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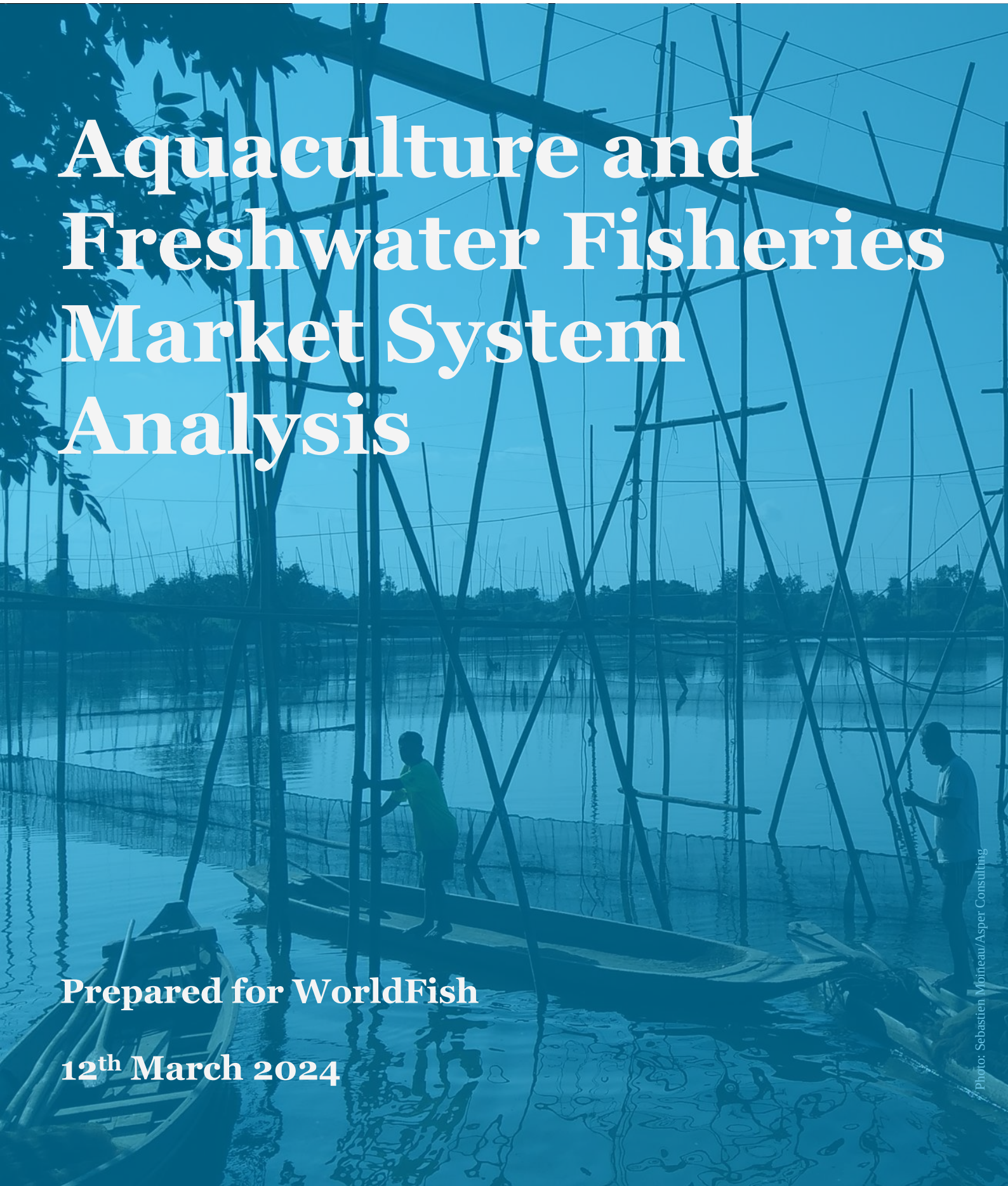
WorldFish

Aquaculture and Freshwater Fisheries Market System Analysis



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List of Acronyms

ADS: Myanmar Agriculture Development Strategy

CDZ: Central Dry Zone

DOF: Department of Fisheries

FAO: United Nations for Food and Agriculture

GAD: General Administration Department

GAqP: Good Aquaculture Practice

GoM: Government of Myanmar

JICA: Japan International Cooperation Agency

KII: Key informant interview

MFF: Myanmar Fisheries Association

MoALI: Ministry of Agriculture, Livestock and Irrigation

MSA: Market System Analysis

SIS: Small Indigenous Species

SRS: Self-Recruiting Species or Self Breeding Species

SSA: Small Scale Aquaculture

VAD: Value added

Units

ha	hectare
kg	kilogram
mt	metric tonne
Viss/peitha	approx. 1.63293 kg

Currency Equivalents

(Conversion Rate: 1 USD = 2089.73 MMK*)*

1 Introduction

WorldFish Myanmar is implementing the USAID-funded Feed the Future Burma Fish for Livelihoods (F4L) and the multi donor fund Livelihood and Food Security Trust (LIFT) My Market (MYM) project. This Aquaculture and Freshwater Fisheries Market System Analysis (MSA) aims to provide WorldFish with a systemic analysis of the market constraints associated with the aquaculture and freshwater fisheries system, and how the fisheries food system has evolved as a result of the measures taken by Governments and other external factors that have affected availability, affordability and accessibility of fish production, processing and market systems for fish, and fish-based food in general.

The purpose of this MSA is to understand how the aquaculture and freshwater fisheries market system has evolved since 2020 and what coping mechanisms by the different value chain and market actors have developed since 2020. The underlying research will assist in designing fish food security, livelihoods, and private sector interventions to help fish farmers, communities, trades and SME increase their resilience and cope with the consequences of increasing climate variability, internal conflicts in Myanmar, the global economic inflation and uncertainty.

The structure of this MSAS is as follows:

Section 1: Introduction
Section 2: The context
Section 3: Aquaculture and freshwater fisheries
Section 4: Research methodology
Section 5: Market system analysis
Section 6: Constraints Analysis
Section 7: Proposed market system interventions
Section 8: Conclusion and recommendations

2 The context

Three key events in the last three years have necessitated updating the assessment of current aquaculture and freshwater fisheries situation in Myanmar.

First, is the unfolding of a Black Swan event in the form of a Corona virus. The virus was confirmed to have reached Myanmar on 23rd March 2020. On 1st July 2023, Myanmar lifted all testing and vaccination requirements of foreign travelers. The governments lockdown and other measures to try to curb the spread of COVID-19 globally and in Myanmar have led to falling exports and lost revenue from tourism and international remittances, hitting the economy hard[1],[2],[3].

The second is the coming from the militaries. On 1st February 2021 the Myanmar military (also known as the *Tatmataw*) launched a coup against the civilian government, declaring the results of the November 2020 general election invalid and instating itself into power. The military's crackdown on anti-coup protestors and the clashes between the military and the People's Defense Forces and ethnic armed organizations (EAO) have resulted in a devastating humanitarian crisis across the country. Several major clashes have taken place in Chin State, Sagaing Region, Magway Region, Rakhine state, Kayah State, Kachin state and Northern Shan State. EAOs control border regions are referred by Myanmar natives as *lumyaukneimyei*, or

[1] World Bank (2020). "Myanmar's Economy Hit Hard by Second Wave of COVID-19: Report". World Bank. Retrieved on 25 December 2023.

[2] Takeshima, Hiroyuki (2020). Monitoring the Impact of COVID-19 in Myanmar. International Food *Policy Research Institute*.

[3] Aura CM, Nyamweya CS, Odoli CO, Owiti H, Njiru JM, Otuo PW, Waithaka E, Malala J. (2020). Consequences of calamities and their management: The case of COVID-19 pandemic and flooding on inland capture fisheries in Kenya. *J Great Lakes Res*. 2020 Dec; 46(6):1767-1775. doi: 10.1016/j.jglr.2020.09.007.

Free Regions. The resurgence of armed conflicts has resulted in recurring, protracted and new displacement, and over 2.68 million people are displaced within Myanmar and 22,000 people have sought refuge in neighboring countries. The closure of markets for months[4] have disrupted fish trade.

In 2021, the US, the EU, the UK, Australia and Canada imposed sanctions against Myanmar in response to its government's violent suppression of pro-democratic movements, institutional corruption, and human rights abuses. The sanctions include arms embargoes, trade embargoes, asset freezes, travel bans, and investment prohibitions.

The third is the climate change events in Myanmar[5]. Myanmar is one of the most vulnerable countries to climate change in the world.

Myanmar is at risk to several natural hazards, including extreme temperatures, drought[6], cyclones, flooding and storm surge, and heavy rainfall events. Drought, and floods are considered the most severe natural hazard in the country based on the impacts that it has on health, property, assets, and livelihoods[7]. Much of this vulnerability is already evident, with severe drought events increasing and cyclones — once considered 1-in-3-year events — now occurring almost every year since the new millennium. Severe disasters have occurred more recently, such as the 2019 heavy monsoon rains that overflowed rivers and led to seasonal floods in many regions of the country[8]. Myanmar has experienced floods and landslides in September 2023, July 2021, and June 2020.

The cumulative effect of government measures to try to curb the spread of COVID-19, the military take over, and natural disasters has severely weakened the economy and constrained development activities.

The GDP growth rate in 2020 was -5.9%, which rose to 2.2% in 2021, and 2.8% in 2023. Real GDP is estimated to be around 13 percent below 2019 levels. Business operations continue to be disrupted by high input prices, electricity outages, conflict and logistics constraints[9], trade and foreign exchange restrictions, and frequent changes in rules and regulations. Labor market conditions remain precarious and inequalities in household welfare have worsened.

3 Aquaculture and freshwater fisheries sector

Myanmar's Law relating to Aquaculture No. 24/89 defines aquaculture as meaning "the propagation of fish species, breeding of fish through different stages of growth in natural or artificial waters by various culturing techniques". Aquatic organisms including fish, crustaceans, and mollusks are grown under aquaculture. Aquaculture has grown significantly in the past decade, now responsible for 22 percent of annual fish production[10].

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[4] Horsey, Richard (17 Nov. 2023) A New Escalation of Armed Conflict in Myanmar, Crisis Group, Retrieved on Dec. 26, 2023 from https://www.crisisgroup.org/asia/south-east-asia/myanmar/new-escalation-armed-conflict-myanmar

[5] Akester, M., Dubois, M., Leemans, K. Langeard, R., Soe, Khin Maung (2020) Climate risk assessment for fisheries and aquaculture-based adaptation in Myanmar: Technical report outlining the methodology and Approach, WorldFish, Myanmar.

[6] Zar Thin. K., & Yunsheng, L. (2021). A Study of Severe and Extreme Drought in Central DryZone of Myanmar. *North American Academic Research*, 4(5), 55-64. doi: https://doi.org/10.5281/zenodo.476586

[7] Matthews, William & Marsh-Matthews, Edie. (2003). Effects of Drought on Fish Across Axes of Space, Time and Ecological Complexity. *Freshwater Biology*. 48. 1232 - 1253. 10.1046/j.1365-2427.2003.01087.x.

[8] Hickey, Sharon Pia (2022) Myanmar's Environment and Climate Change Challenges, International IDEA Policy Paper No. 27, November 2022, IDEA, Stockholm.

[9] World Bank. (2022). Transport and Logistics: Myanmar Infrastructure Monitoring. © Washington, DC: World Bank. http://hdl.handle.net/10986/37426 License: CC BY 3.0 IGO.

[10] Soe, KM, Baran, E, Grantham, R, Tezzo, X & Johnstone, G (2020), Myanmar inland fisheries and aquaculture: a decade in review, monograph no. 209, Australian Centre for International Agricultural Research, Canberra, & WorldFish, Yangon, 93 pp

Aquaculture and freshwater fisheries correspond to fishing activities occurring in the interior of the country (excluding estuaries). Freshwater fisheries is further distinguished between two management regimes: (i) leasable fisheries where exclusive exploitation rights of delimited water bodies are auctioned, and (ii) open fisheries for which fishing gears licenses are issued by the Department of Fisheries (DoF). Freshwater bodies cover 8.1 million ha of which 1.3 million ha are permanent; the remainder are seasonally inundated floodplains. The fisheries sector in Myanmar provides employment to 3.2 million people.

The total fish production has been around 11-12 million tons over the last six years. The share of marine fisheries, **aquaculture, open fisheries and leasable fisheries** have remained static around 54%, **19%, 21%,** and **6%** respectively.

Table 1: Fish production ('000 MT) in Myanmar

Year	Aquaculture	Leasable fisheries	Open fisheries	Marine fisheries	Total
2016-17	1048.69	339.23	1251.13	3036.42	11,350.94
2017-18	1130.35	341.02	1253.95	3152.14	11,754.92
2018-19	1121.35	339.36	1260.69	3249.7	11,942.20
2019-20	1145.02	342.94	1265.12	3264.84	12,035.84
2020-21	1167.35	343.99	1268.41	3295.07	12,149.64
2021-22	1028.53	324.11	1145.62	2729.11	10,454.73
2022-23	1113.63	337.01	1226.38	3096.34	11,546.74

NB: The figures for 2022-23 is estimated using 3 year moving average method.

Source: DOF (2021) Fishery Statistics 2021, pg. 52

National economic statistics in Myanmar combine the fishery and agriculture sectors, which are reported to have accounted for around 7.67% of gross domestic product (GDP) in 2020. The contribution of fisheries and agriculture to GDP has remained fairly constant over the past two decades, ranging from 7.2% in 1990 to 8.2% in 2000, and 7.67% in 2020 despite the apparent fivefold increase in fish catch in the ensuing years.

The important fishing grounds are the six natural types of freshwater fisheries bodies that Reeves et al, 1999[11] identified throughout Myanmar: (i) rivers and their tributaries; (ii) seasonally formed fluvial lakes (plunge pools, fluviatile dams and meander lakes); (iii) estuaries, and their surrounding wetlands; (iv) inundated paddy fields and low-lying areas in Ayeyarwady, Bago, and Yangon region in the lower Myanmar; (v) perennial lakes such as the Inle Lake and Indawgyi Lake and tanks; and (vi) main irrigation canals and branches. The variety of water bodies provides year-round resources for fishers; however, it has implications for standardization and scaling up. Heterogeneity in fish types, wide dispersion of water bodies, and small size of fish catch poses challenges for marketing in scale.

Fishing takes place all year though the amount caught may vary from season to season. Yearlings are abundant during the rainy season from June to September when new water activates spawning. Yearling fish grow to full size during October to December when water level in most inland habitats start levelling off. The catch size during this season is highest.

[11] Reeves P, Bob Pokrant and John McGuire, (1999). The Auction Lease System in Lower Burma's Fisheries, 1870-1904: Implications for Artisanal Fishers and Lessees, *Journal of Southeast Asian Studies* 30, 2 (September 1999): 249-262

Various fishing gears are used. The most widely used gear includes stationary pots, stow net, lift net, gill net, line, scoop net, bamboo trap and cast net.

Table 2: Monthly use of fishing nets

Type of Net	Jan	Feb	Mar	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Cast net						■	■	■	■	■	■	■
Croaker gillnet							■	■	■	■	■	■
Drift gillnet/ Fish traps	■	■	■	■				■	■	■	■	■
Fence net							■	■	■	■	■	■
Hook and line	■	■	■	■	■				■	■	■	■
Hilsa gillnet	■	■	■	■								
Lift net						■	■	■	■	■	■	■
Set gillnet (flood plain)					■	■	■	■	■			
Set gillnet (stream)						■	■	■	■	■	■	■
Stow/bag net												

Source: Adapted from Tezzo et al. 2016, pp. 15

Women are critical actors in Myanmar's fish production—they make and mend fishing nets; feed and catch fish from ponds; and process, cook and sell fish[12]. With 70 percent of Myanmar's 54 million people engaged in agriculture, including fisheries[13], enhancing the equality and equity of women's opportunities, engagement and benefits from fisheries and aquaculture will have significant impacts on food security and poverty reduction. A major gap in fish data reporting is the disregard of reflecting the contribution of women in fish value chain. There are social norms which determines the sexual division of labor[14] in fish capture, processing and distribution.

Table 3: Sexual division of labour in fish business

Women	**Men**	**Both**
• Cooking for labourers during pond preparation and harvesting • Preparation of feeds • Feeding • Purchasing feeds and fertilizers • Weighing of harvested fish	• Purchase, renting and repair and laying of fish net • Pond preparation and renovation • Fish seed stocking • Market negotiation with wholesalers	• Fish mongering • Vigilance of ponds • Harvesting • Market negotiation with traders

Traditionally fish farmers have relied on the Rohu, Tilapia, and indigenous carp for around 70 – 80 percent of their output. Mrigal and catla carps make up a further 10 percent, while pangasius, tilapia, grass carp, common and silver carps, bighead carp, snakehead, catfish, sea bass and grouper are all cultured in smaller quantities. Most fish farms are built on rice paddy

[12] Angeles, M.B., Barbesgaard, M., Franco, J. (2019),Trends in small-scale fishery in Myanmar: Tenure rights and gender in Mon State and Tanintharyi Division1 Transnational Institute, TNI WorkINg paper , March.

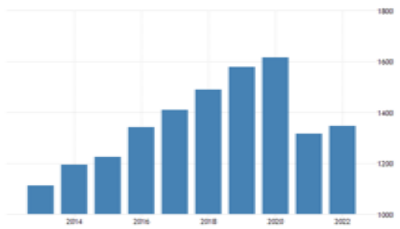
[13] Aregu, L. and Rajaratnam, S. (2017) Towards a gender-equal fisheries sector in Myanmar, WorldFish, Myanmar. Retrieved on 1 January 2024 from https://worldfishcenter.org/blog/towards-gender-equal-fisheries-sector-myanmar

14 Tial, D. H., Thang, R. H., Lian, V. C. and Khaiang, W. W. (2020) A Stacked Value Chain Analysis Study of Smoked Rohu from Kale Township, Sagaing Region, Myanmar – Final Report, WorldFish, Penang.ay-2020

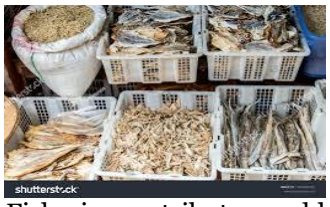
lands. This is an illegal practice, which farmers routinely manage to circumvent the regulations. If strict enforcement of the regulations is upheld, the development of a smallholder fish farm sector may be stifled.

Fast growing tilapia ponds are multi-acre in size and managed through intensive growing practices[15]. To harvest the largest and fastest-growing fish, large mesh seine nets are pulled through the water. For small trap-and-hold ponds, ordinary nets suffice.

Fish is an important export product for Myanmar. In the first three quarters of the current financial year 2023-24, Myanmar exported over 290,000 tonnes of fisheries worth US$448 million to more than 40 foreign countries. The value of fish exports has declined by 41% since 2022-23. Myanmar ships fishery products to over 40 countries, mostly to China and Thailand.



GDP (2023) USD 1,392



Fisheries contribute roughly 7.67% of Myanmar's GDP (FAO, 2020)

Area under freshwater fisheries 8.1 million ha

Fisheries share in employment is 6% and over 34% in coastal areas.

The fisheries sector contributes roughly 56 percent of state/regional government revenue.

Main species: 80% of the catch comprise of Rohu, Tilapia, indigenous carp, Mrigal and Catla carps

The contribution of capture fisheries was 81 % and aquaculture was 19 % respectively in fishery production in 2020.

Fish available for consumption per capita - 45.9 kg (2020, FAO Globefish)

Major fish market players

Source:https://www.fao.org/3/cc5632en/cc5632en.pdf; http://map.seafdec.org/NewBulletin/fisher.php

Figure 1: Myanmar aquaculture and freshwater fisheries at a glance

[15] Holmyard, Nicki (2017) Giving a lift to tilapia farmers in Myanmar, Global Seafood Alliance, Retrieved on 1 January 2024 from https://www.globalseafood.org/advocate/myanmar/

4 Research methodology

The research methodology followed is described in the figure below.

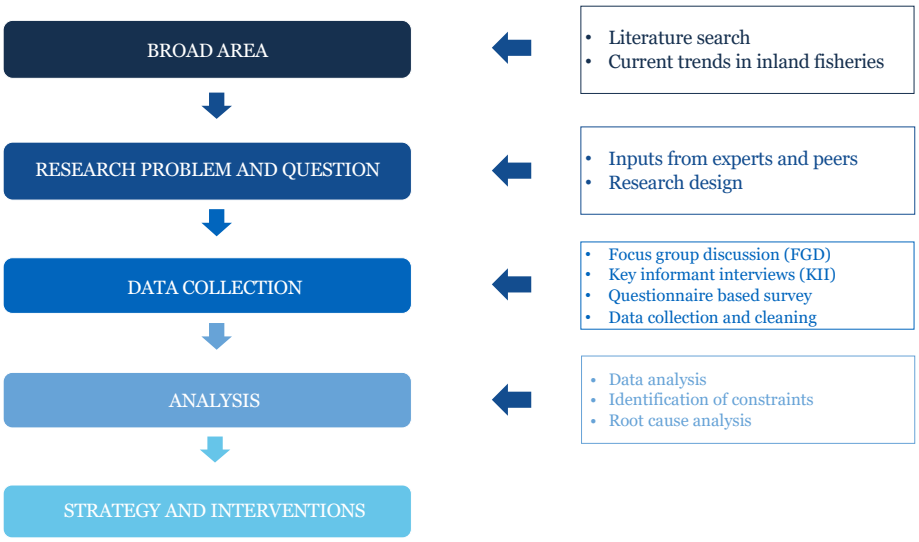


Figure 2: Graphical approach to the study

The study begins with a survey of literature related to aquaculture and freshwater fisheries market system in Myanmar. The issues highlighted in the literature are briefly described in section 3.0 above. The research problem posed is comparison of the market system's prior capacity and performance (baseline situation) with current capacity and performance. For this purpose, the principal supply and demand problems in the market systems with particular reference to trade volumes, prices, integration and conduct has to be analyzed. An understanding of what has happened in the market will help in inferring about the system's capacity and potential to contribute to the emerging situation. Finally, the analysis would indicate potential market-support options to sustain services, resources and infrastructure.

The research questions of the study are:

a) How has the aquaculture and freshwater fisheries system has evolved in years 2019-20 – 2022-23?

b) Based on the assessment of the fisheries system, what strategic interventions can help to reinforce existing intervention and/or proposed new interventions as part of Fish for Livelihood and My Market programming?

4.1 Survey design

Mixed methods research combining elements of qualitative and quantitative research was used in order to answer the research questions. The principal tool for qualitative research used was FGD 206 respondents spread in 33 townships in 5 regions (Ayeyarwady, Magway, Mandalay, Sagaing, Yangon) and 2 states (Kachin, Shan)[16]. The map of the regions/states surveyed is presented in Figure 3.

[16] Myanmar is broadly divided into three agro-ecological zones. Ayeyarwady falls under "wet zone". Magway, Mandalay and Sagaing in Central Myanmar is included in the "dry zone". Kachin and Shan States are in the intermediate areas.

Figure 3: Map of regions/states surveyed

The list of townships where FGD were conducted is available in in Table 4. The FGD were conducted with hatcheries, nurseries, feed producers, fishers, grow out farmers, processors, village trader, retailers/vendors, and wholesalers.

Table 4: Region wise townships surveyed for FGD

Region/State	F4L Townships	MYM Townships	Common
Ayeyarwady region		Dedaye, Kyaiklat, Maubin, Nyaungdom, Pyapon	
Sagaing region	Khin-U	Kale	Shwebo
Mandalay region	Madaya, Sintgaing	Meiktila	
Magway region	Myothit, Ngape, Sinbaungwe, Taungdwingyi		Salin
Yangon region			Yangon
Kachin state	Bhamo, Mansi, Momauk, Myitkyina		
Eastern Shan State	Waingmaw, Mongyuang, Monghpyak, Tachileik		Kengtung
Southern Shan State	Hopong, Hsihseng, Nansang, Nyaungshwe, Pindaya, Pinlaung,		Taunggyi
Total	21	7	5

A two-stage process was applied for collection of questionnaires based quantitative data. First, the districts were chosen where F4L and MYM was operating. For the purpose of questionnaire-based survey, 31 townships (17 F4L, 9 MYM, and 5 common to both projects) were selected from 5 regions (Ayeyarwady, Magway, Yangon, Mandalay, Sagaing) and two states Kachin and Shan. In consultation with WorldFish, Momauk and Myitkyina townships in Kachin state -which were in FGD- got dropped as the survey team could not find a large

enough sample of non-WorldFish beneficiaries. Yangon was included in the FGD, KII, and in the questionnaire-based survey.

Second, within these locations, beneficiaries and non-beneficiaries of WorldFish programs were chosen randomly. The sample was chosen out of F4L's 4,868 beneficiaries and MYM's 1,135 beneficiaries who were operational since 2009. For obtaining statistically valid results at confidence level, for a population of 6,003, a minimum sample size of 362 was required. The questionnaire was responded by 705 persons which exceeds the minimum sample size requirement. A pre-tested questionnaire was administered to the respondents at their place of dwelling or business. The purpose of the questionnaire was to collect information about the characteristics and background of the selected market players, the socio-economic environment in which they currently make a living, as well as the legal environment and available support functions for aquaculture and freshwater fisheries. The questionnaire was in line with the research objectives. The questionnaire was administered by trained local field personnel in local dialect.

4.2 Data source

Kobo toolbox was used for primary data collection by the enumerators. The questionnaire was administered in the Myanmar language. The Kobo data was downloaded as an Excel Analyzer form. The form was subjected to data cleaning for fixing or removing incorrect, corrupted, incorrectly formatted, duplicate, or incomplete data within a dataset. Further, a final review was conducted to ensure the dataset adheres the quality standard for data submission form.

4.3 Demographic information

Focus Group Discussions

There were 206 FGD respondents – 30% were WorldFish beneficiaries and 70% non-beneficiaries. 54% of the respondents were male and 46% female. The mean age of the respondents was 41 years. The maximum number of respondents were from Ayeyarwady and South Shan (see Table 5).

Table 5: Distribution of FGD respondents by project categories

Beneficiary	Ayeyarwady	Mandalay	Sagaing	E. Shan	S. Shan	Kachin	Magway	Yangon	Total
WorldFish	8	0	13	20	15	5	0	1	62
Non-WF	45	20	3	30	38	2	1	5	144
Total	**53**	**20**	**16**	**50**	**53**	**7**	**1**	**6**	**206**
in %	**26%**	**10%**	**8%**	**24%**	**26%**	**3%**	**0%**	**3%**	

Of the 206 respondents, fishers, fish retailers/vendors, and grow-out farmers, accounted for 31%, 30% and 22% of the total respondents. Three regions Ayeyarwady (26%), South Shan (26%) and East Shan (24%) accounted 76% of the respondents (Table 6).

Table 6: Distribution of FGD respondents by occupation and region/state

Occupation	Ayeyarwady	Mandalay	Sagaing	E. Shan	S. Shan	Kachin	Magway	Yangon	Total	in %

Hatchery		1	2	2	1				6	3%
Nursery		1	2	3		1			7	3%
Grow out farmers	18	6	8	17	8	4		3	64	31%
Fishers	18	3		3	22				46	22%
Fish retailers/ vendor	11	7	2	22	15	1		3	61	30%
Fish processors		0	2	0	3				5	2%
Feed producers										0%
Village trader	3	1		3	3				10	5%
Wholesaler		1			1	1	1		4	2%
Feed distributor	3								3	1%
Total	**53**	**20**	**16**	**50**	**53**	**7**	**1**	**6**	**206**	**100%**
in %	**26%**	**10%**	**8%**	**24%**	**26%**	**3%**	**0%**	**3%**	**100%**	

Key informant interviews

Twelve one to one KIIs were conducted with 3 grow-out farmers, 3 village traders. 1 wholesaler, 4 fish processor, and 1 retailer (Table 7). The purpose of the KIIs were to find out costs and returns from business operation from the interviewees. 11 of the 12 respondents belonged to Ayeyarwady region, and from Yangon region.

Table 7: KII respondents and their occupations

Name	Business	Township	Region	Top species dealt with
U Zaw Min Naung	Grow-out	Payapon	Ayeyarwady	Pangasius
Daw Hla Win	Grow-out	Kyaiklat	Ayeyarwady	Stinging catfish, Tilapia
Naw Ei Ei Thu	Grow-out	Maubin	Ayeyarwady	Rohu
U Pyae Phyo Aung	Village trader	Bogalay	Ayeyarwady	Pangas, Mystus
U Soe Min Naing	Village trader	Kyaiklat	Ayeyarwady	Snakehead, catfish, eel, hilsa
U Nay Myo Oo	Village trader	Maubin	Ayeyarwady	Rohu
U San Aung	Wholesaler	Yangon	Yangon	Rohu
Ma Win Lae Thu	Fish processor	Maubin	Ayeyarwady	Fish Paste, Dry Fish Processing
Daw Mya Tin	Fish processor	Maubin	Ayeyarwady	Dried Silver barb
Daw Cho Cho San	Fish processor	Maubin	Ayeyarwady	Snake head
Daw San Mya	Fish processor	Maubin	Ayeyarwady	Several small fishes[17]
Daw Mya Tin	Fish retailer	Maubin	Ayeyarwady	Silver barb

Questionnaire based survey.

A questionnaire was used to collect response from different categories of market actors namely hatcheries, nurseries, grow-out, fisher, feed producers, processors, and retailers. There were 705 questionnaire respondents – 64% were F4L beneficiaries, 34% MYM beneficiaries and 3% non-beneficiaries. 63% of the respondents were male and 37% were female (Table 8).

[17] Small fishes are the main ingredients to prepare *Hmyin Ngapi* or pressed fish which is a pungent paste and is used as a condiment or additive in dishes in Lower Myanmar.

Table 8: Distribution of questionnaire respondents by project categories

Project	Male	Female	Total	in %
F4L	276	172	448	64%
MYM	156	82	238	34%
Non-beneficiary	13	6	19	3%
Total	445	260	705	100%
in %	63%	37%	100%	

74% of the respondents represented grow-out farmers (Table 9). The trades of other respondents were 2% hatchery 2%, nursery, 3% fisher, 4% feed producer, 4% processor, and 7% fish retailers. South and East Shan accounted for 27% and 20% of the respondents respectively. No questionnaire-based survey was done in Yangon.

Table 9: Distribution of questionnaire respondents by region and trade

Trade	Ayeyarwady	Mandalay	Sagaing	E. Shan	S. Shan	Kachin	Magway	Total	in %
Hatchery	1	1	5	3	2	0	0	12	2%
Nursery	23	3	6	0	7	6	2	47	7%
Grow-out	54	46	67	125	129	27	77	525	74%
Fisher	0	0	0	0	18	0	0	18	3%
Feed producer	2	4	6	4	3	3	3	25	4%
Processor	6	0	12	0	13	0	0	31	4%
Retailer	0	0	7	7	21	7	5	47	7%
Total	**86**	**54**	**103**	**139**	**193**	**43**	**87**	**705**	100%
in %	**12%**	**8%**	**15%**	**20%**	**27%**	**6%**	**12%**	**100%**	

5 Market system analysis

Figure 4 below outlines the structure of the inland fish market system in terms of the core value chain, supporting functions and rules which can be formal and informal. Each part is described in detail in the following sections.

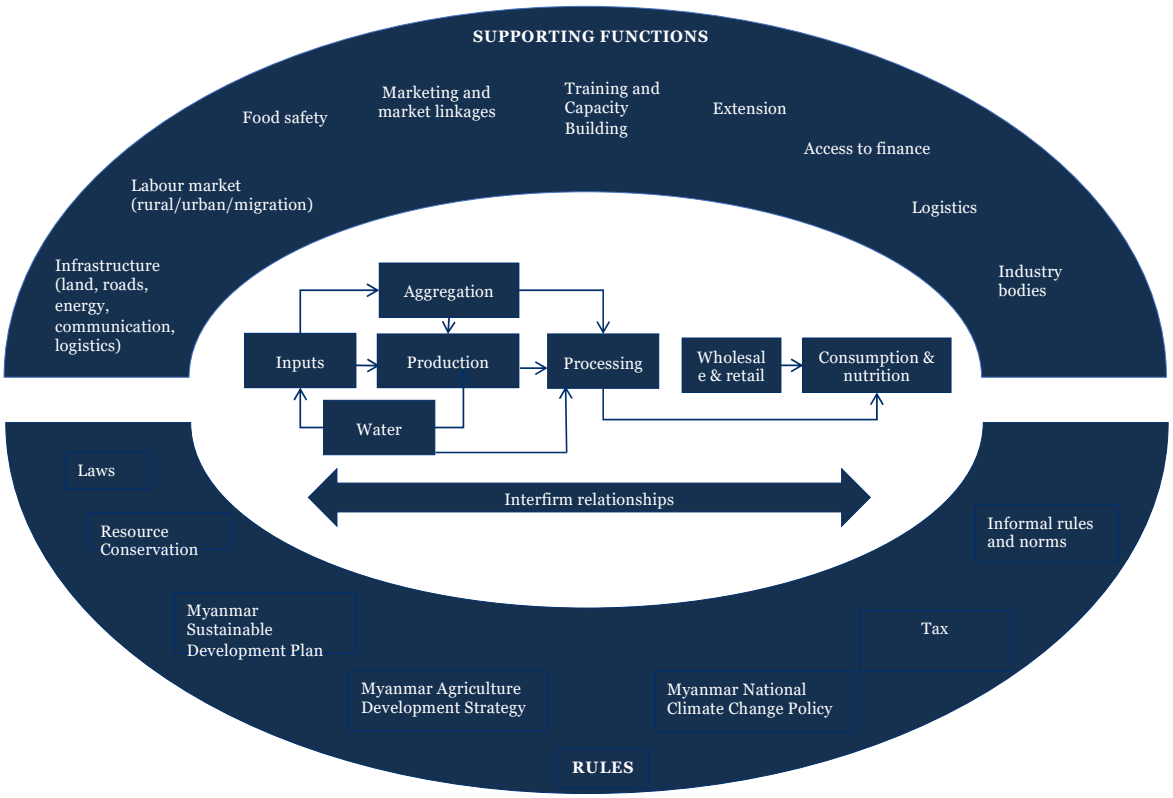


Figure 4: The inland fishery market system

5.1 Current business outlook

After introduction by a moderator of Asper Consulting, each group taking part in FGD was asked for their opinion on a) impact of political turmoil on their business; b) COVID 19 impact; c) business evolution; d) coping mechanism; and e) future outlook. The discussion took place in local dialect. A summary main FGD points is presented in Box 1.

Box 1: Summary of FGD narrative

Impact of political turmoil on business: On the demand side, consumers are less willing to buy fish due to inflation, and tendency to hold on to savings. On the supply side, the imposition of daytime travel blockade to Yangon Shwe Padauk Fish Market, and curfews imposed by village councils restricting fishing only in the afternoon have disrupted the supply chain. Farmers and fish vendors are selling less and making little profit. No new investment taking place. Lenders are less willing to lend (not more than half of borrower demand for money is met).

Impact of COVID19: Except during the peak of COVID 19 pandemic, fishing operations were generally uninterrupted. However, those who halted their fishing activities or paused the processing of aquatic animals due to the closure of trading during COVID, have not resumed operations.

Business evolution: Low profits in fish business is having varied impact on fish grow-out and fish vendors. To reduce expenses, fish growers have opted to reduce the feeding frequency, supplementing regular feed pellets with natural food. The fish vendors are expanding into new markets, and processing fish into paste or dried forms. Since fish vendors in the Delta also serve as fishers, they are currently striving to maximize their fish volume by utilizing fish traps.

Coping mechanism: An immediate response to COVID19, and later political turmoil has been growth in barter trade. Grow-oust are bartering fish for essential items like vegetables, oil, and chili within the village. The grow-outs are fine tuning their production targets in coordination with the availability of fries/fingerlings from hatcheries and availability of feed. Fish vendors have opted for product diversification – many have started collecting small fish species from grow-outs to make fish paste. Some traders have opted out of fish business and ventured into selling tea, betel nut, and beverages.

Future outlook: There is consensus among the respondents that ppolitical instability is likely to persist for many years. The price of fish will remain volatile due to fluctuations in cost of diesel, labor and transportation. A likely outcome of the economic and political turmoil is many small grow out pond operators will cease to exist and opt for rice cultivation.

The FGDs confirmed that the three major value chains in the fisheries sector are:

1. Aquaculture chain (Grower – Village Trader – Wholesaler - Retailer
2. Inland fishery chain (Fisher – Village Trader – Wholesaler – Retailer
3. Processor chain (Grower/fisher – Trader - Processor – Distributor - Retailer

5.2 Profitability

Of the 12 KIIs conducted, three were selected for profitability analysis (Table 10). The samples comprised of a grow-out, a village trader and feed processor. The main expenses related to material, and labour. Each of the businesses were self-financed, and sales were conducted on spot payment. Of these, the grower business is seasonal lasting for 6 months, while that of village trader and feed processor is conducted throughout the year. The margin of profit for per kg (approximately 0.61 viss) of produce sold was MMK 1991 (USD 0.95) for the grower, MMK 84 (USD 0.04 cents) for village trader and MMK 984 (USD 0.47 cents) for the feed processor. Since the risk profile, and capital invested is different for the three businesses, the profit margin should be viewed only for illustrative purposes.

Table 10: Gross profit margin for three fish trades

Occupation	**Growout farmer**	**Occupation**	**Village trader**	**Occupation**	**Fish processor**
Township	Maubin	Township	Bogalay	Township	Maubin
Main species	Rohu	Main species	Pangasius, Myctus	Main species	Silver barb
Sales in MMK					

Annual sales/ kg	7,680	Annual sales/ kg	62,400	Annual sales/ kg	1,600
Sales price/ kg	3,750	Sales price/ kg	2,500	Sales price/ kg	3750
Revenue	28,800,000	Revenue	156,000,000	Revenue	6,000,000
Expenses in MMK					
Materials		**Materials**		**Materials**	
Fries and fingerlings (#8500 *120MMK)	1,020,000	Fish (Mystus, 2,000 MMK	124,800,000	Fresh fish (1600 kg @2344 MMK)	3,750,400
Feed (Rice bran-2 bags, Commercial Feed-2bags)	5,130,000	Ice (50 lb) - 2,000 MMK * 5* 365	3,650,000	Banana leaves for packing (2500@10MMK)	25,000
Oil & Fuel 96 gallons * 11,000 MMK)	1,056,000	Oil & Diesel charges (3@5000 MMK *365)	5,475,000	Salt (50 viss @600 MMK)	30,000
Pond preparation	5,000,000	Ice box (5 *250,000)	1,025,000	Rice (5 @ 4000MMK)	20,000
		Delivery cost (1 ice box@10,000 MMK*365)	3,650,000		
Labor charges (# 30 *10,000 MMK *3 Days)	900,000	Labor (# 3* 10,000 MMK *365 Days)	10,950,000	Labour (2*6000MMK*50 days)	600,000
Water pumping (2 engines, fuel, maintenance)	250,000	Tricycle + maintenance (# 3 * 10,000,000 MMK)	1,200,000		
Rent for fish net	150,000				
Expenses	13,506,000	Total Expenses	150,750,000	Total Expenses	4,425,400
Gross profit	15,294,000	Gross profit	5,250,000	Gross profit	1,574,600
Profit per kg	1,991	Profit per kg	84	Profit per kg	984

The growers sell either directly to wholesalers at the Fish Market (Shwe Padauk, Yangon) or through village traders. The village traders collect fish from growers and sell to the retail shop or wholesaler shop. The main off taker for the feed producers are growers, and nurseries.

5.3 The aquaculture and freshwater fisheries value chain

5.3.1 Hatchery

A fish hatchery is a place for artificial breeding, hatching, and rearing through the early life stages of animals. Hatcheries procure brood fish to produce larval and juvenile fish, primarily to support the aquaculture industry where they are transferred to on-growing systems, such as grow outs, to reach harvest size.

Description of the sample: The sample size was 12 (11 male and 1 female). Table 11 shows the project wise and region wise distribution of the respondents. The respondents were from Sagaing (42%), followed by E. Shan (25%), S. Shan (17%) and 8% each from Ayeyarwady, and Mandalay. There was no respondent from Kachin and Magway.

Table 11: Hatchery: project wise and region wise respondents

Project	Ayeyarwady	Mandalay	Sagaing	E. Shan	S. Shan	Total	in %
F4L		1	1	2	2	6	50%
MYM			4	1		5	42%
Non-beneficiary	1					1	8%
Total	**1**	**1**	**5**	**3**	**2**	**12**	
in %	**8%**	**8%**	**42%**	**25%**	**17%**		**100%**

Current state of business

- Production
  - For hatching, 66% of the respondents use concrete tanks, 25% use metallic jars, and 8% earthen tanks.
  - In terms of species, half of the respondents prefer Rohu (Table 12). The other species hatched are grass carp, common carp, Intha carp, silver barb, and tilapia.

Table 12: High growth species favoured by hatcheries

Project	Rohu	Tilapia	Grass carp	Common carp	Intha carp	Silver barb	Total	in %
F4L	2	1	1	1	0	1	**6**	50%
MYM	4				1		**5**	42%
Non-WF		1					**1**	8%
Total	**6**	**2**	**1**	**1**	**1**	**1**	**12**	100%
in %	**50%**	**17%**	**8%**	**8%**	**8%**	**8%**	**100%**	

  - Of the 12 respondents, 3 respondents utilised their tank capacity to meet increased demand.3 respondents restricted tank capacity utilisation to below 25%, because of low demand and technical issues.

- 5 of the 12 respondents cited rise in temperature as a major cause of mortality of fish. Unspecified fish diseases were listed as the cause of fish mortality by 3 respondents.
- The brood stock for hatcheries is procured in equal measure from the wild, private hatcheries, and Thailand.

- Marketing
  - The hatcheries sell their output to nurseries, grow-out, and trader/intermediaries.
  - On being asked what kind of relationship you have with majority of your buyers - 8 of the respondents conduct their business through spot transactions, and 4 through verbal agreements. All transactions are in cash.
  - Competition among hatcheries have increased, which has prompted at least three of them to explore online marketing options.

- Access to training and technical advice
  - Of the 12 respondents who availed opportunities for training, 11 were male and 1 was female. 6 of the respondents received training from WorldFish, 3 through self-learning, 2 from other hatchery operators, and 1 from DOF. The sole female respondent received training and technical advice from another hatchery operator. The areas of technical training and advice are hormonal induction to stimulate spawning, nutrients that promote reproductive health, and stress reduction.

- Access to finance
  - Capital shortage for the purchase of machineries and working capital was identified as a constraint by 4 of the 12 respondents.

Change in the last three years.

- There is not major change in business over the last three years.
- The respondents noted that they have not changed their mode of conducting business in the last three years.
- Compared to three years ago, 8 respondents opined that their pricing strategy is more aligned to competition, 2 have adopted dynamic pricing depending on supply and demand conditions, and 2 have not altered their pricing strategy.
- Of the 12 respondents, profit margin in the last three years have decreased slightly for 2, increased slightly for 6, increased significantly for 1 respondent, and no change for 1 for 1 respondent.
- In the last three years, the regulatory environment for 11 has remained the same, and for 1 has become more supportive.

Market constraints

On being asked what challenges you currently face in marketing your hatchery products,

- 4 of the respondents listed “high competition” as the significant challenge.
- 2 listed lack of peace as a major factor
- 2 listed logistical issues being a barrier to access new markets and deliver perishable products on time.

5.3.2 Nursery

Fish nurseries are required for rearing of various stages of fish namely: - (1) Nursery pond - rearing of Spawn to Fry stage (approx. Size 4- 15 mm) for about 15 days. (2) Rearing pond – rearing of fry to fingerling stage (approx. Size: 16-40 mm) for about 2-3 months. (3) Stocking pond- rearing of fingerling (approx. Size 41- 150 mm) to marketable sizes/ adult fish.

Description of the sample: The sample size was 47 (32 male and 15 female). There were 23 each F4L and MYM respondents, and 1 non-beneficiary. Table 13 below shows the project wise and region wise distribution of the respondents.

Table 13: Nursery respondents by project and region

Project	Ayeyar wady	Mand alay	Sagaing	S. Shan	Kachin	Magway	Total	in %
F4L		3	6	7	6	1	23	49%
MYM	23						23	49%
Non-WF						1	1	2%
Total	**23**	**3**	**6**	**7**	**6**	**2**	**47**	**100%**
in %	**49%**	**6%**	**13%**	**15%**	**13%**	**4%**	**100%**	

Current state of business

- Production
  - The sales are executed largely through prior verbal agreement (92%), and spot transaction (8%).
  - When asked to identify species with high growth and profit, 34% of the respondents Rohu, while 17% preferred common carp, 14% Mrigal, and 8.5% catla, and 6.4% Pangasius (Table 14).

Table 14: High growth species favoured by nurseries

Project	Rohu	Common carp	Mrigal	Catla/ Pangasius	Gras carp/ Silver barb/Tilapia	Other	Total	in %
F4L	8	8	1		6		23	49%
MYM	7		7	7		2	23	49%
Non-WF	1						1	2%
Total	**16**	**8**	**8**	**7**	**6**	**2**	**47**	
in %	**34%**	**17%**	**17%**	**15%**	**13%**	**4%**	**100%**	

- Marketing
  - The marketing channels for 33 of the respondents (70%) were grow-out farmers, 13 respondents (28%) relied on traders/middlemen, and 1 respondent (2%) served an institutional buyer.
  - The sourcing of ingredients is done mainly through local retailers (49%), and rice mills (36%).

- Access to training and technical advice
  - Of the 47 respondents who availed opportunities for training, 32 were male and 15 were female. 21 of the respondents received training from WorldFish, 19 through self-learning, 6 from other nursery operators, and 1 from an NGO. Of the 15 female respondents, 9 opted for self-learning. The areas of technical training and advice are learning about specific growth milestones of the fingerlings, and market price monitoring.

- Access to finance

- Capital shortage was identified by 14 of the 47 respondents. The current sources for financing were not revealed.

- Change in the last three years

    - Of the 12 respondents, the profit margin in the last three years, has increased slightly for 57%, increased significantly for 11%, decreased slightly for 2%, and remained the same for 30% Over the last three years, market access has worsened for 43% of respondent, become much better for 13%, slightly better for another 13%, and remained the same for 32% (Table 15).

Table 15: Nursery - change in profit margin and market access in the last three years

	Market access					
Profit margin	**Worse**	**Better**	**Much better**	**No change**	**Total**	**in %**
No change	2	6		6	14	30%
Decreased slightly		1			1	2%
Increased slightly	4	12	4	7	27	57%
Increase significantly	0	1	2	2	5	11%
Total	**6**	**20**	**6**	**15**	**47**	
in %	**13%**	**43%**	**13%**	**32%**	**100%**	

- In the last three years, the regulatory environment for 39 respondents has remained the same, and for 8 has become more supportive.

Market constraints

- For 68% of the nurseries, profit margin has slightly increased or significantly increased over the last three years.
- 36 of the 47 respondents that the cost of seeds/fries/hatching have increased eroding their profit margin.
- 16 of the respondents identified high prices of inputs as the major constraint, 6 identified lack of quality seed/fries /fingerlings, 4 identified poor transport as the bottleneck, while 11 did not face any challenges.

5.3.3 Grow-out

Grow-out fish farmer stock fingerlings in ponds and grow them to harvestable size. Pre-stocking management and post-stocking interventions are undertaken to enhance productivity. Predatory fish severely affect survival of fish; hence they are routinely eradicated.

Description of the sample: The sample size was 525 (69% male and 31% female). There were 331 F4L, 177 MYM and 17 non-beneficiary respondents respectively. Table 16 below shows the project wise and region wise distribution of the respondents.

Table 16: Grow-out: Project wise and regions wise respondents

	Region/State								
Project	**Ayeyar**	**Mandalay**	**Sagaing**	**E. Shan**	**S. Shan**	**Kachin**	**Magway**	**Total**	**in %**

	wady								
F4L	0	33	22	73	112	27	64	331	63%
MYM	37	13	45	52	17	0	13	177	34%
Non-WF	17	0	0	0	0	0	0	17	3%
Total	**54**	**46**	**67**	**125**	**129**	**27**	77	**525**	**100%**
in %	**10%**	**9%**	**13%**	**24%**	**25%**	**5%**	**15%**	**100%**	

Current state of business

- Production
    - When asked to identify species with high growth and profit, for 31% of the respondents rohu was the first choice (due to high demand), while 25% preferred tilapia, 16% grass carp, 14% common carp, 6% sliver barb, 3% each Pangasius, and climbing perch and 2% others (Table 17).

Table 17: High growth species favoured by grow-out

	Rohu	Tilapia	Grass carp	C. Carp	Silver barb	Pangasius	C. Perch	Other	Total
F4L	95	83	55	47	22	11	10	8	331
MYM	63	43	28	23	7	4	5	4	177
Non-WF	4	6	2	2	1	1	0	1	17
Total	**162**	**132**	**85**	**72**	**30**	**16**	**15**	**13**	**525**
in %	**31%**	**25%**	**16%**	**14%**	**6%**	**3%**	**3%**	**2%**	**100%**

- Marketing
    - The sales are executed largely through prior verbal agreement (85%), spot transaction (11%), and on part advance payment (4%).
    - The sourcing of ingredients is done mainly through oil mills (72%), local retailers (12%), own production (10%), feed producer (4%), and others (2%).
    - The marketing channels to sell aquatic products are village trader (26%), Fish vendors (26%), direct to customers (24%), and wholesaler (24%).
    - The sale of grow out produce is purely based on demand and supply in a perfect competitive setting. 53% of the sale is determined by market prices, 30% through negotiation between buyer and seller. Moreover, 9% of the grower sell produce at prices determined by themselves. In 2% cases, the buyers determine their own prices.

- Access to training and technical advice
    - Of the 525 respondents who availed opportunities for training, 360 were male and 165 were female. 353 of the respondents received training from WorldFish, 98 through self-learning, and 73 from other peers and suppliers. Areas of interest are storing or freezing of products for sale later, cooling to preserve freshness, adjusting production volume according to market demand, and right use of commercial and home-made fish feed.

- Access to finance
    - Access to finance has improved for 58.1% of the respondents. For 24.71% respondents, the situation has deteriorated (Table 18).

Table 18: Access to finance by grow-out farmers

Condition	Frequency	Percent
No change	130	25%
Deteriorated slightly	18	3%
Deteriorated significantly	72	14%
Improved slightly	305	58%
Total	**525**	**100**

- The financial providers were microfinance institutions, cooperatives, and government schemes.

- Change in the last three years

  - Of the 525 respondents, the profit margin has increased slightly for 55%, increased significantly for 14%, decreased slightly for 5%, increased significantly for 1%, and remained the same for 26%.
  - Over the last three years, market access has become better or much better for 71% of the respondents, and not changed for 24% of the respondents (Table 19). Profit margin has worsened for 5% of the respondents. This implies that the growers are coping well with the prevailing situation in the country and benefit from the marketing opportunities it presents.

Table 19: Grow-out: change in profit margin and market access in the last three years

	Market access						
Profit margin	**No change**	**Worse**	**Much worse**	**Better**	**Much better**	**Total**	**in %**
No change	66	9	3	52	7	137	26%
Decreased slightly	5	5	1	11	3	25	5%
Decreased significantly	1	0	2	0	0	3	1%
Increased slightly	50	7	0	194	38	289	55%
Increased significantly	2	2	0	15	52	71	14%
Total	**124**	**23**	**6**	**272**	**100**	**525**	**100%**
in %	**24%**	**4%**	**1%**	**52%**	**19%**	**100%**	

- In the last three years, the regulatory environment for 359 has remained the same, for 7 respondents has become more supportive, and for 39 respondents has become more restrictive.

Market constraints

- For most growers, high price of raw material (fish fries/fingerlings) and frequent stock out of ingredients are the main business challenges (Table 20).

Table 20: Constraints listed by grow-out

	Challenges						
Project	**Stockouts**	**High price**	**Limited availability**	**No distributor**	**None**	**Other**	**Total**
F4L	31	231	7	9	48	5	331
MYM	21	119	2	5	29	1	177
Non-WF	3	9	0	0	5	0	17
Total	**55**	**359**	**9**	**14**	**82**	**6**	**525**
in %	**10%**	**68%**	**2%**	**3%**	**16%**	**1%**	**100%**

5.3.4 Fisher

A fisher is someone who catches fish and other animals living in a water body, or gathers mollusks, clams and oysters to lobster and shrimp.

Description of the sample: The sample size was 18 (67% male and 33% female). All the respondents were F4L beneficiary and belonged to a single state -South Shan.

Current state of business

- Production
  - The fishers use a variety of fishing gears – set gillnets (7%), fish traps (17%) longline set gillnets (11%), and drift gillnet (6%).
  - When asked to identify species which they target during their fishing activities, the respondents ranked tilapia as most preferred (61%), followed by eel (17%), Mrigal and Snakehead 6% each, and other 11%.

- Marketing
  - 55% of the produce is directly sold to consumers and the remaining 45% to fish vendors/traders.
  - Demand for fish has increased for 44% of the respondents, and significantly increased for another 28% of the respondents. For 6% of the respondent's demand has decreased and remained unchanged for the balance 22% of the respondents.

- Access to training and technical advice
  - Of the 18 respondents who availed opportunities for training, 12 were male and 6 were female. All the respondents received training from WorldFish.
    The fishers are very keen on further training. The areas of their interest are access to better storage/cooling facility, advanced market intelligence on demand and prices, and training in market analysis and business skills.

- Access to finance
  - When asked about which formal financial services they use, of the 18 respondents, 8 confirmed using savings accounts, 7 had personal loans, and 2 had received cash advances. 1 did not use any financial products.
  - The financial service providers were MFIs, cooperatives, fisher associations, Government schemes, and informal lenders.

- Change in the last three years

- Of the 18 respondents, the profit margin in the last three years has decreased slightly for 56%, decreased significantly for 17%, and remained the same for 28% (Table 21).

Table 21: Fishers: change in profit margin in the last three years

Change	Frequency	In %
No change	5	28%
Decreased slightly	10	56%
Decreased significantly	3	17%
Total respondents	**18**	**100%**

- The fishers indicated that compared to three years ago, the volume of catch per trip has decreased for 61% of them, increased for 11% of them, and remained the same for 28% of them.
- Over the last years, the daily income of the respondents has been differentially impacted. For 33% of the respondents, income has increased, while for 39% respondents' income has decreased. For 28% of the respondents, income has remained unchanged. Daily income has close relationship with the ability to catch, and market the produce on reasonable price.
- For 17 out of the 18 respondents, fishing regulation had no significant impact on their operations, and for 1 respondent has become more restrictive.
- The fishers have relatively simple value chain where they collect their produce from rivers/streams/ponds and sell directly to consumers or traders/vendors.

Market constraints

For most fishers the main problem encountered is high transportation costs and small catch volume. Over the last three years, the challenges for 39% of the respondents have slightly increased, and for 22% of the respondents the increase was significant. For 11% of the respondents, the challenges have decreased, while for 28%, they remain unchanged (Table 22).

Table 22: Main challenges listed by fishers

Challenges	Frequency	in %
High transportation costs	10	56%
Small catch volume	4	22%
Lack of market access	3	17%
Lack of storage/cooling	1	6%
Total	**18**	**100%**

5.3.5 Feed producers

Fish feed producers manufacture pellets, granules, and flakes to provide a balanced diet and nutrition for fish including about 40 essential nutrients such as protein, carbohydrate, fat, vitamins, and minerals. Live food such as maggots, insect larvae, worms, and feeder fish are popular in Myanmar. Corn, rice bran, cassava, sunflower cake, sesame oil, peanut, salt, dry fish powder are some local ingredients used to in farm-made feeds. Domestic production of raw materials and ingredients is not sufficient to meet competing demands of various sectors.

Description of the sample: The sample size was 25 (72% male and 28% female). There were 16 F4L, and 9 MYM respondents respectively. Table 22 below shows the project wise and region wise distribution of the respondents. 24% of the respondents were from Sagaing, and the rest from Ayeyarwady, Mandalay, East and West Shan, Kachin and Magway (Table 23).

Table 23: Feed producer: project wise and regions wise respondents

Project	Ayeyar wady	Mand alay	Sagaing	E. Shan	S. Shan	Kachin	Magway	Total
F4L		3	2	3	3	3	2	**16**
MYM	2	1	4	1			1	**9**
Total	**2**	**4**	**6**	**4**	**3**	**3**	**3**	**25**
in %	**8%**	**16%**	**24%**	**16%**	**12%**	**12%**	**12%**	**100%**

Current state of business

- Production
  - Most feed producers are home based. They use grinder, mixer, and rotary cutters.

- Marketing
  - 22 of the 25 respondents sell within the township, while 3 sell outside the township. 92% of the customers are grow-out, and nurseries, and 8% others including retailers.
  - The sourcing of ingredients is done mainly through mills (60%), traders/intermediaries (16%), own farm (16%), and direct from farmers (8%). The local ingredients are rice bran, peanut cake, fish meal, dried fish powder, prawn and shrimp meal, salt, legumes, sesame, corn, cassava, and wheat.

- Access to training and technical advice
  - 21 (16 male, and 5 female) of the 25 respondents had received training while 4 (3 male and 1 female) had received no training. Training was solely provided by the WorldFish. The training was in in feed formulation and nutrition, feed production technology and machinery operation and quality assurance in feed production.

- Access to finance
  - 72% of feed producers do not use any institutional financial services (Table 23). Of the remaining 28%, 12% use savings accounts, 8% cash advances, personal loan 4%, and business loans 4%. Clearly, there is large room for bringing formal financial services to the feed producers (Table 24).

Table 24: Financial instruments used by feed producers

Instrument	Frequency	in %
None	18	72%
Savings accounts	3	12%
Business loans	1	4%
Personal loans	1	4%
Cash advances	2	8%
Total	**25**	**100%**

  - The main barrier to access to finance is lack of awareness and high interest rates charged by the financial service providers (Table 25).

Table 25: Barriers to access to finance of feed producers

Factor	Frequency	in %
Lack of awareness	12	48%
High interest rate	8	32%
Complex application process	1	4%
Compatibility with feed producers need	1	4%
Collateral requirement	1	4%
Other	2	8%
Total	**25**	**100%**

- Change in the last three years

    - Over the last three years, 40% of the respondents experienced increase in profit, 28% increased decrease in profit margin, while 32% maintained a steady state (Table 26).

Table 26: Feed producer: change in profit margin in the last three years

Change	Frequency	in %
No change	8	32%
Decreased slightly	2	8%
Decreased significantly	5	20%
Increased slightly	1	4%
Increased significantly	9	36%
Total	**25**	**100%**

- When asked how production has volumed fared in the last three years, 20% of the respondent experienced no change, 48% experience increase, and 32% experienced decrease (Table 27).

Table 27: Change in production volume in the last three years

Project	No change	Decreased slightly	Decreased significantly	Increased slightly	Increased significantly	Total
F4L	4	3	2	4	3	16
MYM	1	0	3	3	2	9
Total	5	3	5	7	5	25
in %	**20%**	**12%**	**20%**	**28%**	**20%**	**100%**

- In the last three years, the regulatory environment for 18 respondents has remained the same, for 6 respondents has become more supportive, and for 1 respondent has become more restrictive.
- The feed producers remain well embedded into the circular nature of the local economy. They enjoy steady demand from township buyers.

Market constraints

For most feed producers, political instability, decline in market demand, business competition from other feed producers and pressure to lower prices are the main challenges (Table 28).

Table 28: Challenges to marketing and selling feeds

Factor	Frequency	in %
Political instability	7	28%
Decline in market demand	6	24%
Business competition	4	16%
Pricing pressure	5	20%
Other	3	12%
Total	**25**	**100%**

5.3.1 Processors

Fish processors prepare fish for human consumption by adding value through rudimentary processing techniques are washing, gutting, sorting, grading, sun-drying, and storing fish.

Description of the sample: The sample size was 31 (72% male and 28% female). There were 7 F4L, and 31 MYM respondents respectively. Table 29 below shows the project wise and region wise distribution of the respondents. 42% of the respondents were from S. Shan, followed by 39% Sagaing, and 19% from Ayeyarwady.

Table 29: Processors: project wise and regions wise respondents

Project	Ayeyarwady	Sagaing	S. Shan	Total
F4L	0	7	0	7
MYM	6	5	13	24
Total	**6**	**12**	**13**	**31**
in %	**19%**	**39%**	**42%**	**100%**

Current state of business

- Production
  - Most fish processors operate small scale, and use basic technologies that are suitable for the small-scale processing of fish: that is, drying, salting, smoking, boiling deboning, and fermenting.
  - For the processors, Rohu, Common carp, and Tilapia are among the favoured species (Table 30).

Table 30: Fish varieties popular with processors

	Species							
State/Region	Rohu	Common carp	Tilapia	Sliver barb	Catla	C. perch	Other	Total
Ayeyarwady	3	**0**	2	**0**	1	1	**0**	7
Sagaing	2	6	0	0	0	0	4	12
S. Shan	6	2	2	1	0	0	1	12
Total	11	8	4	1	1	1	5	31
in %	**35%**	**26%**	**13%**	**3%**	**3%**	**3%**	**16%**	**100%**

- Marketing
    - 21 of the 31 respondents sell within their village, 8 in the township, while 2 sell outside the township.
    - 61% of the sale is to direct consumers, 35% to retailers, and 3% to others.
    - The sourcing of ingredients is done mainly through wholesalers (48%), own catch (23%), direct purchase from grow-out (19%), and direct from fishers (10%).
    - The most saleable fish of retailers are Indian featherback (Chitala) meatball, dry Mrigal, dry small fish, fish balls, powder, and paste, salted fish, and Rohu, Tilapia, and Mrigal.

- Access to training and technical advice
    - Of the 31 respondents who availed opportunities for training, 7 were male and 24 were female. 27 of the respondents (5 male and 22 female) respondents received training from WorldFish. 4 respondents (2 male and 2 female) practiced self-learning and did not join any formal training. The areas of their interest are better financial management, improved hygiene, food safety practices, increased production efficiency, improved product quality maintenance and better packaging.

- Access to finance
    - 26% of fish processors do not use any institutional financial services. 29% use mobile phone payment services[18], 23% use savings accounts, 12% have personal loans, and 10% business loans. Capital shortage is cited as a major constraint by the respondents (Table 31).

Table 31: Financial instruments used by processors

Instrument	Frequency	in %
None	8	35%
Savings accounts	7	30%
Business loans	3	13%
Personal loans	4	17%
Payment services	9	39%
Total	23	100%

    - The barriers to access financial services listed by the producers are high interest (42%), lack of financial awareness (32%), complex time-consuming application process (13%), collateral requirement (10%), and non-compatibility of product offerings with the needs of the processors (3%).

Change in the last three years.

- Over the last three years, 48% of the respondents experienced slight decrease in profit, 16% experience significant decrease, and 23% experienced significant increase in profits, while 13% maintained a steady state (Table 32).

[18] In Myanmar, mobile wallet services are run by telecom companies include Telenor's Wave Money, Ooredoo's M-Pitesan and MPT's MPT Pay. Bank mobile wallet apps include KBZPay, CB Pay, AYA Pay, and OnePay.

Table 32: Processors: change in profit margin in the last three years

Change	Frequency	In %
No change	4	13%
Decreased slightly	15	48%
Decreased significantly	5	16%
Increased significantly	7	23%
Total respondents	**31**	**31**

- The factors contributing to change in profit margin can be traced to transportation difficulties, competition from large national players and foreign imports, political instability, and fluctuations in product prices. It is interesting to note that product freshness is an important consideration for Myanmar consumers – even frozen products are often not considered fresh or nutritious (Table 33).

Table 33: Processors: change in profit margin and market access in the last three years

	Factors affecting market access						
Profit margin	**Competition**	**Unstable prices**	**Logistics**	**Political instability**	**Other**	**Total**	**in %**
No change		3	1			4	13%
Decreased slightly	9		4	1	2	15	48%
Decreased significantly			5			5	16%
Increased significantly			1	3	4	7	23%
Total	**9**	**3**	**11**	**4**	**6**	**31**	100%
in %	**29%**	**10%**	**35%**	**13%**	**13%**	**100%**	

- According to nearly 15 of the 31 respondents, demand for processed fish has decreased, while 14 respondents held that demand has actually increased. 2 respondents believed that demand has stayed about the same over the last three years.
- Of the 31 respondents surveyed, 24 opined the regulations have remained unchanged, 6 respondents believed they have become more supportive and for 1 respondent, the regulations have become more restrictive.

Market constraints

According to the fish processors, 51% of them have not faced any new challenges in the last three years. Raw material shortage (16%), decreased demand due to inflation (16%), difficulty in travelling (13%), and political instability (3%) remain some of the outstanding problems (Table 34).

Table 34: New challenges faced in the last three years by the fish processors

Constraints	Frequency	in %
No change	16	52%
Difficulty in travelling	4	13%
Political instability	1	3%
Decreased demand	5	16%

Raw material shortage	5	16%
Total	31	100%

5.3.2 Retailers

Fish retailers buy from wholesalers through auctions and sell them through different modes. The various forms are selling in shops, selling fish in mobiles like bikes or cart, and selling in the market.

Description of the sample: The sample size was 47 (11% male and 89% female). All the respondents were from F4L. Table 33 below shows the project wise and region wise distribution of the respondents. 45% of the respondents were from S. Shan, 15% each from Sagaing, E. Shan, and Kachin. The rest 11% was from Magway (Table 35).

Table 35: Retailers: project wise and regions wise respondents

	Region/State					
Project	**Sagaing**	**E. Shan**	**S. Shan**	**Kachin**	**Magway**	**Total**
F4L	7	7	21	7	5	47
MYM	0	0	0	0	0	0
Total	**7**	**7**	**21**	**7**	**5**	**47**
in %	**15%**	**15%**	**45%**	**15%**	**11%**	**100%**

Current state of business

- Marketing
  - 40 of the 47 retailers, source their material from wholesalers, and 7 from others (grow-out, and fellow retailers).
  - The retailers have a fixed location in the village or township from where they buy from wholesalers and sell to individual consumers, and institutions (hotels, restaurants, hostels).
  - 61% of the sale is to direct consumers, 35% to retailers, and 3% to others.
  - The top 5 most saleable fish by volume are Tilapia, Rohu, Grass carp, Intha carp, Common carp, and Indian featherback (Table 36).

Table 36: Top species by sales volume of retailers

Specie	**Frequency**	**%**
Tilapia	12	26%
Rohu	7	15%
Grass carp	6	13%
Intha carp	5	11%
Mrigal	4	9%
Indian featherback	4	9%
Common carp	3	6%
Pangasius	1	2%
Prawn/shrimp	1	2%
Other	4	9%
Total	47	100%

- Access to training
    - Of the 47 respondents who availed opportunities for training, 5 were male and 42 were female. 36 of the respondents (4 male and 32 female) received training from WorldFish. 10respondents (1 male and 9 female) practiced self-learning and did not join any formal training, and 1 female received training from an NGO. 36 retailers learnt about hand washing and other hygienic practices from a training organised by WorldFish. 22 retailers were also supported with racks and tables to display their products. The areas of their interest are adoption of new technologies (e.g., use of ice, improved display tables), ways to maintain freshness of unsold fish, better business management, and acquisition of new customers.

- Access to finance
    - 45% of fish retailers do not use any institutional financial services. 19% have savings accounts. 32% of the 47 respondents have availed personal loans, 2% cash advances, and another 2% business loans (Table 37).

Table 37: Financial instruments used by retailers

Instruments	Frequency	in %
None	21	45%
Savings account	9	19%
Business loans	1	2%
Personal loans	15	32%
Cash advances	1	2%
Total	**47**	**100%**

- Among the barriers to access to finance, 45% of the 47 respondents cited high interest as the major barrier followed by collateral requirement (23%), complex application process (6%), lack of financial awareness (4%), and other issues (distance of the bank, bankers' attitude etc) (22%).

- Change in the last three years

    - On being asked if there has been any change in his/her profit margin in past 3 years, 19 of the 47 respondents (i.e., 40%) confirmed there has been significant decrease. Another 19% of the respondents also confirmed experiencing decline in profit margin. At the same time, profit margin significantly increased for 11% and increased slightly for 23%. For 6% of the respondents, profit margin remained unchanged in the last three years (Table 38).

Table 38: Retailers: change in profit margin in the last three years

Change	Frequency	in %
No change	3	6%
Decreased slightly	9	19%
Decreased significantly	19	40%
Increased slightly	11	23%
Increased significantly	5	11%
Total	**47**	**100%**

- According to 33 of the 47 respondents -nearly 70% - there has been a decrease in supply of fish in the last three years. 21% of the respondent believe there has been

an increase in supply of fish, while 9% of the respondents hold that the there is no significant change in supply.

- Of the 47 respondents, 26 have found no major change in regulations. However, 13 respondents found that the regulations have become more restrictive, while on the contrary 8 found that the regulations have become more supportive. It may be noted that several townships have made stricter tax code for retailers.

- According to the retailers, the 40% of the respondents had faced no new challenge. Of the balance 60%, new challenges they faced were economic disruptions during Covid-19, low demand due to fall in consumer's income and high price of commodities, lack of safety of travel and transportation, and floods (Table 39).

Table 39: New challenges faced in the last three years by the retailers

Challenge	Frequency	in %
None	19	40%
Covid-19	10	21%
High commodity prices	5	11%
Low demand	8	17%
Natural disaster	2	4%
Safety in travel & transportation	3	6%
Total	**47**	**100%**

5.4 Supporting functions

In terms of land, telecommunication and utilities supply, land security is the largest issue hampering Myanmar's aquaculture and freshwater fisheries.

5.4.1 Land

Constitutionally, the land and natural resources in Myanmar belong to the state. **Neither the customary land ownership nor the customary land management systems are recognized legally or respected.** Under section 37 of the Constitution of the Republic of the Union of Myanmar, the state is the "ultimate owner" of land in Myanmar; citizens do not hold absolute property rights.

Land ownership and land use in Myanmar are regulated under various laws depending on whether the land is designated grant land, freehold land, permit land, urban area land, forest land, farmland, or fallow land. The most relevant land related laws for businesses are the Land Acquisition Laws (1894, and 2019), the amended Vacant, Fallow, Virgin Land Management (VFV) Law, the Myanmar Investment Law, the Environmental Impact Assessment (EIA) Procedure, the Deed Registration Law, and the Farmland Law. Out of those, the VFV Law, the Land Acquisition Laws, and the Farmland Law cause the most problems for the private sector, followed by the Deed Registration Law and the EIA Procedure [19](Myanmar Centre for Responsible Business, 2020).

There are a number of key concerns that can impact on the development of the aquaculture and freshwater fisheries and the risks associated with land. These are summarised below:

- Demarcation of different land categories is not always clear and often disputed

[19] Myanmar Centre for Responsible Business (2020) Myanmar Land Laws: Current Problems, Possible Solutions. Report on a Discussion with Business, 17 December 2020

- Complex/long registration and land use change process
- Difficulties in determining who owns the land cadastres
- Lack of clarity and costly land transfer procedures
- There are overlapping ministerial jurisdictions on land, particularly between the Ministry of Natural Resources and Environmental Conservation (MONREC) and the MoALI, Department of Agricultural Land Management and Statistics (DALMS), Survey Department, and Central Committee for Management of VFV Lands. For instance, management of bodies of water on forestry land is under the MoALI and provides for different types of public access.

Fundamentally, there are some important legal barriers to growth of the fisheries, and as shown above there is little that positively and transparently articulates specific support to the development of existing ponds and/or the emergence of new ponds as well as processing, storage and other aquaculture facilities. Indeed, any investment in production or processing requires securing a reliable license and source of supply provided by clear land and resource rights to ensure an economic return whether it is by the private sector, SSA or communities.

Key takeaways

- The existing legal frameworks appear inadequate for the formal recognition and protection of customary communal land tenure rights and a new legal mechanism specifically designed for the Myanmar country context is needed.

Market constraints

- Difficulty to secure land ownership and land use limit aquaculture investment and create concerns and fears for farmers.
- Lack of consistency, clarity and cost on the process to obtain pond license, lack of trust by farmers and business on the outcome of the application they make to obtain a land title or a land use permit.

5.4.2 Roads

Among ASEAN countries, Myanmar's roads are the most underdeveloped. Although the road network expanded to 157,000 km as of March 2022, road density at 23 km/100 Km^2 remains among the lowest in the region. Only 22% of the network is paved and 78% unpaved, with the secondary and local road network generally in poor condition and not passable during the monsoon season. The government of Myanmar has two ministries controlling transportation: Ministry of Rail Transportation and the Ministry of Transport. The Ministry of Construction is responsible for construction and maintenance of roads, bridges and airports. Only 26% of roads (39,083 km) fall under responsibility of the Ministry of Construction.

Roads are covered/surfaced between major cities such as Yangon, Mandalay, Nay Pyi Taw, Malawmyaing, Taungyi. But those in mountains, forests and rural areas are primarily dirt, narrow, rough and gravel. Some of the important national highways are:

- NH 1 Yangon – Meiktila Highway is a south–north flowing highway of central Myanmar connecting Bago, Taungoo, Pyinmana and Meiktila townships.
- NH2 is a south–north flowing highway of central-western Myanmar connecting Pyay, Magway, Kyaukpadaung, and Myingyan townships.
- NH3 is one of the most important highways of central-eastern Myanmar connecting Mandalay to Muse on the border with Yunnan, China.

- NH 4 is a west–east flowing highway of central Myanmar connects the town of Meiktila in the Mandalay Region to Tachileik in Shan State in the east on the border with Thailand.
- NH5 is a highway of southern-central Myanmar connecting Taungoo in Bago region to Hopong, east of Taunggy in the Shan State.
- NH8 is the most important highway of south-eastern Myanmar. It connects Payama in Bago region to Myeik in Tanintharyi Region.
- NH31 is the Yangon–Mandalay Expressway that connects the country's largest city Yangon and second largest city Mandalay.

Work is going on the Asian Highways in Myanmar connecting Myanmar with Thailand, China and India. There are four Asian Highways passing through Myanmar namely: AH1, AH2, AH3, AH14. In Myanmar, AH1 starts from Myawaddy (border town near Thailand) and ends in Tamu (border town near India). AH2 starts from Tachileik (border town near Thailand) and overlap with AH1 at Meiktila and ends at the same border town Tamu. AH3 starts from Kengtung, a town in AH2, and ends in Monglar (border town near China). AH14 starts from Muse (border town near China) to ends in Meiktila. The total length of Asian Highway inside Myanmar is about 3,003 km. AH1 and AH2 was scheduled to open in 2023, but now postponed for 3 years due to inactivity on the Myanmar side.

As part of China-Myanmar Economic Corridor of the Belt and Road Initiative (BRI), China is planning to resume work on a road and railway link that was postponed due to outbreak of Corona and later due to the military coup. The new infrastructure development will connect China to Myanmar in two phases: the first linking Muse in Shan State on the China-Myanmar border to Mandalay, and a second running from Mandalay to the seaport city Kyaukphyu in Rakhine Province on the Indian Ocean. The transportation route follows gas and oil pipelines built by China. An important part of the corridor will be creation of three special economic zones in Muse and Chin Shwe Haw in the northern part of Shan State and Kan Pite Tee in Kachin State. However, deterioration in security environment in Shan state have setback the project. The rebel attacks in October 2023 on all trade routes with China, including the busiest border checkpoint in Muse, have resulted in closure of vehicular movements. The Lashio-Muse Highway and Lashio-Chin Shwe Haw Road passing through Northern Shan States are of both economic and military strategic importance.

Due to mounting economic difficulties in the last three years, the Regional and State administration have only been able to undertake routine maintenance of roads, and occasionally built minor roads. However, farm-to-market roads, and links between rural and urban market centres, remain very poor in many of the townships resulting in transportation costs and high post-harvest losses. These are also significant barriers for farmers to gain quick and easy access to market information.

Key takeaways

- The conditions of rural roads in Myanmar have deteriorated in the last three years.
- Mega inter-country road and railway projects are unlikely to be completed before 3 years.

Market constraints

- Lack of road system limits potential sites for cluster development around SSA hubs and limit quick access to market and market information.

5.4.3 Energy

The ongoing political turmoil has severely affected the power sector. The power supply–demand gap has widened since 2021. Generation capacity available for dispatch has been reduced by more than 2.5 gigawatts (GW), due to various factors, including the suspended operation of two large liquified natural gas (LNG)-to-power plants in Yangon, low precipitation and low water levels in hydropower reservoirs, and a supply shortage of domestic natural gas. To maximize the total daily power supply, electricity generation was ramped up from hydropower plants since mid-2021 to compensate for lower electricity generation from gas-fired power plants. More water resources were utilized from the hydroelectric reservoirs during the rainy season. Consequently, there was a sharp drop-off in the amount of water available for electricity production and irrigation in January 2022. Four hydropower units had to be temporarily disabled for maintenance operations in mid-2022, including Myanmar's second biggest dam, Shweli-1. This further reduced available capacity and resulted in an acute electricity shortage during the dry season from January to May 2023. The electric grid network has been attacked and damaged amid ongoing conflict[20]. The authorities claimed that the power grid has been attacked 229 times between February 2021 and April 2023. Constrained transmission and distribution network capacity also contributes to electricity shortages.

The power sector has been spiraling downward since 2021 with prolonged electricity blackouts throughout the country. Electricity generation has been declining, resulting in a widening power supply–demand gap. The repercussions of damaged power infrastructure due to conflict have impacted the stability of the whole transmission system. Major cities, including Yangon, Mandalay, and Nay Pyi Taw, are facing power outages while industrial zones across the country are bracing for crippling power cuts and surging fuel prices.

The difficulty of regular access to energy has been identified as a key challenge by most enterprises consulted during the FGD and field survey. The absence of a reliable and consistent supply of electricity in rural and urban areas makes it challenging for processors to ensure supply and quality consistency of their products. Some hatcheries mentioned electricity to pump and oxygenate water was an issue. The electricity demand in the fisheries sector is mainly for water pumping, refrigerated storage, ice production and processing. Irregular supply of electricity also requires enterprises to run their own diesel generators for operations during power outages. These outages negatively impact the competitiveness of the low-margin garment industry that dominates the country's manufactured goods exports.

The prospects of achieving universal access to electricity by 2030 have dimmed. Between November 2020 and December 2021, the electrification rate at the household level increased from 57.9 percent to 61.6 percent, only 3.7 percent increase over a year, compared to average 6 percent per year between 2017-2020 at the household level. Petroleum fuel prices increased two to three times higher since 2021 due to supply shortages and currency depreciation. Such extremely high fuel prices put pressure on mini-grid operators and businesses, further reducing access. Distributed renewable energy is gaining more ground in meeting electricity demand, but supply chains and access to finance are impediments to further scale up.

There are a number of initiatives in Myanmar from the private sector, non-governmental organizations and ministries (the Myanmar Scientific and Technological Research Department and the Ministry of Energy) to pilot alternative energy production. Support to these alternative energy production initiatives would help increase the production and quality

[20] Edwards, Kim Alan; Mansaray,Kemoh; Myint, Thi Da; Hayati, Fayavar; Maw, Aka Kyaw Min.*Myanmar Economic Monitor Challenges Amid Conflict (2023).* Washington, D.C. : World Bank Group. Retrieved on 10 February 2024 from http://documents.worldbank.org/curated/en/099121123082084971/P5006630739fd70a00a66c0e15bf7b34917

management capacities of the sector. There is a specific need to simplify the negotiations and procedures required to set up alternative energy production units.

Key takeaways

- Myanmar's power sector will likely continue to experience significant challenges. To sustain the current level of power supply would require adding 300-500 MW every year until 2030 which is unlikely to happen.
- Many of the challenges in the power sector are structural, fundamental, and linked with political instability, conflict, and macroeconomic conditions. They cannot be easily fixed with short-term measures and require longer-term approaches and steady progress based on proper planning over the long-term.
- Fisheries industry will require financial assistance to produce electricity from solar and biofuel sources.

Market constraints

- Lack of availability of power negatively affect fishery sector's economic competitiveness.

5.4.4 Communication

The media landscape in Myanmar has undergone significant transformation in recent years. Following the events of February 2021, the new military government announced an amendment to Myanmar Penal Code article 505(a), which criminalized the making of comments that "cause fear" or "spread false news". The use of terms "coup," "junta" and "regime" is prohibited.

Media landscape
Following the takeover by the military junta, many of the most popular television stations have lost their license and abilities to broadcast their content, leaving only the military-controlled television stations. There is a decreasing interest in legacy media like TV, radio and newspapers. In a survey in 223 persons in six states/regions (Karen, Rakhine, Shan, Yangon, Tanintharyi and Sagaing), Lehmann-Jacobse and Thitsar (2022)[21], found that only 1 out of 100 people while less than one in 10 listens to radio on a daily basis.

Currently, most agricultural commodities prices are broadcast through various radios and FM channels as well as in TV programs. However, broadcasting of aquaculture product prices seems to be limited. Ministry of Commerce broadcasts market information and prices on the website, DoF.myanmartradenet.com and the Commerce weekly journal. "e Trade Myanmar" is the only private market information service company using Information Technology through the website, DoF.etrademyanmar.com, eTM mobile APP and Short Message Service (SMS).

ICT Penetration
According to a Datareportal survey in February 2023, there were 23.93 million internet users in Myanmar at the start of 2023, when internet penetration stood at 44.0 percent. Myanmar was home to 15.00 million social media users in January 2023, equating to 27.6 percent of the total population. A total of 64.60 million cellular mobile connections were active in Myanmar in early 2023, with this figure equivalent to 118.8 percent of the total population.

[21] Lehmann-Jacobsen, E., and Thitsar, M.T. (2022) News is life and death to us" – Understanding media audiences in post-coup Myanmar, International Media Service, California, USA. ISBN 978-87-92209-43-6

Internet in rural areas though is most likely also accessed through mobile phone. The State owned Myanmar Posts and Telecommunication is the only provider of Internet access for personal use in areas outside of Yangon and Mandalay is only available through the State owned Myanmar Posts and Telecommunicaitons. , ADSL technology provided by MPT. However, its pricing is prohibitively expensive for most customers, and median mobile internet connection speed via cellular networks: 21.10 Mbps. Myanmar's ICT Market is expected to grow at a CAGR of 0.5% over the next five years (2024-2029). The Government emphasis is on digital technology, cyber security, artificial intelligence, robotics, healthcare, and IT drives the market's growth.

Low levels of digital literacy
Myanmar fish farmers generally have low levels of digital literacy. They do not use their smartphones to browse websites and their experience of the internet is primarily driven through Facebook. Customers change accounts, and SIM cards to protect themselves from unwarranted surveillance. Agro dealers and agricultural extension staff are generally the gateway to introduction of the use mobile apps for agriculture. Geodata for fisheries is not available online in local languages.

FinTech
The fintech market is rapidly evolving, with digital payments, digital investment, digital capital raising, digital assets, and neo banking emerging as some of the most significant trends. Myanmar has 55 Fintech startups, including B2B solutions, bill payment, peer transactions, etc. (Wave money, Ongo, ThitsaWorks, Daung Capital, Near me, etc.). Financial services made available through digital channels can include payments, credit, savings, transfers and insurance and since rural populations are underserved by the formal financial sector, fintech offers a possible solution to reach them. Myanmar's digital finance sector is ascending, with the number of digital and card transactions reaching 1.57 billion in 2022. The total value of these transactions was MMK 12.3 trillion (USD 5.9 million). Digital payments are likely to remain a dominant trend, as consumers increasingly prefer the convenience and speed of mobile payment solutions. Notably, digital transactions accounted for 17.4% of total retail transactions in the country, indicating a gradual shift towards cashless payments. Moreover, reports indicate that approximately 50% of Myanmar's adult population had a bank account in 2020. This growth in financial inclusion is creating new opportunities for businesses and individuals. (Data Source: Central Bank of Myanmar, The World Bank, Global Findex database)

Key takeaways

- There is considerable scope for the use of social media to disseminate price and other information to farmers.

Market constraints

- Limited private sector financing on ICT. Given limited public resources, Myanmar will need help translating its ICT infrastructure needs into financially viable and bankable projects that can attract private sector financing.

5.4.5 Labour market

The labor market in Myanmar has not yet recovered from the shocks of the military takeover nearly three years prior, the COVID-19 crisis and subsequent socioeconomic turmoil. Continuing civil and political conflict, rising public debt, an increasingly negative trade balance and rising inflation[22] have taken their toll on the country's macroeconomic outlook.

[22] The Guardian (2021) Food and fuel prices soar in Myanmar as coup exacerbates Covid-19 crisis". The Guardian. 16 March 2021. Retrieved 25 December 2023.

GDP growth rate has been -12% in 2021, 4% in 2022, and estimated to remain low at 3 per cent in 2023. The opportunities for employment have been shrinking in recent years.

In conflict prone regions in Sagaing region, Magway Region, and Shan State, the drop in employment shares was even higher. With job losses in the public sector and limited opportunities in manufacturing, more workers have turned to self-employment and to work in agriculture and fisheries, even when returns are meagre.

According to an ILO report (2023)[23], real wages declined by 15 per cent between 2017 and 2022. Over 70 per cent of households stated they had resorted to liquidating assets, drawing down on savings, or borrowing as coping mechanisms to deal with wage and income losses.

The Minimum wages have been revised in Myanmar from 01 October 2023. The minimum wage for an 8-hour workday has been increased from MMK 4,800 (USD 2.28) to MMK 5,800 (USD 2.76) per month through an allowance of MMK 1,000 (USD 0.48). However, in the fisheries sector, the wage rate has remained static around MMK 5,000 (USD 2.38) per day, plus lunch for a second day working week.

Lack of job opportunities and mechanization are some of the push factors for migration of skilled labor to Thailand where wages are higher. This has caused shortage of labor to work in agriculture and fisheries in Myanmar.

Due to agriculture's seasonal nature, Myanmar has very high mobility of people within the country for labor purposes. In some parts of the country, turnover of labor is very high due to the constant migratory flux, resulting in a constant need for training, especially in the agri-processing industry. However, this was not mentioned by any of the respondents during the scoping study.

Key takeaways

- Wages are risking but lower than the rate of inflation.
- Due to weak macroeconomic conditions, there is acute underemployment in rural areas.

Market constraints

- Lack of skilled labour in hatcheries and nurseries (i.e., injection and stripping)

5.4.6 Food safety

According to the global food security index of 2021, Myanmar ranked 72 in the area of food safety among 113 countries (Food security index, 2021). Against this backdrop, Myanmar is among the countries that have recently acknowledged the pressing importance of food safety education and introduced food safety in undergraduate university curricula.

Fish is sold in wet markets often comprising of rows of individual vendor stalls offering consumption-oriented, perishable goods (i.e., fresh meats and produce), in an open-air or partially open-air setting. Range of activities in fish retail vending includes weighing, gutting, cleaning or cutting a whole fish to the desired size or product form. Fish can be a vehicle of disease transmission if contaminated with harmful microbes (bacteria, viruses or parasites) or chemicals/toxins.

The fish waste can be of solid waste and liquid waste. The solid waste includes skin, bone, head, frames etc. depends on the processing. The liquid waste more of fish processing effluents. Fish processing effluents are very high in biological oxygen demand (BOD), chemical

[23] ILO (2023) Myanmar: Labour market update 2023. International Labour Organisation. Retrieved on 4 January 2024 from wcms_888644.pdf (ilo.org).

oxygen demand (COD), total suspended solids (TSS), fat-oil-grease (FOG), pathogenic and other microflora, organic matters and nutrients, etc. Only few wet markets have waste disposal system. This results in unhygienic conditions aggravating the inherent microbiological risks of contaminating harmful bacteria, viruses and parasites.

The shortage of power has caused severe disruption in the availability of ice. The Myanmar consumer perceives use of ice as an antithesis to freshness. Hence most vendors do not use ice to freeze their produce. However, such merchandising and post-harvest practices accelerate product deterioration and offer little assurance of food safety. Freezing does affect taste but does not reduce its nutritional content. Protein, fat, and vitamins are not affected by the freezing process. But, during thawing the fish loses some water-soluble vitamins and minerals.

At the township level, the Township/City Development Council is responsible for the following: (i) issuance of health certificate to food stall; (ii) recommendation for licensing of food stall; and (iii) medical examination of food handlers. It is not, however, clear whether these functions also cover the stalls located in the public market.

It seems that there are limited efforts to promote food safety compliance among fish retailers in public markets. The Food Science and Technology Association (FoSTA) conducts training on food processing and Good Manufacturing Practices. In the fisheries sector, the association has worked primarily with fish paste and dried fish processors either as part of their advocacy campaigns or through consultancy assignments undertaken by members.

The International Trade Centre organized a hybrid workshop event in January 2023 to train local food safety experts and sector associations as Trainer cum Counsellors (TcCs). It has set an ambitious timeline to complete the Food Safety Management System (FSMS) implementation in 33 enterprises and get ready for the third-party audit by the end of 2023. FSMS is an essential tool to ensure safe practices are followed within a food business operation. To guarantee the safety of food, all businesses are required to put in place, implement and maintain an FSMS based on the principles of the Hazard Analysis Critical Control Point (HACCP) system.

Another issue raised by public health experts and trade groups sometime in 2019 was the proliferation of integrated poultry-fish farms, which can increase the risk of spreading salmonella and other bacterial diseases. Concern was also raised on the risk of heavy metals like arsenic, copper, zinc, lead and mercury accumulate at dangerous levels in fish raised on integrated farms. The MFF permits up to 1,000 chickens to be raised per acre of fish farm.[24]

Key takeaways

- Implementation of food safety is fragmented and characterized by weak inter-ministerial cooperation.
- Facilitating access to basic tools and infrastructure (hygienic stalls, tippy taps, waste containers, etc.) will also be important in promoting compliance to food safety and improving product quality.
- There is currently low demand for safe food due to poor consumers awareness. Media has an important role in creating building public awareness. This market demand for food safety can push players to adopt new practices. Perhaps, this can also push the government to enforce food safety in public markets including upgrading of infrastructure.

[24] Myanmar Now (2020) Are these controversial fish farms a danger to public health? February 26, 2020. Retrieved on 10 February 2024 from https://myanmar-now.org/en/news/are-these-controversial-fish-farms-a-danger-to-public-health

Market constraints

- Lack of facilities in the market to facilitate safe fish handling
- Market vendors lack knowledge of product quality, cannot afford to invest/upgrade their stall/shop and lack basic business skills
- Lack of public awareness and lack of hygiene across all functions in the value chain

5.4.7 Marketing and market linkages

According to the survey respondents Rohu, Tilapia, and Mrigal are among the most popular fish species.

Box 2: Popular fish species

Each category of fish business have their distinct preference for species of fish. As per the survey conducted, the top three preference of the businesses are listed below.

- Hatchery: Rohu, Grass carp, Tilapia
- Nursery: Mrigal, Rohu, Catla
- Grow-out: Common carp, Grass carp, Mrigal
- Fisher: Tilapia, Stinging catfish, Shrimp
- Feed producers: prawn, dry fish, dry fish powder
- Processors: Rohu, Tilapia, Mrigal -products meat balls, dry fish, fish paste, sauce, fish powder, fish boiled, fish salted
- Retailers: Tilapia, Rohu, Mrigal

In the last three years, the respondents surveyed in this study have not changed their marketing approach. Direct sale to village trader or vendor is first preferred way, followed by on spot transactions at market yards.

Online trading is gaining popularity among larger fish farmers, processors, and feed producers. The fisher's share in consumer's kyat has shown variations across species, marketing channels and markets.

The infrastructure facilities at most of the surveyed landing centers, fishing harbors and wholesale and retail markets have been found grossly inadequate and poorly maintained. The study has highlighted the need for formulating a uniform market policy for fish for easy operation and regulation so that the country's fish production is efficiently managed and delivered to the consuming population, ensuring at the same time remunerative prices to the fishers.

The picture from the survey that emerges confirm that the great majority of farmed fish produced in Myanmar is sold to the fast-growing domestic market; only a small share is exported[25].

In terms of pond area, large fish farms have a large share, however, the productivity of small/medium farms segments is comparable to those of the large ones. This has given rise to a "dualistic" fish farm sector, with many small/medium farmers and nurseries alongside large farms and hatcheries.

[25] Belton, B., Hein, A., Htoo, K., Kham, L Seng., Phyoe, A. S., Reardon, T. (2018) The emerging quiet revolution in Myanmar's aquaculture value chain, *Aquaculture,* Volume 493, Pages 384-394, ISSN 0044-8486, https://doi.org/10.1016/j.aquaculture.2017.06.028.

The bottom stream segment (fisher, grow out) has been partially integrated with the upstream segments (feed and seed) of the supply chain. The integration with the midstream segments (wholesale and logistics) have been slow.

The private investment of SMEs has fueled grow, and adoption of a mix of traditional more modern farm technologies that is intended to intensify production. Paradoxically, the weakening of the Government enforcement since 2021, have helped the conversion of paddy land to ponds in the main fish farming zones in Ayeyarwady delta, Pazundaung, Nyaungdon and Annawa close to Yangon; and Maw- lamyine, Myeik and Kawthoung of the Taninthayi Coast.

Most of the SSA farmers in Myanmar access market information from the nearby market through their neighboring or the traders that come to their villages. Price and market information also seem to circulate through mutual relationships among the traders and informally through the traders, local transporters and neighbors to the producers. Market information services are not widely accessed by SSA farmers.

Key takeaways

- High degree of reliance on personal contacts and informal channels for sales.
- Most transactions take place in cash
- Delayed payment is a growing concern among fishers, processors and feed distributors.

Market constraints

- Limited direct commercial linkages between producers and processors challenges the consistency of both quality and supply and limits opportunities for integration and value addition.
- Weak market information flows
- Poor marketing activities make it more difficult for SSA and SMEs to find new business opportunities and create partnerships with buyers.
- Market information flows to support the development of the sector are weak and limited, although networks and mobile applications are emerging to share market knowledge. There is an un-met demand amongst SSA farmers and business for market, technical information and on-line services.

5.4.8 Training and capacity building

Human resources and capacity are inadequate to support effective resource management, training, and extension activities. However, where technical ability exists in the DoF, it tends to be in aquaculture, (for example, conventional hatchery management). DOF has established six fisheries training centers namely Gyogone, Yangon Region, Twantay, Yangon Region, Sagaing, Sagaing Region), Pyapon, Ayeyarwady Region, Thahton, Mon State, and Bago, Bago Region. Human resource development in fishery sector and capacity building are carried out through the fisheries training centers. In the year 2019-2020, 18 training courses were conducted associated the fields of aquaculture. Most senior DoF staff are former military officers and lack a background in formal fisheries education, or practical experience in fisheries and aquaculture management[26].

In addition, hatcheries, feed suppliers and market players do not provide advisory, training and extension services that can benefit farmers. MFF training offers are limited, and trainers lack training themselves.

[26] World Bank (2020). "Myanmar's Economy Hit Hard by Second Wave of COVID-19: Report". World Bank. Retrieved 25 December 2023.

FAO in collaboration with the Government of Myanmar's Department of Agriculture (DoA) conduct training sessions to support the capacity development of farmers and technical experts. The training courses cover Good Agricultural Practices (GAP), Climate-Smart Agriculture, and nutrition. These courses are not specific to fisheries.

In the FGDs and one to one field surveys conducted during this study, the farmers expressed interest in receiving training, but not willing to invest in training. Overall, almost all hatcheries, nurseries and processors in the F4L and MYM project areas acknowledged the need for technology and knowledge, but they don't really know where to turn for these services. There is a lack of on-site providers to help growers improve their farming practices.

Key takeaways

- Beneficiaries acknowledge the need for training and capacity building, but do not have access to service providers. They may not be willing to bear the cost of training, and technical advisory services.

Market constraints

- Limited capacity of DoF and MFF to provide training to fish farmers in general and to SSA in particular.
- Limited technical know-how and weak adoption of GAqP across all functions in the chain.

5.4.9 R & D and extension services

One of the objectives of DOF is the implementation of research and development, extension and awareness services, and human resources development oriented towards sustainable use of fisheries resources[27]. However, the fisheries sector (capture and aquaculture) has no formal extension service provided by MoALI. Donor funded projects provide this service either via direct contact, farmer-to-farmer, virtual applications (Green Way or Village Link) or a mix of all extension systems. There is not much private extension service delivery apart from some input providers e.g., seed and feed.

DOF is the principal provider of technical services in fisheries sector. The services are offered by field offices at State, district, township, and sub-township offices. The focus is on hatcheries and dissemination of fishery technologies. However, budgetary constraints and non-availability of trained personnel have constrained ability of MOF to deliver technical services. Only 0.8 percent of the recurrent budget of MoALI is allocated to the DOF[28]. Partly as a result, the DOF capacity to conduct research and training, or otherwise engage substantively in the development of the sector, is extremely limited.

Fishery extension services require backing of scientific research and development. With one of the lowest academic capacity standings in the region, Myanmar universities do not have dedicated fisheries or aquaculture curriculum. WorldFish together with DOF has institutionalized a Fisheries Research Development Network (FRDN) between local Universities, the Department of Fisheries, the private sector and local fishing communities with the ambitious objective to improve local research capacity, facilitate knowledge sharing

[27] Department of Fisheries (2021) Fishery Statistics 2021, Government of Myanmar. Retrieved on 10 February 2024 from file:///Users/drnob/Downloads/Year%20book%202021.pdf

[28] Tezzo, X., Belton, B., Johnstone, G., Callow, M. (2018) Myanmar's fisheries in transition: Current status and opportunities for policy reform, *Marine Policy,* Volume 97, 2018, Pages 91-100, ISSN 0308-597X. Retrieved on 10 February 2024 from https://doi.org/10.1016/j.marpol.2018.08.031.

and conjointly identify critical research in Myanmar fisheries and aquaculture. FRDN has supported 22 research projects to characterize fisheries sector including livelihood, aquaculture, value chain and biodiversity. The geographic focus has been on the Ayeyarwady Delta (AD) and Central Dry Zone (CDZ) regions of Myanmar, covering various themes of the fisheries sector.

The number of qualified fisheries technicians and researchers in Myanmar is simply inadequate. The University of Yangon inaugurated the country's first ever three-year diploma course in fisheries and aquaculture in December 2022 in Twenty township of the Yangon region. This is a positive step towards meeting critical manpower gap.

Key takeaways

- The allocation of only 0.8 percent of MoALI's recurrent budget to the DOF confirms the government's relative low priority toward the sector.
- Human resources and capacity are inadequate to support effective resource management, training, and extension activities.

Market constraints

- Limited budget allocation to research, produce and maintain reliable statistics, geospatial and market data on fisheries in general and SSA in particular
- Disconnect between research, innovation, development and market between DoF and the private sector.

5.4.10 Access to finance

The financial sector in Myanmar is at an early stage of development, characterized by a dominance of commercial banks and relatively small-scale financial institutions (FIs) with limited product and service offerings. Myanmar Microfinance Business Law was enacted on 30th November 2011 and fifteen Microfinance Directives have been issued for Microfinance Institutions. Microfinance Institutions have been permitted to increase loan size from 5 million to 10 million MMK for Micro, Small and Medium Enterprises to access financing easily. Access to finance is the biggest constraint for farmers and SMEs in Myanmar, with the micro, small and medium enterprises (MSME) financing gap at $13.8 billion. According to the Myanmar Fin scope study of 2018, **only 48 percent of its adult population has access to financial services provided either by commercial banks or microfinance institutions**. Only 17% of the population use more than one financial product and only 5% of adults have a bank account. Service expansion was largely driven by considerable growth within the MFI and Cooperative sectors.

Key takeaways

- Access to finance is a key constraint in expanding business by SMEs.

Market constraints

- Myanmar's tight collateral requirement (only real estate), limitation of loan amount based on appraised value of collateral property (up to 40 percent), unavailability of long-term loans from the banks, and high interest rate charged by banks and microfinance institutions limits access to finance.

5.4.11 Logistics

According to a World Bank (2022) report transport and logistics services in Myanmar have

been substantially hit by the impacts of the February 2021 change in power and the peaking of Coronavirus cases. Logistics operators have been affected by rising fuel prices, border closures, and a shortage of shipping containers. While the initial effects after the military coup on the transport sector were extremely severe, there have been signs of some recovery of transport services since May 2021. Inter-regional transfers experienced a significant reduction in passenger demand in early months after the coup, subsequently recovering some ground by December 2021. Higher fuel prices, and volatility in the US dollar/kyat exchange as a result of the sharp fall of Myanmar's currency kyat have significantly increased the cost of inland transport services. The imposition of import-export restrictions and fixed exchange rate in a bid to stabilize kyat have failed to prop up value of local currency. Transportation and logistics services are expected to be severely impacted by continuing high fuel prices, mobility constrains, political instability, and evolution of the pandemic.

During the FGDs in Kachin, Shan, Mandalay and Sagaing townships delayed caused in logistics was cited as a major bottleneck. The high cost of refrigerated trucks and ice from other parts of Myanmar have impacted bulk movements of fresh fish. The demand for cool boxes has increased among wholesalers in Kengtung market to ship fish to neighboring townships. The logistic of the fish market remain underdeveloped due to a lack of storage space, refrigerated warehouses, and refrigerated vans.

Key takeaways

- Road transport cost will remain high due to rising fuel costs, and poor conditions of roads.

Market constraints

- Storage facilities for inland fish is highly dispersed, making it difficult to establish large integrated warehouses and processing centre.
- Ice is expensive when ice factories are not located around harvesting point and markets.

5.4.12 Industry bodies

The Union of Myanmar Federation of Chambers of Commerce and Industry (UMFCCI) is an apex national body representing and safeguarding the interests of the private business sector.

The Myanmar Fisheries Federation (MFF) is a member of the UMFCCI. MFF supports and promotes the fisheries industry in Myanmar[29]. MFF earned over US$800 million from marine exports in 2022. The Federation has its units in all seven regions, and all states (except for Chin State). It has 10 functional associations[30] and over 60 district and township organizations with a total of 4,300 members. The Federation prides in improving the socioeconomic conditions and livelihoods of the fisheries community. It is actively engaged in dissemination information on policies, technology, and business opportunities among the stakeholders. The MFF has a technical advisory board where several specialists from the private sector, universities, and retired fisheries department's high-ranking officers are members. The federation carries out advocacy on behalf of its membership at the local, provincial and national levels, and promotes foreign investment in and export from the Myanmar fisheries sector.

[29] http://www.dof-myanmar-fic.org/Multimedia/Proceedings/10.Myanmar%20Fisheries%20federation%20profile%20(%20MFF%20).pdf

[30] The functional associations under the umbrella of MFF are a) Myanmar Shrimp Association; b) Myanmar Fish Farmers Association; c) Myanmar Fishery Products Processors and Exporters Association; d) Myanmar Aqua Feed Association; e) Myanmar Fresh Water Capture Fishery Association; f) Myanmar Crab Entrepreneurs Association; g) Myanmar Eel Entrepreneurs Association; h) Myanmar Ornamental Fish Entrepreneurs Association, and i) Myanmar Fish Paste, Dried Fish, Fish Sauce Entrepreneurs Association.

The most active and influential members are owners of very large fishing and farming operations, and it is the interests of this segment of the industry that the MFF generally seeks to promote rather than small-scale activities. The MFF was established under the auspices of the former military government. Senior MFF members continue to enjoy close relationships with senior-level military or ex-military officials. These relationships give the MFF a high degree of influence over policy initiatives in the fisheries sector giving it, reputedly, the power to block or water down reforms that do not to favor members' interests such as the implementation of more stringent fisheries management initiatives.

The Myanmar Fisheries Products Processors & Exporters Association (MPEA) is an organization that represents the interests of export-oriented Myanmar private companies. The association collates and amalgamates the concerns of different segments and sections, particularly of the marine fish sub-sector.

Key takeaways

- MFF is not reaching its potential to support SSA development as well as financial and technical support from third parties, or to act as the main focal point for coordination, planning, information sharing, and investment.
- MFF vision, mission and objectives do not seem to be formalised and coordinated at the central, state/region level and township level.

Market constraints

- In absence of strong association advocating small scale fishers, the registration of small-scale fishers under various State laws have faltered.

5.5 Rules and regulations

5.5.1 Laws

In the last three years, Myanmar passed two important legislations which have some bearing on the fisheries sector. On 28 October 2022, the State Administration Council ("SAC") enacted the Organization Registration Law ("ORL") via Notification No.46/2022 as per the Section 419 of the Constitution of the Republic of the Union of Myanmar. The new ORL introduces a new regime applicable to international non-governmental organization and national NGOs, including more comprehensive provisions regarding registration mechanisms, prohibitions, and penalties. Many international organizations deem the new ORL as restrictive and opted not to operate in the country. Some of the international organizations were working on livelihood related issues.

A new trademark law came into force on 1 April 2023, in accordance with Notification No.82/2023 by the Republic of the Union of Myanmar State Administration Council. The new Trademark Law will provide much-needed protection to brand owners and encourage innovation and investment in Myanmar, bringing the country in line with other Southeast Asian nations that have already implemented modern intellectual property laws and systems, such as Thailand and Vietnam. The fisheries SMEs in Myanmar will be able to develop and protect their own brands.

The 2008 Constitution is the basis of the legal framework for fisheries. Myanmar's natural resources such as fisheries, land, and forestry are owned by the State and the rights to ownership and access to these assets are assigned by the respective government departments. The aquaculture sub-sector is regulated by the Freshwater Fisheries Law (1991) and the Aquaculture Law (1989)

The Freshwater Fisheries No 1/1991 law defines Freshwater Fisheries Waters as "... waters, pond, course, river, stream and lake which is of a permanent or temporary nature and in which fish live and thrive and which is situated within the inland boundary along the sea coast of Myanmar. This expression also includes a leasable fishery, reserved fishery, fisheries waters in which rights of fishery are permitted under a license, reservoirs, waters in an area belonging to any Government department, inland tidal places, waters on an island, crocodile nets and turtle banks in which crocodile and turtle lay their eggs and brackish waters". This law lays out the process of leasable fishery, tendering and auction modalities.

The Law relating Aquaculture No. 24/89 defines aquaculture as meaning "the propagation of fish species, breeding of fish through different stages of growth in natural or artificial waters by various culturing techniques".

The Law relating to Freshwater Fisheries Law and Aquaculture Law regulates the leasing and licenses for fishing activities. The Aquaculture Law establishes the rules by which DoF may allocate, in accordance with existing land laws, agricultural and waste land for aquaculture activity, and outlines licensing rules. Such grants must be in accordance with existing land laws and farmers are required to develop at least 75% of the leased land into pond surface area. The law also allows DoF to designate other fishing waters to any type of aquaculture.

Fisheries sector is also impacted by other business laws:

- Union Taxation Law of 2022 which determines income tax rate
- The Myanmar Companies Law, 2017 allowed 35% ownership by foreigners of Myanmar companies. This increases the potential for foreign direct investment in Myanmar SMEs.
- The Small and Medium Sized Enterprises (SME) Development Law, 2015 (SME Law). The SME Law defines "small enterprises" in 'other sectors' such as fisheries as those with turnover between MMK50 million (approximately US$23,800) and or with between up to 30 employees. "Medium-size" firms are defined as having between MMK50 million (approximately US$23,800) and MMK 1 billion (approximately US$ 476,000) in capital or between 31 and 60 employees[31]. Only SMEs registered with the Government are eligible to receive tax benefits and incentives.
- Myanmar does not have any product liability law. However, there are extant laws which affect the sale, purchase, and disposal of fish products:
    - National Food Law, 1997 aims to ensure that food is safe and suitable for human consumption, to supervise the production of controlled food, and to control and regulate the production, import, export, storage, transportation, distribution and sale of food.
    - Sale of Goods Act, 1930 which regulate contract of *sale* may be either existing *goods*, owned or possessed by the seller, or future *goods*.
    - Myanmar Contract Act, 1872 deals with contracts made between buyer and seller for a consideration *which are subject to the enforcement processes of a court*.
    - Criminal Penal Code, 1861 which criminalises certain actions, and attracts penalty

The most important law from the perspective of fish farmers is the Aquaculture Law. The farmers are fearful to engage with DoF to apply for a land title, or a conversion of land registered for rice cultivation that was converted into ponds (often because the land was

[31] ADB (2020) SME Monitor 2020 database. Asian Development Bank, Retrieved on 4 January 2024 from https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwj8zPyK7cODAxWpfvUHHYGWDL8QFnoECB8QAQ&url=https%3A%2F%2Fdata.adb.org%2Fmedia%2F7271%2Fdownload&usg=AOvVaw0I_mYdbE_3xQQ9syZmmw7I&opi=89978449

flooded). Farmers are concerned that they could be fined or imprisoned when the authority finds that this conversion has taken place without authorization. This is a serious barrier for farmers to engage with DoF, and potentially with other market players (e.g., seed suppliers).

Key takeaways

- The Aquaculture Law, Farmland Law and VFW Law severely restricts the regularisation of land registered for rice cultivation for any other permanent purposes without authorization being given.

Market constraints

- Farmers are worried because they cannot prove the ownership/legality of their ponds.
- New aquaculture farmers are having difficulties getting a license and existing farmers are concerned with penalties they could get.

5.5.2 Resource conservation

Natural resource conservation is necessary to ensuring fishing communities and businesses have access to these resources for building a prosperous future. Resources exist on a range of renewability, from renewable to entirely non-renewable. Conservation means preserving natural resources that are not easily renewable and extracting without crossing the carrying capacity threshold. Myanmar represents a freshwater biodiversity hotspot of worldwide significance and houses a plethora of endemic freshwater species, among which are amphibians, fish, and various aquatic invertebrates[32]. Conservation efforts in fisheries sector is affected by what happens within it and also around it. Although Myanmar has plentiful natural resources, its environment is seriously threatened by the unsustainable extraction activities of illegal logging, large scale mining of rare earth[33] and gold panning[34], commercial exploitation of flora and fauna, and land degradation[35]. A recent study[36] shows that Myanmar has no system in place to assess ecological condition in rivers and land-use changes and organic pollution are primary causes of freshwater degradation.

The aquaculture and freshwater fisheries sector can have a significant impact on the environment, especially in terms of water pollution[37] from use of fertilizers, pesticide and drugs for the production of phytoplankton and the curing of disease. During the survey study, a limited number of farmers reported issues with fish diseases and those who had have dealt with the problem by using pesticides. Nevertheless, the level of chemical inputs used by SSA seems relatively limited considering the extensive nature of these production systems. The

[32] Bolotov, I. N., Eliseeva, T.A., Kondakov, A.V., Konopleva, E.S., Palatov, D.M., Sokolova, A.M., Vikhrev, I.V., Gofarov, M.Y., Bovykina, G.V., Chan, N., Lunn, Z., Win, T. (2022) Hidden shelter-like associations of minute Alboglossiphonia leeches (Hirudinea: Glossiphoniidae) with sedentary animals and molluscs, *Limnologica*, 10.1016/j.limno.2022.126028, 97, (126028).

[33] Since the February 2021 as local militias and unscrupulous have increased illegal mining in ethnic areas of Kachin, Shan, Karenni, and Karen states, forextraction of gold, tin, nickel, steel, zinc, coal, jade, rare earth minerals, and platinum. Toxic chemicals used in the mining are poisoning fields and water bodies, leading to contamination of drinking water, degradation of agricultural land, and loss of various fish species in rivers.

[34] After the coup, fishermen in Myitkyina and Bhamo in Kachin state are catching fewer fish because gold mining along the Irrawaddy River basin. Mining companies are dumping their extracted top soil overburden and waste rock into the river, killing fish stock, while some fishermen are also stunning the fish with electricity, leading to a decline in stock in the country's most important commercial waterway.

[35] Htun, Su Yin (2019) Myanmar Laws on Forests, Biodiversity and Ecosystems in Myanmar, Rule of Law Handbook for Environmental Law, ISBN - 978 - 99971 - 954 - 2 – 5

[36] Eriksen, T.E., Friberg, N., Brittain, J.E., Søli, G., Ballot, A., Årstein-Eriksen, E., Blakseth, T.A., Hans Braaten, H.F. V. (2021) Ecological condition, biodiversity and major environmental challenges in a tropical river network in the Bago District in South-central Myanmar: First insights to the unknown, *Limnologica*, Volume 86, 2021, 125835, ISSN 0075-9511, https://doi.org/10.1016/j.limno.2020.125835.

[37] Mosley, Luke. (2014). Drought impacts on the water quality of freshwater systems; review and integration. *Earth-Science Reviews*. 140. 10.1016/j.earscirev.2014.11.010.

limited utilization of chemical inputs is a market opportunity for SSA to transition to an 'all-organic' mode of production for a growing health-conscious consumer-base in cities and, increasingly, in rural areas.

The aquaculture and freshwater fisheries sector can also have a significant impact on biodiversity of existing water systems, and associated biotopes (e.g., Inle lake, Pekon Lake, and the Ayeyarwady river in Kachin and Sagaing region). According to the World Bank, Myanmar has a large number of freshwater sites of high ecological value. The 2004 Myanmar Wetland Inventory surveyed 99 different wetlands and identified 17 sites as globally important. Inle Lake, Indawgyi lake, Mogaung Chaung, and Gulf of Mottama are all Ramsar sites and stretches of the Ayeyarwady River support populations of Irrawaddy Dolphin.

The main local environmental impacts associated with the lake and wetland environment include:

- Establishment of large or medium size aquaculture farms inland with no prior environmental impact assessment
- Leasing of inns with no proper monitoring, community involvement and environmental impact assessment
- Annual release of fish seeds in river systems, lakes, reservoirs and other bodies of water by DoF without impact monitoring
- Building of large ponds on previously undeveloped land or farmland, increasing pressure on biodiversity
- Introduction of exotic or alien species that can threaten local and endemic species (e.g., Inle or *Cyprinius intha*) and Small Indigenous Species (SIS)[38]
- Intensive non-organic poultry-fish and/or pig-fish farms.

Key takeaways

- Due to lack of resources of DOF and limited national capacity in natural resource conservation is likely to deteriorate further unless corrective measures are undertaken.

Market constraints

- Lack of support to the development of local community-led Environment Conservation Committee and Environmental Management Fund.

5.5.3 Myanmar Sustainable Development Plan

The GoM launched the Myanmar Sustainable Development Plan (MSDP) (2018-2030) in August 2018 as our national development vision. The MSDP aims to provide a long-term vision (2030) of a peaceful, prosperous, democratic country and transformational economic growth for nation. Myanmar is facing challenges to achieve the MSDP targets set under 5 Goals and 251 Action Plans. In terms of SDG achievement, Myanmar ranked 125 out of the 166 countries included in the UN's Sustainable Development Report of 2022. Of the 17 SDG goals, Myanmar's progress was improving on 5 (quality education, clean water, decent work, industry, climate action), on track on 8 (poverty, zero hunger, health, gender equality, clean energy, sustainable cities, responsible consumption, institutional partnerships) worsening on 3 (life below water, life on land, peace and justice), and unknown on 1 (reduced inequality).

[38] SIS are defined as fish having a body length at maturity of less than four inches in length. They inhabit in rivers and tributaries, small streams, floodplains, lakes, ponds and tanks, wetlands and paddy fields. Some of the popular SIS consumed in Myanmar are mola carplet (*Amblypharyngodon mola)*, climbing perch (*Anabas testudineus*), mango fish (*Polynemus paradiseus*), walking catfish (*Clarias batrachus*), and flying barb (*Esomus ahli*), Burma hairfin anchovy (*Setipinna wheeleri*), spotted snakehead (*Channa ornatipinnis*).

Aquaculture is mentioned one in the plan under MSDP Pillar 2: Prosperity & Partnership, Goal 3: Job creation & Private Sector Led Growth, Strategy 3.1. Create an enabling environment which supports a diverse and productive economy through inclusive agricultural, aquacultural and poly cultural practices as a foundation for poverty reduction in rural areas. The strategy further elaborates the following actions:

- 3.1.1. Revise and develop education and training in the agriculture, aquaculture and food sectors, responding to the evolving needs of farmers and the rural private sector
- 3.1.3. Create market conditions to enable greater investment in agriculture, aquaculture and polyculture, and mechanization
- 3.1.7. Improve investment regulations for agri-investors, including through facilitating foreign investor access to the agriculture, aquaculture and polyculture sectors.

Key takeaways

- Availability of adequate financial and human resources remains a big challenge.
- Ecological information in planning fisheries is considered important in policy circles but rarely acted upon in implementation plans. [39]

Market constraints

- The Myanmar Sustainable Development Plan does not sufficiently address the link between freshwater fisheries and sustainability.

5.5.4 Myanmar Agricultural Development Strategy

The main policy document guiding the agriculture sector in Myanmar is the Agricultural Development Strategy and Investment Plan (2018–2023) which has three pillars: governance, productivity, and market linkages and competitiveness[40]. The long-term plan is intended to be a guide towards inclusive development of agriculture in Myanmar that is based on cooperation between government, farmers and private businesses. The Myanmar Agricultural Development Strategy (ADS) provides strategic directions for the Myanmar Agriculture Sector for 2018–2023. Under the productivity pillar, the ADS set rebuilding aquaculture seedling infrastructure (hatcheries and breeding ponds) for production and distribution of fish and shrimp seeds, and provision and availability of fishing infrastructure facilitated and aquaculture initiatives including land development and cage and pen technology integrated with existing ponds or reservoirs under appropriate legal frameworks. With change of Government in Myanmar, it is unclear whether the ADS will hold in the future.

In the last three years, climate change resilience has been framed as a key component of the country's sustainable development plans. Though the policy narrative for advocating and promoting CSA is already in place, the capacity of line departments to enforce policies on land, water, environment, seed, and fertilizer and pesticide management remain poor. Given the weak extension system and limited outreach in remote areas, the government is likely to seek more active citizen engagement via local nongovernment organizations (NGOs), the private sector, and independent academic institutions. It remains to be seen how CSA is integrated in various government policies.

[39] Crook, David & Reich, Paul & Bond, Nick & McMaster, Damien & Koehn, John. (2010). Using biological information to support proactive strategies for managing freshwater fish during drought. Marine and Freshwater Research - MAR FRESHWATER RES. 61. 10.1071/MF09209.

[40] FAO (2023). National Aquaculture Sector Overview – Myanmar, Food and Agricultural Organisation, Rome. https://www.fao.org/fishery/en/countrysector/mm/en?lang=en#related_links

Key takeaways

- There are no new agricultural policies in the horizon to replace the ADS which has expired.

Market constraints

- The absence of a coherent fisheries development plan leaves a large policy vacuum.
- The States and Regions do not have the resources to undertake development initiatives in fisheries and monitor implementation plans.

5.5.5 Myanmar National Climate Change Policy

The purpose of Myanmar's Climate Change Policy is to provide long term direction and guidance to: (a) Take and promote climate change action on adaptation and mitigation in Myanmar; (b) Integrate climate change adaptation and mitigation considerations into Myanmar's national priorities and across all levels and sectors in an iterative and progressive manner; and Take decisions to create and maximize opportunities for sustainable, low carbon, climate resilient development, ensuring benefits for all.

The long-term goal of Myanmar Climate Change Strategy and Action Plan (2018-2030) is: By 2030, Myanmar has achieved climate-resilience and pursued a low-carbon growth pathway to support inclusive and sustainable development.

Fisheries and aquaculture are specifically mentioned in the objective for action area 4: Increase access to climate-resilient and low-carbon technologies and practices to provide trainings to farmers and fisher folk on climate-smart agriculture technologies and practices — such as improved soil and nutrient management, improved cropping and community aquaculture — with gender considerations based on gender analysis. The expected output is that farmer and fisher folk climate-smart technology capacity is enhanced. However, there is a number of activities in the MCCSAP that can be linked to aquaculture as most actions are concerned with improving climate resilience and mitigation in rural areas.

Key takeaways

- Due to ongoing sanctions, Myanmar has very little access to development aid and climate finance. Hence, it is very unlikely that Myanmar will be able to support climate adaptation and mitigation projects and programmes.
- It is noteworthy that the State of Myanmar was not represented in the recent concluded Conference of the Parties to the United Nations Framework Convention on Climate Change (COP-28) which was held in Dubai from 30 November to 12 December 2023.

Market constraints

- No example of and research on climate-smart aquaculture technology and system in Myanmar and how these systems can help farmer adapt to and mitigate climate change.

5.5.6 Tax Regime

The major taxation laws in Myanmar include the Union Taxation Law of 2022, the Commercial Tax Law of 1990 as amended up to 2015, the Income Tax Law of 1974 as amended up to 2016, the Myanmar Stamp Act 1899 as amended up to 2016, and the Tax Administration Law of 2019. Since 2021, two important developments have taken place on the taxation front. First, on 1 October 2021, the Ministry of Planning and Finance ("MOPF") announced a change to

the income year (previously it was from 1 October to 30 September) to run from 1 April to 31 March. The second was reduction of the Corporate Income Tax ("CIT") from 25% to 22% effective from 1 October 2021.

As per Central Bank Data[41], DOF's core budget reached all an all-time high of 6,693.363 MMK Mn (USD 4.85 MN) in 2020, and then decreased to 6,017.833 MMK Mn (USD 3.38 MN) for 2021, 5,260.57 MN MMK (USD 2.97 MN) in 2022 and reported at 4,503.300 MMK Mn (USD 2.15 MN) in 2023. This is still a fraction of the total management budgets for other natural resources management agencies and just inadequate to meet DOF's mandate. According to official data, central government fisheries revenues from license fees and taxes capture less than 1 percent of fisheries' GDP contribution and around the same amount that is spent on the DOF's budget.

Under Myanmar's 2008 Constitution and 2015 Constitutional Amendment, revenue collection and legislative power for freshwater and inshore fisheries were decentralized to states/regions. The devolution of tax management has led to a great variety of tax and license fees in the five States/Regions where F4L and MM is operating. For example, the licensing of ponds greater than 25 feet by 50 feet by DOF appears to vary across States/Regions. In Magway, pond licensing fees that appear to vary from Kyatt 900 to 2,200 per acre or a flat rate of Kyatt 700.

Lease licenses come with additional conditionalities. The grantees of lease have to buy the fish seeds from government owned hatcheries in value of 30% of the fees of their leases. Further, they have to replenish that fish seeds after reaching the size 4-5 inches in the pan or cage. (3-4 months).

Key takeaways

- Rationalisation of DOF's fishing licensing fees and leasing conditions is essential so that fishers can take informed decisions.

Market constraints

- Lack of transparency on revenue collected by DOF from licensing of inns, ponds and sale of seeds.
- Lack of clarity regarding the type of land converted to ponds, the actual conversion rate of farmland to aquaculture ponds and the net value of these conversions.
- Limited regularization of the status of illegally constructed ponds.

5.5.7 Informal rules and norms

Informal rules are usually part of customary management systems designed by fishing communities to regulate the use, access and transfer of natural resources and are based on traditional knowledge. During the colonial period, there was severe undermining of tradition rights of fishing communities due to imposition of auction system which gives the usufruct rights of the most productive fisheries to the highest bidder on a yearly basis. Recent evidence further suggests that the policy environment has encouraged the adoption of short-term strategies by license holders, often prioritizing profit maximization over long-term sustainability [42].

A policy alternative has been to legally recognize the response to the current community-based

[41] Myanmar Budget: TR: SOP: Fisheries: 2018 - 2023 | Yearly | MMK mn | Central Bank of Myanmar, https://www.ceicdata.com/en/myanmar/government-budget-annual/budget-tr-sop-fisheries

[42] Tezzo X., Kura, Y., Baran, E. and Wah, Z.. (2016). Individual tenure and commercial management of Myanmar's inland fish Resources in Song A., S. Bower, S. Cooke, P. Onyango and R. Chuenpagdee. (eds). Inter-sectoral governance of inland fisheries: too big to ignore. St John's, NL: Global Partnership for Small-Scale Fisheries Research (TBTI).

fisheries management (CBFM) as a more suitable alternative to the auction system[43]. The Myanmar Fishery Partnership (MFP) initiative led by WorldFish incorporates the principle of co-management of fisheries resources by the government and communities. The MFP initiative is to assist the Myanmar government in strengthening effective collaboration for the sustainable development of Myanmar's fisheries and aquaculture sector. The MFP builds on the work of the Rakhine Fishery Partnership and Ayeyarwady Fisheries Partnership that involves DoF representatives, members of parliament, the private sector, CSOs, NGOs, universities and fishers, in developing improved state & regional fisheries legislation in Myanmar. There has been little progress in the last three years on the MFP initiative due to internal resistance from DOF.

Key takeaways

- Auction system introduces short term profit maximisation over conservation of fisheries resources.

Market constraints

- Innovative mechanism pioneered by the Rakhine and Ayeyarwady Fisheries Partnership is not being adapted for replication in the intervention area
- CBFM is strongly supportive of subsistence level livelihood, and conserving fish breeding grounds, the system may not be suitable for upscaling production.

5.6 Development activities in the sector

There are few donors active in fisheries sector in Myanmar. This is due to economic sanctions imposed by few countries. United Nations projects are active in the country. The projects active in 2024 is listed in table 41 below. The projects are implemented by DOF.

Table 40: Summary of other ongoing initiatives in aquaculture and freshwater fisheries

Initiative	Main activities
Myanmar - Global Agriculture and Food Security Program (GAFSP) (2019-2024) Funder: FAO	Objective: The project objective is to create an enabling environment that reduces the incidence of poverty, food insecurity and malnutrition among the rural poor of the project area. The project aims to simultaneously strengthen the effectiveness, sustainability, equity, climate resilience and nutrition outcomes of the interventions through the combination of value chain improvements targeted to small producers, brokers, traders and processors with specific poverty reduction, climate smart, nutrition and land administration interventions. Activities: The FAO-implemented activities are following four core sections: i) Dissemination of Good Agricultural Practices (GAP); ii) Nutrition Improvements; iii) Promotion of off-farm rural employment; iv) Capacity Development for Monitoring and Evaluation.
ARISE Plus Myanmar	Objectives: The specific objective of the project is to increase trade diversification and integration, regionally (ASEAN) and

[43] Tezzo, X. (2020) Governing Myanmar's Inland Fisheries: towards a more sustainable fish production and inclusive benefit-sharing among fish-dependent communities, WorldFish. Retrieved on 4 January 2024 from https://mel.cgiar.org/projects/myfishii/281/governing-myanmars-inland-fisheries-towards-a-more-sustainable-fish-production-and-inclusive-benefit-sharing-among-fish-dependent-communities

(2019-2024) Funder: European Union	internationally (EU and global markets), with a focus on gender-inclusive market-led value chains. Activities: International Trade Centre has implemented series of training programs for entrepreneurs and Master trainers in preparation of Hazard Analysis and Critical Control Points (HACCP) plan and getting HACCP certified. This ensures and guarantees proper food safety management, which is crucial for a premium natural food item like fish.
Small-scale Aquaculture Extension Project for Promotion of Livelihood of Rural Communities in Central Dry Zone (SAEP in CDZ) Funder: JICA (2018 ongoing)	Objectives: To promote small-scale aquaculture as "Farmer to Farmer Extension Approach (FTF)" through the Project for Small-scale Aquaculture Extension. Activities: The project activities are not only to promote farmer's aquaculture activities but also School-pond aquaculture activities as an awareness program for aquaculture for pupils as well as for parents in community. Core farmers were also eager to support other neighbouring farmers so that neighbouring farmers benefit more from aquaculture. All the farmers were satisfied with the support from the core farmers and the DOF officers.

6 Constraints analysis

6.1 Main constraints

In a response to an open-end question, 1,247 responses were received from hatchery operators (32), nursery operators (116), grow out farmers (861), fisher (32), feed producer (54), processors (74) and retailers (81). The top five constraints, accounting for 75% of all responses cited, were raw material shortage (22%) followed by political instability (14%), inflation (13%), climate change (9%), poor transportation (9%), capital shortage (9%), and market condition (9%) (see Figure 5).

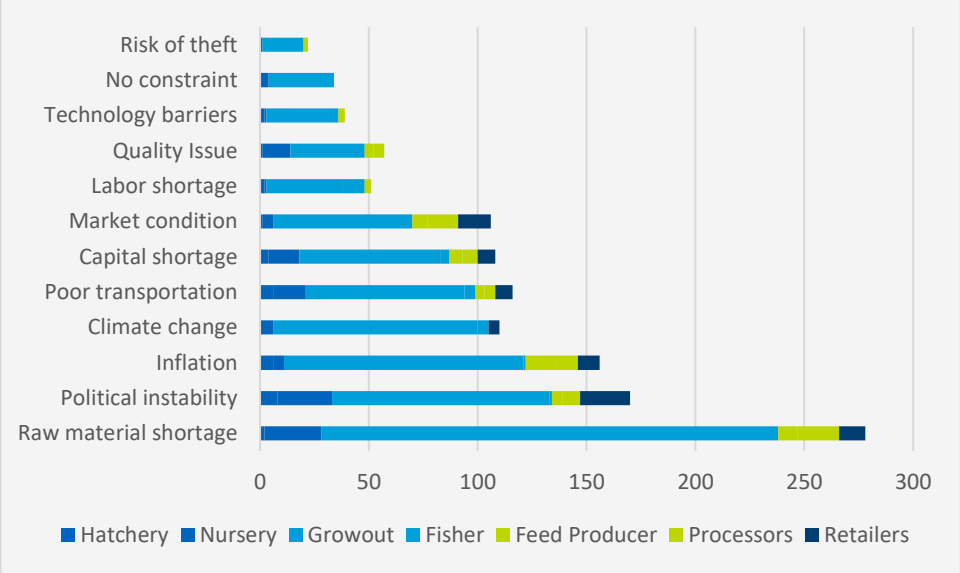


Figure 5: Main constraints to aquaculture and freshwater fisheries development

Raw material shortage impacts most the hatcheries, nurseries, grow outs and feed processors. Hatcheries complain about not getting enough fish from nurseries. Nurseries face shortage of oxygenated bags, and packing material of specified density. The shortage and high prices of fries and fingerlings and delayed delivery due to transport bottlenecks affect the hatcheries.

The grow-out face shortage of affordable quality feed, availability of rice and storage facility. Fish meal and fish oil are key ingredients for fish feed. They are combined with other components such as vegetable proteins, rice bran, wheat bran, peanut oil cake, vitamins and mineral and formed into feed pellets.

The material used for production for fish meal are soybean cake (35%), cereal brans (30%), bycatch fish (15%), leaves and legumes (5%), auxin (1%), salt (0.5%) and others (14.5%). The area under soybean in Myanmar (mainly Shan and Sagaing) has contracted from 135,000 ha in 2021 to 120,000 ha in 2023 – a 13% decline in three years. The high international prices of soybean have further increased cost of fish feed.

Icing is the most commonly used method for storing fish before manufacture of fish meal. The power shortages and transportation difficulties have affected ice production and on-time distribution. Political instability has led to frequent road closures leading to logistics issues, which has contributed to shortage of raw material shortage, and volatility in market supply.

Climate change issues expressed by respondents were shortage of water, excess untimely rainfall, overflow of ponds and lakes causing migration of fish stock. Inflation is high since the 2021 coup, standing between 18 and 22 percent.

Worsening logistics and falling supply due to less output, as well as soaring fertilizer and fuel prices, are largely fueling higher rice prices. Short sighted policies are also contributing to inflation. For instance, despite falling domestic production of soybean, Myanmar exported soybeans worth $3.01 million to neighboring countries, which led to spike in soybean prices in the country.

Safe, secured and predictable transport is a must for moving goods from producers to various markets. However, curfews, seizures, and delays in obtaining security clearances have impeded transportation. This has resulted in increase in risk for transporters who have increased their transportation to charges to compensate themselves.

More than 40% of the fishing community do not have access to formal finance. A survey of the microfinance sector in Myanmar[44] by the Myanmar Micro Finance Association (MMFA) in 2022 show that the prolonged nature of the political and economic instability is now affecting the sector more significantly, in particular through a rise in non-performing loans. Overall, the total loan portfolio for the sector declined by 216 billion MMK (USD118 million) or 10.2% between December 2020 and June 2022 as lenders had insufficient liquidity to make new loans and demand decreased. Similarly, there was a dramatic decrease in savings by 25% (38 billion MMK or USD 20 million) between December 2020 and June 2022. New cash withdrawal limits at banks and foreign exchange controls have made it very difficult for MFIs to repay loans to foreign lenders, making foreign investors reluctant to continue to fund the sector. For the foreseeable future, microfinance and bank lending may not be available to meet the fishing sector's working capital needs and soft loans for purchase of equipment.

44 Myanmar Micro Finance Association (2022) Myanmar Microfinance Sector Evolution - MFI Health Check Survey Results Phase II Myanmar Microfinance Sector Evolution - MFI Health Check Survey Results Phase II, https://www.ada-microfinance.org/en/blog-news-ada/deteriorating-liquidity-and-funding-conditions-microfinance-institutions-myanmar

6.2 Root causes

The root causes of the aquaculture and freshwater fisheries sector under-development can be traced to government failure and market failure. In economic literature, government failure refers to a situation where government intervention in a market result in further economic inefficiencies. Market failure refers to inefficient distribution of goods and services in a competitive market. In such a situation supply and demand is not in equilibrium resulting in market distortion, monopolistic control and under investment. Given the difficult situation in Myanmar, it would be prudent to focus on few short-term interventions that the private sector and civil society can execute. **Some of the market constraints listed** above are more amenable to solutions by development organisations like WorldFish. Addressing the constraints associated with the government failure require deep macroeconomic and political reform which is beyond the scope of most development projects. From the above list, **raw material shortage, market condition, quality issues, and technology barriers** has been considered for further elaboration in the table below. Issues like political instability, climate change, capital shortage, labor shortage due to migration and theft are inextricably linked to macro-economic and political situation, which is well beyond the scope of WorldFish, hence they are not considered further.

Table 41: Interventions to address root causes

Key constraints	Manifestation	Root causes	Proposed intervention
Government failure			
Inflation, Increase in theft, lack of government investment in fisheries infrastructure	Armed conflict, breakdown of law and order	Political instability	NA
Poor transportation	Refusal of transporters to travel through conflict zones	Security threats	NA
Limited access to institutional finance for production, marketing, and fixed assets	Restrictions placed on repatriation of capital invested.	Capital shortage and weak banking system.	NA
Market failure			
Post-harvest losses	The losses can broadly be categorized as weight loss due to spoilage, quality loss, nutritional loss, and monetary loss.	Lack of access to refrigeration, and cooling	Solar cooling and ice making; product diversification through dehydration, drying of fish, and conversion to fish powder and paste (Intervention 7.2)
Supply bottlenecks	Raw material shortage e.g., feed ingredients, fries and fingerlings	Disruptions of supply chain	Expand seed supply from hatcheries (Intervention 7.3), Improve fish feed development (Intervention 7.4) Scale up storage and marketing (Intervention 7.5)

Lack of training and capacity building	Weak adaptation of new technologies	Lack of robust extension services	Capacity building and training of extension staff, NGOs, farmers, feed processors, retailers etc. (Capacity building and training Intervention 7.6).

7 Proposed market system interventions

7.1 Overview of opening portfolio of interventions

The MSD approach focuses on addressing the root causes of poor system performance by identifying leverage points in the system where interventions can drive systemic change. Program design aim to address root causes identified that can unlock growth in multiple value chains by intervening in, for example, streamlining input supply systems, increasing access to information, removing logistical bottlenecks, and nurturing an enabling business-friendly environment.

Inclusive MSD approaches lays emphasis on expanding economic opportunities for all market players, particularly SSAs (Heirli, 2008[45]), boosting domestic trade and exports, and attracting private sector investment in ways that contribute to poverty alleviation and improve dietary intake of households (USAID, 2014[46]). Past experience in using the MSD implementation suggest that programs are most effective when they are rooted in facilitation, co-creation, co-investment, and co-management of interventions through local communities, businesses, government, civil society, academia, media and technical experts (WorldFish, 2021[47], USAID, 2022[48]). The MSD approach in Myanmar has to be dovetailed with the constantly evolving political, macroeconomic and security situation and consider what is feasible on the ground.

Few potential interventions are suggested to improve the condition of aquaculture and freshwater fisheries. The focus is on developing the untapped potential of the aquaculture and freshwater fisheries to fill the growing gap between supply and demand for fish in Myanmar. Each intervention included the following:

- Focus on short term interventions which can deliver immediate benefits
- A time frame for implementation and for impact to manifest (short, medium and long-term indicating two years, five years and seven years respectively).
- The potential impact on income, nutrition and food security for the most vulnerable people, particularly members of vulnerable groups, such as women and children.
- Identification of direct beneficiaries
- Potential implementing partners
- Priority level (low, medium and high).

[45] Heirli, Urs (2008) Market Approaches that Work for Development – How the Private Sector can Contribute to Poverty Reduction, Swiss Agency for Development and Co-operation, Berne.
[46] USAID (2014) A Framework for Inclusive Market System Development, USAID, Retrieved on 10 February 2024 from https://www.marketlinks.org/sites/default/files/resource/files/Market_Systems_Framework.pdf
[47] World Fish (2021) Market System and Consumer Dynamic Analysis of the Fish Sector in Bangladesh, World Fish and Light Castle Partners, Bangladesh
[48] USAID (2022) Integrating a Market Systems Approach in Programming U.S. Government's Global Food Security Strategy Activity Design Guidance. USAID. Retrieved on 10 February 2024 from https://pdf.usaid.gov/pdf_docs/PA00ZVF4.pdf https://pdf.usaid.gov/pdf_docs/PA00ZVF4.pdf

The recommended interventions have been arranged in the following order (Table 42):

Table 42: Recommended Interventions

Areas of Intervention	Priority	Feasibility
Production		
Reduce postharvest losses and better product quality (Intervention 7.2)	High	Highly feasible as WorldFish is already promoting solar icemaking, cool boxes and better methods of drying fish.
Expand seed supply from hatcheries (Intervention 7.3)	High	Feasible to scale up WorldFish current work with private partners.
Improve fish feed development and supply (Intervention 7.4)	Medium	Feasible, WorldFish can facilitate scaling up black fly soldier and feed pellet production.
Marketing		
Scale-up storage, marketing and transportation (Intervention 7.5)	High	Feasible. WorldFish is working on fish powder as food supplement and promoting dried or fermented paste form or in combination.
Institutional development		
Adopt a cluster based approach for fisheries development (Intervention 7.6)	Medium	Could be piloted in one or two selected clusters.
Capacity building and training (Intervention 7.7)	High	Highly feasible to scale up WorldFish's current training initiatives and deliver tailor-made packages through its network of own staff and local partners.
Access humanitarian assistance for fisheries development (Intervention 7.8)	High	Feasible to tie up with ongoing UN and other donor initiatives.

7.2 Reduce postharvest losses and better product quality

The high level of postharvest losses in aquaculture and freshwater fisheries can be potentially addressed by improving the currently limited primary processing of fish. While frequent power outages and high diesel costs for generator use make investment in cold room infrastructure risky for private investors, research is needed to assess the feasibility of small-scale and locally fabricated processing plants, such as using local materials like engineered bamboo boards and equipping them with basic processing equipment, such as counter tops, basins and ice dispensers, to process fish, put on ice and provide cold storage.

Solar drying of fish, and small scale solar-powered refrigerators (1.8 Cubic ft 24.5inL x 27.5inW x 36.5inH) are economical to operate. Fish could then be suitable for sale in higher value fresh fish markets, taken to market in cool boxes, as well as for smoking in traditional value chains. Successful models in Myanmar and from other countries should be explored. 12L, 20L, 50L Plastic Cooler Solar Fishing Cooler Boxes could be popularized. Solar-powered cooler is expected to reduce the dependency on ice, prolong the shelf life and ensure the quality and hygiene of fresh fish sold in the retail.

Cold rooms at market yards would also reduce postharvest losses for traders who would be able store leftover fish to sell the next day, especially during the peak season for Hilsa fish, which floods the market during the rainy season.

Time frame: short to medium term
Potential impact – medium
Potential beneficiaries – female fish mongers, and processors, SMEs, and consumers.
Potential implementation partners – MFF, private sector

7.3 Expand seed supply from hatcheries

Adequate supply of good quality and affordable fingerling to fish farmers is a pressing need in Myanmar. The supply from the two dozen hatcheries of the Department of Fisheries is far short of the demand. Therefore, alternate business models for hatchery development such as contract farming between private companies and communities and providing technical, and financial support to private hatcheries should be considered. Both technical and business development training should be conducted with private hatcheries and startup entrepreneurs who are desirous of building fingerling business to supply farmers in the country. WorldFish has ready to use training material for entrepreneurs.[49]

Time frame: short to medium term
Potential impact – high
Potential beneficiaries – hatcheries, growers, nurseries
Potential implementation partners – Yangon University, private companies, Htoo Thit Co. Ltd, one of largest aqua feed companies in Myanmar.

7.4 Improve fish feed development and supply

The evolution trajectory of fish feed industry in many countries show that initial step is to develop farm made fish feed based on locally available ingredients. There is scope for reduction of feed costs by partial replacement of ingredients of animal origin (fish oil and meal) with vegetable ingredients.

Use of black solider fly, earthworms, termites, snails, trash fish, tadpoles and frogs can diversify the feed options[50]. A critical training input is to develop the capacity of WorldFish staff, Implementing Partners, and feed producers to make cost-effective, nutritious farm-made feed. Different business models should be explored (e.g. cooperative, private sector or NGO led, PPPs, or humanitarian projects.

Time frame: medium term
Potential impact – medium
Potential beneficiaries – hatcheries, nurseries, growers, nurseries
Potential implementation partners – WorldFish, feed producers, Asian Food and Feed Insect Association (AFFIA)

7.5 Scale-up storage, marketing and transportation

The marketing of fresh fish both raw and iced can be enhanced through improvements in storage technologies available to traders, the provision of credit for business development, and addressing transportation bottlenecks through coordination with Township authorities. Further availability of ice box/cold storage would increase profit margins for traders and improve fish quality since consumers, especially in inland areas are currently being sold

[49] Silvester, Pete (2018) Nursery Fish Farm: A Business Modelling Guide for Aquaculture Entrepreneurs, WorldFish, 3 December 2018

[50] Deguerry, A., Preteseille, N., Kovitvadhi, A., Allan, D.J., , Nampanya, S., Newman, S. (2023) From the heart of the animal feed industry: a Southeast Asian perspective on insects for feed in Asia, *Animal Frontiers*, Volume 13, Issue 4, August 2023, Pages 41–49, https://doi.org/10.1093/af/vfad036

spoiled dry fish. The feed producers and fish processors could also be provided equipment on matching grant basis.

Time frame: medium to long term
Potential impact – medium
Potential beneficiaries –grow-outs, fishers, fish retailers and wholesalers
Potential implementation partners – MFF , Mawlamyaing Holding Ltd.

7.6 Strengthen fish farmer network in one or two clusters

It is suggested that WorldFish facilitate a cluster based approach to serve nurseries, hatcheries, grow outs, fish processors, feed producers, and retailers in one or two clusters. The benefit of cluster approach is rendered through a focus on physical infrastructure creation, technology dissemination, training, product diversification, innovation, design improvement, better improved packaging and warehousing with the aim to improve farmers income, and user convenience. Aggregation of fish at common facilities, and collective marketing could fetch better prices, and lower logistics costs because of bulk transportation.

Time frame: short to medium term
Potential impact – medium
Potential beneficiaries – hatcheries, nurseries, fishers, grow-outs, fish processors, feed producers, fish retailers
Potential implementation partners – WorldFish, WorldFish Implementing Partners

7.7 Capacity building and training

The capacity building need of the individuals surveyed during this assignment falls into three distinct categories:

- Awareness raising through training/workshops
- Availability of technical manuals in vernacular (e.g., simple methods in fisheries series, disease diagnostics and preventions, technical manuals in hatcheries, feed preparation, fish feeding, marketing techniques, food hygiene).
- Mobile supported market price information, and query resolution

Future custom-made training courses could include:

- Strengthening fisher associations, cooperatives and producer self-help groups
- Better management practices
- Hygienic, cleaner and better management of fish storage and handling at landing sites
- Responsible and efficient small-scale fishing production technologies
- Fish marketing techniques and financial management
- Fish entrepreneurship development
- Advanced and improved feed manufacturing
- Disaster preparedness, rehabilitation and recovery;
- Training on selective fishing gear, bycatch reduction and sustainable fishing methods

Time frame: short, medium and long term
Potential impact – medium
Potential beneficiaries – hatcheries, nurseries, fishers, grow-outs, fish processors, feed producers, fish retailers, women and youth
Potential implementation partners – Private and government training institutes, NGOs, Myanmar National Skills Development Authority

7.8 Access humanitarian assistance for fisheries development

Normal development activities have come to standstill in Myanmar for two reasons. The military takeover in 2021 and the unrelenting cycle of violence has severely curtailed mobility of government and development officials. The second is in the light of Western sanctions, many prominent aid agencies have suspended development aid, closed offices, and only supported humanitarian activities. The immediate outlook remains bleak with conflict spreading to new areas, public services in disarray, and macro-economic instability worsening the financial distress of fishing communities.

According to the Myanmar Humanitarian Response Plan 2023 consolidated by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), one-in-three, or 17.6 million people, are now in humanitarian need. In Myanmar, increased armed conflict and monsoon floods continue to trigger new displacement and exacerbate humanitarian needs. According to the UN, over 1.9 million people remain displaced within the country, with 47 townships in the North-West and the South-East still under martial law

With surging displacement, nutritious food is becoming more scarce and increasingly unaffordable due to inflation. UN OCHA has proposed a Socioeconomic Resilience and Response Plan (SERRP) to respond to ongoing Myanmar crisis.

Under the Myanmar Humanitarian Response Plan 2023, WorldFish is in a unique position at preventing fishing communities from slipping into humanitarian need by targeting those who are impoverished and at-risk but not yet in humanitarian need, supporting people to build their resilience and recover from humanitarian situations, and pivoting available development resources to reach those with urgent needs whom humanitarians are not able to reach due to funding constraints through different kinds of support. In collaboration with DOF, NGOs and other stakeholders, it can offer the fishing communities.

- Limited financial assistance to restart their business
- Training for improving their fish productivity, food hygiene and food processing
- Creating marketing outlets for their produce
- Re-establishing marketing networks

Time frame: short, medium and long term
Potential impact – high
Potential beneficiaries – hatcheries, nurseries, grow-outs, fish processors, feed producers, fish retailers, wholesalers, internally displaced persons.
Potential implementation partners – DOF, INGOs, NGOs, UN OCHA, global philanthropies

8 Conclusion and recommendations

Based on research data and analysis, it may be concluded that the Myanmar aquaculture and freshwater fisheries system is very resilient. The fishing community has largely recovered from the shock induced by Governments-imposed restrictions during the 2019-Covid crisis. The impact of political instability, high prices and logistical difficulties has differential impact on fish trades. For fishers and feed producers, there is slight decrease in profit. For hatcheries, nurseries and grow-outs, profit margin has increased slightly. The profit margin of fish producers has increased significantly. The withdrawal of development funding agencies and international development financial institutions has negatively affected fisheries projects in the country. This situation is likely to persist in the near future.

The recommended interventions provided in section 7 of the report should be further developed through a detailed design process like the co-creation organised by WorldFish with

stakeholders in 2020. The co-creation process will enable sharing of the findings and analysis of the report with shareholders, conduct root cause analysis, identify and prioritized intervention that to creating a linkage with the processes of localization, capacity building, and employment options in the aquaculture and freshwater fisheries sector (especially for disenfranchised women and youths) together with the importance of both food security and food safety.

As an example, the joint root cause analysis facilitated by Asper Consulting with WorldFish during the on-line market systems development training on Sagaing seed supply chain revealed that the constraint in raw material /seed was due to a lack of market intelligence, from nurseries on the actual demand from grow outs in different species of fish and the seasonality of this demand. This type of market facilitation intervention that can be facilitated by WorldFish or implementing partners can unlock the supply of fingerlings.

- End -