Insight Brief

WAVES
Insight Brief
Myanmar
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Background

This insight brief complements the "Investment Analysis in Mangrove Ecosystems in the Ayeyarwady Region." This insight brief serves to provide a comprehensive overview and enhance understanding of the commercialization of aquaculture farmed products and the production practices within the mangrove landscapes in the Ayeyarwady Region. This analysis can support design of specific actions targeted at promoting inclusive livelihoods and value chain development while supporting mangrove forest restoration and conservation efforts.

Mangrove Aquaculture: Polyculture Products in the Ayeyarwady Region

Value Chain Analysis

Executive Summary

In the mangrove areas of the Ayeyarwady Region, aquaculture is one of the most important and highest sources of income for local livelihoods. In Forest Reserve mangroves, aquaculture systems have emerged that are characterized by polyculture farming (combining fish, shrimp, and crabs) and that primarily depend on natural recruitment of seed, fingerlings, and juveniles. Despite the profitability and attractiveness of this economic activity, an operational assessment of mangrove aquaculture systems highlights an existing gap between observed practices and the National Standard on Good Aquaculture Practices in Myanmar. The gap identified is not only related to the challenges faced by mangrove aquaculture systems, but it also reflects the barriers that the aquaculture sub-sector faces for its development in the region, and throughout the country. Considering the government's interest in the aquaculture sub-sector as an engine for development, the following analysis aims to strengthen the understanding of mangrove aquaculture systems, or silvofishery, and the underlying opportunities to further promote the sustainable and inclusive development of the sub-sector. In this regard, the analysis also aims to support the outputs identified in the National Aquaculture Development Plan for prioritized implementation related to the development of small-scale aquaculture and mangrove friendly systems. COVID-19 impact on production levels is also presented. Recommendations are suggested in order to support the sustainable development of mangrove aquaculture systems and the overall aquaculture sub-sector in the Ayeyarwady region.

Penaeus monodon (Adobe Stock)

Methodology

The methodology for this insight brief is framed by a functional value chain analysis, identifying the main stakeholders/agents of the value chain, and emphasizing on the production stage of aquaculture farmed products in mangrove areas. For the analysis, 24 aquaculture farmers across the mangrove areas in the Ayeyarwady Region were interviewed. Farmers were selected using a random sampling methodology from a list of aquaculture farmers compiled by village head.

Acknowledgement

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Investment Analysis for Mangrove Ecosystems in the Ayeyarwady Region

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Environment, Natural Resources and the Blue Economy Global Practice

WAVES

Mangrove Aquaculture System

In Myanmar, the aquaculture sector has grown rapidly over the past two decades despite constraints from a policy environment that strongly favors the production of rice and tightly regulates the conversion of agricultural land to alternative uses. The Ayeyarwady Delta is the most important area in the development of the aquaculture sector in Myanmar, reporting a fish-farming output growth of 250% over the past decade due to a combination of growth in the pond area and yields (Belton & et al., 2015). Farming households have been a fundamental force towards this growth, as they are attracted by aquaculture returns (higher than those from alternative agriculture activities) and rely on it as an important income source that supports rural livelihoods. Despite this positive outlook, the development of this sector reports little diversity in the production technologies used, or in the species produced (Belton & et al., 2015); and high dependency on the availability of natural resources as inputs for stocking the ponds (GGKP, 2020). Furthermore, besides challenges related to land access and secured land tenure, the aquaculture sector in Myanmar reports low skills and technical knowledge, a lack of access to credit and support services, and conflicting policies between different government agencies and stakeholders (TFS, 2017 & San, 2019). The impact of these problems is reflected in low productivity levels of existing farms, especially when comparing Myanmar with neighboring countries. Myanmar's current aquaculture productivity per hectare is estimated to be half of Thailand's, one-quarter of Bangladesh's, and one-seventh of Vietnam's production (WB, 2019).

	Aqua Ponds (ha)	Paddy Land (ha)
Ayeyarwady	75,792	2,038,482
Myanmar	198,840	7,161,124

Table 1. Official land use statistics by aqua ponds and paddy land in hectares (2017)

Source: DOF, Fishery Statistics, 2017-2018, CSO, Statistical Yearbook 2017 (Department of Fishers, 200).

In 2018, The Ministry of Agriculture, Livestock, and Irrigation (MOALI) adopted the Agricultural Development and Investment Strategy (ADS) with a new vision of transforming the rice-bowl of Asia into a regional food basket, emphasizing agriculture diversification, market integration, and value-added production to improve value chains and address technology gaps of rural farmers. The plan recognized the important role of the fishery sub-sector and made an important commitment to mobilize budgetary and other financial resources to develop the sub-sector in parallel with crop sectors, as well as regional market trends. The Department of Fisheries (DOF) launched the "National Aquaculture Development Plan" (NADP) in early 2020 to fulfill the objectives of the ADS in terms of productivity, competitiveness, and governance of the sub-sector in line with the Myanmar Sustainable Development Plan (MSDP). Furthermore, in line with the government's efforts to gain approval for Myanmar aquaculture product exports to the European Union (European Commission, 2018), it has been promoted the adoption and implementation of Good Aquaculture Practices (GAqPs) among aquaculture farmers (Department of Fisheries, 2020).

Besides the recognition of aquaculture as a sub-sector that could positively contribute to the sustainable development of Myanmar, aquaculture is not yet considered as a form of agriculture and therefore, an onerous and time-consuming change of land process needs to be completed before the land can be used for aquaculture purposes. The ADS recognizes the challenges of unsecured land rights and those associated with a cumbersome and lengthy administrative procedure to change the land use. In this regard, the legal status of fish aquaculture ponds is still uncertain, with the NADP fully endorsing the necessity to address a set of land issues that are negatively impacting the social fabric and development process of Myanmar (Department of Fisheries, 2020).

Box 1. Linkages of Aquaculture to the Myanmar Sustainable Development Plan (MSDP)

Inclusive Development – Aquaculture presents an opportunity for the rural population to increase their livelihoods, with earnings per hectare much higher than those from crop-based farming, and a more stable and higher rate of pay when compared to the agricultural sector.

Export Revenue – If Myanmar can increase the production, quality, and supply reliability of fishery products, the potential exists to increase exports, leading to greater foreign earnings.

Job Creation – The development of the aquaculture sector will increase the employment opportunities in rural Myanmar, and also, it will increase the quality of jobs available.

Food and Nutrition Security – Aquaculture will improve food and nutrition security, as fish products are recognized as a rich and cost-effective source of animal protein.

Environmental Conservation – Aquaculture plays a vital role in ensuring the sustainability of the fisheries sector, as fish resources are coming under increasing stress.

Source: DOF, National Aquaculture Development Plan (NADP) 2020.

In the mangrove areas of the Ayeyarwady Region, aquaculture is one of the most important and highest sources of income for local livelihoods. Considering small-scale farming, aquaculture is largely extensive (depending mostly on natural fish stocks), with limited semi-intensive ponds built in mangrove areas inside and outside Reserve Forests (RF). Even though aquaculture has not been a leading cause of mangrove loss (main drivers: fuelwood collection, charcoal production, illegal logging, and paddy cultivation; WB, 2019), people have occupied large areas of mangroves and established aquaculture ponds, after several decades of encroachment (GGKP, 2020). Regardless of the main drivers of mangrove loss, mangrove habitat conversion has likely contributed to declines in the resources of coastal fisheries, given their crucial ecological role as nursery habitats (WB, 2019). In line with the Myanmar Reforestation and Rehabilitation Plan (2016-2026), the Forestry Department has encouraged local farmers to group together and submit applications for community forestry (CF) land certificates. Under this framework, and within RFs, Community Forestry User Groups (CFUGs) have gained the permission to maintain small-scale aquaculture ponds within designated RF areas as long it is aligned with their CF management plan as part of the agroforestry act. This CFUG management plan provides a 30-year use right to the designated RF area.

Box 2. Gender Role in the Fishery Sub-Sector

The fishery sub-sector in Myanmar is dominated by men; however, women play an important role in inland fisheries, aquaculture, and small-scale fisheries (ADB, UNDP, UN Population Fund, And UN Women, 2016). While men mainly set the nets, women are more involved in retrieving the nets and sorting the catch into categories, determining what will be sold, eaten by the household, or processed. Women are involved in equipment preparation and repairs, and in selling fishery related products, including fish paste and bait (WB, 2018).

In the Ayeyarwady Region, and in Myanmar overall, literature regarding aquaculture systems that attempt to combine utilization and conservation, or in other words, mangrove (friendly) aquaculture systems or silvofishery, is limited and scarce. Therefore, the following analysis aims to strengthen the understanding of mangrove aquaculture products' value chain, emphasizing the production stage by small-scale farmers and CFUG users, and the support needed to further promote the sustainable and inclusive development of this sub-sector. In this regard, the following analysis supports the implementation of NADP priority Outputs: **2.2.** Small-scale aquaculture systems especially homestead aquaculture is developed for the poor, landless, women led households especially in fish deficit areas; and **2.3.** Rice-fish systems and mangrove friendly farming systems are developed and promoted.

Box 3. Small-Scale Farmers

Small-scale farmers are typically defined here as resource-poor individuals or groups of people involved in small-scale aquaculture production, i.e. aquaculture production facilities and processes with small production volume and/or relatively small surface area and typically lacking technical and financial capacity and other resources to support individual certification.

Functional Value Analysis

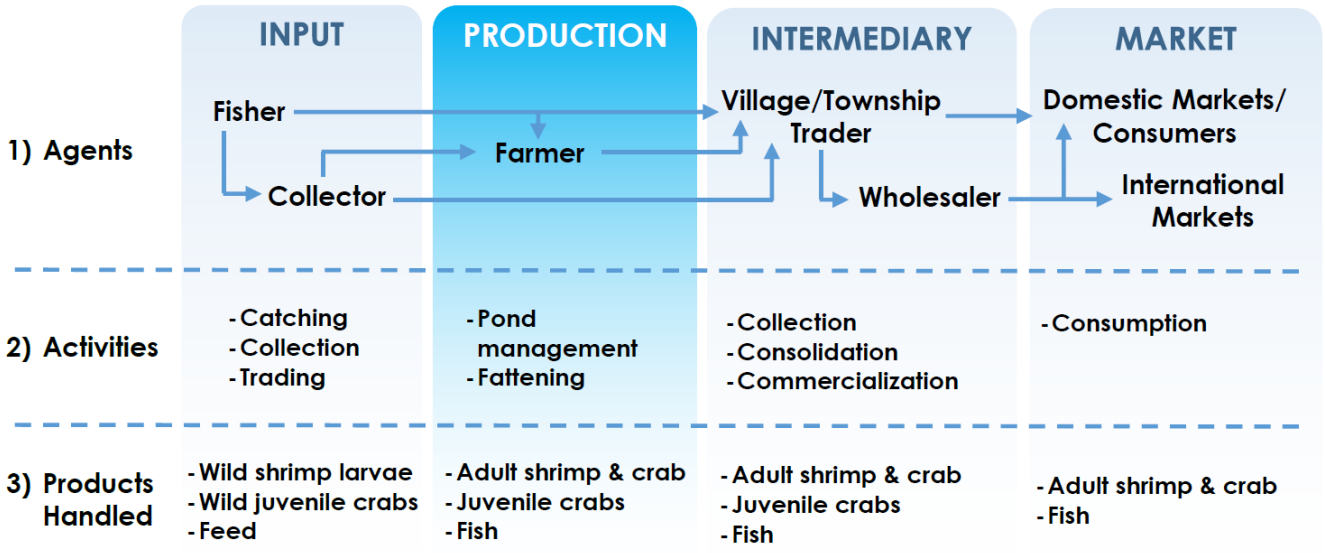

Figure 4. Polyculture products functional value chain in the Ayeyarwady Region (small-scale farmers).

Based on the interest of analyzing mangrove aquaculture systems, the farmers (production agents) and the products considered for the value chain analysis were located and came from RF areas, certified under the CF framework.

Along the value chain of products from mangrove aquaculture systems managed by small-scale farmers, mud crab (*Scylla spp.*) and tiger shrimp (*Penaeus monodon*) are the two main products commercialized and traded in local, regional, and international markets. Fish products, mostly sea bass (*Lates sp.*), are also part of this system; however, and given the natural conditions of sourcing them (during high tide), the quantity and type of fish farmed vary significantly from farmer to farmer.

The main actors identified in the value chain include fishers, collectors, small-scale farmers, local traders, major traders in main markets (Yangon and Labutta), and national and international markets and consumers. Along the main actors identified, most of the roles were dominated by men. Additionally, all the actors along the value chain reported, to some extent, to be vulnerable to short-term and long-term effects of climate change following the NADP (2020) climate change impact description. Short-term impacts include losses of production and infrastructure arising from extreme events such as floods and storms (e.g. Cyclone Nargis in 2008) and increased risk of diseases and parasites. There are also significant concerns regarding the reduced availability of wild aquatic seed and juveniles due to a combination of habitat loss and overfishing. While specific data is not available for the species involved in this analysis, there have been 80% and 60% declines in pelagic and demersal fisheries biomass over the last 40% timeframe (Watson & et al., 2018).

Input Stage

Mangrove aquaculture systems depend on wild shrimp larvae, wild juvenile crabs, and wild fish. Fishers use locally designed and manufactured tools to collect shrimp larvae and catch juvenile crabs from mangrove creeks and channels. The naturally available harvest is either sold to village-level traders and collectors, or directly to small-scale farmers. Aquaculture ponds are also stocked with natural crab, shrimp, and fish that migrate into the pond with incoming tides. None of the small-scale farmers interviewed reported sourcing their fishery inputs from hatcheries. This fact, unfortunately, jeopardizes their productivity. For instance, in 2018 input suppliers reported low availability of natural stocks (GGKP, 2020); an issue that was also reported by farmers in 2019 according to the information exchanged with their suppliers.

As a reference, in 2016-2017, the DOF owned 26 hatcheries nationwide. From these 26 hatcheries, only five were located within the Ayeyarwady Region (Department of Fisheries, 2017). Despite the importance of aquaculture in the region, there is a scarcity of hatcheries to support local requirements. Moreover, among public and private operational hatcheries, it has been reported that they have not been able to produce sufficient amounts of seed and fingerlings to meet local demands (Department of Fisheries, 2017). Their main operational difficulties include insufficient and unstable electricity supply, poor quality feed, and high energy requirements, which are translated into high production costs (Department of Fisheries, 2020).

The average traded price for fishery inputs was reported at MMK 11[1] per shrimp fingerling and MMK 3,500 per kg of juvenile crabs. Fish, as mentioned before, was reported to be naturally stocked during high tides. Among other production inputs, no farmer reported the acquisition and use of fertilizers or pesticides. Around 90% of the farmers reported using feed, with most of them acquiring trash fish, followed by small fish, and then fish meal as the least preferred option. Fishers, traders, and vendors were listed as feed suppliers. Finally, it was reported that no formal agreement is in place between farmers and input suppliers.

Recommendation	Importance	Compliance
Seed Stock: All seed stock used by the farm should come from a source that has been approved by the competent authority. Only healthy and verified disease-free seed stock should be stocked. The use of wild seed stock is discouraged.	Sourcing of strong seed stock from appropriate sources also results in improved farm performance with higher survival rates and better growth rates.	NO
Feed Management: Only approved feeds and feed additives should be acquired, and these should be sourced from suppliers authorized by the competent authorities.	Quality feeds and feed ingredients improve the growth and survival rates of the cultured stock, and also contribute to reducing pollution.	NO

Table 2. National Standard on Good Aquaculture Practices (GAqP)
Reference: MYSAP, 2019 (document in DRAFT version).

Production Stage

In the area allocated for aquaculture purposes within the CF certified land, small-scale farmers in mangrove areas typically build low earthen walls around their mangrove area. The walls are built in the process of digging ditches which result in shallow ponds. Within the pond walls, the farmers keep the mangroves in the remaining platform; however, and due to the altered hydrology (higher water level than normal), there is the possibility for the mangroves to die or degrade (GGKP, 2020). To counteract this risk and considering the consumption of mangroves as fuelwood, 80% of the farmers interviewed reported planting additional mangroves mostly inside the pond at a frequency of at least once per year. Additional characteristics of the aquaculture system are presented in Table 3.

[1] USD1 = MMK1,382.

Parameter	Characteristics Observed	Compliance of Technical Measures (GAqP)
Species Used	Polyculture: mud crab (*Scylla spp.*), tiger shrimp (*Penaeus monodon*), and fish (mostly sea bass *Lates sp.*)	**Species selection:** use of native species – **YES**
Stocking Rate	Low/Moderate (natural stocking and acquisition of fish inputs)	**Seed stock:** source seed stock from appropriate sources – **NO** **Survival and growth:** appropriate culture procedures implemented - **NO**
Engineering Design and Layout	May or may not be well laid-out (average water pond depth: 1.12 m) Very big ponds (average pond size: 14 ha) Mangroves within the ponds Wood-based and concrete gates observed. Tidal dependence for water replacement (no use of water pumps)	**Site selection and construction:** mitigate and minimize the impact on the surrounding environment and the local community – **YES** **Layout and design:** should incorporate logical workflow and process flow – **PARTIAL** **Pond preparation:** implementation of proper measures for pond preparation and pond maintenance – **PARTIAL** **Quality and control of incoming water:** ensure incoming water quality – **NO** **Climate change and extreme weather events:** mitigate the impacts of climate change and the increased occurrence of extreme weather events – **YES**
Fertilizer	No use of fertilizers (no use of lime reported)	**Management of chemicals and veterinary drugs:** follow strict guidelines for the use of veterinary drugs and chemicals – **YES**
Pesticides	No use of pesticides. Few farmers reported using traps for predator control	**Predator control:** not use of hazardous chemicals – **YES**
Food and Feeding Regimen	Natural and feed use (trash fish, small fish, and fish meal)	**Feed management:** proper management and use of quality feeds and feed ingredients – **NO**
Activity Duration and Employees	9 months Farmer and family members involved	**Discrimination, gender equality, and freedom of culture:** equal treatment of all employees – **NO** **Contracts, working hours and rates:** fair and right compensation – **PARTIAL** **Community relations and interactions:** planning, communication, and mutual respect – **YES**
Product Quality	Medium/Good quality Variable sizes	**Cleanliness and sanitation:** farm surrounding, facilities, and equipment should be kept in sanitized conditions – **NO** **Waste management:** implementation of proper waste management measures – **NO** **Diseases:** implementation of a thorough disease management policy – **NO**

Table 3. Mangrove Aquaculture System Characteristics and Compliance with the GAqP

Reference: MYSAP, 2019 (document in DRAFT version).

Figure 2. Mangrove aquaculture system

Based on the information collected, on average, small-scale farmers reported a productivity level of 36 kg/ha/year for the tiger prawn and 85 kg/ha/year for the mud crab. Productivity for the fish was unknown, considering the variability of species and quantity farmed. The average price per kilogram of shrimp was 8,900 MMK and for a kilogram of crab 7,000 MMK. On average, farmers reported an estimated annual income of 11,800,000 MMK, equivalent to around USD 8,500. Among their operational costs, the inputs for production represented the greatest cost, followed by maintenance costs, labor costs, and other operation costs (i.e. packing, transportation, and permits). The average annual net income was positive, with a profitable and attractive net margin, benefit to cost ratio, and monthly net income (considering 12 months).

Code	Average	Unit	Average (USD/unit)
Gross Income	**11,860,313**	**MMK/year**	**8,582**
Operational Costs	**7,447,231**	**MMK/year**	**5,389**
Production Inputs	3,635,625	MMK/year	2,631
Maintenance Costs	2,197,917	MMK/year	1,590
Labor Costs	1,537,083	MMK/year	1,112
Labor involved (excluding farmer & family member)	*1*	*# people*	
Other Operational Costs	76,604	MMK/year	55
Net Income	**4,413,082**	**MMK/year**	**3,193**
Net Margin	0.37	%	
Benefit to Cost Ratio (BCR)	1.59	ratio	
Net Income (monthly – considering 12 months)	367,757	MMK/month	391
Farmer and family members involved	*1*	*# people*	

**Reference Foreign Exchange Rate: 1,382 MMK per USD (Central Bank of Myanmar)*

Table 4. Polyculture small-scale farmers operational information

Regarding the investment required by the farmers to operate a mangrove aquaculture system, the average construction cost was reported at 330,088 MMK/ha. Two types of gates were observed, wood-based gates and concete gates. Even though farmers reported that both types of gates have provisions for draining the surface water, have slots or grooves for the placement of screens (to prevent cultured animals from leaving the pond and entrance of undesirable species), and allow net installation for harvesting, concrete gates have the main advantage of lasting for long periods of time and avoiding the need for constant replacement and maintenance. Concrete gates on average cost almost twice the price of wood-based gates, but their lifespan is much longer (>10yrs). They were mostly used by farmers with the highest operational scale among the surveyed farmers.

Among the small-scale farmers interviewed, the same challenges as the ones identified in the NADP were reported. Small-scale farmers face difficulties in obtaining land and appropriate land rights for operating their aquaculture business (i.e. CF certificates), lack of access to finance with few financing options available to the sector (lack of credit for improving their ponds – e.g. concrete gates), poor access to supplies and equipment, and the prevalence of diseases due to a lack of effective water management. Additionally, the lack of access to proper seed and feed negatively impacts the productivity of the aquaculture system.

Figure 3. Wood-based and concrete gates

Box 4. COVID-19 impact at production level

92% of all farmers surveyed reported to have suffered, to some extent, from the impacts of COVID-19. Of these farmers, most of them (86%) reported an impact reflected in a low price received from the products sold. 14% reported a slowdown in their products' turnover (delay in selling their products). 9% of the farmers reported the need to borrow short-term money in order to continue their operations, while 9% reported that they will change the amount of products acquired and farmed to be commercialized during this year given the uncertainty of COVID-19. Finally, only 5% of the farmers surveyed reported to have observed an increase in production costs.

Code	Average Wood-based	Average Concrete	Unit	Average (USD/unit)	
Investment per ha (construction)	330,088		MMK/ha	239	
Investment per gate (construction)	152,353	287,500	MMK/gate	110	208
Gates duration	*Around 2*	*Above 10*	*years*		
Tools and other costs	1,222,917		MMK	885	

**Reference Foreign Exchange Rate: 1,382 MMK per USD (Central Bank of Myanmar)*

Table 5. Polyculture small-scale farmers investment information

Intermediary and Market Stage

All the farmers reported commercializing their products through village or local traders. The drivers behind this relationship included receiving a quick payment, followed by the price received, the pre-existing social relationship, the large volume traded, and the continuity in the acquisition of products. Besides the relationship the farmers had with the traders, no formal agreement was reported to be in place between them.

Village and township traders commercialize the fishery products through local markets or with well-established wholesale markets located in Yangon and Labutta. The wholesale market has a range of buyers which include exporters, hotels and restaurants, and local retailers. For example, in 2019 almost 90% of the mud crabs were exported to China, 8% went to local soft-shell crab producers, and only 2% were sold to retailers (GGKP, 2020). Despite this market perspective, the vast majority of farmed fish produced in Myanmar are sold to the fast-growing domestic market with only a small share being exported, according to the NADP. This suggests a robust demand for fish within the domestic market (Department of Fisheries, 2020). Belton & et al., 2015, anticipated that the export share will even decline further in the near-to-medium term as urbanization and income growth in Myanmar will lead to an increasing share of the farmed-fish market.

Opportunities

The State of World Fisheries and Aquaculture (2018) affirms that if an ecosystem and its services are not maintained, or in some cases restored, the natural capital is eroded, and the system will not succeed; it will thus not contribute to improved food security or to achieving any SDG goals and targets. Furthermore, biodiversity-rich, well-managed systems may be less sensitive to change than overfished and biodiversity-poor systems (FAO, 2018). Mangrove aquaculture systems in RF in the Ayeyarwady Region represent an opportunity that minimizes environmental degradation while using the ecosystem for economic returns and social benefits.

Based on the farmers' operational assessment, and the gaps observed between the GAqP technical guidelines recommended and the farmers' practices observed, mangrove aquaculture systems have a number of ways in which they can be improved, leading to greater benefits. If the system is properly improved and supported, there is also an opportunity to replicate this system in areas outside RFs, including where mangroves have been completely cleared for pond construction and subsequently abandoned after aquaculture has failed due to disease vulnerability and low water quality (GGKP, 2020).

As a reference, the Mangrove Friendly Aquaculture report developed by the Southeast Asian Fisheries Development Center recommends the following measures for improving silvofishery practices: proper design and pond construction, suitable vegetation, a high value of target organisms, good water quality and quantity, and optimal rearing conditions (stocking density, adequate feeding, etc.). Improved mangrove aquaculture systems can increase shrimp productivity up to 300 – 500 kg/ha/year (observed in Vietnam) and mud crab productivity up to 300 – 600 kg/ha/year (observed in Vietnam) (Primavera & et al., 2000).

Box 5. Aquaculture and Domestic Food Security

In Myanmar, aquatic organisms are important for domestic food security, as they are the leading purveyor of animal protein and the lead provider of micronutrients, especially relevant for child development. In the country, 14% of food expenditure is spent on fish products, which is almost as much as the amount spent on rice (19% of food expenditure). Furthermore, of the total volume of farmed-fish products sold domestically, urban consumers buy 38%, while rural consumers buy 62% (Belton & et al., 2015).

Box 6. Importance of Inclusion of Women in the Aquaculture Sub-Sector

Encouraging the participation of women in the aquaculture sub-sector is considered a direct method for improving household nutrition. Rural Myanmar women are traditionally responsible for buying food that will be prepared and consumed at household meals. Additionally, their involvement also provides them with the ability to obtain greater financial independence leading to greater female involvement in household decision making (Department of Fisheries, 2020).

Scylla serrata (Adobe Stock)

Conclusions and Recommendations

In the mangrove areas of the Ayeyarwady Region, within RFs, small-scale aquaculture is largely extensive (dependent on natural fish stocks), with a polyculture system based on mud crab (*Scylla spp.*), tiger shrimp (*Penaeus monodon*), and fish (mostly sea bass, *Lates sp.*). However, the two main products farmed and commercialized from mangrove aquaculture systems are mud crab and tiger shrimp. On average, mangrove aquaculture systems represent a profitable activity, with an annual average net income, net margin, and benefit to cost ratio reflecting an attractive economic activity. However, based on the farmers' operational assessment, and the existing gap between observed practices and the GAqP technical guidelines recommended, mangrove aquaculture systems can be further improved leading to greater benefits.

Several issues need to be addressed in order to enable this sector to develop, including the same ones that block the proper operations and growth of this economic activity and the overall development of the aquaculture sub-sector in the region. As mentioned, small-scale farmers face difficulties in obtaining land and appropriate land rights for operating aquaculture ponds, lack access to finance, have poor access to supplies and equipment, and the prevalence of diseases due to the lack of effective water management. Moreover, one of the greatest barriers faced by farmers is the dependence on naturally available stocks, which at the same time is dependent on the status of the mangrove habitat currently under pressure.

Based on the findings and the opportunities identified, even for replicating and promoting mangrove aquaculture systems outside RFs, the following actions are recommended:

- **Develop a mangrove-friendly aquaculture system guideline for Myanmar.** Even though the Department of Fisheries is preparing to raise the technical awareness of the GAqP among aquaculture farmers, the proper implementation and management of aquaculture systems in mangrove areas in Myanmar require specific and targeted guidelines considering the conditions prevailing in the country.
- **Relaxation of regulations and facilitation of processes related to land use.** The necessity to address a set of land issues is highlighted once again, as this is a barrier that affects the development of the sub-sector, leads to high transactional costs, and negatively impacts the investment attractiveness in the sub-sector
- **Support infrastructure and technical assistance for the sustainable development of the sub-sector.** For aquaculture systems, including mangrove aquaculture or silvofishery, the main inputs towards improving sustainable production and efficiency lie behind the technical knowledge on the utilization of water bodies, proper site selection and pond design, improved pond operation and management, among others. However, the major support required for the sustainable development of this sub-sector depends on sourcing seed stock from hatcheries and quality feeds from authorized institutions.

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