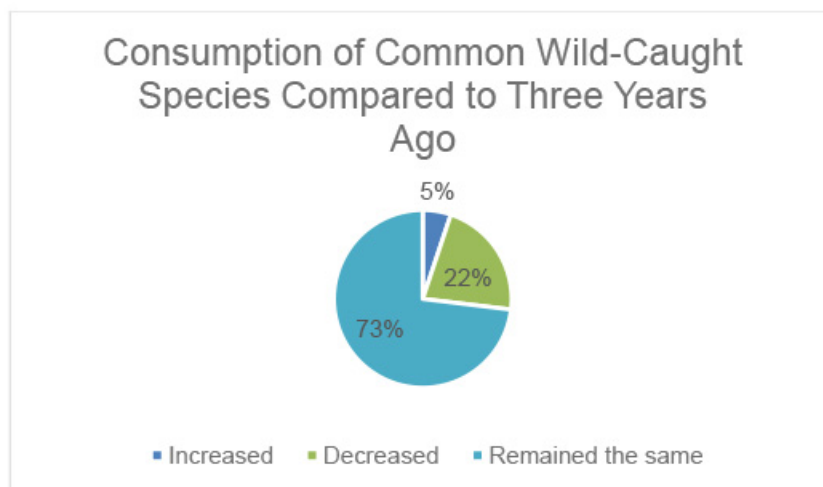


Figure 7

Sub-question 2: Changes in Market Price of Fish

When asked whether the market price of different fish species has increased, decreased or stayed the same over the past three years, 59.4% of responses in the market survey indicated an increase (for fish from all sources), while none indicated a decrease.

It is surprising that the price of both locally farmed and Yangon-farmed fish has increased despite the increased supply. The implication is that costs may be increasing, although further investigation is needed to determine the source of these cost increases, and general inflation may be a factor. All traders interviewed agreed that the quality of the roads connecting Yangon to Kalay has improved substantially in the past decade, but transport costs may have still risen due to other factors (e.g. toll charges, petrol prices).

Sub-question 3: Logistical Supply Challenges

The household survey found that some Kalay fish farmers faced difficulty with transporting their fish to markets. As can be seen in Figures 8 and 9, two out of 17 fish farmers indicated “quite difficult” or “very difficult” in response to questions assessing challenges posed in the transportation of fish to the point of sale. Indeed, some Kalay traders noted in interviews that they risk injury when collecting fish from fish farms during the wet season. No one reported experiencing difficulties with distance to markets or ice for keeping fish cool before sale in the household survey.



Figure 8

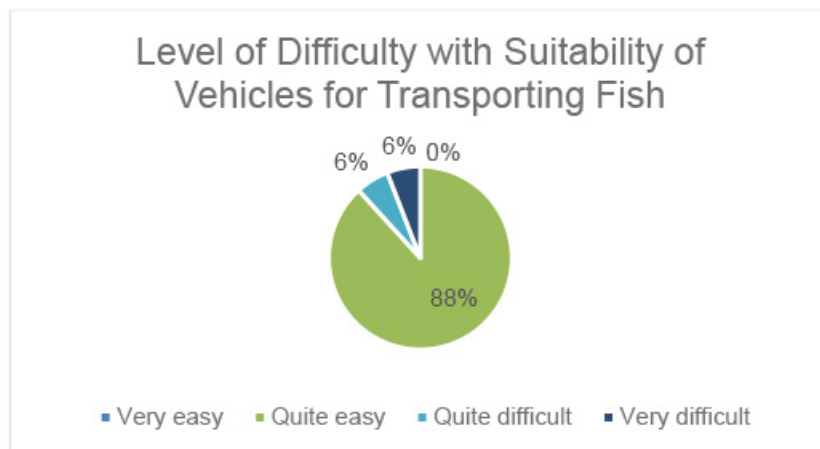


Figure 9

Kalay traders were found to be regular suppliers of fish to Chin vendors, who typically come every two days. It was mentioned by one trader that during the wet season Chin vendors are often unable to come to Kalay, leading to reduced

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sales volumes and losses for Kalay traders. Yangon-farmed fish were noted as being severely affected by this, as these are favoured by Chin consumers. It was reported that the total sales volume of Yangon-farmed fish can collapse by as much as 50% in the wet season. Chin consumers were described as having a distinct preference for barbequed fish. As such, the wet season often sees processors making losses as their barbequed fish takes longer to reach markets in Chin State and are thus less fresh, forcing them to sell the fish at a lower price.

Sub-question 4: Comparisons Between Supply Chains

According to a hatchery owner, about one third of fish consumed in the township is locally farmed. Although only 3.85% of households in the household survey reported a preference for Yangon-farmed fish over locally sourced fish, the hatchery owner explained that Yangon-farmed fish is more competitive than their locally farmed counterparts in Kalay markets, as they tend to be cheaper and larger in size. However, the market survey found that Yangon-farmed fish is more expensive in the case of multiple species. The DoF noted it is likely the case that Yangon-farmed fish occupies a larger market share than locally farmed fish because of better availability.

Sub-question 5: Prevalence of Fish Processing

The household survey found that consumption of processed fish in Kalay Township was the highest among studied townships (6.27 meals containing processed fish products per week), but this may have been due to oversampling of Chin households. It was noted by the DoF and processors that processed fish products in the township consist mainly of barbequed fish, consumed largely by Chin households in hilly areas. According to one processor, there are only around five processors producing barbequed fish. The household survey found only one household, out of 17 aquaculture producers, that did fish processing. The DoF indicated that it is typically leftover fish that is processed.

The barbequed fish that were observed were typically locally farmed rohu, grass carp or silver barb, with rohu being the most common. One processor detailed how his family (around three people at a time) spend 20 days each month barbequing fish. He mentions that outside labour is hired only when the demand is very high, and that traders come from Chin State once a week to purchase the fish, which are transported by bus. The Kalay DoF noted that barbequed fish is also exported to India via the border town of Tamu.



Figure 10: Barbequing of Fish in Kalay

Both processors that were interviewed reported an increase in the consumption of processed fish products in the township in the past three years, mainly by Chin households in the hilly areas. One processor explained that she now sells barbequed fish equivalent to around 1,000 viss of fresh fish in a week, whereas a few years ago she would not be able to sell this much in even a month. The processors noted that they have not always been able to meet the demand. In part, this was due to shortages of sawdust needed for barbequing, as a result of reduced timber production in Kalay.

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Another constraint to expanding production is that barbequing fish generates severe heat, which processors said they were unable to bear for extended periods.

6. Additional Findings

In this section, we report additional findings from the field mission to Kalay. We include estimates of price mark-ups as well as some profit margins along the value chain.

Mark-ups and Margins

Through assessing price and cost data from fish farmers in the household survey, we can roughly estimate² the average profits that producers received for different species. Table 3 summarises this data for Kalay. The most profitable fish species were estimated to be common carp followed by mrigal, while tilapia was found to be the least profitable.

Table 3

Fish species	Average selling price (MMK per viss)	Average profit (MMK per viss)
Rohu	2,885	1,828
Mrigal	4,800	2,477
Catla	3,833	2,375
Common carp	4,346	3,250
Grass carp	3,792	2,804
Big head carp	3,500	2,300
Tilapia	3,000	1,529

As can be seen in Table 4, grass carp had the largest mark-up among traders, followed by mrigal. In line with the producer findings, tilapia was found to receive the smallest mark-up, recorded at MMK 333. Transport costs did not vary greatly for traders. Ice costs did vary considerably, however, ranging from MMK 2,000 to MMK 20,000.

Table 4

Fish species	Average markup (MMK per viss)	Transport cost (MMK per day)	Ice cost (MMK per day)
Rohu	460	1,000-3,000	2,000-20,000
Mrigal	700		
Catla	450		
Common carp	560		
Grass carp	900		
Tilapia	333		

Additional costs for traders included taxes and the cost of renting selling space. Tax contributions amounted to MMK 10,000 per year in order to be able to sell meat. Municipality fees in the markets surveyed ranged from MMK 300 to MMK 800 per day. Some traders rented spaces in houses at MMK 10,000 to MMK 40,000. Cleaning fees of MMK 100 per day and fees of MMK 6,000 per month for rental of fish display shelves were also mentioned. No labour costs were recorded by traders interviewed in Kalay. One-off costs noted by traders included the cost of weighing scales, tricycles,

² Average profit was calculated by dividing average total fish cost by average total fish production, giving average unit cost. Average unit cost was then subtracted from selling price in order to arrive at a crude estimate of average profit.

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motorcycle carry shelves, plastic buckets and plastic sheets. One trader even mentioned the cost of constructing a fish shop (MMK 300,000).

Vendors reported an average mark-up of MMK 1,290 across fish species, ranging from MMK 833 for mrigal to MMK 1,700 for pearl danio, as depicted in Table 5. Transport costs varied from MMK 1,000 to MMK 8,000, while ice costs only ranged from MMK 1,000 to MMK 2,000.

Table 5

Fish species	Average markup (MMK per viss)	Transport cost (MMK per day)	Ice cost (MMK per day)
Rohu	1,025	1,000-8,000	1,000-2,000
Mrigal	833		
Catla	1,500		
Common carp	1,240		
Grass carp	1,633		
Tilapia	1,200		
Mola carplet	1,267		
Spotted barb	1,000		
Gymnostomus horai	1,500		
Pearl danio	1,700		

Vendors incurred additional costs similar to those reported by traders. Reported taxes varied from MMK 10,000 to MMK 20,000 per year. Municipality fees ranged from MMK 200 to MMK 300 per day. Selling place fees added MMK 500 to daily costs. Cleaning fees of MMK 100 per day were also reported.

Table 6

Fish species	Average markup (MMK per viss)	Transport cost (MMK per viss)
Rohu	11,300	120
Grass carp	10,500	
Silver barb	10,800	

Table 6 shows that processors in Kalay that did fish barbequing enjoyed substantial mark-ups, averaging MMK 10,867 per viss across species. Transport costs amounted to just 1.1% of the average mark-up, at MMK 120 per viss. Fuel costs ranged from MMK 800 to MMK 4,000 per week, while the cost of firewood varied from MMK 11,000 to MMK 20,000 per week.

Hatcheries and Nurseries

It was reported that there are no DoF hatcheries or nurseries in Kalay Township. The field mission found three main private hatcheries in the township. Of these, two were located in the village of Nat Kyi Kone and one was in Bone Taw. There were a couple more hatcheries in Nat Kyi Kone but these were not significant suppliers. In addition to selling fish fry and fingerlings to fish farmers, Kalay hatcheries tended to also sell fish to traders.

According to those interviewed, Kalay hatcheries supply fish seed to fish farmers in Kalay Township as well as customers from further afield, including from other townships in Sagaing Region, Magway Region and Chin State. The hatchery owners interviewed were not able to specify the number of fish farmers who have purchased fish seed from them in the past year, as they did not maintain records, but one suggested that it was in the hundreds. They were able to say that the number has increased in the past several years.

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One hatchery owner explained how they have been unable to keep pace with the growing demand for fish seed. In part, the increased demand was due to Kalay fish farmers harvesting their fish two or three times a year instead of just once, as they did previously. The DoF pointed out that Mandalay hatcheries have surplus fish seed, which could fill shortages in fish seed in Kalay Township. According to hatchery owners, 20% of fish seed in the township is already supplied from Mandalay via local hatcheries.

The main fish species in Kalay hatcheries, in order of sales, were: (1) rohu; (2) common carp; (3) grass carp; and (4) silver barb. One hatchery owner explained that rohu is favoured by fish farmers because it is a fast-growing and profitable species. Tilapia has become noticeably more popular recently. Broodstock was obtained from the DoF and local fish farms. Some hybridisation was attempted with fish imported from other parts of Myanmar. It was mentioned that mono sex fish seed is not available in the township.

Challenges Faced by Kalay Hatcheries

- Although Kalay hatchery owners participated in daylong trainings conducted by the DoF in Shwebo and elsewhere in Sagaing Region, they said they lacked knowledge of modern fish breeding techniques, including hybridisation. It was also not uncommon for fish to be mated with parent fish.
- They were not able to distinguish between or treat fish diseases.
- Fish farmers in the area were noted to be poor, so fish seed was often sold under the condition that payment is made after harvest, often resulting in financial problems for hatcheries in the interim.
- Another problem was water shortages in the dry season, potentially being worsened by climate change, as per one hatchery owner. Kalay hatcheries did not have reservoir tanks and relied on underground water sources instead. However, they frequently faced electricity outages, leaving them unable to pump water.
- They were often unable to afford fish feed or hatchery equipment. The use of low quality feeds such as chicken manure resulted in reduced growth.
- They lacked capital to invest in new ponds. As a result, they were struggling with overcrowding of ponds and poor growth of fish.



Figure 11: A Hatchery in Bone Taw Village

Other Observations

- Processors were found to be credit constrained. Despite this, they often paid fish farmers, who they mentioned as usually being poor, in advance for fish that had not yet been harvested. This would financially burden their business.
- 11 out of 13 vendors interviewed said they bore the cost of transporting their fish to the market.

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- 9 out of 13 vendors used ice to keep their fish cool at market stalls.
- No vendors, traders or processors reported using chemical preservatives.
- According to the DoF, there are no livestock feed or specialised fish farming shops in Kalay Township. One hatchery owner explained that pelleted feed is not available in Kalay Township and must be ordered in from Mandalay. However, this is often too costly as there is not enough demand to buy in bulk.
- Climate change has contributed to increased flooding. Floods lead to copious amounts of soil being deposited in Kalay fish farms and hatcheries. As the owners usually could not afford to hire machines to remove this soil, they ended up with severe losses when there were floods.
- The DoF noted that there is strong potential for local fish farming in Kalay Township. The DoF can assist with knowledge of fish breeding, fish seed is affordable and the water quality is good.
- No concerns were voiced about gender-specific challenges faced by traders or processors.

7. Recommendations

In this section, we present recommendations coming out of the value chain study in Kalay. These are aimed at different levels of the fish value chain in Kalay.

Input Supply

Recommendation: Provide Regular Water Supply

It was noted that a major challenge for hatcheries in Kalay Township has been a lack of water during the dry season. This problem was also cited by fish farmers. Providing Kalay hatcheries and fish farms with backup generators will help them utilise existing tube wells without disruption from electricity outages. INLAND MYSAP should also invest in constructing new tube wells for Kalay hatcheries and fish farms.

Recommendation: Establish Mono Sex Tilapia Hatchery

The establishment of a mono sex tilapia hatchery in Kalay that supplies all-male tilapia seed can help farmers achieve better growth. Fish farmers in Kalay currently purchase mixed-sex male and female tilapia seed. This leads to unintended breeding and, as a result, overcrowded ponds. The mono sex technique involves delivering feed containing sex hormones to tilapia seed before sex is determined.

Recommendation: Provide Training in Modern Hatchery Techniques

Hatchery owners in Kalay Township would benefit from receiving training in modern hybridisation techniques and tackling fish disease. These should comprise of practical demonstrations and lectures, together with dissemination of pamphlets and manuals. Equipment needed to implement these techniques should be provided to hatchery owners. The DoF noted that they currently lack equipment themselves.

Production

Recommendation: Establish Credit Support Scheme for Fish Farming Sector

Fish farmers lack access to credit, which reduces their ability to construct new ponds and purchase pelleted feed, resulting in diminished growth. One strategy could be to guide and support fish farmers in the process of land registration, so that they are then able to obtain bank loans. This recommendation is also applicable to Kalay hatcheries and processors.

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Recommendation: Conduct Practical Demonstrations to Fish Farmers

The goal of these should be to update the knowledge and fish farming practices of local aquaculture producers. The DoF explained that Kalay fish farmers are not aware of modern technologies and methods, as well as how to maximise profits.

Recommendation: Rent Out Soil Digging Machines at Low Cost

The local DoF should receive support from INLAND MYSAP in renting out soil digging machines at low cost to hatcheries and fish farmers in the township. These are needed after floods.

Recommendation: Promote Backyard Fish Farms

Currently, fish farms smaller than 25 by 50 feet do not need to obtain permission or require a licence to operate and thus are not constrained by the land use policy in Myanmar. Small backyard fish farms could thus be promoted by the project. These fish farmers should receive training from INLAND MYSAP as well as support with access to inputs (seed, feed, etc.).

Recommendation: Promote Farming of Giant Freshwater Prawn

Giant freshwater prawn (*Macrobrachium rosenbergii*) should be promoted among local fish farmers. Giant freshwater prawn has strong commercial potential overseas, which could allow local fish farmers to tap lucrative export markets. To begin with, seed could be sourced from Yangon. Eventually, once a market is established, local hatcheries could begin producing giant freshwater prawn seed as well. There are, however, constraints to be overcome in giant freshwater prawn hatcheries in Myanmar, which have biosecurity issues and high losses due to disease.

Processing

Recommendation: Encourage Production of Fish Snacks Using Locally Farmed Fish

The production of processed snacks made with locally farmed fish could boost both fish consumption as well as create demand for local fish farmers to expand their business. In particular, this could serve as a strategy to encourage non-Chin households to consume processed fish products. Local processors would need to be trained in the methods of production.

8. Conclusions

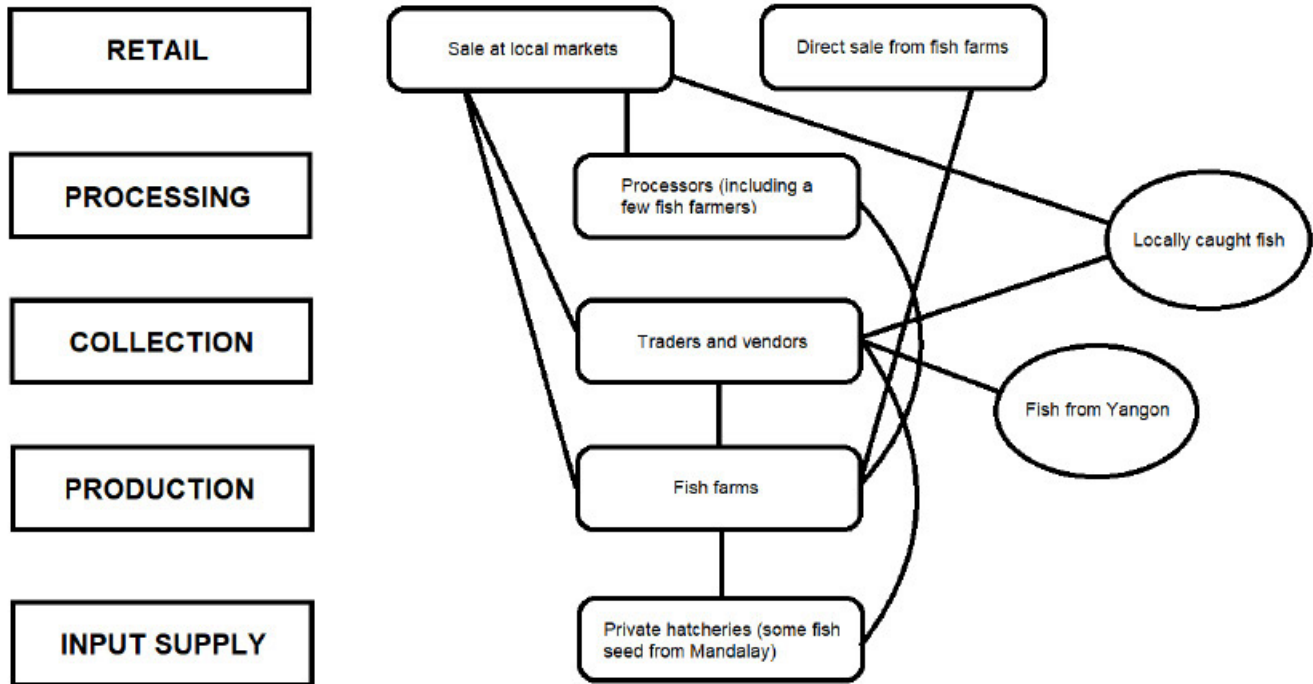
Fish farming in Kalay is a growing sector, but needs to expand further in order to offset a decreased supply of wild-caught fish in the township. DoF records indicated that there were around 300 registered fish farmers in the township. The main farmed species that were identified in the market survey were: (1) rohu; (2) some catla; (3) some mrigal; (4) common carp; (5) grass carp; and (6) a little tilapia. Silver barb was also sold, and big head carp was found in the household survey. In terms of small indigenous species, the market survey spotted some vendors selling mola carplet, spotted barb, *Gymnostomus horai* and pearl danio. These were typically locally caught, but mola carplet sourced from Yangon was also sold. It was observed that fish processing in the township typically involves barbecuing rohu, grass carp and silver barb for Chin customers from the hilly areas.

Prominent constraints to the sector include a lack of water in the dry season, frequent flooding, inadequate production of fish seed, deficits in technical knowledge and poor credit access. The lack of credit, in particular, has placed significant restrictions on the fish farming sector in Kalay, diminishing the ability of fish farmers and hatchery owners to make or

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receive payments on time, rent soil digging machines and purchase pelleted feed from Mandalay. A lack of finance was also a problem for processors interviewed. Recommendations relate to providing hatchery owners, fish farmers and processors with technical support and advice, equipment and better access to credit.

Annex A: Fish Value Chain Map for Kalay



Annex B: Photos from Field Mission



Figure 12: Cooling of Barbequed Fish



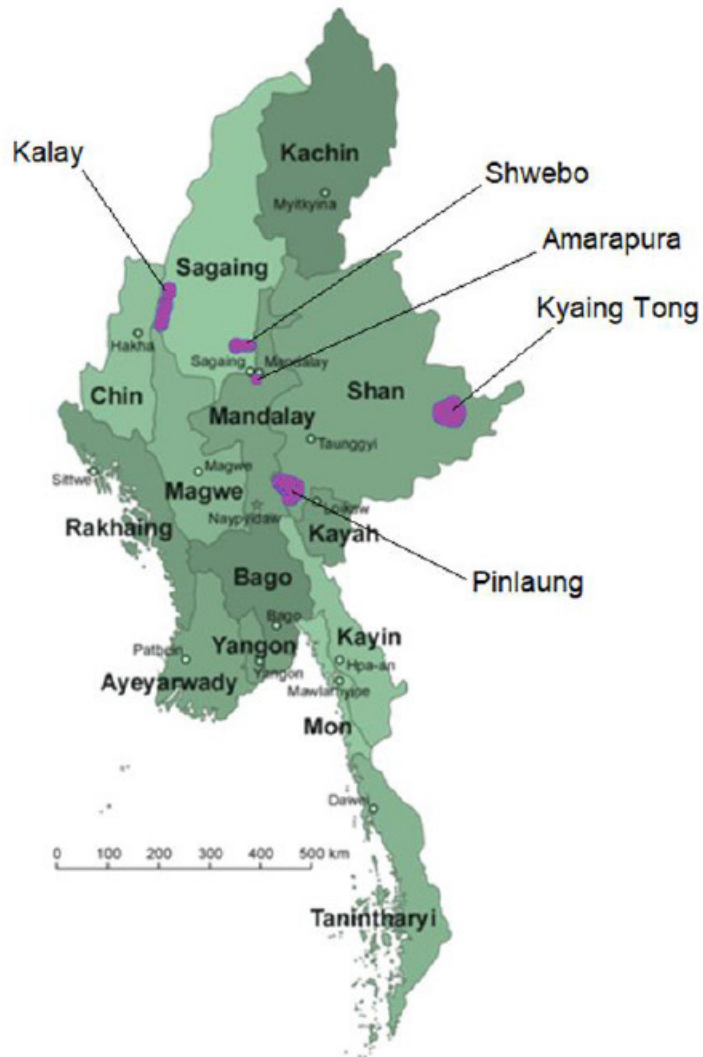
Figure 13: Storage of Barbequed Fish



Figure 14: A Hatchery in Nat Kyi Kone Village

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Annex C: Map of Project Areas



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Annex D: Value Chain Questionnaires

MARKET QUESTIONNAIRE

Section A: Basic Information

Date of interview: __/__/____

Name of interviewer: _____

Name of respondent: _____

Gender of respondent: _____

Phone number of respondent: _____

Respondent identification number: __-__

Location of market: _____

Township of market (select one): Kalay / Amarapura / Kyaing Tong / Pin Laung / Shwebo

Frequency of market (select one): daily / weekly / every two weeks / monthly / other (specify: _____)

Section B: Sales

Product	1. On a typical day in the last month, how much [product] did you sell?	2. What was the unit used for the previous question?	3. Has this amount increased, decreased or remained the same compared to three years ago?	4. To what extent does this amount vary depending on the season?
Wild-caught fish		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all
Aquaculture products CHECK AMOUNT AGAINST SUM OF AMOUNTS BELOW		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all
Farmed rohu		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all
Farmed catla		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all

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Product	1. On a typical day in the last month, how much [product] did you sell?	2. What was the unit used for the previous question?	3. Has this amount increased, decreased or remained the same compared to three years ago?	4. To what extent does this amount vary depending on the season?
Farmed mrigal		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all
Farmed common carp		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all
Farmed silver carp		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all
Farmed big head carp		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all

Product	1. On a typical day in the last month, how much [product] did you sell?	2. What was the unit used for the previous question?	3. Has this amount increased, decreased or remained the same compared to three years ago?	4. To what extent does this amount vary depending on the season?
Farmed grass carp		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all
Farmed tilapia		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all
Farmed small indigenous species		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all

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5. Has the amount of farmed fish that you sell increased, decreased or remained the same compared with wild-caught fish in the past three years? Select one.

- a) Increased
- b) Decreased
- c) Remained the same

6. What do you do with the fish that you are unable to sell at the end of the day? Select all that apply.

- a) Try to sell it another day
- b) Consume it
- c) Throw it away
- d) Other (specify: _____)

Section C: Price

Product	7. On a typical day in the last month, what was the average price, in MMK, at which you sold your [product] (per preferred unit)?	8. What was your "preferred unit" in the previous question?	9. Has this amount increased, decreased or remained the same compared to three years ago?	10. To what extent does this amount vary depending on the season?
Rohu		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all
Catla		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all
Mrigal		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all

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Product	7. On a typical day in the last month, what was the average price, in MMK, at which you sold your [product] (per preferred unit)?	8. What was your "preferred unit" in the previous question?	9. Has this amount increased, decreased or remained the same compared to three years ago?	10. To what extent does this amount vary depending on the season?
Common carp		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all
Silver carp		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all
Big head carp		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all
Grass carp		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all

Product	7. On a typical day in the last month, what was the average price, in MMK, at which you sold your [product] (per preferred unit)?	8. What was your "preferred unit" in the previous question?	9. Has this amount increased, decreased or remained the same compared to three years ago?	10. To what extent does this amount vary depending on the season?
Tilapia		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all
Snakeheads		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all
Small indigenous species		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all

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Section D: Supply

11. In the past month, from where did you obtain your fish? Select all that apply.

- a) Self-farmed
- b) Self-caught
- c) Trader
- d) Fish farmer
- e) Fisher
- f) Other (specify: _____)

12. Has the supply of farmed fish in your area increased, decreased or remained the same compared with wild-caught fish in the past three years? Select one.

- a) Increased
- b) Decreased
- c) Remained the same

Section E: Costs

Product	13. If you purchase fish to sell, what was the average price, in MMK, that you paid on a typical day in the last month for [product] (per preferred unit) that you intended to sell?	14. What was your "preferred unit" in the previous question?	15. Has this amount increased, decreased or remained the same compared to three years ago?	16. To what extent does this amount vary depending on the season?
Rohu		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all
Catla		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all
Mrigal		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all

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Product	13. If you purchase fish to sell, what was the average price, in MMK, that you paid on a typical day in the last month for [product] (per preferred unit) that you intended to sell?	14. What was your "preferred unit" in the previous question?	15. Has this amount increased, decreased or remained the same compared to three years ago?	16. To what extent does this amount vary depending on the season?
Common carp		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all
Silver carp		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all
Big head carp		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all

Product	13. If you purchase fish to sell, what was the average price, in MMK, that you paid on a typical day in the last month for [product] (per preferred unit) that you intended to sell?	14. What was your "preferred unit" in the previous question?	15. Has this amount increased, decreased or remained the same compared to three years ago?	16. To what extent does this amount vary depending on the season?
Grass carp		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all
Tilapia		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all
Small indigenous species		a) Kg b) Viss c) Single piece d) Bunch e) Can f) Other (specify: _____)		a) Very much b) Quite a lot c) A little bit d) Not at all

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17. Do you transport your fish to the market? Select one.

- a) Yes
- b) No

18. If you answered 'Yes' to the previous question, how much do you spend, in MMK, on transporting your fish to the market (per preferred timeframe)?

Answer: _____

19. What was your "preferred timeframe" in the previous question? Select one.

- a) Day
- b) Week
- c) Month
- d) Other (specify: _____)

20. How much ice (in preferred units) do you use to keep your fish cold at the market (per preferred timeframe)?

Answer: _____

21. What was your "preferred unit" in the previous question?

Answer: _____

22. What was your "preferred timeframe" in **20**? Select one.

- a) Day
- b) Week
- c) Month

23. How much do you spend, in MMK, on ice supplies to keep your fish cold at the market (per preferred timeframe)?

Answer: _____

24. What was your "preferred timeframe" in the previous question? Select one.

- a) Day
- b) Week
- c) Month
- d) Other (specify: _____)

25. How much do you spend, in MMK, on chemical preservatives to use on the fish that you sell (per preferred timeframe)?

Answer: _____

26. What was your "preferred timeframe" in the previous question? Select one.

- a) Day
- b) Week
- c) Month
- d) Other (specify: _____)

27. How much do you spend, in MMK, on labour in order to sell fish (per preferred timeframe)?

Answer: _____

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28. What was your "preferred timeframe" in the previous question? Select one.

- a) Day
- b) Week
- c) Month
- d) Other (specify: _____)

29. Can you estimate, in MMK, any other short or long-term costs (e.g. market fees) that you incur in order to sell your fish at the market (per preferred timeframe)?

Answer: _____

30. What was your "preferred timeframe" in the previous question? Select one.

- a) Day
- b) Week
- c) Month
- d) Year
- e) Other (specify: _____)

QUESTIONNAIRE FOR KII WITH PROCESSOR (MALE)

Date of interview: __/__/____

Name of interviewer: _____

Name of respondent: _____

Position of respondent: _____

Gender of respondent: _____

Phone number of respondent: _____

1. How prevalent is processing of fish in the area?
2.
 - i) What kind of processing do you do (e.g. fish balls, dried fish)?
 - ii) What species of fish does this use?
 - iii) What is most common in the area?
3.
 - i) From where do you source your fish for processing (e.g. self-caught, purchased from fish farmer)?
 - ii) What is usually the case in the area?
4.
 - i) To whom do you sell your processed fish products – to traders, vendors or consumers?
 - ii) What is usually the case in the area?
5.
 - i) How prevalent is consumption of processed fish products compared with unprocessed (fresh) fish in the area?
 - ii) Has it increased, decreased or stayed the same compared with three years ago?
6.
 - i) How profitable are processed fish products compared with unprocessed (fresh) fish?
 - ii) Can you give us a sense of your typical profit margin on different types of processed fish products?
7. How much do you spend on chemicals to preserve fish during processing?
8.
 - i) How can MYSAP Inland support processors in your area in increasing the sale of processed fish products?
 - ii) How about in terms of increasing the consumption of processed fish products?
9. Are there particular challenges faced by male processors that female processors do not face?

QUESTIONNAIRE FOR KII WITH PROCESSOR (FEMALE)

Date of interview: __/__/__

Name of interviewer: _____

Name of respondent: _____

Position of respondent: _____

Gender of respondent: _____

Phone number of respondent: _____

1. How prevalent is processing of fish in the area?

2.

iv) What kind of processing do you do (e.g. fish balls, dried fish)?

v) What species of fish does this use?

vi) What is most common in the area?

3.

iii) From where do you source your fish for processing (e.g. self-caught, purchased from fish farmer)?

iv) What is usually the case in the area?

4.

iii) To whom do you sell your processed fish products – to traders, vendors or consumers?

iv) What is usually the case in the area?

5.

iii) How prevalent is consumption of processed fish products compared with unprocessed (fresh) fish in the area?

iv) Has it increased, decreased or stayed the same compared with three years ago?

6.

iii) How profitable are processed fish products compared with unprocessed (fresh) fish?

iv) Can you give us a sense of your typical profit margin on different types of processed fish products?

7. How much do you spend on chemicals to preserve fish during processing?

8.

iii) How can MYSAP Inland support processors in your area in increasing the sale of processed fish products?

iv) How about in terms of increasing the consumption of processed fish products?

9. Are there particular challenges faced by female processors that male processors do not face?

QUESTIONNAIRE FOR KII WITH TRADER (MALE)

Date of interview: __/__/____

Name of interviewer: _____

If not already identified, ask to identify [minor market 1] and [minor market 2].

1.
 - i) Are traders common in your area, or do most fish farmers and fishers sell their fish at the markets themselves?
 - ii) How common is it in your area for traders to also be vendors?
2.
 - i) How common is farmed fish compared with wild-caught fish in your area?
 - ii) Can you give us an estimate of the total number of aquaculture producers in the township?
3.
 - i) Are there any wholesalers in your area that trade in Yangon-farmed fish and fish products? What species of fish and kinds of fish products (e.g. fish balls) are these?
 - ii) How common are these compared with locally farmed versions of the same?
4.
 - i) Has there been an increase in the supply of fish in your area in the past three years?
 - ii) Has there been an increase in the supply of farmed fish compared with wild-caught fish?
 - iii) How have these trends influenced trade and consumption patterns in your area?
5.
 - i) To what extent does the supply of farmed fish in your area vary depending on the season?
 - ii) To what extent does the supply of wild-caught fish in your area vary depending on the season?
6.
 - i) What is the general price at which you buy (1) rohu, (2) mrigal, (3) catla, (4) common carp, (5) big head carp, (6) silver carp, (7) grass carp, (8) tilapia and (9) small indigenous species from fish farmers/fishers?
 - ii) Have these prices increased, decreased or remained stable over the past three years?
 - iii) Do these prices vary depending on the season?
7.
 - i) What is the general price at which you sell (1) rohu, (2) mrigal, (3) catla, (4) common carp, (5) big head carp, (6) silver carp, (7) grass carp, (8) tilapia and (9) small indigenous species to vendors (if you sell to vendors)?
 - ii) Have these prices increased, decreased or remained stable over the past three years?
 - iii) Do these prices vary depending on the season?
8.
 - i) How prevalent is the supply of processed fish products in your area? What kind of products (e.g. fish balls, dried fish) are these?
 - ii) Can you give us a sense of the typical profit margin on different types of processed fish products?
9.
 - i) How much fish do you transport on a "good" day? How much on a "bad" day?

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- ii) How much does this cost? Does the cost vary depending on the season?
- iii) What are the individual costs involved in transporting aquatic products?

10.

- i) Do you use ice to cool your fish? If so, how much do you use on a typical day?
- ii) How much does this cost?

11. How much do you spend on chemical preservatives to use on fish?

12. Can you give us an indication of your total labour cost per month?

13. Can you estimate the main investment costs in establishing yourself as a fish trader? What are they?

14.

- i) Do traders in your area face important logistical challenges?
- ii) What are they and how do you address these?
- iii) Are there particular challenges faced by male traders that female traders do not face?

QUESTIONNAIRE FOR KII WITH TRADER (FEMALE)

Date of interview: __/__/____

Name of interviewer: _____

If not already identified, ask to identify [minor market 1] and [minor market 2].

1.
 - iii) Are traders common in your area, or do most fish farmers and fishers sell their fish at the markets themselves?
 - iv) How common is it in your area for traders to also be vendors?

2.
 - iii) How common is farmed fish compared with wild-caught fish in your area?
 - iv) Can you give us an estimate of the total number of aquaculture producers in the township?

3.
 - iii) Are there any wholesalers in your area that trade in Yangon-farmed fish and fish products? What species of fish and kinds of fish products (e.g. fish balls) are these?
 - iv) How common are these compared with locally farmed versions of the same?

4.
 - iv) Has there been an increase in the supply of fish in your area in the past three years?
 - v) Has there been an increase in the supply of farmed fish compared with wild-caught fish?
 - vi) How have these trends influenced trade and consumption patterns in your area?

5.
 - iii) To what extent does the supply of farmed fish in your area vary depending on the season?
 - iv) To what extent does the supply of wild-caught fish in your area vary depending on the season?

6.
 - iv) What is the general price at which you buy (1) rohu, (2) mrigal, (3) catla, (4) common carp, (5) big head carp, (6) silver carp, (7) grass carp, (8) tilapia and (9) small indigenous species from fish farmers/fishers?
 - v) Have these prices increased, decreased or remained stable over the past three years?
 - vi) Do these prices vary depending on the season?

7.
 - iv) What is the general price at which you sell (1) rohu, (2) mrigal, (3) catla, (4) common carp, (5) big head carp, (6) silver carp, (7) grass carp, (8) tilapia and (9) small indigenous species to vendors (if you sell to vendors)?
 - v) Have these prices increased, decreased or remained stable over the past three years?
 - vi) Do these prices vary depending on the season?

8.
 - iii) How prevalent is the supply of processed fish products in your area? What kind of products (e.g. fish balls, dried fish) are these?
 - iv) Can you give us a sense of the typical profit margin on different types of processed fish products?

9.
 - iv) How much fish do you transport on a "good" day? How much on a "bad" day?

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- v) How much does this cost? Does the cost vary depending on the season?
- vi) What are the individual costs involved in transporting aquatic products?

10.

- iii) Do you use ice to cool your fish? If so, how much do you use on a typical day?
- iv) How much does this cost?

11. How much do you spend on chemical preservatives to use on fish?

12. Can you give us an indication of your total labour cost per month?

13. Can you estimate the main investment costs in establishing yourself as a fish trader? What are they?

14.

- iv) Do traders in your area face important logistical challenges?
- v) What are they and how do you address these?
- vi) Are there particular challenges faced by female traders that male traders do not face?

QUESTIONNAIRE FOR KII WITH HATCHERY

Date of interview: __/__/____

Name of interviewer: _____

Name of respondent: _____

Position of respondent: _____

Gender of respondent: _____

Phone number of respondent: _____

Ask to share data on main costs of breeding/seed production (including different kinds of costs, e.g. feed, water, energy) as well as data on sales price and volume. Ask for separate price and volume data for carp (rohu, mrigal, catla, common carp, big head carp, silver carp, grass carp), tilapia and small indigenous species.

1.
 - i) What are the top three fish species that you breed? (Number 1, 2, 3.)
 - ii) Do you breed/sell seed of carp (rohu, mrigal, catla, common carp, big head carp, silver carp, grass carp), tilapia and/or any small indigenous (local) fish species?
 - iii) What kind of fish seed do you sell (swim-up fry, fry, fingerlings)?
2.
 - i) To how many people did you sell fish seed in this township in the last year?
 - ii) Do you supply farmers outside the township? If yes, where?
3.
 - i) Approximately how many fry did you sell in the last year?
 - ii) What are your top three species in terms of fry sales? (Number 1, 2, 3.)
4.
 - i) Approximately how many fingerlings did you sell in the last year?
 - ii) What are your top three species in terms of fingerling sales? (Number 1, 2, 3.)
5.
 - i) Are there many other hatcheries in the township supplying fish seed?
 - ii) What percentage of the township demand for seed do you think is supplied from hatcheries within the township? What percentage do you think is supplied from outside?
6.
 - i) In the last three years, have you noticed any increase in the demand for fish seed by farmers for stocking?
 - ii) Are there any species that are becoming more popular in your township?
7.
 - i) How often do you replace your broodstock (parent fish)? Differentiate between species.
 - ii) Where do you get replacement broodstock from (e.g. another farm, DoF)? Differentiate between species.
 - iii) What is the country of origin of your broodstock? Differentiate between species.
8. What is your main source of technical advice?

Value Chain Report - Kalay Township

9.
 - i) Have you heard of anyone producing/selling genetically improved fish seed of any kind? How about specifically carp (rohu, mrigal, catla, common carp, big head carp, silver carp, grass carp), tilapia and/or small indigenous species?
 - ii) If yes, is demand strong?
10. What do you think are the main constraints for hatcheries, nurseries and grow-out farms in your township?

QUESTIONNAIRE FOR KII WITH NURSERY

Date of interview: __/__/__

Name of interviewer: _____

Name of respondent: _____

Position of respondent: _____

Gender of respondent: _____

Phone number of respondent: _____

Ask to share data on main costs of nursing (including different kinds of costs, e.g. seed and feed, water, energy) as well as data on sales price and volume. Ask for separate price and volume data for carp (rohu, mrigal, catla, common carp, big head carp, silver carp, grass carp), tilapia and small indigenous species.

1.
 - iv) What are the top three fish species that you nurse? (Number 1, 2, 3.)
 - v) Do you nurse/sell seed of carp (rohu, mrigal, catla, common carp, big head carp, silver carp, grass carp), tilapia and/or any small indigenous (local) fish species?
 - vi) What kind of fish seed do you sell (swim-up fry, fry, fingerlings)?
2.
 - iii) To how many people did you sell fish seed in this township in the last year?
 - iv) Do you supply farmers outside the township? If yes, where?
3.
 - iii) Approximately how many fry did you sell in the last year?
 - iv) What are your top three species in terms of fry sales? (Number 1, 2, 3.)
4.
 - iii) Approximately how many fingerlings did you sell in the last year?
 - iv) What are your top three species in terms of fingerling sales? (Number 1, 2, 3.)
5.
 - iii) Are there many other nurseries in the township supplying fish seed?
 - iv) What percentage of the township demand for seed do you think is supplied from nurseries within the township? What percentage do you think is supplied from outside?
6.
 - iii) In the last three years, have you noticed any increase in the demand for fish seed by farmers for stocking?
 - iv) Are there any species that are becoming more popular in your township?
7.
 - i) Which hatchery/ies do you buy the fish seed that you nurse from? Differentiate between species.
 - ii) Is any of the seed from outside the township or even from another country?
8. What is your main source of technical advice?
- 9.

Value Chain Report - Kalay Township

- iii) Have you heard of anyone producing/selling genetically improved fish seed of any kind? How about specifically carp (rohu, mrigal, catla, common carp, big head carp, silver carp, grass carp), tilapia and/or small indigenous species?
- iv) If yes, is demand strong?

10. What do you think are the main constraints for nurseries and grow-out farms in your township?

QUESTIONNAIRE FOR KII WITH DOF

Date of interview: __/__/____

Name of interviewer: _____

Name of respondent: _____

Position of respondent: _____

Gender of respondent: _____

Phone number of respondent: _____

If not already identified, ask to identify [minor market 1] and [minor market 2].

Ask for a list of any private hatcheries and nurseries and DoF hatcheries and nurseries in the area, together with their contact details.

Ask to share any data on production, sales volume and price of fish in the area. If possible, data should differentiate between carp (rohu, mrigal, catla, common carp, big head carp, silver carp, grass carp), tilapia and small indigenous species and between farmed (locally farmed, Yangon-farmed) and wild-caught fish.

1. Can you give us an estimate of the total number of aquaculture producers in the township?

2.
 - i) Do you think the amount of wild fish being caught in the township is going up or down?
 - ii) Do you think the total amount of farmed fish and the proportion of farmed fish in the market is increasing in the township?
 - iii) How have these trends influenced trade and consumption patterns in your area?

3. If there has been an increase in fish from aquaculture in the area, has the price of fish at local markets remained stable, lowered or increased?

4.
 - i) Are local fish farmers and traders facing important logistical challenges to supply their products to the market?
 - ii) What are they and how do they address these?

5.
 - i) How is local fish farming positioned compared to the wild-caught and Yangon-farmed fish supply in your area?
 - ii) What are the main interrelations between these three supply chains?

6.
 - i) What are the main types of fish processing conducted in this township and how do they impact on fish consumption patterns in your area?
 - ii) Are there potential processing activities that MYSAP Inland could support?

7.
 - i) Are there any shops in the area that sell livestock and fish feed and fish-farming products like medicine, fertiliser, etc.? What products do they sell?
 - ii) Are there any specialist shops in the area that sell imported fish-farming products from India, China and/or Thailand? What products do they sell?

- 8.

Value Chain Report - Kalay Township

- i) What would you say are the main constraints to expanding fish production/sales in the area (e.g. low technology, high price)?
 - ii) What would you say are the main opportunities for expanding fish production/sales in the area (e.g. upcoming policies, extension services)?
9. To what extent do local markets in the township function as redistribution points for regional fish trade and what is their geographical reach?
- 10.
- i) Do you think if people were more aware of the nutritional benefits of eating fish that they would eat more fish?
 - ii) Do you think if people were more aware of the nutritional benefits of eating small indigenous species that they would eat more of these?
- 11.
- i) Are there particular concerns regarding the climate resilience of fish in the area?
 - ii) Do you have suggestions for how MYSAP Inland can contribute to sustainable fish production and consumption in the area?
12. Are there particular challenges faced by female fish farmers/fishers, traders, processors and/or vendors in the area that their male counterparts do not face?
13. Are there particular governance challenges (e.g. land use rights) that hamper aquaculture production and/or fish consumption by low-income people in the area?

QUESTIONNAIRE FOR KII WITH MFF

Date of interview: __/__/__

Name of interviewer: _____

Name of respondent: _____

Position of respondent: _____

Gender of respondent: _____

Phone number of respondent: _____

If not already identified, ask to identify [minor market 1] and [minor market 2].

Ask for a list of any MFF hatcheries and nurseries, other private hatcheries and nurseries and DoF hatcheries and nurseries in the area, together with their contact details.

Ask to share any data on production, sales volume and price of fish in the area. If possible, data should differentiate between carp (rohu, mrigal, catla, common carp, big head carp, silver carp, grass carp), tilapia and small indigenous species and between farmed (locally farmed, Yangon-farmed) and wild-caught fish.

1. Can you give us an estimate of the total number of aquaculture producers in the township?

2.
 - iv) Do you think the amount of wild fish being caught in the township is going up or down?
 - v) Do you think the total amount of farmed fish and the proportion of farmed fish in the market is increasing in the township?
 - vi) How have these trends influenced trade and consumption patterns in your area?

3. If there has been an increase in fish from aquaculture in the area, has the price of fish at local markets remained stable, lowered or increased?

4.
 - iii) Are local fish farmers and traders facing important logistical challenges to supply their products to the market?
 - iv) What are they and how do they address these?

5.
 - iii) How is local fish farming positioned compared to the wild-caught and Yangon-farmed fish supply in your area?
 - iv) What are the main interrelations between these three supply chains?

6.
 - iii) What are the main types of fish processing conducted in this township and how do they impact on fish consumption patterns in your area?
 - iv) Are there potential processing activities that MYSAP Inland could support?

7.
 - iii) Are there any shops in the area that sell livestock and fish feed and fish-farming products like medicine, fertiliser, etc.? What products do they sell?
 - iv) Are there any specialist shops in the area that sell imported fish-farming products from India, China and/or Thailand? What products do they sell?

- 8.

Value Chain Report - Kalay Township

- i) What would you say are the main constraints to expanding fish production/sales in the area (e.g. low technology, high price)?
 - ii) What would you say are the main opportunities for expanding fish production/sales in the area (e.g. better technologies, improved access to finance)?
9. To what extent do local markets in the township function as redistribution points for regional fish trade and what is their geographical reach?
- 10.
- iii) Do you think if people were more aware of the nutritional benefits of eating fish that they would eat more fish?
 - iv) Do you think if people were more aware of the nutritional benefits of eating small indigenous species that they would eat more of these?
- 11.
- iii) Are there particular concerns regarding the climate resilience of fish in the area?
 - iv) Do you have suggestions for how MYSAP Inland can contribute to sustainable fish production and consumption in the area?
12. Are there particular challenges faced by female fish farmers/fishers, traders, processors and/or vendors in the area that their male counterparts do not face?
13. Are there particular governance challenges (e.g. land use rights) that hamper aquaculture production and/or fish consumption by low-income people in the area?