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[FISH FOR LIVELIHOODS]

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Submitted by: [Michael Joseph Akester], CoP

[WorldFish]

[Bayint Naung Road, West Gyogone, Insein Township, Myanmar Fisheries Federation (MFF), Yangon, Myanma]

Tel: [+95 9 96116 7548]

Email: [M.Akester@cgiar.org]

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Abbreviations

AP	Aquaculture Promoter
APP	Mobile phone application
BMP	Better Management Practices
CBA	Cost and Benefit Analysis
CBO	Community-Based Organization
CLA	Collaboration Learning and Adapting
CoP	Chief of Party
COVID-19	Corona Virus Disease 2019 caused by SARS-CoV-2
CSO	Civil Society Organization
DO	Dissolved Oxygen
EMMP	Environmental Mitigation and Monitoring Plan
EoW	End of Week
F2F	Farmer-2-Farmer
F4L	Fish for Livelihoods
FCR	Feed Conversion Ration
FDI	Foreign Direct Investment
FY	Fiscal Year
GIFT	Genetically Improved Farmed Tilapia
HH	Household
ICT	Information Communication Technology
IECT	Information Education Communication and Training
IFDA	Inclusive Finance and Development Associates Limited
INGO	International Non-Government Organization
IP	Implementing Partner
IRs	Intermediate Results
IWMI	International Water Management Institute
KMSS	Karuna Mission Social Solidarity
KPA	Knowledge Practices and Attitude
LLWs	Lessons Learned Workshops
LoA	Life of <i>Activity</i>
M&E	Monitoring and Evaluation
MDDW	Minimum Dietary Diversity for Women
MEL	Monitoring Evaluation and Learning

MFF	Myanmar Fisheries Federation
MMK	Myanmar Kyat
MSA	Market System Approaches
MSD	Market System Development
NGO	Non-Government Organization
PCA	Participatory Community Appraisal
PIOs	Public International Organizations
SBCC	Social Behavior Change Communication
SIS	Small Indigenous Fish Species
SRT	Sex Reversal Technique
SSA	Small-Scale Aquaculture
SUN CSA	Scaling Up Nutrition Civil Society Alliance
ToT	Training of Trainers
USAID	United States Agency for International Development
USD	United States Dollar
VfM	Value for Money
WASH	Water Sanitation and Hygiene
Y1	Year 1
Y2	Year 2
Y3	Year 3

1. Executive Summary

The Fish for Livelihoods (F4L) *Activity* has completed three years of implementation and assistance to Small-Scale Aquaculture (SSA) farmers, fisherfolk and market system operatives in Myanmar. This report captures major accomplishments, events, challenges, and issues being faced during F4L implementation across Myanmar in the financial year (FY) 2022 (October 2021 to September 2022). FY 2022 was yet another difficult year for the F4L *Activity* and its team. The world is gradually returning to normal after a devastating pandemic and Myanmar is not an exception. The country is also facing challenges created by the coup d'état on 1st February 2021. Fortunately the F4L *Activity* was designed to have a strong local presence in the zone of influence (ZOI). WorldFish has Field Coordinators (FC) in each of the States/Regions and they in turn have helped our implementing partners select Aquaculture Promoters (AP) to work closely with selected beneficiary farmers. This network of local experts has allowed all aspects of F4L work to be successfully implemented despite the considerable challenges. This can be seen by the outputs and the average burn rate of 98% over the first three years and 94% in this reporting period.

Building on the successful implementation of the first two years, the F4L *Activity* was well-placed to interact with SSA farmers and communities. In FY 2022, 1,155 (Male=755, Female=400) new SSA farmers are selected from 17 townships and 1,023 SSA farmers stocked their ponds with fish seed. The farmers and their families received support in the shape of fish seed, extension services, vegetable and fruit seeds, Water Sanitation and Hygiene (WASH) material, and training on a range of topics. In addition, SSA farmers who were assisted in the previous year received 50% of their input costs in the current year. Delivery of training to SSA farmers, household (HH) members, and market actors either virtually or in person remained central to building capacity. The F4L *Activity* supported 6,541 indirect beneficiaries in FY 2022.

Capacity building through training is a critical component of F4L *Activity*. The F4L *Activity* delivered virtual and in-person training sessions on a range of topics. These topics included; fish management, broodstock care, data management, post-harvest practices, and micro-credit among others. In addition, WorldFish and its partners' staff were trained in Training of Trainers (ToTs) in order that the field staff can pass on their gained knowledge to Aquaculture Promoters (APs) and SSA farmers. In aggregate, 7,204 (Male=4,480, and Female=2,724) participants¹ attended training sessions delivered throughout FY 2022.

In terms of production and consumption, F4L supported farmers who stocked their ponds in Year 2 (Y2) and harvested their ponds in Year (Y3), for them, the production database shows that 1,613 SSA farmers harvested their ponds from 15 townships. In addition, a Cost Benefit Analysis (CBA) survey was employed only with demonstration farmers² to ascertain benefits relative to costs incurred. The average production from the demonstration farmers is approximately 2,158 kg/ha equivalent. Furthermore, 588 (Male=437, Female=151) SSA farmers harvested Small Indigenous Fish Species (SIS³) from their ponds. CBA is ongoing and will help farmers know the profitability of their fish farming endeavors. Subsequently, 1,748 (Male=1,339, Female=399) SSA farmers shifted from subsistence to commercial⁴ aquaculture practices in Y3.

Better Management Practices (BMP) in aquaculture are an integral part of improved production and increased income. It also helps the environment and production system become sustainable and profitable. In Y3, 1,020 (Male=741, Female= 279) SSA farmers adopted BMP in their production systems. The F4L *Activity* helped facilitate the formation of two groups of farmers who sold their produce as a group. In the wake of increasing input prices and inflation, access to credit is now more

¹ Training attendees are counted for each training event with some attending more than one.

² Demonstration farmers were selected as detailed records are kept by farmer and FC.

³ This is important as SIS are typically eaten whole – hence provide better nutrition in for form of protein, essential fats, minerals and vitamins.

⁴ Commercial refers to farmers marketing fish in excess of those consumed by the household and friends.

critical than ever for SSA farmers. The F4L *Activity* ensures a consistent supply of credit to SSA farmers and fisherfolk as individual micro-credit and group loans. In Y3, 382 (Male= 294, Female = 88) SSA farmers and fisherfolk received loan assistance. The loan schemes will scale up in the forthcoming years based on a set of recommendations proposed by an independent consulting firm – Pegu Partners, hired by F4L to conduct an assessment of micro-credit systems in Myanmar.

The F4L *Activity* builds the capacity of input providers; feed millers, hatchery and nursery owners/operators. These input providers get received technical and material assistance from F4L to facilitate a consistent supply of fish seed and feed for F4L and non-F4L SSA farmers. In the reporting period, F4L set up five new feed mills, hence 21 feed mills since the implementation began. An estimated 1,868 (Male=1,268, Female=600) farmers received fish feed from F4L-supported feed mills. The feed produced from F4L-supported feed mills used local ingredients making feed cheaper, affordable, and accessible to farmers. Similarly, F4L-supported hatcheries and nurseries produced 55.7 million fingerlings in the reporting period.

In Y3, there were opportunities for F4L field team members to interact and collaborate with value chain actors because of relaxed COVID-19 measures and traveling becoming easier than the previous years. The F4L *Activity* scaled further and started implementing interventions with several market actors (fish processors and vendors). F4L identified 14 fish processors and rolled out post-harvest capacity-building initiatives among them. The virtual platforms including Shwe Ngar (Golden Fish) and Htet Htoe (Village Link) mobile applications expanded their coverage in Myanmar. There are now 1,646 farmers and community members who registered with Shwe Nagar. F4L disseminated 35 articles, messages, brochures, and Information Education and Communication (IEC) material through Htet Htoe with 371,228 views and 9,149 reactions.

SSA farmers, value chain actors, and HH members of SSA farmers received assistance on Nutrition and WASH in the form of knowledge through IEC material, nutrition events, and WASH material (toilet bowls, hand washing station, etc.) from F4L. Two hundred and forty-one (Male=122 and Female=119) SSA farmers received WASH materials. To commemorate Nutrition month, August 2022, F4L organized several promotional and awareness events attended by 353 (Male=183, and Female=170) farmers and HH members. For diversity in diets, 813 (Male=492, and Female=321) HH members of SSA farmers received vegetables and fruit seeds to grow on pond embankments. The installation of toilet bowls in 69 farmers' houses provided access to 428 HH members and 98% of surveyed SSA farmers' houses had access to soap and running water in their houses. In terms of nutrition, an estimated 61% of the women of reproductive age reported consuming a diet of minimum diversity requirements.

Monitoring Evaluation and Learning (MEL) led annual performance surveys to feed data to four critical indicators on production, adoption of better practices, access to clean water, and nutrition status of reproductive women. A two-day workshop on Collaboration Learning and Adapting (CLA)/Monitoring Evaluation and Learning (MEL) was organized for WorldFish and partners staff and attended by 36 (Male=21, and Female=15) participants. Another two-day meeting on Planning activities for FY 2023 was organized, the first in-person event post-COVID, to reflect on what worked and what didn't and to plan for the next year's implementation. Fifty-seven (Male=28, and Female=29) participants from USAID, WorldFish, and partners attended the meeting. Furthermore, Market System Approach (MSA) will be integrated in the remaining years of implementation. On gender mainstreaming and integration, the newly hired Gender and Inclusion Expert took note of activities to be implemented from year four onwards. Finance and grant management supported the smooth operations of grant management, finance, and accounts with F4L partners. The F4L burn rate in Y3 was 94% – an excellent achievement under difficult circumstances.

The success story of F4L is ongoing, thankfully with a presence of resilient WorldFish and partner field staff grappling with day-to-day challenges at the grass root level. The F4L *Activity* staff members are on the ground to assist SSA farmers, their families, and fish value chain actors and to tackle food insecurity. The F4L *Activity* now moves into its fourth year of implementation. The

Activity will continue its assistance to SSA farmers, market actors, HH members, and community members to ensure small-holder farmers expand their role in turbulent times to address food insecurity. The need to work with farmers and their families is now greater than ever with daunting challenges like COVID-19, coup d'état, and climate change – a combination that makes people more food insecure. Consistent support will ensure farmers and their family members are food secure through an increase in their production and incomes and they play a critical role across the fish value chain.

PERFORMANCE INDICATORS TARGETS AND ACHIEVEMENTS OF FISH FOR LIVELIHOODS

INDICATOR	BASELINE (Annex 2)	OVERALL TARGETS	ACHIEVEMENT OF THE REPORTING PERIOD (OCT 2021 TO SEP 2022)	TOTAL ACHIEVEMENT AS OF DATE
EG.3-2: Number of individuals participating in USG food security programs [IM-level]	0	10,000 = 5,000 SSA Farmers and 5,000 others	3,663 (Male=2,218, Female=1445)	9,094 (Male= 5,778 Female=3,316)
EG. 3-10, -11, -12: Yield (i.e., production/unit area) of targeted agricultural commodities among program participants with USG assistance	3,288 [this figure is being checked]	10% increase from the baseline	2,158 (kg/ha) ⁵	2,158 (kg/ha)
Custom 1.1: Number of farmers shifted from subsistence to commercial aquaculture practices	0	30% of the total direct farmers 10000 participants shifted to commercial aquaculture = 3000	1,748 (Male=1339, Female=399)	2,377 (Male=1,866, Female=511)
E.G., 3.2-24: Number of individuals in the agriculture system who have applied improved management practices or technologies with USG assistance	15%	60% of SSA Farmers = 3,000	1,020 (Male=741, Female=279)	2,415 (Male=1,891, Female=524)
EG. 4.2-7: Number of individuals participating in USG-assisted group-based savings, micro-finance or lending programs [IM-level]	13%	30% of farmers and fishers of 10,000 (a)	382 (Male=294, Female= 88)	853 (Male=698, Female=155)

⁵ This production data is of the vey carried out with demonstration farmers.

INDICATOR	BASELINE (Annex 2)	OVERALL TARGETS	ACHIEVEMENT OF THE REPORTING PERIOD (OCT 2021 TO SEP 2022)	TOTAL ACHIEVEMENT AS OF DATE
Custom 1.4: Number of fry and fingerlings produced by the hatcheries/nurseries supported	0	600 million seeds	(Nursery farmer production) = 264,590 + (Hatchery farmer production) = 556,662,277 = 55 million	430 million seeds
Custom 1.5: Number of households accessing quality feed and feed ingredients through the newly established feed traders and feed mills	0	1800 households (direct)	1,868 (Male=1,268, Female=600)	1,868 (Male=1,268, Female=600)
CBLD-9: Percent of USG-assisted organizations with improved performance [IM-level]	0	06/08 (75%) organization/ CBOs	-	-
Custom 1.6 Number of non-participants (indirect beneficiaries) engaged and assisted by the <i>Activity</i>	0	14,000 indirect beneficiaries	6,541 (Male=3,268, Female=2,917, Disaggregates not available=356)	6,541 (Male=3,268, Female= 2,917, Disaggregates not available=356)
EG.3.2-26: Value of annual sales of producers and firms receiving USG assistance [IM-level]	0	US\$ 10 million (direct) + 5 million (indirect) = 15 million	2.2 million USD	4.6 million USD
Custom 2.1: Number of farmers groups selling fish and fish products using BMPs (Best Management Practices)	0	15 groups	2 farmer groups (BMP survey)	6 farmer groups (BMP survey)
Custom 2.2: Number of food processors improved their processing practices	0	20	14 (Male=4, Female=10)	14 (Male=4, Female=10)
GNDR 2: Percentage of female participants in USG-assisted programs designed to increase access to productive economic resources [IM-level]	0	35%	39%	37%
HL.8.2-2: Number of people gaining access to a basic	0	1400	428 (Male=205, Female=223)	1,295 (Male=642, Female=653)

INDICATOR	BASELINE (Annex 2)	OVERALL TARGETS	ACHIEVEMENT OF THE REPORTING PERIOD (OCT 2021 TO SEP 2022)	TOTAL ACHIEVEMENT AS OF DATE
sanitation service as a result of USG assistance [IM-level]				
HL.8.2-5: Percent of households with soap and water at a handwashing station on premises [IM-level]	80%	100%	98%	98%
EG.3.3-10: Percent of female participants of USG nutrition-sensitive agriculture activities consuming a diet of minimum diversity [IM-level]	59%	80%	61%	67%

2. Introduction

In October 2019, USAID provided a grant (AID-442-IO-16-00002) to WorldFish for the implementation of the Small-scale Aquaculture Investments for Livelihoods (SAIL) project in Myanmar. The project subsequently referred to as an *Activity* subsequently had the SAIL acronym modified to F4L (Fish for Livelihoods) to avoid acronym usage. The *Activity* is designed to cover the 5-year period 2019-2024. The work will focus on improving the nutrition status in Central and Northern Myanmar by promoting inclusive and sustainable aquaculture growth that focuses on small-scale farmers. WorldFish is leading this activity with implementing partners including IWMI, BRAC, PACT, KMSS, and MFF. This *Activity* aims to provide a means of ensuring the improved availability of diverse, safe, affordable nutrient-rich food, especially for women and young children from poor and vulnerable households.

This will be achieved by ensuring that poor households have an increased ability to purchase accessible nutritious food due to improved incomes from entrepreneurial activities including better managed small-scale aquaculture and integrated agriculture systems (rice-fish-vegetable) in the intervention areas and the strengthening of aquaculture market systems with attention to expanding opportunities for women and youths. In addition, behavioral change work will prioritize nutrition-conscious household decisions by means of both home production and local market access. Specifically, it is expected that the adoption of fish culture technologies would contribute to improved food and nutrition security for poor households in several ways;

1. Generating income from the fish culture which would be used to purchase nutritious food
2. Creating alternative employment-generating activities and increasing labor productivity
3. Increasing available food supply and fish consumption

3. Goal and Objectives

The *Activity* proposes to change the current aquatic food production scenario by contributing to the development of the necessary conditions for more inclusive and sustainable development of small-scale aquaculture producers to increase income, production, and nutrition, especially for the most vulnerable groups. The overall development objective is:

Inclusive and sustainable small-scale aquaculture growth to enhance integrated agriculture nutrition pathways utilizing improved production and market systems approaches to increase the availability of fish, income and dietary diversity, dietary and agriculture practice behavior change, reduce poverty of beneficiary populations, especially women and children, in central and northern Myanmar.

The project will ensure that fish production in areas distant to the Ayeyarwady Delta will provide fish closer to fish deficit areas while promoting market systems and value chains to deliver food-safe fish and fish products to local markets. This will be accompanied by activities in the nutrition and WASH areas, to ensure a more integrated approach that comprehends various aspects of small-scale aquaculture. More specifically, the objectives for each of the three dimensions are:

1. Increase small-scale aquaculture production through strategic activities including improved land and water use, increased access to high-quality inputs (feed, seed, and equipment), capacity development and research into production, and access to credit.
2. Further, develop and utilize market-based system approaches (MSA) to increase access to food, and safe fish and fish products.
3. Enhanced nutrition and WASH practices delivered via social behavior change communication (SBCC) activities.

4. Targets

The *Activity's* three components are increased SSA production, leveraging market actors, and nutrition and WASH interventions. This will target the small-holder farmers who own small ponds in the five selected States/Regions. In addition some fisherfolk operating in the Shan lakes (Inle and Pekhon) will be assisted with improved post-harvest activities. These farmers and fishers comprise the *Activity's* direct beneficiaries. The *Activity* aims to reach at least 10,000 SSA farmers during the life of the *Activity* (LoA). These farmers will be provided with SSA interventions in fish stocking management, better management practices (BMPs), efficient use of inputs, access to credit, and access to markets. Increased production will in turn improve the livelihoods and increase incomes of these farmers and their households (HHs). Yield (production/unit area) will be another parameter set to assess the performance of the project. Initially, the target set for the project is 3 tons fish per hectare.

The second component of the project is about market systems and how the different market actors, hatcheries, nurseries, wholesale operatives and retailers function in different markets under varied conditions. All the market actors work in a complex environment, however are interconnected and dependent on each other. The existing value chains will be analyzed and all these market actors would be linked efficiently and effectively to boost the market worth as a result of project interventions. The value of annual sales of the farmers linked with the market and major actors would be the benchmark to assess the project performance. The target set for the project is to achieve USD 10 million in sales from the SSA production in intervention areas during the five years.

The third component focuses on improving nutrition and the adoption of effective WASH behaviors among project participants. The approach is to provide information on basic nutrition and WASH at the household level, including distribution of WASH hardware and seed kits as well as an assessment of barriers and the enablers among the target group to facilitate change of behaviors, thereby achieving good nutrition. The primary target for nutrition and WASH interventions would be deprived women and children under the age of five. These services will also be provided to the targeted smallholder farmers.

5. Approach

The WorldFish mission in Myanmar focuses on the improved production of aquatic food for enhanced human nutrition either from Small-Scale Aquaculture (SSA) or small-scale artisanal fisheries both inland (freshwater) and inshore (coastal and estuarine). Small-scale farmers are among the most vulnerable groups to external shocks and there are no sufficient measures and strong enough institutions to create safety nets and protection. As such, the small-scale aquaculture sector in the country remains underdeveloped and fragile, putting at risk the livelihoods of the ones affected. The potential for development is enormous and much can be achieved by providing the country with the technological, financial, and policy tools to restructure itself.

Smallholder farmers, typically rice farmers are sometimes involved in rice-fish or freshwater aquaculture activities. However, the aquaculture environment they are involved with, presents multiple barriers, such as poor fish species diversification and availability of quality fish seed, regulatory limitations on land and water use, unsustainable practices, low productivity, limited /no access to the market and the impacts of climate change. Changing these conditions to more favorable ones, would boost the aquaculture potential and the sub-sector's ability to respond to the increasing demand for fish and at the same time improve the livelihoods of poor smallholders. Indeed, most of the individuals that rely on small-scale production are food insecure. The human nutrition quality such as dietary diversity and food safety undermines the overall well-being and health of the smallholder population, especially child-bearing women and young children.

To address the challenges discussed above, WorldFish with financial assistance from USAID is implementing the five-year *F4L Activity*.

6. Geographical Focus

The intervention will focus on five inland states and regions in Central and Northern Myanmar:

- Central Dry Zone: Mandalay, Magway and Sagaing
- North: Shan (East and South) and Kachin

These areas present more challenges to aquaculture development and livelihood opportunities. The growth in aquaculture can play an important role to change this scenario by increasing production and income opportunities. A detailed mapping of the target townships and their characteristics was developed after the scoping study, which helped to clearly identify the areas of intervention and beneficiaries. Figure 1 shows the intervention townships within the selected States/Regions where the *Activity* operates in Myanmar.

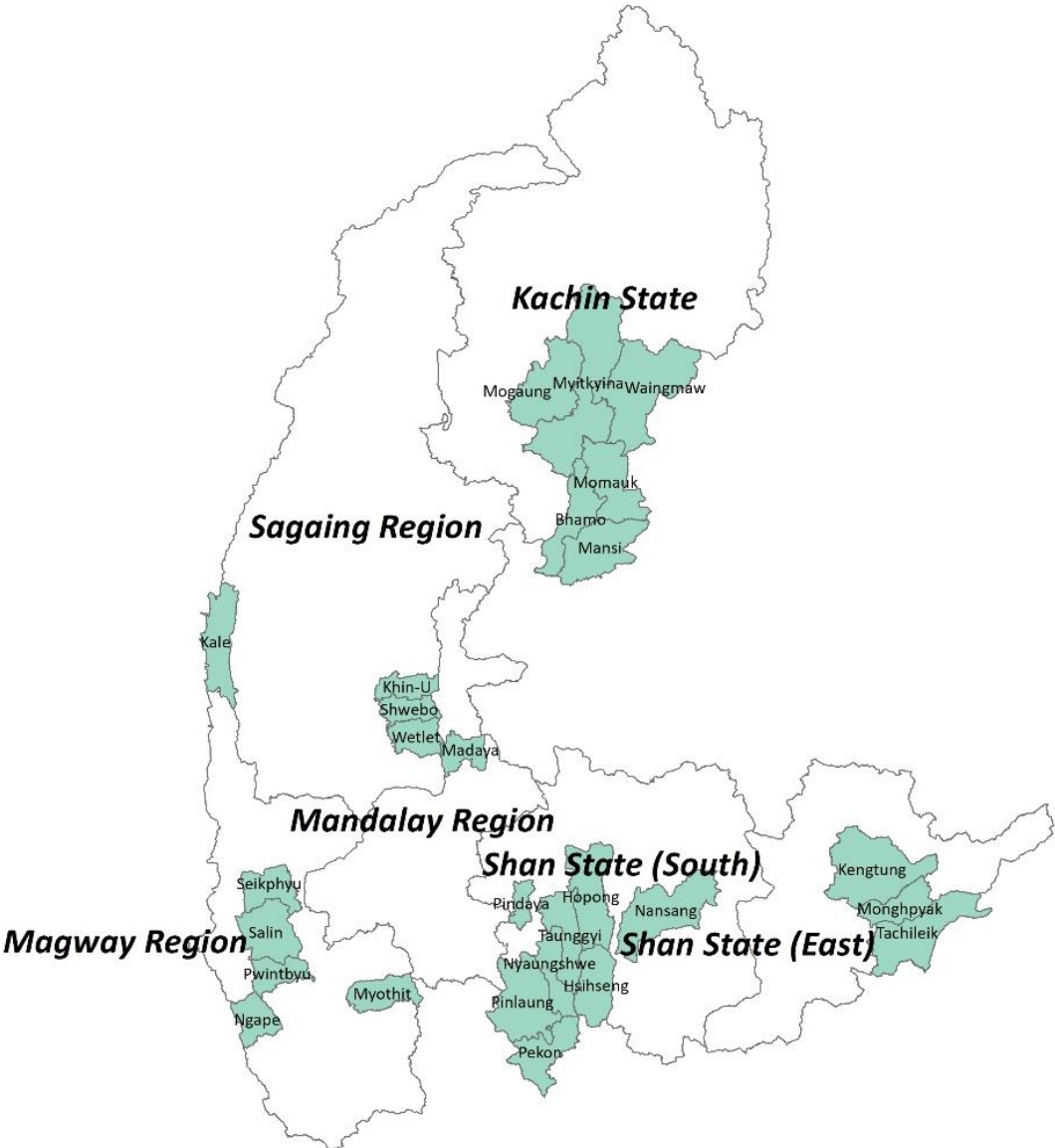


Figure 1: A Map of the Activity zone of intervention within the five State/Regions

7. Work plan Progress

IR 1. Small-scale aquaculture production increased by improved land and water use, together with increased access to information, high quality inputs and credit.

The F4L *Activity* and sub-grantees provided extension services and technical support to the Y2 and Y3 farmers during the reporting period. And provided quality fingerlings to the farmers who were ready to stock their fish ponds. The F4L *Activity* reached 162 (Y2+Y3) villages and conducted a farmer identification process that selected 1,023 new farmers with a pond total pond area of 336 acres for the Y3 *Activity* implementation. Table 1.

Table 1: Farmer and Pond selection process completed townships and number of farmers selected in Y3

Region	Township	No. of Village	Y3 farmers	Pond acreage	Remarks
Eastern Shan	Kengtung	31	165	38.44	Grow out, Nursery and feed-maker (include drop out farmers also)
Southern Shan	Namsang	10	114	29.78	Grow out and Nursery (include drop out farmers also)
Southern Shan	Pindaya	10	38	6.28	Grow out, Nursery and feed-maker
Southern Shan	Nyaung Shwe	13	68	18.01	Grow out
Southern Shan	Pekon	10	32	5.34	Grow out
Southern Shan	Pin Laung	3	22	0.85	Grow out
Sagaing	Wetlet	8	80	8.99	Grow Out
Sagaing	Shwebo	23	150	68.54	Grow Out
Kachin	Bhamo	6	21	6.86	Grow out, Nursery
Kachin	Momauk	5	9	2.05	Grow Out
Kachin	Mogaung	2	9	1.67	Grow Out
Kachin	Myitkyina	8	12	6.2	Grow out, Nursery
Kachin	Waingmaw	10	52	29.37	Grow out, Nursery
Magway	Salin	8	123	75.85	Grow out, Nursery and feed-maker
Magway	Myothit	7	63	24.24	Grow Out
Magway	Ngape	5	44	7.15	Grow Out
Magway	Seikphyu	3	21	5.89	Grow Out
Total		162	1,023	335.51	

Sub-IR 1.1 An enabling environment is created to increase the engagement of farmers in commercial aquaculture production (water, land use and market knowledge)

Due to the global Covid-19 pandemic, some activities had to be amended as travel restrictions made travel by IWMI expatriate staff to Myanmar impossible regarding fieldwork during the reporting period. The recent political situation has also further complicated the original project activity plan. Plans had to be adjusted several times due to quickly evolving health risks and the political situation. Several field-level activities such as water quality monitoring in the Pekhon and Inlay Lake catchments have been delayed or put on hold until the security situation improved. New monitoring sites were also selected due to the

security situation. Instead of field-based surveys, phone interviews have been carried out where possible. Further details can be seen in this report; IWMI Annual Report.

Output 1.1.1. Assess water quality for and from small-scale aquaculture development in selected locations in Shan state.

Bi-weekly data for parameters consisting of water temperature, electrical conductivity, Total Dissolved Solids (TDS), pH, Dissolved Oxygen (DO), and salinity have been collected from March 2022 to July 2022 from 14 ponds. Attempts have been also made to collect nutrients inclusive of Total Phosphorus (TP) and Total Nitrogen (TN) but due to failures in monitoring equipment, the data are intermittent. DO loggers were installed in the same five ponds in August 2022 – much later than anticipated due to supply restrictions. The main water quality variable is in focus in DO as it is a primary factor that drives fish growth and its susceptibility to diseases. The DO in the monitored fishponds varied greatly and the average DO concentration was as low as 3.11 mg/, which may have implications for fish yield. While other factors such as feed quality can affect fish growth, low DO can further elevate stress and may result in reduced metabolic rates. The data set collected over the year is limited but continuous DO monitoring will be extended in the coming year. An Automated DO logger will be used to collect high-frequency data to enable the analysis of diurnal variation of DO. The data will be used to develop a DO model that can be used to conduct scenario testing to investigate the impacts of rising temperature under climate change on DO concentrations and potential risks for fish yield under a changing environment.

In-depth interviews with the owners of some of the monitored ponds indicated an almost total lack of understanding of how water quality affects fish health and growth. This finding resulted in an activity in IWMI's Year 4 water quality component that will generate local language basic training material on the importance of and management of water quality in fishponds, and its deployment through training of fishpond owners in Southern Shan and possibly other focal regions of the project, and the staff of other project partners who could disseminate the material. The written outputs from this activity will also add to the legacy of this project, as they will be available nationwide via digital platforms.

This component also carried out a telephone survey of 55 fishpond owners across all the Upper Ayeyarwady States using WF's fishpond database to get a sense of trends around water quality. The results showed that farmers are generally very satisfied with both the quality and reliability of their water supply. This might explain why they tend to rely on often a single source of water, although future changes in climate and/or quality may make such reliance a vulnerability. At least amongst the pool of respondents, water quality has thus far not been a significant issue, with a large proportion of fish loss events resulting from flooding rather than death. However, the results confirm that the ponds of a majority of respondents are located within cropping landscapes, which makes the impacts of agrochemicals for both fish and human health via fish consumption a latent concern. Even though the levels of these chemicals may not be killing fish outright, current levels of bioaccumulation are unknown. Moreover, as was the case with pond owners in Southern Shan, knowledge of water quality impacts on fish could be minimal amongst fish pond owners in the other areas of the project's focal geography, making IWMI's Year 4 activity of developing local language awareness material and training all that more relevant.

Output 1.1.2. Mapping policy, structural, economic, and other drivers of agricultural land use toward identifying better management interventions from a system perspective

Focus Group Discussions and in-depth semi-structured interviews were conducted with 50 crop farmers with fields upstream of the fishponds monitored for water quality. Key informant interviews were conducted with local input suppliers, an extension officer of the Department of Agriculture, and a local and experienced community facilitator who could provide a more detached yet informed view as a non-

stakeholder. This primary data supplemented a literature review. The findings, documented in the report “Agrochemical Regulation and Use in Myanmar, with emphasis on Southern Shan State” developed under this component suggest that while the availability of agrochemicals has increased exponentially, including an array of illegal and cheap options, farmers by and large use regulated brands in their belief that these brands will provide the best returns on investment. It was also commonly claimed by farmers that levels of use either were what was recommended on the label/shop owner or less as farmers appear to be conscious of not wasting their investment in these chemicals.

It was interesting and somewhat surprising to find that the use of illegal substitutes had not gained popularity during Covid-19 and the political unrest, although it is questionable as to whether the respondents were comfortable disclosing the use of illegal substitutes. Furthermore, the dialogs with farmers also suggest a significant increase in the use of organic fertilizer by way of manure for some non-rice crops, rather than resorting to illegal and unknown chemical substitutes. In-depth interviews suggest that this adaptation to the Covid-19 and political conditions that have limited the supply of preferred chemical fertilizers may have inadvertently caused farmers to experiment with organic options. It also appears some farmers have developed a more positive view of organic fertilizer in terms of yields and contribution to overall profit. What is however not known is whether, when supplies of chemical fertilizers improve, farmers will abandon organics. One key aspect that supports the adoption of organic fertilizer at scale is the prominent role livestock plays in diversified livelihood strategies, with farmers having organized local transport solutions to source excess manure from nearby villages. IWMI’s ambitions of understanding the overall agrochemical regulatory process however was limited by difficulties in accessing senior government staff and private sector actors given the prevailing circumstances.

Output 1.1.3. An analysis of the water availability for aquaculture scaling and potential consequent impacts on other water uses and users in the upper Ayeyarwady basin

The results from the SWAT and HEC-HMS⁶ models (Years 1 and 2) were used as inputs to a PyWR⁷ model for assessing the impacts of the expansion of fishponds on water resources in the Upper Ayeyarwady. PyWR’s suitability for developing scenarios related to the relationship between surface water and fishpond expansion lies in its principal application being in resource allocation in water supply networks and is designed to be easily integrated into multi-objective optimization analyses. This work builds on assessments from the recently concluded Future Dams project IWMI was involved in and incorporates fishpond data from the WorldFish database.

The configuration of the PyWR water model covers the Ayeyarwady River Basin including fishpond clusters along with other water users. The simulation for both existing fishpond clusters inside the basin suggests they reduce downstream discharge by around 30 Mm³/day in the dry season. Future scaling scenarios based on a doubling and tripling of fishpond area shows increasing water deficit conditions, especially in rainfed ponds, with the potential for serious conflicts between crop farmers and fish farmers. In these scaling scenarios, except for Kachin State, all rainfed fishpond clusters in the study area are not appropriate for expansion due to higher annual volume water deficits, especially in the case of two very large two irrigated fishpond clusters in Sedawgyi and Thapanzeik. The scenarios are more accommodating for some small irrigation dams (e.g., Linzin, Eyema, Natmauk located in Magway) that support a 50% expansion, although this too may not be feasible if two irrigation seasons are desired. Hence, these areas

⁶ The Hydrologic Modeling System (HEC-HMS) is designed to simulate the complete hydrologic processes of dendritic (having a branched form) watershed systems.

⁷ Pywr is a tool for solving network resource allocation problems at discrete time steps using a linear programming approach. Its principal application is in resource allocation in water supply networks. <https://www.sciencedirect.com/science/article/pii/S1364815219307133>

may be more suited to a 50% increase in fishpond area coupled with rice-fish systems that utilize the same irrigation water.

Output 1.1.5: Improved access to information on market and SSA technologies (BMPs)

1.1.5.1: Improving the existing Trainer of Trainers (ToT) manual by updating some of the sessions and integrating gender throughout.

During the reporting period, F4L's IECT team produced 33 sets of ToT manuals updated one in the Myanmar version and distributed them to the F4L *Activity's* field staff and Implementing Partner (IP) staff.

1.1.5.2: Organizing and delivering ToT to WorldFish staff, Implementing Partners (IP) staff, Aquaculture Promoters (AP) and other stakeholders of the *Activity*.

As one of the critical components of the *Activity* is to promote the consumption of a healthy and nutritious diet and the adoption of better WASH practices. Through the ToT sessions, staff gained knowledge on nutritious diets, and they had a practical cooking demonstration of nutritious food by using small fish and other recipes which are affordable by the farmers. Moreover, they gained knowledge on how to use the produced IEC materials to promote nutrition and WASH practices. Staff also gained and improved their facilitation skills through attending the ToT session. The field staff will in turn train the Aquaculture Promoters and SSA households to sustainably supply affordable nutritious food for their families and earn extra household income.

The objective of the ToT session is to train the technical and field staff of the implementing partners (IP) including the Myanmar Fisheries Federation (MFF) and the non-government organizations BRAC Myanmar, PACT Myanmar, KMSS, MFF Shan, and Kachin. how to conduct field training of small-scale aquaculture (SSA) farmers on sustainable fish and vegetable production systems and how to use the Shwe Ngar, Htwet Toe, and Green Way mobile applications efficiently and effectively.

In the ToT sessions, a total of 47 (24F, 23M) implementing partners' staff and 20 (08F, 12M) WorldFish staff attended. The WorldFish South East Asia and Pacific Director and a Representative from USAID participated in one of the sessions as did other WorldFish senior staff. Details can be seen in the 8.7 Community Development session of this report.

1.1.5.3: Delivering trainings on SSA, nutrition, gender, COVID-19 to project participants (including fisherfolk) and their family members through IPs (NGOs, MFF and CBOs/CSOs)

From December 2021 to September 2022, IP staff (BRAC, KMSS, and MFF) and one of the trained CBOs (Shwe Inn Thu) staff delivered training on SSA and improved human nutrition for three days with the support of F4L Field Coordinators. The training was conducted to project participants in several batches and the course is separated into three modules.

A total of 904 (381 women) people attended module 1 on pre-stocking management pond preparation and stocking management, 998 (424 women) people attended module 2 on post-stocking management and

human nutrition part-1, and 860 (386 women) people attended module 3 on post-stocking management and human nutrition part-2.

In addition, IP staff (BRAC, KMSS, and MFF) delivered one day of SSA modules refresher training to the F4L participants from Year 1 and Year 2. A total of 570 (232 women) people from Shan and Kachin States, and Sagaing Region attended in several batches. In Magway region, a total of 139 (13 women) people attended key messages on pre-stocking and fish stocking management, a total of 252 (31 women) people attended key messages on post-stocking and harvesting management, a total of 252 (31 women) people attended key messages on nutrition and WASH, a total of 371 (72 women) people attended key message on SSA and a total of 52 (5 women) people attended key message on SSA, nutrition and WASH in several batches provided by PACT. In September 2022, KMSS Pekhon staff conducted one day in-person training on key messages on nutrition and WASH separately in Pinlaung and Pekhon Townships. A total of 102 (38 women) people attended. Detail can be seen in the 8.7 Community Development session of this report.

1.1.5.4: Delivering training on SSA, nutrition, gender, COVID-19 to project participants through hatchery operators, nursery operators, feed millers, feed traders and CBOs

This activity is combined together with activity 1.1.5.3.

1.1.5.5: Delivering training on market (quality, prices, inputs suppliers, availability, access, etc.) to market actors

The F4L *Activity* deployed market specialist staff and he provided a series of market-related activities to the market actors and farmers during the reporting period. See detail in activity 2.2.1.1 in this report.

1.1.5.6: Disseminating extension materials (leaflets, booklets, posters, guidebooks, videos etc.) on SSA, nutrition, market, COVID-19 etc. to relevant target groups (grow-out farmers, nurseries, hatcheries, traders, feed millers, retailers, wholesalers)

During reporting period, a total of 52 types of IEC materials and products were produced by F4L and a total of 21,879 were distributed to *Activity* participants, IP staff, and F4L staff in Y3. The detail of produced materials and their distribution list can be seen in section 8.6 communications section of this report.

1.1.5.7: Improving access to information on SSA, nutrition, market, COVID-19 etc. for the project participants (direct, secondary) through Shwe Ngar, Htet Htoe, and Green Way smartphone apps.

This activity is combined with activity 1.1.5.3.

1.1.5.8: Monitor the performance of these apps and upgrade as needed

This performance of the above can be seen in detail in the 8.6 communications session of this report.

1.1.5.9: Farmer to Farmer program (F2F)

During the reporting period, F4L collaborated with the Farmer-to-Farmer program F2F which is funded by USAID, and conducted 7 virtual training sessions starting in January 2022. A total of 244 (129 Female) participants attended.

Table 2: Type of training provided through F2F and F4L collaboration, and attendees

Sr.	Type of Training	Male	Female	Total
1	Business Planning for small-scale integrated aquaculture farmers training (F2F and F4L joint activity)	18	17	35
2	Record-keeping training (F2F and F4L joint activity)	16	18	34
3	Risk Management of Integrated Aquaculture training (F2F and F4L joint activity)	21	21	42
4	Vegetable nursery and seed production (F2F and F4L joint activity)	21	18	39
5	Cluster fish farming (Market Strategy Planning) (F2F and F4L joint activity)	21	20	41
6	Community fish farming and production training (F2F and F4L joint activity)	19	18	17
7	Module development and teaching guide training on business planning and record-keeping training (F2F and F4L joint activity)	19	17	36
	Total	135	129	244

Sub-IR 1.2 Efficiency of aquaculture production systems increased

Output 1.2.1: Farmers adopted improved fish farming practices in a range of production systems (e.g., ponds, rice-fish systems)

1.2.1.1 Review and evaluate work plan and budgets submitted by implementing partners, and extend their existing contracts

F4L *Activity* reviewed the submitted IP proposals and started the implementation in the field in late 2021 despite all the challenges from the aftermath of the coup and Covid-19 outbreaks.

In Year 3 the *Activity* selected a total of 2,468 (724 Female) SSA farmer households through preselected implementing partners (BRAC, PACT, MFFs, and KMSS Kengtung and Pekhon).

Table 3: Number of F4L Grow out farmers by sub-IPs and geographical spread

Region	Township	Started Year	IP	Type of Participant	Year 2 Grow Out-F4L			Year 3 Grow Out-F4L			Total		
					M	F	Total	M	F	Total	M	F	Total
Kachin	Bhamo	2019-2020	MFF Kachin	Y1+Y2+Y3	5	1	6	19	2	21	24	3	27
Kachin	Mansi	2019-2020	MFF Kachin	Y1+Y2	20	0	20			0	20	0	20
Kachin	Momauk	2019-2020	MFF Kachin	Y1+Y2+Y3	3	2	5	8	1	9	11	3	14
Kachin	Mogaung	2019-2020	MFF Kachin	Y1+Y2+Y3	6	2	8	6	3	9	12	5	17
Kachin	Myitkyina	2019-2020	MFF Kachin	Y1+Y2+Y3	9	4	13	11	1	12	20	5	25
Kachin	Waingmaw	2019-2020	MFF Kachin	Y1+Y2+Y3	43	13	56	31	21	52	74	34	108
Magway	Myo Thit	2021-2022	PACT	Y3			0	58	5	63	58	5	63
Magway	Ngape	2019-2020	PACT	Y1+Y2+Y3	27	4	31	43	1	44	70	5	75
Magway	Salin	2019-2020	PACT	Y1+Y2+Y3	94	27	121	99	24	123	193	51	244
Magway	Seik Phyu	2021-2022	PACT	Y3			0	21		21	21	0	21
Magway	Pwintbyu	2020-2021	PACT	Y2	132	30	162			0	132	30	162
Mandalay	Madaya	2019-2020	BRAC	Y1+Y2	24	6	30			0	24	6	30
Sagaing	Khin U	2019-2020	BRAC	Y1+Y2	7	3	10			0	7	3	10
Sagaing	Wetlet	2020-2021	BRAC	Y2+Y3	95	60	155	23	27	50	118	87	205
Sagaing	Shwebo	2020-2021	BRAC	Y2+Y3	132	168	300	60	90	150	192	258	450
Shan (East)	*Tachileik	2019-2020	KMSS Kengtung	Y1+Y2+Y3	78	14	92			0	78	14	92
Shan (East)	Monghpyak	2020-2021	KMSS Kengtung	Y2+Y3	46	12	58			0	46	12	58
Shan (East)	Kengtung	2021-2022	KMSS Kengtung	Y3+Y4+Y5			0	140	23	163	140	23	163
Shan (South)	Namsang	2020-2021	BRAC	Y2+Y3	95	55	150	60	52	112	155	107	262
Shan (South)	Nyaungshwe	2019-2020	Fish For Livelihood	Y1+Y2			0	60	8	68	60	8	68
Shan (South)	Pekon	2019-2020	KMSS Pekon	Y1+Y2	101	8	109	30	2	32	131	10	141
Shan (South)	Pinlaung	2019-2020	KMSS Pekon	Y1+Y2	42	3	45	20	2	22	62	5	67
Shan (South)	Pindaya	2019-2020	MFF Southern Shan	Y1+Y2+Y3	17	13	30	20	16	36	37	29	66
Shan (South)	Hsihseng	2020-2021	MFF Southern Shan	Y2+Y3+Y4	27	7	34			0	27	7	34
Shan (South)	Hopong	2020-2021	MFF Southern Shan	Y2+Y3+Y4	28	14	42			0	28	14	42
Shan (South)	Nyaungshwe	2019-2020	Inle Lake Committee	Y1+Y2+Y3	4	0	4			0	4	0	4
Total					1,035	446	1,481	709	278	987	1,744	724	2,468

1.2.1.2 Facilitate implementation of agreed plans and grant management

F4L supported 2,468 (724 Female) SSA grow-out farmers and value chain actors in *Activity* implementation townships through respective IPs. The F4L Field Coordinators closely supported the IP staff in the targeted 5 State / Regions.

F4L assisted implementing partners in setting up demonstration ponds with the aim to maximize fish production more efficiently and profitably by providing intensive technical and input support to the demonstration farmers. A total of 70 (Female 15) demonstration ponds were established in the *Activity* implemented area (Table 4). The demonstration ponds were stocked, in general, from May to October. Rohu, Common Carp, and Grass Carp were the favorite species stocked. A total of 78,330 fingerlings were stocked in farmer demonstration ponds during the reporting period.

It was noticed that the neighboring farmers learned Better Management Practices (BMP) from the demonstration ponds. They learned how to feed their fish, calculate the Feed Conversion ratio (FCR), and maintain the water quality of the pond among other BMP aspects.

Table 4: Demonstration Pond Stocking Y3

Region	Township	Started Year	IP	Year 2+Year3			# of Fish Species							Total Pond Area (Acre)	Stocking Density per acre
				Demo Farmers			Tilapia	Rohu	Silver Barb	Grass Carp	Common carp	Silver carp	Total		
				M	F	Total									
Kachin	Bhamo	2019-2020	MFF	1	0	1			650	390	260		1,300	0.40	3023
Kachin	Momauk	2019-2020	MFF	1	0	1			250	150	100		500	0.17	2941
Kachin	Mogaung	2019-2020	MFF	1	0	1			750	210	440		1,400	0.23	6087
Kachin	Myitkyina	2019-2020	MFF	0	1	1		375	625		250		1,250	0.41	3049
Kachin	Waingmaw	2019-2020	MFF	3	1	4		900	3,000	900	1,200		6,000	2.00	3000
Magway	Myo Thit	2021-2022	PACT	1	0	1			400				400	0.09	4444
Magway	Ngape	2019-2020	PACT	1	0	1			600				600	0.23	2609
Magway	Salin	2020-2021	PACT	7	0	7			9,100				9,100	3.24	2809
Magway	Pwintbhyu	2020-2021	PACT	4	0	4			2,800				2,800	1.47	1905
Mandalay	Madaya	2019-2020	BRAC	1	0	1			5,000				5,000	0.51	9804
Sagaing	Wetlet	2020-2021	BRAC	3	2	5	6,500						6,500	0.81	8025
Sagaing	Shwebo	2020-2021	BRAC	1	4	5		5,100			2,200		7,300	2.16	3380
Shan East	*Tachileik	2020-2021	KMSS	7	0	7	2,706						2,706	1.08	2506
Shan East	Monghpyak	2020-2021	KMSS	6	1	7	3,441						3,441	1.38	2493
Shan East	Kengtung	2021-2022	KMSS	8	2	10	4,205	2,032		100	2,176		8,513	1.68	5067
Shan South	Namsang	2020-2021	BRAC	6	3	9		1,800		2,550	7,440		11,790	3.55	3321
Shan South	Pekon	2020-2021	KMSS	2	0	2				3,000	450	2,600	6,050	2.25	2689
Shan South	Pindaya	2020-2021	MFF	2	1	3			1,110	1,770	800		3,680	0.65	5662
		Total		55	15	70	16,852	10,207	24,285	9,070	15,316	2,600	78,330	22.00	3506

Table 5: Fish seed distribution to the SSA grow-out farmers in Y3

Region	Township	Started Year	IP	Total Participants who received Fingerlings				Total Pond Area (Ac)	Stocking Densit	Fish Speices
				M	F	Total	# of Seed			
Kachin	Bhamo	2019-2020	MFF	22	2	24	22,000	7.19	3059.81	Rohu, Silver barb,Grass Carp,Common Carp
Kachin	Mansi	2019-2020	MFF Kachin	20	0	20	20,400	6.65	3067.67	Rohu, Silver barb, Common Carp
Kachin	Momauk	2019-2020	MFF	10	3	13	9,300	2.92	3184.93	Rohu, Silver barb,Grass Carp,Common Carp
Kachin	Mogaung	2019-2020	MFF Kachin	11	5	16	10,900	3.32	3283.13	Silver barb,Grass Carp,Common Carp
Kachin	Myitkyina	2019-2020	MFF	17	5	22	23,350	8.07	2893.43	Rohu, Silver barb,Grass Carp,Common Carp
Kachin	Waingmaw	2019-2020	MFF Kachin	71	35	106	144,000	48.35	2978.28	Rohu, Silver barb,Grass Carp,Common Carp
Magway	Myo Thit	2021-2022	PACT	58	5	63	85,400	24.24	3,523	Rohu, Silver barb
Magway	Ngape	2019-2020	PACT	64	4	68	39,400	12.78	3,083	Silver barb
Magway	Salin	2019-2020	PACT	176	46	222	317,600	101.03	3,144	Silver barb
Magway	Seik Phyu	2021-2022	PACT	21	0	21	20,600	5.89	3,497	Silver barb
Magway	Pwintbyu	2020-2021	PACT	124	28	152	59,800	29.1	2,055	Silver barb
Mandalay	Madaya	2019-2020	BRAC	1	0	1	5,000	0.51	9,804	Silver barb
Sagaing	Wetlet	2020-2021	BRAC	106	94	200	131,000	26.17	5,006	Tilapia
Sagaing	Shwebo	2020-2021	BRAC	192	258	450	413,350	172.28	2,399	Rohu, Common Carp
Shan (East)	*Tachileik	2019-2020	KMSS	59	5	64	23,093	9.18	2515.58	Tilapia
Shan (East)	Monghpya	2020-2021	KMSS	38	9	47	20,162	8.06	2501.49	Tilapia
Shan (East)	Kengtung	2021-2022	KMSS	114	22	136	100,103	34.92	2866.64	Tilapia, Rohu, Grass Carp, Common Carp
Shan	Namsang	2020-2021	BRAC	151	99	250	276,890	94.55	2928.50	Rohu, Common Carp, Grass Carp
Shan (South)	Nyaung Shw	2019-2020	Fish For Liv	60	8	68	110,150	18.01	6116.05	Common Carp, Grass Carp
Shan (South)	Pekon	2019-2020	KMSS Peko	78	6	84	72,475	12.57	5765.71	Silver Carp, Common Carp, Grass Carp
Shan	Pin Laung	2019-2020	KMSS	62	5	67	21,450	7.65	2803.92	Silver Carp, Common Carp, Grass Carp
Shan	Pindaya	2019-2020	MFF	59	38	97	105,905	15.39	6881.42	Common Carp, Grass Carp
				1,514	677	2,191	2,032,328	648.83	3,132	

In this reporting period, a total of 2.03 million fingerlings were stocked in the SSA farmers' ponds. Most of the species farmers stock in their pond is Tilapia, Rohu, Silver barb, Grass Carp, and Common Carp. See the detail in table 5 above.

Table 6: Harvested ponds data in Y3

Type of Ponds	Region	Number of Ponds (Acre)	Weight of Harvested Fish (Viss)	Remark
Completely Harvested	Southern Shan	334 ponds 117.50 acre	52164.44	
Completely Harvested	Eastern Shan	142 ponds 24.26 acre	6451.67	
Completely Harvested	Sagaing	432 ponds 132.44 acre	49620.11	
Completely Harvested	Mandalay	48 ponds 17.13 acre	11021.22	
Completely Harvested	Magway	458 ponds 90.83 acre	19916.90	
Completely Harvested	Kachin	199 ponds 97.42 acre	43958.94	
Total		1613 ponds 479.58 acre	183,133.28	293,000kg from 195 ha

A total of 1,613 ponds were harvested completely in this reporting period and a total of 183,133.28 Viss of fish were produced. See table 6 above. This equates to 1,500kg/ha fish production.

1.2.1.3 Performance assessment of extension methodologies adopted by F4L beneficiaries on knowledge, Practices and Attitude (KPA) of SSA value chain actors (including farmers).

During the Y3 reporting period, several constraints occurred, the political instability and Covid-19 outbreaks made it difficult to conduct fieldwork in-person. However, despite all the difficult situations in Myanmar, F4L staff and IP staff made regular field monitoring and provided key messages to the farmers and monitored the adoption of methodologies and knowledge provided by F4L to the value chain actors and farmers.

Moreover, in this reporting period, F4L conducted Lessons Learned Workshops (LLWs) with the farmers in Myitkyina, Bahmaw, Mong Phyat, Tarlay, and Nyaung Shwe. In Nyaung Shwe Workshops, farmers from Taunggyi, Nam Sang, Pekhon, Pin Laung, Pindaya, and Nyaung Swe Townships attended. The hatchery, nursery, feed mill operators, and fish vendors also participated. A total of 111 (30 Female) participants attended the Workshops.

The top nine (09) key recommendations where less than 50% or equal of respondent farmers were following were:

Fish for Livelihoods' SSA Small-Scale Aquaculture Recommendations	Percentage of farmers NOT implementing
Fill the pond to a depth of 1 foot and leave for 3-5 days until the water color becomes light green. This means there is phytoplankton in the water for fish fingerlings to eat	50%
If possible, plough the pond bottom, as this releases nutrients from the mud.	68%
Remove any excess pond sludge and mud and use the mud to fertilize vegetables.	52%
Do you have any experience testing the quality of pond water by using a hand or Secchi Disk? Do you know how to test? Do you know how and how much to apply the fertilizer into your pond?	76%
It is important to know how many fish survive transportation and stocking into the pond. If possible, release fish fingerlings into a nursing hapa and nurse for 2 weeks before release into a grow-out pond.	72%
Put feed onto a feeding tray or a cloth bag about 6 inches below the water surface so that you can observe the fish carefully when they feed.	63%
Each week check the pond's pH. If the pH is less than 6.5 add lime.	72%
When you cannot see the palm of your hand or the secchi disk at less than 1 foot, stop fertilizing the pond.	53%
Regularly check water clarity (light penetration) once a week using the palm of your hand or a secchi disk and if you can see your palm or the secchi disk at more than 1 foot add some fertilizer to the pond to promote natural feed.	60%

The above table is one of the outputs from the LLW, and it shows that some of the F4L recommended methodologies, techniques, and knowledge need improved adoption by the farmers. See details in the Lessons Learned Workshops report attached to this report.

Sub-IR 1.3 Increased access to credit and financial instruments

Output 1.3.1: Credit and financial instruments targeting smallholder aquaculture producers and processors introduced and further developed

1.3.1.1 Promote credit delivery systems (i.e, formal loans via INGOs, local CBOs, and or in-kind assistance from input suppliers) to help sustain aquaculture and fisheries initiatives

Access to financial loans has always been a challenge for smallholder aquaculture producers, and the F4L *Activity* addresses this challenge so that all benefits flow to smallholders and farmers. Financial resources would increase the purchasing power of farmers, enabling them to buy additional inputs (fingerlings, feed, vegetable seed, fertilizer). These inputs result in improved outputs as productivity increases. Hence, higher financial resources will benefit farmer production and income. To make this happen, PACT employs two kinds of interventions: giving cash grants to both small-scale aquaculture (SSA) grow-out and nursery farmers and establishing a community-managed revolving fund, or farmers group revolving fund. Cash grants and revolving funding for farmers are two alternatives that are linked to one another.

The goal of the SSA group fund is to provide loans to SSA farmers for fish farm investments such as acquiring farm materials, labor costs, and services. The loan will only be used to invest in a fish farm. Following the formation of farmer groups, the project supported cash grants (subsidies) to SSA farmers. Each farmer then contributed 5-10% of his or her cash grant to the SSA group fund, which is then loaned to member farms. Saving is a one-time event (no more monthly savings). The SSA group committee oversees the revolving fund process. After a member meeting, the committee will keep the group fund and make loans to farmers. The committee will then collect the repayment following the schedule. The loan duration varies by group (1 - 6 months). The interest rate is also variable, ranging from 0.5 to 5% per month. When the loan term expires, the borrower only has to pay it back once. There is no set repayment plan and borrowers must repay both principal and interest at the same time. Late repayment penalties must be paid.

Cash Grant Distribution

Farmer subsidies were granted to 251 selected SSA grow-out farmers and two nursery farmers in Year 3 for pond preparation and the purchase of agricultural inputs such as fingerlings, fertilizer, lime, and farm materials. A total of MMK 40,000 (approximately 20 USD) was provided to each SSA farmer, and MMK 190,000 (approximately 90 USD) was provided to each nursery farmer in the form of cash subsidies. A total of 10,040,000 MMK (approximately 4,781 USD) was granted to 251 SSA farmers and 380,000 MMK (approximately 181 USD) to two nursery farmers. A small portion of each grant awarded - about 5%-10% - was saved in the form of a group fund and subsequently loaned to member farmers at a low-interest rate.



Figure 2: A woman farmer in Hpaung Lin village, Salin Township, receiving SSA farmers' subsidies.

Table 7: Year 3 cash grant distribution by farmer type and township

Grant Types	Township	No. of farmer groups	Grantee (No. of farmers)			Total MMK granted
			Male	Female	Total	
SSA grant	Salin	9	99	24	123	4,920,000
	Ngape	5	43	1	44	1,760,000
	Myothit	7	58	5	63	2,520,000
	Seikphyu	2	21	0	21	840,000
Nursery pond grant	Salin		1	0	1	190,000
	Ngape		0	1	1	190,000
Total		23	222	31	253	10,420,000 (approx. 4,962 USD)

Status of Farmer Group Revolving Funds

The IP encouraged SSA farmers to form local SSA fund groups using their savings and provide the opportunity for member farmers to invest in their fish farming business by borrowing money from their group funds. There is a total of 44 SSA fund groups with 666 members (men - 548, women - 118) formed over the project period, with 15 SSA fund groups in Y1 (Salin - 11, Ngape - 1), 16 Y2 (Salin - 7, Pwintbyu - 8, and Ngape - 1), and 13 Y3 (Salin - 7, Pwintbyu - 8, and (Salin 9, Myothit - 2, and Seikphyu - 2). The total start-up capital fund of these 44 fund groups is 6,505,000 MMK (approximately 3,098 USD). When borrowing money, the loan term ranges from two (2) to six (6) months, with interest rates ranging from 0.5% to 5% amongst fund groups.

Table 8: Groups members and start-up capital fund of SSA fund groups by year

Year	No. of fund groups	Member			Total capital fund (MMK)
		Men	Women	Total	
Year 1	15	147	25	172	2,430,000
Year 2	16	223	52	275	2,430,000
Year 3	13	178	41	219	1,645,000
Total	44	548	118	666	6,505,000 (approx. 3,098 USD)

In Year 3, 84% (37/44) of the fund groups across five project areas are operational and lending money to member farmers. During the project time, about 328 members of farmers took out 653 business loans, bringing the total 21,062,500 MMK (approximately 10,030 USD) from their farmer group funds for fish farming. Around 18% (118/666) of women farmers participate in farmer revolving fund groups, granting them greater access to capital for their fish farming businesses.

Table 9: Status of Revolving of SSA Group Funds

Townships	Total No. of fund groups formed	Fund groups functioned in Y3	Total no. of recipients	Total no. of loans	The total amount of money borrowed (MMK)
Salin	27	24	196	362	13,491,350
Pwintbyu	8	7	113	265	6,454,150

Townships	Total No. of fund groups formed	Fund groups functioned in Y3	Total no. of recipients	Total no. of loans	The total amount of money borrowed (MMK)
Seikphyu	2	2	3	3	210,000
Ngape	5	2	11	18	612,000
Myothit	2	2	5	5	295,000
Total	44	37	328	653	21,062,500 (approx. 10,030 USD)

The total current fund value of 44 fund groups from five project townships is 8,338,260 MMK (approximately 3,971 USD), and fund growth varies between groups and is mostly determined by lifetime, loan duration, and interest rate. Due to the widespread economic downturn, some fund member farmers were unable to repay their loans on time, and the fund's management committee from seven SSA fund groups in Ngape and Salin is confronting the funds' revolving issue and stop revolving the fund.

Table 10: Status of total funds of SSA fund groups

Township	Batch (Year)	No. of fund groups	Member			Total capital fund (MMK)	Current Total Fund
			Men	Women	Total		
Salin	1	11	156	30	186	2,235,000	3,289,850
Salin	2	7	84	22	106	1,185,000	1,458,290
Salin	3	9	99	24	123	1,240,000	1,265,000
Ngape	1	4	22	11	33	195,000	213,260
Ngape	2	1	7	0	7	35,000	57,160
Pwintbyu	2	8	132	30	162	1,210,000	1,643,700
Myothit	3	2	27	1	28	195,000	201000
Seikphyu	3	2	21	0	21	210,000	210,000.0
Total		44	548	118	666	6,505,000 (approx. 3,098 USD)	8,338,260 (approx. 3,971 USD)

F4L Activity also assisted the fisherfolk fishing on Inle and Pekhons Lakes in Southern Shan State. See detail in section 1.7.1.4 of this report.

1.3.1.2 Pilot newly identified opportunities with selected stakeholders as recommended by Inclusive Finance and Development Associates Limited (IFDA)

F4L Activity contracted PEGU partners to conduct the activity in the country. In the aftermath of the coup in Myanmar, the partner faced several difficulties to conduct the activities in the targeted states and regions. However, the partner organization was trying to collect all the available information through various channels to shape the IFDA recommended activities. The contract is extended to December 2022.

1.3.1.3 Provide financial/credit literacy to SSA as a support to access available credit sources

F4L contracted with a consortium (MDF Asia Myanmar, Fresh Studio, and Sympathy Hands) to build the capacity of targeted farmers. The consortium provided a series of trainings related to Financial Management, Community Based Micro-Finance Management, Operational Management, Project Cycle Management, Proposal Writing & Resource Mobilization training, and Strategic Planning

training sessions to the CBO member. The CBO members in turn provide to the farmers in the targeted area. See details in the consortium reports attached.

1.3.1.4 LEARNING: assess effectiveness of different credit delivery systems: in kind subsidy (inputs, seed), revolving funds etc.

PEGU partner's contract was extended to December 2022. See activity 1.3.1.2.

Sub-IR 1.4 Increased access to fish seed through engaging and strengthening linkages between private and public sector

Output 1.4.1: Improved knowledge and understanding of the existing seed sector

1.4.2.1 Sign new contracts with private and public hatcheries, build their capacity and management practices with the aim to increase availability of improved seed in the ZOI

1.4.2.2 Explore sources of good quality broodstock and distribute to hatcheries

In the Y2 implementing period the Field Coordinators of F4L explored the sources to get good quality broodstock in the country. F4L got good contact with broodstock rearing farmers from the Delta area and bought the broodstock and replaced the good quality broodstock with the hatchery owners. The activity was done in Y2.

1.4.2.3 Assess the performance of model hatcheries (carp or tilapia) and nursery systems established in year 1 and share key learning with new hatcheries and nurseries

The activity is ongoing and if the political situation is favored it will be finalized in Y4.

1.4.2.4 Develop a business plan for sustainable carp hatchery management (WorldFish documents for reference).

F4L Activity developed the hatchery business plan and hatchery record book and distributed to the hatchery owners. They use them properly in the field. Please see the attached hatchery business plan and record book format in the example.

1.4.2.5 Develop breeding plan for improving quality of broods and off springs and reduce inbreeding (see WorldFish Genetic expert's report).

The activity is still ongoing and F4L team will discuss further detail the breeding plan for improving the quality of broodstock and offspring to reduce inbreeding.

1.4.2.6 Facilitate scaling of model hatchery (carp or tilapia) and nursery systems by the selected private and public sector using BMPs together with distribution networks during following years (cost sharing with private sector)

The *Activity* continuously provided technical assistance to the F4L supported hatchery and nursery owners to produce quality fingerlings using BMPs for the local aquaculture farmers in the five States / Regions. The following tables 11 and 12 show the number of fingerlings produced by the *Activity*-supported hatcheries and nurseries.

Table 11: Fingerling production from Activity-supported Hatcheries in Y3

Township	Name of Hatchery Owner	No. of hatchlings produce	No. of fingerlings produce	Fish Species
Khin U	U Aung Kyaw Lin	140,000,000	20,000,000	Rohu
		29,000,000	2,000,000	Pangus
			1,000,000	Common Carp
Madaya	U Kyaw San	145,500,000		Rohu
		3,500,000		Pacu
		2,000,000		Marigal
Myitkyina	U Hpauyu Tu Myat		25,000	Common Carp
			730,000	Grass Carp
			1,050,000	Rohu
			650,000	Silver Barb
Nyaung Shwe	U Hla Kyaw		13,860,000	Common-Carp
			87,773,936	Grass-Carp
			21,423,334	Marigal
			46,309,507	Rohu
			667,000	Sliver-Barb
			1,613,500	Sliver-Carp
			990,000	Common-Carp
			2,880,000	Grass-Carp
			720,000	Marigal
			3,240,000	Rohu
Kengtung	Sai Loon Tip		100,000	Common-Carp
			10,000	Tilapia
Total		320,000,000	205,897,277	

Table 12: Fingerling production from Activity supported Nurseries in Y3

Township	Name of Nursery farmer	No. of fingerlings produce	Fish Species
Tachileik	U Lone Kyaing	23,156	Tilapia
	U Naing Htun	22,295	Tilapia
Kengtung	U Sai Yi Loot	7,375	Common-Carp
		250	Grass-Carp
		9,499	Rohu
		1,500	Tilapia

Township	Name of Nursery farmer	No. of fingerlings produce	Fish Species
Nansang	U Aike Su	1,500	Common-Carp
	U Maung Aung	7,000	Grass Carp
	U Naing Win	11,500	Grass Carp
	U Sai San	2,000	Rohu
Bhamo	U Mg Ko	3,980	Common Carp
	U Tu Mai	14,500	Common Carp
Waingmaw	Daw Ye Naw	24,050	Common Carp
	U Hpauwung Naw	23,010	Common Carp
	U Min Hkum	7,025	Common Carp
Ngape	Daw Yi War War Tun	18,000	Silver Barb
	U Kyauk Tan	28,000	Silver Barb
Salin	U Myo Myint Shwe	10,800	Silver Barb
	U Sein Thaug	20,000	Silver Barb
Wetlet	Daw Chit Su Mon	14,700	Rohu
	Daw Yin Nyein Aye	400	Rohu
Total 18 farmers		250,540	

1.4.2.7 Technical assistance to the carp hatchery operators and broodstock development (1.4.2.2)

The activity is combined with 1.4.2.2.

1.4.2.8 Define GAP and HACCP certification needs for hatcheries and nursery with certification organizations (see the [National Aquaculture Development Plan 2020](#))

This activity was not possible to conduct in the current context of Myanmar although a simple form of local ‘certification’ is being promoted by the adoption of the BMP.

1.4.2.9 Promote GIFT by establishing new breeding cohort and satellite hatchery in Mandalay

This activity was combined with activity 1.4.2.13.

1.4.2.10 Extend technical assistance to the GIFT hatchery partners (multiplication and brood stock development)

This activity was conducted combined with activity 1.4.2.12.

1.4.2.11 Assess production and economic performance of monosex tilapia seed stocked in year 1

The regular field monitoring of distributed monosex⁸ tilapia, which were bought from Nam Sai Farm, Thailand, was conducted by the F4L Field Coordinator and IP staff of KMSS Kengtung, Eastern Shan State. There had very good perceptions and responses on mono sex tilapia by farmers of Eastern Shan. Farmers responded that they have good income by growing monosex tilapia, it grows very quickly and gives a good profit because tilapia has a high market price and demand.

1.4.2.12 Capacity building training for nursery operators and FCs on how to produce Sex Reversed Tilapia (SRT)

F4L *Activity* organized a training session in Nam Sai Farm during the Y3 reporting period. The key implementing staff of the F4L team, hatchery, and nursery owners attended the Tilapia Mass Production and Sex Reversal Technique (SRT) training in Nam Sai Farm, Thailand. A total of 13 (3 women) participants from 7 (2 women) WorldFish staff and 6 (1 woman) F4L key farmers attended the training to replicate the technique in Myanmar and to promote the national and international market linkages on GIFT (Genetically Improved Farm Tilapia) and Sex Reversal Technique Tilapia production.

1.4.2.13 Promote and support nurseries to produce SRTs

F4L provided one hatchery renovation in Madaya Township, Mandalay region, to produce the Sex Reversal Technique Tilapia. The renovation of the nursery was completed in this Y3 implementation period, although there had many constraints related to political instability and Covid-19 restrictions, and the hatchery owner is starting testing to produce the SRT. All required equipment and technologies were provided, and the hatchery owner joined the Nam Sai Farm, Thailand visit. So that he got full of knowledge of SRT-producing techniques and he had practical experience in Nam Sai Farm.

A total of 120 Male and 150 Female broodstock had been provided to the tilapia private Hatchery of Madaya, Mandalay Township. The owner, as he received proper SRT training in Nam Sai Farm, Thailand, he starts to produce the monosex tilapia during this reporting period. Every five day intervals, the hatchery owner collects the eggs and the first batch of 2,000 monosex tilapia fry have been produced and 30 October 2022 they were one month old.

1.4.2.14 Provide Induce Breeding training to Carp Nursery Farmers

During reporting period F4L *Activity's* Field Coordinator, Eastern Shan State provided Common Carp induced breeding in-person practical training to a nursery, demonstration, aquaculture promoter, and SSA farmers from Kengtung Township at Nam Khun Hatchery. A total of 32 (4 women) participants and 5 (2 women) KMSS Kengtung staff attended the training. See detail in the 8.7 capacity development session in this report.

Sub-IR 1.5 Increased availability and access to a quality affordable feed using agricultural co-products by farmers

Output 1.5.1: Improved feed formulation adopted by small and commercial feed mills

1.5.1.1 Facilitate implementation of additional fish feed grants based on ideas generated from year 1, and organizing consultation meetings with feed millers and ingredient suppliers.

⁸ <https://aquafeed.co.uk/entrada/how-to-produce-millions-of-high-quality-monosex-tilapia-fry-24785>

F4L provided 5 new fish feed mills to the farmers in Y3. A total of 21 feed millers produced just over 67,000 Viss of sinking pelleted fish feed in this reporting period and a total of 1,616 farmers accessed the sinking pelleted fish feed in five states and regions. The objective of providing a feed mill is to produce quality fish feed from locally available quality raw materials to increase the food conversion ratio and profitability. Based on the experience learned from years 1 and 2 the *Activity* organized a series of consultation meetings with feed millers for the smooth running of quality feed-producing systems locally. F4L has formed a collaborative link to the USAID-funded Agriculture and Food Systems Development Activity (AFDA) to better utilize ground nut oil cake – a byproduct from the ground nut oil production value chain. The collaborative action with AFDA will continue in Y4. See the detail in table (13) below.

Table 13: Status of feed mills in Y3

Region	Number of feed mill	Produced fish feed (viss)	Number of farmers access	Remark
Southern Shan	5	11249.00	437	1 new (Pindaya) in Y3
Magway	5	1903.50	14	2 new (Salin & Myo Thit) in Y3
Kachin	3	22698.00	103	
Sagaing	3	18430.20	792	1 new (Shwebo) in Y3
Mandalay	1	3156.56	152	
Eastern Shan	4	9696.82	118	1 new (Keng Taung) in Y3
Total	21	67,134	1,616	5 new feed mills in Y3

1.5.1.2 Provide training for feed mill technicians and feed mill operators

In this reporting period, F4L provided a series of feed miller trainings in all 5 states and regions starting from May 2022 as the political and Covid-19 situations favored organizing face-to-face training. A total of 59 (M42, F17) SSA farmers including feed millers attended the training.

F4L helped fish millers to gain knowledge on the importance of feed quality control, and pellet processing methods, it can help them to promote their income and to help local farmers to get pelleted feed at affordable prices.

In the training, F4L Field Coordinator explained thoroughly about the feed mill and how to set up the machine. Moreover, farmers were trained on observation of raw materials available in the local market and the knowledge on replacement of alternative raw materials, protein level inclusion of ingredients, and in practical farmers gained the knowledge on a calculation of the recommended feed formula, feed preparation and production by using pellet feed mill, feed sun drying, feed packing and feed storage. They provided the main idea on fish weight sampling measurement and feeding calculation and calculation of FCR (Feed Conversion Ratio) and Water quality of the pond in general. See the Table 14 below.

Table 14: Provided feed miller training and attended to participants

Training place	Male	Female	Total	Remark
Nyaung Shwe	2	5	7	Pindaya (M1, F3), Inlay (M1, F1), Nyaung Shwe (M0, F1)
Tarlay	10	3	13	
Shwebo	10	6	16	Wetlet (M1, F3), Shwebo (M9, F3)
Salin	7	0	7	
Myothit	9	0	9	
Bhamaw	1	1	2	
Waingmaw	2	1	3	
Myitkyina	1	1	2	
Total	42	17	59	

1.5.1.3 Collaborate with private sector laboratories to provide triple function of testing for 1) feed ingredients, 2) finished feed products and 3) the fish and shellfish produced in terms of nutrient and micronutrient content

This activity is not possible to implement in this reporting period, as the political situation is not favored. Although the testing of food safety for the fish powder production was carried out both in Myanmar and Thailand.

1.5.1.4 Promote and use Shwe Ngar app for small and medium-scale feed producers for optimizing their feed formulation and ingredient selection

The training sessions on Shwe Ngar mobile app (an app developed by F4L) was delivered by Field Coordinators to the implementing partner's staff in the field during the reporting period. A total of 46 IP staff were trained on the Shwe Ngar app, 8 aquaculture promoters from 3 regions and 2 states also received training on how to use the Shwe Ngar application. In turn, a total of 140 farmers were trained by the IP and aquaculture promoters in Y3.

During the reporting period a total of 1,646 people registered on the Shwe Ngar app (accounts from Myanmar). Out of 1,646 Shwe Ngar accounts, 1,201 (25% Female) were aquaculture promoters (AP), farmers, hatchery and nursery farmers and the rest are retailers, wholesalers, partner staff, WorldFish staff, and observers. See Table (15) below.

Table 15: Shwe Ngar Mobile Application registered and usage

	AP	Farmers	Feed Millers	Hatchery Owner	Nursery Owner	Processor	Retailer	Other	IP staff	WorldFish Staff	Total
Female	9	205	3	1	3	4	15	18	32	11	301
Male	25	594	12	13	11	9	9	152	42	33	900
Unspecified											445
Total	34	799	15	14	14	13	24	170	74	44	1646

As mentioned, farmers could easily learn about feed ingredients, prices and contact details of the feed mills in Myanmar whenever they need. After the February 2021 military coup mobile service providers were forced to close their service provision periodically. The cuts in mobile data use often made it difficult for farmers to use the app. IP staff and aquaculture promoters continued training courses for the SSA farmers intensively so that the farmers would use the feed calculator and other features (FCR calculation, knowledge database, linkages with all actors) of the app and benefit.

1.5.1.5 Establish innovations for feed involving women

F4L assisted a total of 21 small-scale feed operators in the reporting period in targeted townships of five states and regions. Out of these, six feed mills were operated by women entrepreneurs. During the reporting period, over 67,000 viss of sinking pellet feed was produced and it had been sold to 1,616

farmers. Women play an important role in the feed-making process, buying ingredients and product marketing.

1.5.1.6 Assess performance of feed ingredients on tilapia and silver barb, and share learning to project participants and non-project beneficiaries

Assessing the performance of different types of feed is one of the F4L objectives in the different geographical areas. During Y3 the Activity set up two feed trails in Nyaung Shwe Township, Southern Shan State, and Madaya Township, Mandalay Region.

In the Nyaung Shwe feed trail, the growth performance of Common Carp (*Cyprinus carpio*) under different feeding treatments in hapa conditions was tested, while Silver Barb (*Barbonymus gonionotus*) and Rohu (*Labeo rohita*) growth performance under different feeding treatments were conducted in Madaya Township, Mandalay Region.

Approximately 80% of small-scale aquaculture (SSA) farmers rely on farm-made diets to feed their fish due to the high cost of commercial pelleted feed. In general, depending on the ingredients, farm-made feeds contain around 19-20% percent crude protein, whereas commercial feeds contain 26–35% including animal-sourced protein from fishmeal, blood meal, or bone meal. The performance of using farm-made feeds and ingredients on cultured species is still unknown in Myanmar due to limited research in distinct geographical areas. F4L conducted the feed trials with Common Carp, Silver Barb, and Rohu species in Southern Shan and Mandalay.

The research trials aimed to achieve the following objectives: 1) to assess the performance of different types of feed formulated with locally available agricultural by-products on fish productivity and profitability, and 2) to optimize the feed formulation and ingredient selection to produce low-cost affordable nutritionally rich feed by small and medium scale feed producers. The trial also compared a commercial floating⁹ pelleted feed and a ‘rice bran only’ scenario.

1. Feed Trial Nyaung Shwe Township, Southern Shan State.

I.I. Growth performance of Common Carp (*Cyprinus carpio*) under different feeding treatments in hapa condition, Nyaung Shwe township, Southern Shan state.

On 30th June 2022, F4L set up a larger scale feed trial based on the findings of the trial in 2021 to assess the productivity and profitability of Common Carp (*Cyprinus Carpio*) by applying different types of farm-made feed compared to commercial feed available in Nyaung Shwe, Southern Shan State.

At the trial, six types of treatments, each with three replications are tested to compare feed performance among treatments; 1 commercial feed-fed treatment, 4 farm-made feed fed (with different protein content) treatments, and 1 control treatment that uses only rice bran. Farm-made feed is produced by engaging with a feed miller supported by the project. Fertilizers will be applied monthly to optimize pond fertility depending on the physical condition of the pond water. Water quality; Temperature, and pH are measured weekly and dissolved oxygen is checked in early morning when lowest. Ammonia levels are measured monthly as a condition factor on fish growth rate. The feed intake and fish weight are sampled monthly to monitor the growth rate and to calculate the feeding amount for the ensuing weeks. The feed trial result will show the performance of formulated farm-made feeds and the selection of ingredients that are affordable and nutritionally adequate, with no negative impact on the environment to increase fish productivity. With that result, it would help feed producers and farmers to optimize their feed formulation to produce nutritionally rich feed using locally available ingredients effectively.

⁹ The advantage of a floating pellet is that fish can be observed eating the feed hence there is less feed waste and improved feed conversion to fish flesh (FCR).

II. Materials and Methods

II.I. Experimental Design

The experiment was designed with 6 treatments each with 3 replications (Figure 3). The 3 plots (hapa) were set up for each treatment in one earthen pond. The size of plot (hapa) was 6 ft x 6 ft x 6ft with stocking density 6 fish/m² (24 fish/plot). The initial stocking size is 30 g per fish. The hapa is cleaned every two weeks to avoid algae clogging and oxygen depletion in the hapa. Supplemental feeds purchased from a commercial feed supplier (De Heus) and farm-made feed using locally available ingredients (Table 16) were given in treatment-1 (Commercial floating pellet (CP 25%)), treatment-2 (Farm-made feed CP 26% (Delta Formulation)), treatment 3 (Farm-made feed CP 20% (Central Dry Zone Formulation)), treatment 4 (New trial formula with oil and vitamin inclusion), treatment 5 (Rice bran 70%: peanut oilcake 30% (rice bran without boiling)), and treatment 6 (Control treatment (only rice bran)). Fertilization (urea and triple super phosphate) was done one time after pond preparation. This experiment was conducted for 12 weeks.

Treatments	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5	Treatment 6
Plots	P1	P6	P11	P16	P21	P26
	P2	P7	P12	P17	P22	P27
	P3	P8	P13	P18	P23	P28

Figure 3: Trial Plot Design

Table 16: Feed Formulation with different protein content

Ingredient	T1: Commercial floating pellet Crude Protein (CP) 25%	T 2: Farm-made feed CP 26% (Delta Formulation)	T3: Farm-made feed CP 20% (Central Dry Zone Formulation)	T4: New trial formula with oil and vitamin inclusion	T5: Rice bran (70%): peanut oilcake (30%) (rice bran without boiling)	T6: Control treatment (only rice bran)
Inclusion level (%)						
Rice Polish (Bran)	-	50	65	69	70	
Dry Fish Powder	-	28	5	17	0	
Peanut Cake	-	12	20	5	30	
Cassava	-	9	9	5	3	
Salt	-	1	1	1	0	
Cooking oil (palm)	-	0	0	2	0	
Vitamin mineral mix	-	0	0	1	0	
Total		100	100	100	103	

Farm-made feeds were produced with locally available ingredients such as rice bran, fish meal, peanut cake, cassava, salt, cooking oil, and vitamin-mineral mix. Feed is formulated with different protein content at the project-supported feed mill according to the feed formula provided by the project.

II.II. Feeding Protocol

Fish were sampled monthly to calculate the required feed amount based on body weight. The fingerlings were initially fed at 8% of body weight per day and were reduced gradually based on body weight in the following months. The fish were fed two times at 10 AM and 4 PM each day. A feeding bag is applied to feed the feed so that the feed is less likely wasted. The following feeding protocol is applied over the study period.

Table 17: Feed Amount for Carp species

Avg. weight of fish (gm)	Feeding rate (% of body weight)	Feeding frequency
0.1-5	15-12%	2 times/ day
5-20	12-8%	
20-50	8-7%	
50-200	7-5%	
200-400	5-4%	
400-600	4-3.5%	
600-800	3.5-2.5%	
800 - marketable size	2.5-2%	

II.III. Data Collection

The fish weights were sampled monthly to monitor the growth rate, and FCR and to calculate the feeding amount for the ensuing weeks. The 5 fish are randomly collected and weight in each plot. The feed intake was recorded daily basis. Four major water quality such as Temperature and pH were measured by a PH tester (HANNA HI98129) on daily basis, DO was measured by a test kit (HANNA 3810) weekly, and Ammonia is measured by an ammonia checker (HI7333) weekly. Water exchange was carried out depending on physical checking of the water turbidity in the pond.

III. Results

III.I. Production

The total biomass under different feeding treatment over the experimental period are presented in table (18). During the three months, the production was observed to be 9,321; 9,480; 7,632; 7,104; 6,288 and 5,976 g/treatment/13 weeks in T1, T2, T3, T4, T5, and T6 respectively. The highest fish production was obtained at 9,480 g in T2 under feeding farm-made feed CP 26% compared to a commercial floating pallet. The lowest fish production 5,976 g was observed in T6 under only rice bran feeding treatment. (Figure 3). The cost-benefit will be examined for the marketable size fish after the completion of the trial.

Table 18: Growth of common carp in terms of increase in weight (g) in different treatments

Treatments	Total Biomass (g)		
	1st Month	2nd Month	3rd Month
T1: Commercial floating pellet (CP25%)	5,568	7,512	9,312
T 2: Farm-made feed CP 26% (Delta Formulation)	6,360	7,224	9,480
T3: Farm-made feed CP 20% (Central Dry Zone Formulation)	5,400	6,504	7,632
T4: New trial formula with oil and vitamin inclusion	3,576	6,504	7,104
T5: Rice bran (70%): peanut oilcake (30%) (rice bran without boiling)	4,452	5,688	6,288
T6: Control treatment (only rice bran)	4,248	5,640	5,976

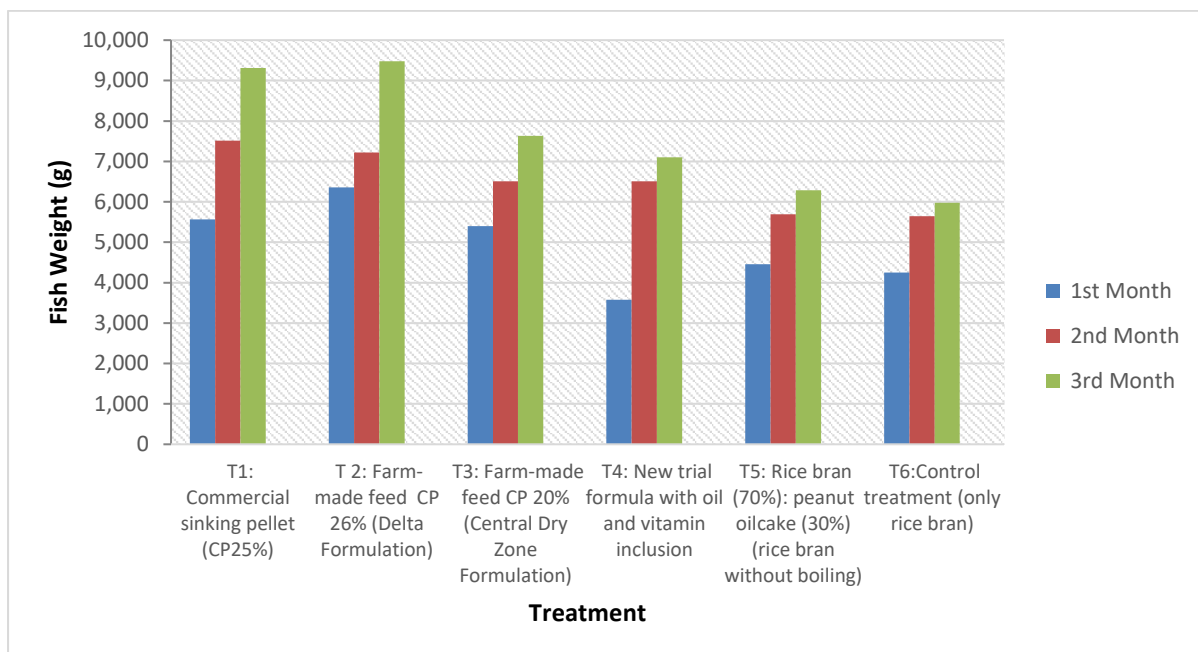


Figure 4: Growth of Common Carp in terms of increase in weight (g) in different treatments

III.II. Water Quality

The variation in temperature, pH, Ammonia, and Dissolved oxygen was revealed during the study period as shown in table 19.

Table 19: Values of water quality parameters in all treatments throughout the study period

Months	Temperature °C		pH		Ammonia (mg/l)		DO (mg/l)	
	Mean Value		Mean Value		Mean Value		Mean Value	
	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening
1st Month (July)	26.31	27.47	8.22	8.46	3.80	2.83	2.6 ¹⁰	6.8
2nd Month (Aug)	27.17	28.34	8.22	8.58	3.70	3.80	4.3	7.1
3rd Month (Sept)	25.53	28.10	8.16	8.70	3.10	3.51	3.3	6.8

¹⁰ A dissolved oxygen (DO) level below 3ppm is considered critically low. Common carp can ‘gulp’ air at the surface to compensate for low DO conditions. See IWMI comments above re water quality (output 1.1.1).

PHOTOGRAPHS OF TRIALS



Setting up feed trial in Nyaung Shwe



Fish stocking at feed trail



Fish selection for feed trail



Feeding fish at feed trail



Feed preparation at a feed mill



Feed preparation at a feed mill

2. Feed Trial Inn Gone Village, Madaya Township, Mandalay Division.

Growth performance of Silver Barb (*Barbonymus gonionotus*) and Rohu (*Labeo rohita*) under different feeding treatments in hapa condition, Inn Gone Village, Madaya Township, Mandalay Division.

I. SITE SELECTION

Since it is the monsoon season, site selection plays an important role in feed research, because the central regions of Myanmar sometimes experience heavy rains and frequent flash floods. So, we chose a fish pond that was higher than normal and had good water flow to avoid flash floods and disaster risks. Figure 5 shows the location of feed trial research farm in Madaya Township, Mandalay region. Location is Lat-22.238225 N and Long-96.155891 E. Altitude is 82.523758 m.



Figure 5: Feed Trial Map

II. MATERIAL AND METHODOLOGY

II.I. Hapa Design

The hapas are in the shape of a 6-foot-long cube and we have 36 hapas. There are nine hapas in one row and we have four rows. We used two rows for the “Silver Barb” species and another two rows for the “Rohu” fish species. Hapa’s frame is made of bamboo and walkways were made with betel nut trees that were old and no longer bearing fruit. Plastic nets are used to make it last longer in water and it can easily get in the local market. And then braided rope with coconut hair and a metal rope was used to tie the bamboo poles to make them durable in water and harmony with nature. The average water level of the pond is 6 feet and we submerged the hapas in water for 4 feet. Figure 3, shows the hapa design for feed trial research.

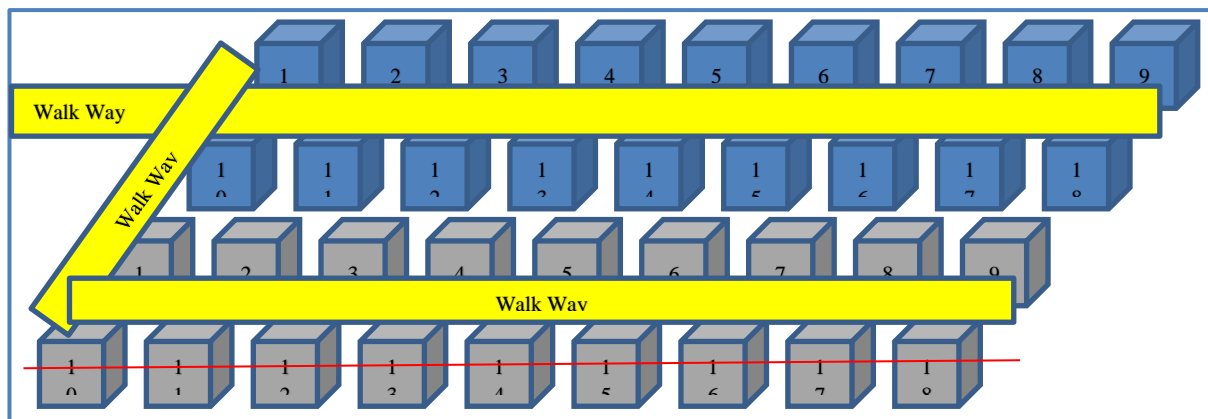


Figure 6: Design of the fish hapas for Feed Trial Research (in figure, blue hapas represented the “Silver Barb” and gray hapas represented the “Rohu” and a red line show the water level)

II.II. Fish Stocking

We have two species of fish for feed trial research, these are “Silver Barb” and “Rohu” fish species. And we have two rows of hapas and six treatments for each species. Therefore, we have six treatments of 18 hapas for Silver Barb species and another six treatments of 18 hapas for the Rohu fish species. 3 hapas for 1 treatment and then 18 hapas for 6 treatments are shown in tables 20 & 21.

Table 20: Fish stocking of Silver Barb

Treatment	Plot (Hapa) 6'x6'x6	SPECIES	Stocking Density (6 per sq.m)	Initial Stocking Weight(g)	Total number of fish	Total Weight(g)	Stocking Date
Treatment 1	1 to 3	SILVER BARB	6	8	24	192	6/25/2022
Treatment 2	4 to 6		6	8	24	192	6/25/2022
Treatment 3	7 to 9		6	8	24	192	6/25/2022
Treatment 4	10 to 12		6	8	24	192	6/25/2022
Treatment 5	13 to 15		6	8	24	192	6/25/2022
Treatment 6	16 to 18		6	8	24	192	6/25/2022

Table 21: Fish stocking of Rohu

Treatment	Plot (Hapa) 6'x6'x6	SPECIES	Stocking Density(6 per sq.m)	Initial Stocking Weight(g)	Total number of fish	Total Weight(g)	Stocking Date
Treatment 1	1 to 3	ROHU	6	20	24	480	6/25/2022
Treatment 2	4 to 6		6	20	24	480	6/25/2022
Treatment 3	7 to 9		6	20	24	480	6/25/2022
Treatment 4	10 to 12		6	20	24	480	6/25/2022
Treatment 5	13 to 15		6	20	24	480	6/25/2022
Treatment 6	16 to 18		6	20	24	480	6/25/2022

II.III. Type of Treatment

We have 6 types of treatments. There are (Treatment 1) Commercial Floating Pellet (De Heus), (Treatment 2) Farm-Made Feed (Delta Formulation CP 26%), (Treatment 3) Farm-Made Feed CP 20% Central Dry Zone Formulation, (Treatment 4) Rice Bran 70%: Peanut Oil Cake 30% (Rice Bran without boiling), (Treatment 5) New Trial Formula with Oil & Vitamin inclusion, (Treatment 6) Rice Bran Only (100%). We can get commercial sinking and floating pellets from Mandalay. But other treatments such as-treatment 2, 3, 4, and 5 were made by mixing ingredients that will be supported for the growth of fish. And these ingredients of feed can easily get in Madaya Township. The percentage of ingredients included in treatments are described as follow-Treatment 2 included rice polish (bran) 50%, dry fish powder 28%, peanut cake 12%, cassava 9%, and salt 1%. Treatment 3 included rise polish (bran) 65%, dry fish powder 5%, peanut cake 20%, cassava 9% and salt 1%. Treatment 4 included rice polish (bran) 70%, peanut cake 30%, and cassava 3%. Treatment 5 included rice polish (bran) 69%, dry fish powder 17%, peanut cake 5%, cassava 5%, salt 1%, cooking oil (palm) 2% and

vitamin-mineral mix 1%. Here some formula has a salt content of 1% for a 14-day meal, so the salt content for a 1-day meal is 0.0714%. Table 22 shows the local fish food prices by Myanmar kyats (MMK).

Table 22: Local food prices for treatment

Fish Food Prices (MMK) for One Viss						
	2nd week	4th week	6th week	8th week	10th week	12th week
Commercial Floating Pellets (De Heus)	8573	8573	8573	8573	8573	8573
Rice Bran	667	667	667	667	833	917
Dry Fish	1000	1000	1000	1000	1000	1000
Peanut Oil Cake	2000	2000	2000	2000	2700	2800
Cavassa	2200	2200	2200	2200	2800	2800
Salt	800	800	800	800	800	800
Oil	8000	8200	8000	6500	6500	6500
Vitamin	13928.57	13928.57	19285.7	19285.7	19285.7	32142.85



Figure 7: Images of food that are stored in plastic containers

II.IV. Feeding

Fish were fed directly with commercial floating pellets (De Heus) that can float on the water and no need to put feeding bags. And we used the feeding bags for the other treatments that are in powder form and can easily dissolve in water. And also, plastic bottles were used to make small cups for feeding. In figure 7, we can see two small plastic cups in a red plastic bucket. Then we used a small one for the “Silver Barb” and a little big cup for the “Rohu”. We changed the size of feeding small cups after every weight sampling data collection has done.

II.V. Weight Sampling & Data Collection

Feed trial data were collected once every two weeks and collected the water quality data for every day. After every two weeks of feeding, fish weight samples were taken and feed rates were calculated. We have 3 hapas for treatment and 18 hapas of 6 treatments for a species. And 36 hapas for two species. Each hapa contains 24 fish and collected only 10 average fish for an average weight of the hapa when we make sampling. And then we calculated the average weight of the treatment by collecting every hapa of the treatment. For example- we have 48 g of the total weight from a hapa if we got 20g of weight from 10 fish samples of a hapa, $(24/10 * 20=48)$. We used a net to collect fish

samples from the hapa and it looks like a butterfly net (the local name is water net). For the water quality, daily collected 4 types of qualities for morning and evening, there are- Temperature, pH, DO, and Transparency. And collected ammonia quality every two days. Tables 20 & 21 show the data of average weight gain once every two weeks.



Figure 8: Images of fish sampling for weight record

II.VI. Fish Disease Appearance and Treatment

When we collected fish samples for the fourth time, we saw small red spots on the body of a “Silver Barb” fish from hapa number 3. According to the symptoms of the fish, it was determined to be a red pest a bacterial infection (*Bacterium cyprinicida*), and treated. The treatment method was to mix one tetracycline capsule with food and feed once in the morning and once in the evening. After two days, the disease was cured. Figure (9) shows a silver barb fish with a red pest.



Figure 9: Image of Red Pest appearance in a "Silver Barb"

II.VII. Water Quality Measurement

Instruments that were used in water quality measurement are HI 98129 (HANNA instrument PH/EC/TDS & Temperature waterproof tester), Secchi disk 8 inches in diameter with 4-foot rope for Transparency, Lutron DO-5510 oxygen meter for DO measurement, and HI 733 (Ammonia High Range Handheld Colorimeter) for the measurement of Ammonia.

To obtain the pH & Temperature of the pond water, immersed the HI 98129 meter about 3 inches into the pond water and measured directly. When measuring the DO, the entire Oxygen Probe Handle was dipped into the pond water and measured. When measuring transparency, was measured using a Secchi disk and a regular ruler. And then to measure ammonia, the pond water is taken directly with a clean plastic bottle and measured with HI 733 Ammonia High Range Handheld Colorimeter.



Figure 10: Images of meters for Water Quality (WQ) measurements

III. RESULTS

III.I. Production

Growth rates and total weights of each treatment six times sampling were attained. Figure 11 represents the production weight of the “Silver Barb” species and Figure 12 represents the production weight of the “Rohu” species. In Figures 11 and 12, the green column shows the growth rate of 2nd week of sampling, the yellow column shows the growth rate of 4th week of sampling, the sky-blue column shows the growth rate of the 6th-week sampling, the black column shows the growth rate of 8th-week sampling, the red column shows the growth rate of 10th-week sampling and gray column show the growth rate of 12th-week sampling. The average weight gain of “Silver Barb” fish after every two weeks of feeding was 12.83 g for treatment 1, 5.86 g for treatment 2, 5.28 g for treatment 3, 5.47 g for treatment 4, 5.25 g for treatment 5 and 4.47 g for treatment 6. And the average weight gain of “Rohu” fish after every two weeks of feeding was 16.67 g for treatment 1, 11.53 g for treatment 2, 11.53 g for treatment 3, 10.11 g for treatment 4, 11.25 g for treatment 5 and 9.7 g for treatment 6. Tables 23 and 24 show the average weight gain by treatments after every two weeks of feeding.

Table 23: Average weight gain of a "Silver Barb" fish by treatment after every two weeks of feeding

Average weight gain of a "Silver Barb" fish by treatment after every two weeks of feeding (gm)						
Sr.	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5	Treatment 6
2nd week	10.00	5.00	4.67	5.50	6.00	6.33
4th week	16.83	9.50	5.33	8.50	6.33	3.34
6th week	20.84	3.17	9.00	3.00	4.84	4.33
8th week	7.53	7.00	1.83	3.00	4.33	4.33
10th week	9.80	4.33	4.17	6.50	4.50	2.34
12th week	12.00	6.17	6.67	6.33	5.50	6.16

Table 24: Average weight gain of a "Rohu" fish by treatment after every two weeks of feeding

Average weight gain of a "Rohu" fish by treatment after every two weeks of feeding (gm)						
	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5	Treatment 6
2nd week	18.33	14.67	16.67	12.00	12.83	13.67
4th week	19.00	10.33	9.00	6.33	6.17	7.83
6th week	8.84	6.33	6.66	9.67	7.00	7.67
8th week	14.00	13.50	8.67	6.17	6.17	9.50
10th week	9.33	7.84	16.17	16.00	14.50	10.16
12th week	30.50	16.50	12.00	10.50	20.83	9.34

Table 25: Average weight gain by treatments after every two weeks of feeding

Average weight gain by treatments after every two weeks of feeding (g)		
Treatments	Silver Barb	Rohu
1	12.83	16.67
2	5.86	11.53
3	5.28	11.53
4	5.47	10.11
5	5.25	11.25
6	4.47	9.7

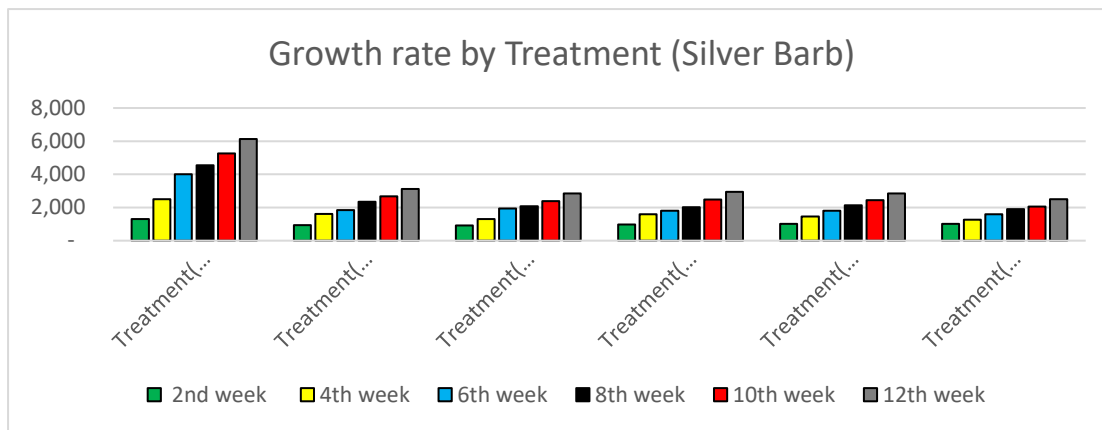


Figure 11: Production Weights for Silver Barb (g)

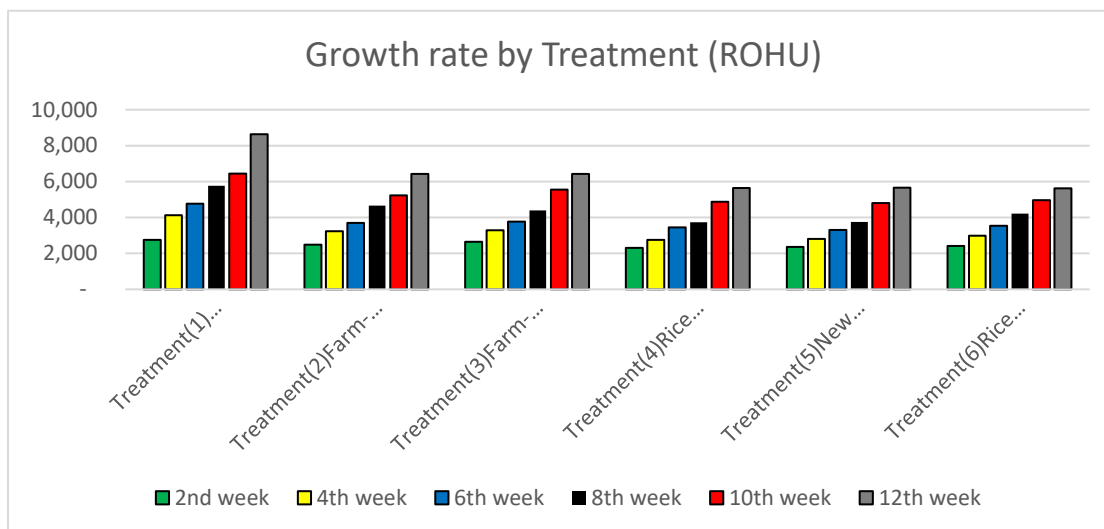


Figure 12: Production Weights for ROHU (g)

III.II. FCR (Food Consumption Ratio)

We have two types of fish species and got two types of food consumption ratios for each sampling. For the “Silver Barb” species, we got the following average food consumption ratio- 0.5 g for Treatment 1 (commercial floating pellet CP (28%)), 0.9 g for Treatment 2 (Farm-Made feed CP26% Delta formulation), 1.0 g for Treatment 3 (Farm-Made feed CP20% Central Dry Zone formulation), 0.9 g for Treatment 4 (Rice bran (70%): Peanut Oil Cake (30%) Rice bran without boiling), 0.9 g for Treatment 5 (New trial formula with Oil and Vitamin inclusion) and 1.1 g for Treatment 6 (Rice bran only).

For the “Rohu” fish species, we got the following average food consumption ratio - 0.6 g for Treatment 1 (Commercial floating pellet CP (28%)), 0.8 g for Treatment 2 (Farm-Made feed CP 26% Delta formulation), 0.8 g for Treatment 3 (Farm-Made feed CP20% Central Dry Zone formulation), 0.9 g for Treatment 4 (Rice bran (70%): Peanut Oil Cake (30%) Rice bran without boiling), 0.9 g for Treatment 5 (New trial formula with Oil and Vitamins inclusion) and 0.9 g for Treatment 6 (Rice bran only). Table 26 shows the food conversion ratio of “Silver Barb” and “Rohu” fish.

Table 26: FCR for Silver Barb fish & Rohu Fish :

SILVER BARB						
Treatments	2nd week	4th week	6th week	8th week	10th week	12th week
1	0.61574	0.56938	0.3982	0.46611	0.46667	0.46118
2	0.85256	0.88148	0.86364	0.90641	0.92072	0.90811
3	0.875	1.10185	0.82099	1.02168	1.03232	0.98824
4	0.82099	0.90152	0.88667	1.05208	0.98744	0.960
5	0.79167	0.97541	0.88079	0.99859	1.00196	0.99241
6	0.78235	1.12264	1.00758	1.11867	1.64419	1.12536
ROHU						
Treatments	2nd week	4th week	6th week	8th week	10th week	12th week
1	0.36522	0.85465	0.66121	0.63742	0.67263	0.60229
2	0.40385	1.08889	0.85227	0.78817	0.82844	0.81056
3	0.38182	1.07299	0.83599	0.8377	0.78013	0.81056
4	0.4375	1.27826	0.91146	0.98585	0.88747	0.92266
5	0.4264	1.25641	0.95109	0.97955	0.903	0.92070
6	0.41584	1.18072	0.88983	0.87102	0.87548	0.92463

Water Quality

Water quality is one of the most important factors in aquaculture and our feed trial research. The average water temperature is 31 °C in the morning and 34.7 C in the evening, pH can be seen as 7.6 & 8 respectively, dissolved oxygen in the morning is 3.8 mg/L and evening dissolved oxygen is 5.1 mg/L, morning ammonia is 0.7 ppm & evening also 0.7 ppm and morning transparency is 13.2 inches & evening transparency is 15.4 inches respectively. Graph xx shows the water quality data of the feed trial research pond.

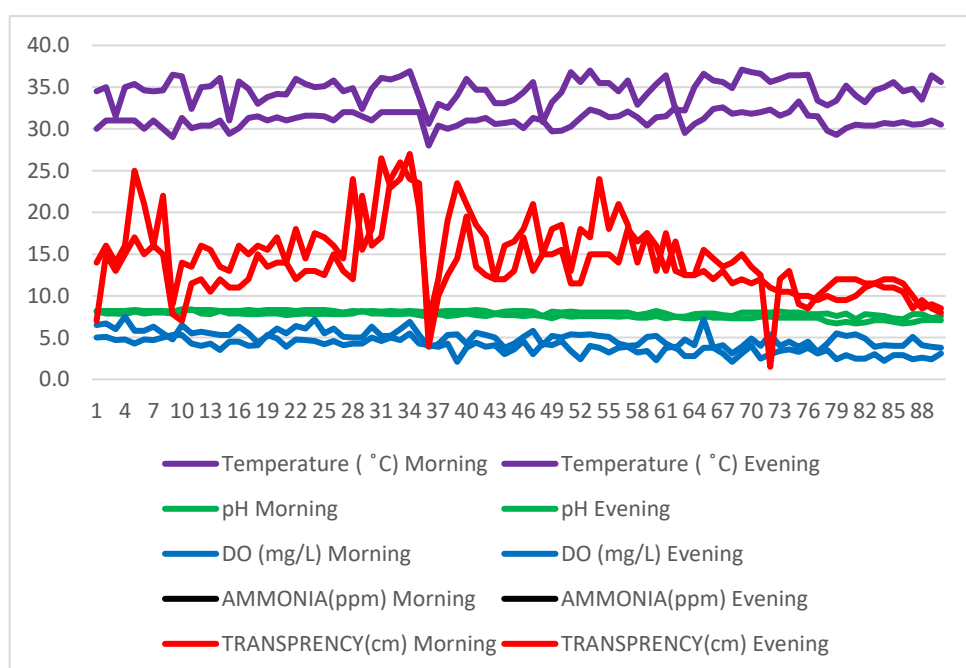


Figure 13: Water Quality measurements

Discussion & Conclusion

Of the six treatments in feed trial research, the commercial floating pellet (treatment 1) was the best for weight gain but it was factory-made and more expensive than other formulas. However other formulas 2, 3, 4, 5, and 6 can be compared with the factory-made commercial floating pellet by price. And if we can make other treatments that float on water, we can get better weights than now, because other treatments are very small particles that dissolved well in water and fish can't eat. And then the width of the cages can affect the weight of the fish and the muscles of the fish. Water quality was stable in the pond and average values are higher in the evening than in the morning. A cost benefit analysis will be completed once the trial is finalized.

Sub-IR 1.6 Enhanced capacity and role of MFF and its associations in supporting SSA for improved management practices

Output 1.6.1: Institutional analysis of MFF performed and alternatives to enhance their capacity identified

1.6.1.1 Provide support to build institutional capacity of MFF as recommended by a consultant hired in year 1

The consultant report of Y1 identified five gaps the F4L should address to build the institutional capacity of MFF. These were: (a) Financial aptitude, (b) Capacity building of fisheries and ecological best practices, (c) Visibility & reporting back to WorldFish from MFF, (d) Market systems approaches to develop and involve more actors, and (e) Human Resources and Administration processes.

Based on the findings of the consultant report on MFF, F4L provided a series of training courses to core staff of MFF Kachin and Southern Shan during this reporting period. MFF staff attended Small Scale Aquaculture, Carp Management, and Carp Induce Breeding training sessions. In addition they participated in the Nam Sai Farm visit regarding monosex tilapia growth and intensive fry production. Moreover, they participated in the F2F program's series of trainings in Y3, details in Table 2 above. The capacity building of MFF staff enhanced their ability to provide improved training to the farmers in their target areas.

1.6.1.2 Review Y3 proposals submitted by MFF (Eastern Shan and Southern Shan) in relation to developing inclusive market system and sustainable management practices which benefit the project participants

The proposals submitted by MFF Kachin and Southern Shan were reviewed and finalized with the help of the *Activity* team. Subsequently, a fixed amount sub-grant agreement between the WorldFish and the Myanmar Fisheries Federation (Kachin State) and Southern Shan were signed and implemented in Y3.

To efficiently implement and closely monitor the activities, MFF Kachin State formed an *Activity* Management Committee with 9 members. MFF Kachin had recruited two local coordinators (Kachin State- MFF) and 4 Community Facilitators to implement the Activity and help monitor field activities in Myitkyina, Waimaw, Bamaw, Mogaung, and Momauk Townships. MFF, Southern Shan had also formed a team to implement the Activity in Pindaya and Nyaung Shwe Townships, Southern Shan.

1.6.1.3 Facilitate implementation of the systems identified above around SSA business

MFF Kachin: MFF-Kachin's activities were implemented in five townships in the targeted villages of Waing Maw, Myitkyina, Moe Kaung, Bhamo, and Momouk townships of Kachin State. For the year Y3, the MFF selected 13 villages in Waing Maw, 06 villages and 01 wards in Myitkyina, 02 villages

in Moe Kaung, 05 villages and 01 wards in Bhamo, and 05 villages in Momouk townships respectively. According to their pond situations and willingness to grow the fish a total of 50 aquaculture farmers (29 male and 21 female), 11 aquaculture farmers (10 male and 1 female), 9 aquaculture farmers (6 male and 3 female), 21 aquaculture farmers (02 Female and 19 Male) and 9 aquaculture farmers (09 Male) whose pond size is around 0.5 acres were selected in Waing Maw, Myitkyina, Moe Kaung, Bhamo, and Momouk area respectively. Selection criteria were used when choosing farmers. A total of 10 APs for Year3 were also selected. For Year 3, the female beneficiaries' participation was 27%.

The accomplishments in Y3 included:

- SSA module and refresher training were conducted in Waing maw, Myitkyina, Moe kaung and Bhamo
- MFF staff conducted a participatory rural appraisal exercise together with aquaculture farmers, women, village leaders, and elders in the targeted villages
- Htwet Toe App and Shwe Ngar App training were conducted in Waing maw, Myitkyina, Bhamo, and Momouk townships
- Nursery and Induced Carp breeding training were conducted and a total of 15 participants (13 Male and 2 female) attended
- Good Processing Practices Training had been conducted for fish vendors at Mff-Office Kachin.
- Nutrition Promotion Month Events were conducted in Waing Maw and Bhamo
- Fish Seed and Feed were distributed to 5 nurseries farmers (3 farmers in Waing maw, 1 farmer in Myitkyina, and 1 farmer in Bhamo)
- Fish Seed and Feed were distributed to 8 demo farmers (4 farmers in Waing maw, 2 farmers in Myitkyina, 1 farmer in Moe Kaung, and 1 farmer in Momauk)
- In cooperation with WorldFish F4L staff, a WASH survey was carried out, 16 farmers in Waing maw and Moe Kaung participated
- Good Post harvest practices training was conducted in Myitkyina and Bhamo
- Project staff collected MDDW surveys at six townships; Myitkyina, Waing Maw, Moe Kaung, Bhamo, Mansi, and Momauk townships
- 60 beneficiaries received toilet bowls and wash materials
- Completed Y2 and Y3 fish ponds were harvested
- Vegetable seeds were distributed to 100 beneficiaries
- MFF-Kachin staff attended Refresher TOT training in Keng Tung
- MFF-Kachin staff attended F2F Program session (online)
- 2 MFF staff joined Tilapia Sex Reversal training in Nam Sai Farm (Thailand)
- Collaborated Lesson learn and market system workshop with the WorldFish team in Myitkyina and Bhamo
- Follow-up action on pond monitoring, fish sampling and farmer record book data record entry carried out regularly
- Fish cold supply chain management meet with fish vendors, 4 Female and 2 Male participants attended

See detail numbers of participants who participated in MFF and F4L-provided training sessions 8.7 Capacity Development session of this report.

MFF Southern Shan: MFF Southern Shan was conducting field-level activities such as community mobilization, capacity building, awareness raising, and grant disbursement to the targeted farmers in the field. To achieve F4L objectives, MFF conducted community mobilization, a series of capacity-strengthening activities, providing WASH-related practices through awareness-raising sessions, and promoting market accessibility for the farmers in the Y3.

In this reporting period, a total of 37 (M=21, F=16) new beneficiaries in Pindaya township were selected through in-person field visits by the project's beneficiary selection criteria. Out of 37

beneficiaries, 35 were confirmed to be grow-out farmers while 1 nursery pond owner and 1 demonstration pond farmer were willing to participate as nursery owner and demo farmer respectively. The 45 fisherfolk of Inle lake were also willing to proceed with the revolving fund process.

Throughout the Y3 implementation period, a series of capacity-building training were conducted including SSA module 1, 2, and 3 training. During the module 2 training session, MFF Southern Shan added Shwe Ngar app usage training to the aquaculture farmers. The “Good Post Harvesting Practices” training and “Good Processing Practices” training were provided to a group of retailers and vendors in Pindaya and Inle, Nyaung Shwe Township. In this regard, a total of 86 fish farmers (11 in Pindaya and 75 in Nyaung Shwe) received “Good Post Harvesting Practices” training and 16 fish farmers (11 in Pindaya and 5 in Nyaung Shwe) participated in “Good Processing Practices” training.

Fish feed miller training was also conducted at the end of Y3 period, and a total of 2790 Viss of sinking pelleted fish feed were produced locally and supported to 37 (Y3) farmers, and produced 480 Viss of sinking pelleted fish feed were provided to 24 (Y2) farmers accordingly. To enhance their nutritional knowledge, 30 (M=18, F=12) fisher folks from Inle lake received “Nutrition Awareness” training conducted in Pindaya Township. A Nutrition Campaign was conducted in Pindaya Township and a total of 84 participants (M=47, F=37) attended.

In Y3 reporting period, a total of 66,900 fingerlings were provided to grow-out farmers, demo farmers, and nursery farmers. The F4L provided revolving fund activity with fisher folk was continuing in Inle Lake with 45 fisher folks and regular monitoring of the activity was conducted by MFF staff.

The detailed list of participants who participated in the MFF-provided training and awareness sessions can be seen in the 8.7 Capacity Building session of this report.

Sub-IR 1.7 Enhanced capacity and role of Inle and Pekhoh Lake committees in supporting lake and lake fishers for improved management practices

Output 1.7.1: Capacities of lake committees and fishers are strengthened and improved

Inle Lake

1.7.1.4: Assist in generating revolving funds for fishermen (45 fishers; 3 groups)

In the year 2020, the project disbursed 14,625,000 MMK to the 45 fisherfolk in three villages in Inle Lake in collaboration with Inle Lake Committee. In September 2021, the revolving fund was successful for the first cycle. It contributed to increasing fisherfolk’s household income through alternative livelihood activities. In the year 2021-2022, the project collaborated with the Myanmar Fisheries Federation (MFF Southern Shan) to sustain the fund and fisherfolk livelihood activities. The *Activity* disbursed funds, a total revolving fund amount of 18,720,000 MMK (Initial *Activity*’s Injected fund 14,625,000 MMK + 1st circle members’ saving 1,170,000 MMK + 1st circle interest received 2,925,000 MMK) was loaned to 18 fishers in Nyaung Won, 15 fishers in Hae Lone, and 12 fishers in Inn Pyar villages for the second circle to invest mainly in post-harvest activities; fish selling and value addition work including the drying of fish, aquaculture, and homestead vegetable garden (land-based) interventions. These activities generated additional incomes for the borrowers and that will be reinvested in the revolving fund. The project distributed the fund record book to monitor the fund status in each group such as investment, income, repayment, and interest to make sure fishers’ income is increased through revolving funds and the fund is sustained.

It has contributed to increasing fisherfolk household income through alternative livelihood activities invested by the *Activity* fund (Table 27). The fishers earned a net income through the revolving fund of 2,756,000 MMK in Nyaung Won village, 2,296,500 MMK in Hae Lone village, and 2,527,000

MMK in Inn Phyar village respectively. In the reporting period, the total fund was increased from monthly savings (1,818,000 MMK) and interest (3,906,000 MMK) (Table 27). Those funds will subsequently be reimbursed to the member proportionally in third cycle in year 4.

Table 27: The amount of fund disbursement, saving, interest, and income generation through revolving funds for the second cycle as of September 2022

Name of village	# of members	Loan Duration (Month)	Fund provided by project	1st circle member Interest (70%)	Total revolving fund for 2nd circle	Member Saving fund	Interest fund 2%	Cash Balance Closing	Total revenue generated through the livelihood activities invested by the fund	Net income by fisher households MMK
Nyaung Won	18	12	5,850,000	819,000	6,669,000	756,000	1,620,000	9,425,000	9,425,000	2,756,000
Hae Lone	15	12	4,875,000	682,500	5,557,500	630,000	1,350,000	7,854,000	7,854,000	2,296,500
Inn Phyar	12	12	3,900,000		3,900,000	432,000	936,000	6,427,000	6,427,000	2,527,000
Total	45		14,625,000	1,501,500	16,126,500	1,818,000	3,906,000	23,706,000	23,706,000	7,579,500

With increased access to credit promoted by F4L, the fisherfolk have invested in some alternative livelihoods in addition to fishing and generated incomes from diverse activities. Table 28 indicates that the vast majority of fisherfolk invested the fund mainly in the fish retailing business by 63% and growing vegetables 5%, either for their consumption or to generate household income. The main income generated from the fresh fish selling business is highest by 58% and follow by tomato selling from the homestead garden (Table 29).

Table 28: Types of investment by 45 fishers using revolving funds for the second cycle as of September 2022

Sr	Type of investment	Amount of investment MMK	Amount of investment in percentage
1	Vegetable seeds	730,000	5%
2	Bamboo pole	497,000	3%
3	Homestead chicken farm	75,000	0.47%
4	Corn seeds	160,000	1%
5	Homestead duck farm	300,000	2%
6	Fish retailing business (Fresh Fish)	10,138,500	63%
7	Fish Feed	468,000	3%
8	Fuel	15,500	0.10%
9	Ice-container	25,000	0.16%
10	Ice	10,000	0.06%
11	Salt for processing	28,000	0.17%
12	Salted fish processing	220,000	1%
13	Small shrimp retailing	444,800	3%
14	Vegetable's watering bucket	45,000	0.28%
15	Sunflower seeds	100,000	1%
16	Tomato Seeds	768,500	5%
17	Water Pipe	640,000	4%

Sr	Type of investment	Amount of investment MMK	Amount of investment in percentage
18	Chilli Seeds	75,000	0.47%
19	Farm preparation	170,000	1%
20	Cucumber Seeds	100,000	1%
21	General Equipment for fish retailing business	979,000	6%
22	Preparation fish pond	106,000	1%
	Total	16,095,300	

Table 29: Income generated by 45 fishers from different livelihoods activities for the second cycle as of September 2022

Sr	Type of Income	Amount Of Income MMK	Amount of income in percentage
1	Homestead Chicken Farm	967,500	2.04%
2	Sell Bean	195,000	0.41%
3	Chilli selling	702,500	1.48%
4	Sell Corn	1,074,500	2.26%
5	Cucumber selling	484,000	1.02%
6	Sell Dried Fish	60,000	0.12%
7	Sell Dried Shrimp	325,000	0.68%
8	Sell Duck Egg	607,500	1.28%
9	Sell Eggplants	1,947,400	4.10%
10	Sell Tomato	12,195,900	25.70%
11	Fresh fish selling	27,504,400	58.00%
12	Small shrimp selling	340,000	0.71%
13	Salted fish selling	1,040,000	2.19%
	Total	47,443,700	

Pekhon Lake

1.7.1.4: Assist in generating revolving funds for fishermen (100 fishers; 4 groups)

Access to finance for the fisherfolk to invest in the fishery business is very limited in the Pekhon lake area. Since fishers are not able to access microcredit, it is difficult to expand the fishery business and other livelihood activities. To address the financial constraint for the fisherfolk, the Pekhon lake committee initiated the revolving fund as one of the mechanisms to access credit with the support of the *Activity*. A survey was conducted in 10 villages to select the fishers around the Pekhon lake area. The 100 fishers from 4 villages were selected to support revolving funds by the project. The project established 4 fisher groups and disbursed 15,000,000 MMK initially in compliance with the revolving fund mechanism developed to invest in their fisheries and aquaculture-related activities in December 2020. The status of funds disbursement and repayment, investment, and profit are recorded on monthly basis. In the reporting period, the payback loan in a total of 14,150,000 MMK and interest 2,384,409 MMK have collected (Table 30). Due to the unstable political situation in the Pekhon area, the activity could not able to record regularly the livelihood activities, types of investment, and

income through revolving funds. After collecting payback from all groups, the 2nd circle will be disbursed to the member in Year 4.

Table 30: The amount of fund disbursement, interest, and loan balance of 1st circle as of September 2022

Name of village	Name of group	Number of members	Loan Duration Month	Fund provided by project MMK	Interest fund MMK (2.5%/month)	Saving	Payback loan so far	Cash Balance	Remaining loan Balance including interest
Nan Toke	1	33	12	4,950,000	804,375	5,757,312	4,950,000	11,511,687	0
Knoe Thar	2	30	12	4,500,000	731,250	5,235,420	4,500,000	10,466,670	0
Nyaung Khone	3	20	12	3,000,000	487,500	3,487,840	3,000,000	6,975,340	0
Nyaung Pin Thar	4	17	12	2,550,000	361,284	2,048,771	1,700,000	4,110,055	903,142
Total		100		15,000,000	2,384,409	16,529,343	14,150,000	33,063,752	903,142

IR 2. Increased access to food-safe fish and fish products in the market

Sub-IR 2.1 Clustered production using BMPs to improve direct marketability of product increased

Output 2.1.1: Improved market linkages among aquaculture market actors

Output 2.1.1: Improved market linkages among aquaculture market actors

2.1.1.1 Issue call for piloting fish marketing collectively engaging small-scale aquaculture farming households and explore possible fields of cooperation with commercial buyers.

In the aftermath of the coup in Burma/Myanmar, many countries-imposed sanctions on Myanmar. The country's economy shrunk significantly and most of the Foreign Direct Investment (FDI) companies decided to downsize or withdraw from Myanmar. A German Whole Sale Company METRO is one of the foreign companies that decided to cease its operation in Myanmar by the end of October 2021.

2.1.1.2: Sign partnership agreements with aqua feed companies

F4L Activity hired a Market System Specialist (MSS) in FY 2022. The MSS will coordinate and liaise with aqua feed companies in upcoming years of implementation. Pegu Partners are in the process of establishing in-kind credit options for fish feed (the most expensive farming input) with the De Heus feed company.

2.1.1.3: Build capacity of CBOs through engaging them with market actors

F4L contracted a consortium of three partners during the reporting period: Fresh Studio Myanmar, MDF Asia Myanmar, and Sympathy Hands to strengthen the capacity of 10 CBOs and CSOs (PHECAD, DFSS, Mawk Kon Local Development Organization, Hnalone Hla Inn Maung Mae, Alinn Bhamo, Shan Women Development Network, Dai Fai Social Service, Yawng Sin, Shwe Kanbawza and Shwe Inn Thu) in the five F4L Activity areas. The participants from 10 CBOs and CSOs enhanced their knowledge of aquaculture, organizational development, and microfinance-related capacity building. From February to June 2022, nine training aspects were conducted and a total of 418 people (246 women) attended. Please see the separate document: "Consortium CBOs/CSOs capacity assessment and capacity building report" and "Sympathy Hand CSOs/CBOs Capacity Building Training Report".

2.1.1.4 Sign partnership agreements with aqua-equipment/medicine companies

The implementation situation of activities 2.1.1.1 to 2.1.1.4 are related to the improvement of Burma/Myanmar's political situation and foreign countries' economic sanctions to Myanmar.

During the reporting period, Activity could not implement the above-mentioned activities. However, F4L explored the possibility of engaging foreign private sectors/entities to collaborate with F4L like FedWell Foods. The Nam Sai Farm, Thailand might be one of the companies to consider engaging to fulfil the seed requirements for farmers in Myanmar.

Sub IR 2.2 Reduced post-harvest loss

Output 2.2.1: Enhanced capacity of fish processing and fresh fish trading actors to adopt food safety practices

2.2.1.1: Workshop to further increase engagement of private sectors e.g., finance institutions, ICT companies' media organizations, advertising agencies in aquaculture and fish processing markets

F4L organized a series of Workshops with SSA farmers, hatchery and nursery operators, fish processing actors, feed-producing feed miller farmers, and vendors organized in reporting period combined with Lessons Learned Workshops. With serious unstable political situations in the targeted area, finance institutions, IECT companies, media organizations, and advertising agencies were difficult to invite to participate in the workshop. A total of 111 (30 Female) attended the Workshops. See the detail in the Lessons Learned Workshop report attached.

2.2.1.2: Provide capacity building and information to fish processors, fresh fish, processed fish collectors/traders, and SSA producers

To improve income and enhance the ability of fresh fish vendors, fish processors, and SSA producers in providing safe and fresh fish for consumption, the F4L team continued conducting training on good post-harvest and fish processing practices in Year 3. A total of 12 training sessions were conducted and a total of 134 (F-96; M-38) were trained. The manual that was developed in collaboration with Asper Consulting company in Year 2 is utilized in F4L areas and other WorldFish projects.

In addition, a short survey on the fish handling and hygiene practices among fresh fish vendors and fish processors was conducted on February 2022 and July 2022, respectively. The staff from implementing partners were responsible for collecting the data and they were trained on how to conduct the digital survey using the kobo collect application software. The survey was focused on the following; i) personal hygiene, ii) fish handling and storage, iii) cleanliness of premises, iv) waste management and v) pest control systems.

A total of 51 fresh vendors from Magway, Sagaing, Kachin, Southern, and Eastern Shan participated in the survey, and the majority were women (90%). A higher number of respondents were from Southern Shan (45%) followed by Kachin (20%). Meanwhile, fish processors engaged in a community-based savings activity by F4L were selected, and a total of 18 fish processors with an equal proportion of women and men from Inle Lake, Southern Shan agreed to participate in the survey.

A mix of direct observation and face-to-face interviews were utilized by the staff and once the survey was completed, the staff uploaded the digital questionnaire to the kobo application server. The questions were answered as yes or no by the participants, however, for questions that required direct observation, the staff decided on the appropriate response as yes or no. Surveys with between 15 and 17 questions were developed for fresh fish vendors and fish processors, respectively. Respondents who obtained yes for 75% of the questions was considered to observe the basic fish handling and hygiene practices.

Based on the results, it showed that only 36% of fresh fish vendors obtained the cut-off point of 12 which means they observed basic hygiene and fish handling practices. While for the fish processors, it showed that the majority of the respondents (77%) reached the cut-off score of 12. In year 4, a similar survey will be conducted to compare the results and observe if there is progress in terms of the adoption of good behaviors among market actors.

During the reporting period, The Activity organized the workshop in Kachin, Eastern Shan, and Southern Shan where the political situation is not as severe as other *Activity* areas. The Market System session is part of a lesson learned workshop to improve the knowledge of the systemic approach to market development for the market players who are working with WorldFish under F4L. Four different groups; hatchery, nursery, grow-out farmer, and vendor joined the workshop. The main purpose of the workshop is to improve the awareness of market players on how the market system

works in the development project and to open the floor for discussion of market players' challenges in the fish production sector as shown below.

Hatchery and Nursery

Challenges	Possible activities to overcome the challenges
1) Less number of private hatchery/nurseries 2) Limited access to raw materials 3) Limited fish varieties 4) Logistic issue 5) Poor Coordination 6) Poor market for fingerlings demand in local	1) Support private hatcheries/ nursery in facilities & infra through cost-sharing 2) Linkage with market and organize the trade fair 3) Promote the sale of fingerlings 4) Strengthen the network with grow-out farmer

Grow-out farmers

Challenges	Possible activities to overcome the challenges
1) Logistic issue 2) Access to fish feed 3) Not enough nursery 4) Small size fish 5) Poor packing tech 6) No stable market for fish	1) More hatchery/ nursery service 2) Improved the network with hatchery, nursery and farmers 3) Packing tech

Vendors

Challenges	Possible activities to overcome the challenges
1) No stable market for fish 2) Logistic issue 3) No wholesaler in their area 4) Storage facility 5) Quality maintaining for extra fish after selling	1) Improve cold storage facilities 2) Establish the wholesale in their place



Figure 14: Presentation on the concept of Market Systems Development (MSD)



Figure 15: Group Discussion (grow-out farmer)

Detailed participants attended can be seen in session 8.7 of this report.

"2.2.1.3: Pilot test activity/ies (e.g., competition among vendors, provision of fabricated tables cum fish storage container with ice) that can enhance fish quality for local consumers and improved hygiene and sanitation practices among fish vendors in the local market with the assistance of partners"

To address one of the barriers in adopting good fish handling practices among fresh fish vendors, the F4L team provided durable and good quality fish display racks in selected F4L areas, a total of 65 (F-61, M-4) racks were distributed. The vendors contributed to purchasing the racks and are willing adopters of good practices by using and maintaining the display racks. Moreover, fresh fish vendors adhered to good food safety and fish handling practices which helps them increase their income and provide safe and nutritious food to consumers. The activity demonstrated the importance of applying good practices that may result in adoption by other vendors creating a ripple effect in the communities.

Output 2.2.2: Increased business opportunities around fish processing

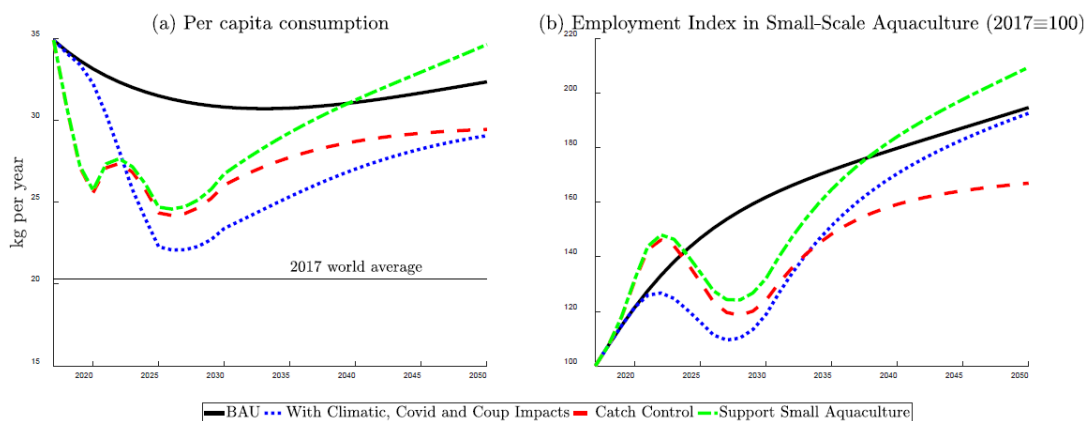
2.2.2.1: Scale-out of tested innovations/extension packages in activity areas by Activity partners

Similar to 2.2.1.3

2.2.2.2: Foresight analysis

WorldFish foresight analysis experts developed a multi-species-multi-sector-multi-region equilibrium model to provide projections for Myanmar's fishery sector until 2050. The model is calibrated using real-life data in 2017 as a baseline together with forecasts on the dynamics of driving factors. Using the model, a range of plausible scenarios to provide insights and policy implications for the fisheries sector in Myanmar.

The results highlight that Myanmar's fishery sector is facing both challenges and opportunities. The challenges include disruptions caused by the COVID19 and the 2021 political coup, the vulnerability to climate change, over-exploited capture fisheries, and (relatively) inefficient small-scale aquaculture. These challenges emphasis the need for appropriate responses and mitigation policies. This requires building an adaptive management system with good practices and principles. If successfully implemented, these responses can promote the sustainable development of the fishery sector, generate positive spillover effects to other sectors of the economy, and improve the welfare of people in Myanmar.



Predicted changes in per capita fish consumption in Myanmar and the potential for employment from SSA over time. Taken from 'The outlook of Myanmar fish sector: a foresight modelling approach', by Hoang Long Chu for WorldFish

2.2.2.3: Conduct workshops and meetings on cold chain management (i.e., improved packaging techniques and materials to minimize post-harvest loss) and explore opportunities on how to develop cold chain, business models.

In the last quarter of the project period, the F4L team contracted a national consultant to help in collecting and analyzing processes and practices of fresh fish market actors and local ice suppliers/vendors in F4L areas. A total of 74 in-person key informant interviews were conducted among ice plant owners, ice retailers, fish farmers, fish vendors, and consumers in Salin, Shwebo, Myitkyina, Pindaya, Nyaung Shwe, Taunggyi and Kengtung Townships. In addition, a total of 7 focus group discussions with 66 participants were conducted in the abovementioned areas.

Initial findings below;

- A small number of vendors who use ice appreciate the benefits such as: (i) fewer flies compared to other stalls: (ii) clean looking stall, and (iii) a fresher appearance of fish. Some customers appreciate these attributes.
- Almost all of the vendors interviewed do not use ice due to the following reasons; (i) they only sell for a short period and (ii) customers do not like iced fish.
- Most of the customers, especially in Shan State do not like iced fish. Some believed that iced fish contain harmful preservatives.
- Most of the areas have difficulties in accessing ice in the summer season, especially in Salin and Shwebo in the Dry Zone.
- Some of the ice plants do not use a water filtration system due to the following misperceptions: (i) groundwater is potable and of acceptable quality (ii) since ice is used externally and not directly consumed, there was no need to use good quality potable water.

The next steps are further analysis of the weaknesses and opportunities and providing recommendations related to local cold chain management that leads to improved practices on delivering safe and good quality fresh fish and fish-based products to local consumers.

IR 3. IMPROVED NUTRITION, FOOD SAFETY, AND WASH

Sub-IR 3.1 Improved adoption of nutrition and wash behaviors

"Output 3.1.1: Increased awareness on nutrition, WASH and food safety practices"

3.1.1.1: Development and printing of communication materials on nutrition and WASH based on the Essential Nutrition Actions and Essential Health Actions messages; including the importance of the consumption of micronutrient-rich small fish (SIS), farming SIS, food safety, etc.

For Year 3, a total of 9 IEC materials (posters, pamphlets) related to the importance of consuming small indigenous fish species (SIS), handwashing with soap at critical times, and drinking filtered water to avoid water-borne diseases were produced and distributed in the F4L *Activity* areas. In Y4, new materials will be developed following the recommendation from the Social Behavior Change Communications (SBCC) strategy.

3.1.1.2: Develop Social Behavior Change Communications (SBCC) nutrition strategy targeting different household members +community

The F4L team with the support of international consultants developed the SBCC strategy to increase the adoption and maintenance of positive behaviors among mothers of young children and small-scale fish farmers. The report consists of 3 sections; i). the background of the F4L *Activity*, identified behaviors (adoption of BMP practices and consumption of diverse foods), and the rationale for developing the strategy, ii). the theory used in developing the strategy, and iii) recommended activities. The strategy was developed to be achievable within the F4L *Activity* period, and in recognition of two major constraints: COVID-19-related restrictions and uncertainties due to an ongoing political crisis. This strategy serves as a roadmap of the communication activities and platforms that can be used by WorldFish and F4L implementing partners.

The main cross-cutting recommendations are below;

- Develop a few simple and specific key messages.
- Harmonize nutrition and SSA messaging and integrated delivery.
- Use multiple mutually reinforcing channels to achieve high message intensity.
- Prioritize communications channels that are reliably available.
- Address multiple “stages of change” levels.
- Engage trusted community leaders and leverage available community platforms.
- Promote active engagement through the use of adult learning techniques, games, practical and iterative skill building, and social accountability.
- Use innovative approaches and technologies to bridge capacity limitations and/or geographic barriers.

Beginning of Y4, F4L and IPs will follow the above recommendations as much as possible to facilitate the adoption of identified behaviors. The SBCC strategy is available when requested.

3.1.1.3: Dissemination of digitized key nutrition and WASH messages through an online platform to Activity and non-Activity participants

A total of 35 articles, messages, and briefs related to nutrition and WASH were posted on the Htwet Toe app for this project period. These postings gained 371,228 views and 9,149 reactions. Moreover,

these articles are cross-posted to Htwet Toe's Facebook page which is widely used in the country gaining more visibility on the approaches of the activity to a wider audience.

3.1.1.4: Continue engagement with the established network to increase the extension of key nutrition and WASH messages (e.g. SUN CSA, Nutrition TWG)"

In year 3, WorldFish Myanmar is elected, for two consecutive years, as one of the steering committee members of the Scaling Up Nutrition Civil Society Alliance (SUN CSA) network. As a member, WorldFish participated in 4 quarterly meetings and 6 technical working group meetings that provided an opportunity to get involved in nutrition and health discussions and share experiences among colleagues to effectively work in the current political environment. Moreover, nutrition and WASH achievements of Fish for Livelihoods Activity were shared in the quarterly SUN CSA newsletter which leads to wider dissemination of information to other local and international organizations in Myanmar.

3.1.1.5: In-depth study on the significant determinants based on the Barrier Analysis study findings

This is included in 3.1.1.2. as part of the process when developing the SBCC strategy.

Sub-IR 3.2 Improved consumption of diverse, safe and nutritious food"

Output 3.2.1 (a): Improved knowledge on food safety, vegetable, and mola-carp polyculture production "

"Output 3.2.1 (b): Improved access to diverse, safe and nutritious food"

3.2.1.1: Provision of seed kits depending on the types of seed identified that are grown in the area for vegetable dyke production among beneficiary households; after the development of the vegetable seasonal calendar per area

A total of 772 SSA farmers (F- 320, M- 452) were provided with different types of vegetables and fruits such as Bitter Gourd, Cucumber, Long Green Bean, Pumpkin, Ridge Gourd, Tomato, Corn, Tomato, Mustard leaves, and Carrots to support household achieve diverse diets that contribute to good nutrition and health.

3.2.1.2: Provision of Small Indigenous Fish species (SIS) broodstock among beneficiary households

A total of 588 farmers (F-151, M- 437) reported producing multiple types of small indigenous fish species such as Burmese Loach, spotted barb, Flying barb, Swamp barb, and Mola in Magway, Mandalay, Kachin, Eastern, and Southern Shan. It was reported that a total of 116 households increased their consumption of SIS from their ponds. According to the farmer's record book, farmer households consumed an average of 6 kg of SIS in the reporting period.

"3.2.1.3: Distribution of WASH package materials (e.g., handwashing stations with soap, toilet bowls, water filter) to increase adoption of improved WASH practices among beneficiary households"

In Year 3, three different types of WASH materials, including handwashing containers, toilet bowls, and water filters were distributed to SSA farmer households in F4L areas. Women account for around 53% of WASH material beneficiaries as PACT emphasizes the inclusion of vulnerable families led by women, pregnant women, and mothers with Under-5 children. Toilet bowls were supplied to farmers who needed to fix their toilets, and water filters were distributed to farmers with children under the age of five and with limited access to a clean drinking water source. Farmers installed handwashing containers in the kitchen or near the toilet so that their family members can wash their hands after

using the restroom and before preparing meals or eating. The fish farmers are currently applying donated WASH supplies into their everyday routines. The project also shares nutrition and WASH knowledge with every family member, including children and the elderly through aquaculture promoters and community facilitators with a focus on handwashing with soap at critical times. Beneficiary farmers and their families then disseminate information to their neighbors regarding better WASH practices.

"3.2.1.4: Establishment of integrated Agri/fish-food system model households in 6 geographical areas; model HHs will have large + SIS in ponds, homestead garden, improved latrine, water filter, and tippy tap"

Similar to the previous year, implementing partners identified a total of 5 SSA model households in Southern Shan that applied integrated fish agri-food systems and adopted effective WASH practices by using an improved latrine, drinking filtered water, and practicing handwashing with soap at critical times. The homestead of SSA households serves as a demonstration site for other farmers so they are encouraged to apply the same which can support increasing income and improve nutrition.

"3.2.1.5: Competition of best-integrated Agri/fish food system in selected activity areas (large + SIS in ponds, homestead garden in dyke or backyard, improved latrine, water filter, and tippy tap)"

To promote diverse food production among project participants, the F4L team conducted a competition among 18 small-scale aquaculture (SSA) households from Namsang, Pindaya, Taunggyi, Salin, and Pwintbyu Townships that adopted the best practice in integrating fish and vegetable/fruit production. From the selected households, 6 households emerged as the winners; they were given prizes such as seeds, detergent, basins, and a certificate to recognize their efforts. All the winners will be featured in F4L newsletters so other households can learn about their stories and at the same time will be encouraged to adopt the integrated production system.

3.2.1.6: Conduct of minimum dietary diversity for Women (MDDW) survey to determine dietary diversity score of women of reproductive age in Activity participating households

In Year 3, WorldFish conducted the minimum dietary diversity for Women (MDD-W) survey among 481 women of Y1 and Y2 SSA household farmers from 21 townships in Magway, Sagaing, Mandalay, Kachin, Eastern, and Southern Shan. The survey explored whether women, 15-49 years of age, consumed at least five out of ten defined food groups during the previous day or night. The results of the MDDW survey will provide key information regarding the micronutrient adequacy of groups of women who achieve minimum dietary diversity and who are therefore likely to have higher (more adequate) micronutrient intakes than groups of women who do not. WorldFish is in the process of data analysis and will compare the results from the previous year to determine the effectiveness of the intervention. The findings will be disseminated when completed.

3.2.1.7: Analysis of the nutritional impact of "F4L" Activity interventions with the University of Stirling, Scotland, UK

F4L sought the support of an international researcher to conduct further analysis on the F4L baseline data that identify potential pathways on the impact of intensification on food security and livelihoods of smallholders enrolled in the F4L training activities. The study investigated the state and nutrition contribution of fish consumption in baseline diets and explored correlations between production and fish consumption/dietary diversity scores. In particular, F4L is interested in focusing on the outcomes for nutritionally-vulnerable smallholders.

The preliminary analysis of the baseline data found that most of the respondents are not eating fish from their production. This could be due to personal preferences, the higher perceived value of selling or gifting the fish rather than retaining it for household consumption, or simply insufficient production. It could also be that people are eating fish from markets but not from their production. This work also found that production weight was positively correlated with fish consumption for smallholders only (those who produce less than 250kg per year). We also found that tilapia is the most consumed species by weight, and provides more nutrients compared to other fish categories due to the volumes consumed.

The nutritional impacts of intensification are critical to monitor throughout the intervention. The pathways to food security are not always simple, where multiple dynamics influenced by preferences, markets, and production quantities will affect nutritional outcomes for producers, particularly smallholders who are the most vulnerable to change in markets.

3.2.1.8: Pilot test open-pollinated vegetable seeds production in the selected area.

The activity is going to organize in the winter season and the pilot will be conducted in Southern Shan State. The 2 potential farmers from Pindaya Township and 2 from Nam Sang Townships were selected during the reporting period. The objective of the activity is for a farmer to hold back seeds from crops produced each year and therefore save money on seed purchase the next year by using open-pollinated seeds. Moreover, a farmer can get good quality mother-type plants every year as well.

To pilot the activity, F4L will collaborate with a local seed company, like Myanmar AWBA to consult them and ask them to provide necessary training to the farmers in the field. In addition, the F2F program provided virtual training on vegetable seed production and storage to the participants where IP and F4L staff gained knowledge of vegetable seed production systems and its requirement. It will be helpful when the *Activity* implements the Open Pollinated Seed production pilot activity in the field Y4.

3.2.1.9: Home production of dried small fish powder in the pilot area

F4L introduced the production of dried small fish powder that targets women with U5-year-old children and youth in Shwebo Township. Producing at home increases the intake of essential nutrients in daily meals and a pathway to improve income from the surplus products that are sold. The activity is built on from previous WorldFish project, MYSAP Inland that demonstrated favorable results when conducting the pilot activity.

The use and preparation of dried small fish powder addresses the late introduction of animal-source food for infants in Myanmar, a practice that has negative consequences on nutrition and health. When added to complementary foods for infants over 6 months of age and also to family foods such as soup, curry, and, vegetable dishes; the powder enhances the nutritional value of the diet. In addition, when the dried small fish powder is prepared ahead of time and safely stored, women and care-givers save time and energy. Below are the objectives of the activity.

- To engage women and youth in producing dried small fish powder at home for consumption and business.
- To disseminate information on the importance of fish in achieving good nutrition, especially for infants, young children, and WRA.
- To increase the use of dried small fish powder in preparing meals among women and caregivers at home.

A total of 20 women were trained on how to produce the dried fish powder at home and on how to add the powder to family meals and for complementary food for infants. The result of the activity will be reported in Year 4.

Sub IR 3.3: Improved diet diversity and food safety for young children and women of reproductive age through SBCCs and nutrition education

Output 3.3.1: Improved knowledge and consumption behaviors on fish

3.3.1.1: Conduct of refresher training course focusing on nutrition especially on the consumption of fish and Small Indigenous fish and vegetables resulting in dietary diversity, and improved WASH practices to implementing partners.

After the delay in conducting the training due to COVID-19 restrictions, in Year 3, two batches of the refresher training course were conducted in Nyaung Shwe, Southern Shan, and Kengtung, Eastern Shan. A total of 47 (F-24, M-23) implementing partners staff from BRAC, PACT, KMSS Kengtung, KMSS Pekhon, MFF Southern Shan, and MFF Kachin participated in the week-long training. Participants demonstrated their willingness to learn and commitment to the activity by sharing their experiences and their knowledge resulting in an interactive discussion among the participants.

3.3.1.2: Social Behavior Change communication activities on nutrition and improved WASH practices such as cooking demonstration, formation of Mothers support group, nutrition month campaigns, etc. at a different venue (markets, health center, etc.) (Includes nutrition messages in SBCC strategy promoting consumption of nutrition fish)

August is Nutrition Month, and the project commemorated the occasion to promote healthy eating. Under the severe constraints imposed by COVID-19 and the unstable political climate, F4L team held 19 in-person nutrition month celebration sessions, with 641 participants (F- 382, M-259) from 7 townships in Magway, Kachin, and Eastern Shan. Health and nutrition posters were exhibited in communities to raise awareness of nutrition and WASH knowledge and practices, and nutrition and WASH information brochures were handed out to all participants.

In addition, to extend awareness of the importance of handwashing with soap among the communities, F4L joined in the Global handwashing day celebration which is celebrated every 15 October with the theme “*Our Future is at Hand – Let’s Move Forward Together*” in Magway, Sagaing, Kachin, Southern Shan, and Eastern Shan. Despite the challenges in the field, the team was able to reach a total of 93 (M-41, F-52) individuals. The activity was facilitated by F4L implementing partners; Pact, BRAC, KMSS Kengtung, and KMSS Pekhon. The field team conducted the following; i.) distributed soaps and posters with the message on the importance of handwashing with soap at critical times to reduce the burden of many diseases and ii) an information sharing session with a demonstration on proper handwashing methods among villagers in selected townships.

The activity provided awareness of the importance of the simple but cost-effective practice of handwashing with soap among the communities the F4L Activity is working. It is presumed that those who participated in the event will apply what they learn and disseminate the information among their neighbors to ensure that everyone in the community achieves good health.

3.3.1.3: Conduct Facilitation Training among partner staff (CFs and team leaders) to learn the importance of effective facilitation and participatory approaches when conducting training at the community level

This activity is combined above section 3.3.1.1.

8. Project Management and Cross-cutting

The sub-sections from 8.1 to 8.7 below brief on the accomplishments made on cross-cutting issues ranging from MEL to Gender to communications, to mention a few. Cross-cutting contributed greatly to achieving what was achieved throughout the year.

8.1. Activity Management

WorldFish is the lead implementer of F4L *Activity*. In year 3, WorldFish continue to work with the same sub-grantees or partners who carried out F4L implementation in previous years. In FY 2022, there were incidents where WorldFish and partners get opportunities to physically see each other. For the first time since implementation began, F4L *Activity* organized a planning meeting where all partner's key staffs members came and presented what they are planning to conduct in FY 2023. Furthermore, two major events of Training of Trainers (ToT) were organized for all partners' staff in Southern and Eastern Shan respectively. F4L *Activity* Manager from USAID also attended an event in Eastern Shan. There have been more interactions and F4L team members were happy to share what has been learned in the first three years of implementation with USAID, WorldFish, and among themselves.

8.2. Grants and Finance

The new grant agreement (Cost-Type Agreements with Public International Organizations-PIOs), Agreement No. 72048221IO00001, Fish for Livelihoods Activity (F4L) has been fully effective since 15th September 2021 and will last until 14th September 2024, i.e., for three years, with the total estimated amount of USD 8,000,000, with the first obligated amount of USD 2,500,000 increasing to USD 3,000,000 in the third quarter.

1. The estimated (planned) expenditure for the period of 1 July to 31 September 2022 is USD 1,063,062 while the actual amount spent is USD 1,006,608 - underspending the estimate by almost 5%. Since the results of a credit pilot, which will identify and link past-due payments to the service consultant's payment to the work plan for Q1 of year 4, will be delivered at the end of 2022, this underspending is mainly related to the activities that have been delayed under the contract with Pegu Partners. There are also some remaining funds of the sub-IPs budget line, which is about 7% of the IPs' allocated budget in year 3 due to the political situation and unsafety reasons hence some of the activities were postponed. However, most of the targets that we achieved and the overall burn of 92% after considering the budget revision. By September 30, 2022, a total of USD 2,283,304 had been reimbursed.

Note: Please kindly refer to Annex C: Progress Expenditures and Funds Status, for more details.

8.2.1 Value for Money (VfM)

- Cost-effectiveness and enhancing USAID's return on investment are very important to WorldFish. As a result, it has made several attempts to maximize VfM were considered throughout hiring, subcontracting, and procurement in which we delivered 32 different types of training to the beneficiaries in year 3, and of the 6,734 participants, some of them participated in more than one training. In year three 2,747 beneficiaries were reached as contrasted to the 2,500 targeted beneficiaries.
- While some of the activities were carried out virtually when it was possible to reduce the costs as a result of this ability costs saving the incurred operation costs and reaching out more to the target areas, WorldFish continues to focus on achieving efficiencies through programmatic linkages with the implementation partners and stakeholders' different intervention modes for the country under the double crisis.

- The VfM framework described by the F4L project is anticipated to be updated in the following fiscal year to take into account how donors want to see evidence of increased output over a five- or ten-year period as confirmation that their money is being used effectively. For instance, we could enhance the aquaculture business model (hatcheries, nurseries, grow-out, value addition, and marketing), which would ideally increase the quantity of fish produced per unit area while simultaneously giving producers and value chain players with a workable amount of additional profit. Besides the benefits for human health and the reduction of hunger, our estimations show a gain in value and a high cost-benefit ratio, proving a good value for money at the project's completion and beyond.

8.3. Monitoring Evaluation and Learning

Virtual Session on Collaborating Learning and Adaptability (CLA):

The fish for Livelihoods (F4L) Monitoring Evaluation and Learning (MEL) Team facilitated a one-day virtual workshop on Collaborating, Learning, and Adapting (CLA). The main purpose of the workshop was to interact with WorldFish F4L and sub-grantees (partners) management to explore the concept of CLA and how this will help F4L implementation. Throughout the workshop participants learned and discussed how they are collaborating, learning, and adapting to the current circumstances. They exchanged their experiences and each partner developed a plan on how to effectively collaborate and learn in the future. Twenty-nine (Male=16, Female=13) participants attended this virtual session. (Figure-16). Participants represented WorldFish (WF) and F4L partners; BRAC, IWMI, PACT, MFF, and KMSS.

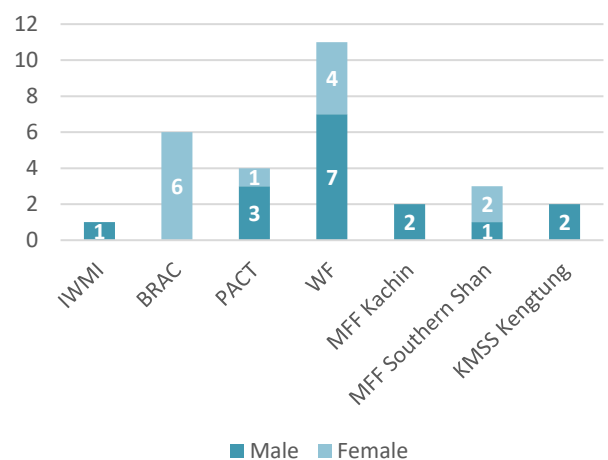


Figure 16: Gender Break-up of participants

For the next steps, the WF MEL team shared the CLA template with partners. It is recommended that they should consult their team members, fill out the template, and submit it back to the WF MEL team. This process will document the C of CLA for each partner. Furthermore, it was communicated that a follow-up session will follow. In that session, the participants will focus on working on the same template but Learning and Adapting. In short, this workshop helps the F4L team to sit together to discuss what worked well and what did not. How the CLA will help in Activity implementation for the remaining years of the Activity.

Physical Monitoring Visit to Kengtung and Mongphyak Townships, Eastern Shan by the MEL Team:

In June, the WorldFish “Fish for Livelihoods” (F4L) Monitoring & Evaluation (M&E) Team carried out a physical monitoring visit to observe and assess the services being provided to SSA farmers. The M&E team members met grow-out farmers in Kengtung and Mongphyak Townships. In aggregate, the team visited nine (Male=6, Female=3) farmers. Eight out of nine were grow-out farmers and one, from Mongphyak Township, was a feed maker. The farmers culture fish for personal consumption and to sell in the market directly or through an intermediary. Even though the farmers are culturing fish for many years they need information on how to



Figure 17: F4L MEL team members interviewing SSA farmers in Eastern Shan

increase production and knowledge about different types of fish species. The farmers had recently stocked their ponds with rohu and common carp fingerlings. The farmers are encouraged to record their inputs; fingerlings, feed, labor costs, and production at the time of harvest. This will ascertain the profitability of their aquaculture system.

A field monitoring visit provides an important opportunity for the M&E team to meet farmers in the field. Previously this was not possible because of COVID-19 and political instability. The major observations from the field visit are that farmers are satisfied with the *Activity's* assistance and are willing to work with the local field teams and partners to gain more aquaculture knowledge. The *Activity* also distributed vegetable seeds to farmers for production on pond dykes as part of the integrated farming promotion. This will ensure that households in the intervention areas have access to nutritious food for personal consumption.

Weekly Reporting on End of Week (EoW) notes to USAID

The MEL and Communications department's Lead, Monitoring & Evaluation, and Communications Specialist ensure the supply of EoW notes to the USAID Burma office. During the reporting period, EoW notes were shared continuously with the USAID Burma office to keep them fully informed on the *Activity* implementation status. It helps inform USAID and senior management on how the implementation takes place and what some of the key challenges field teams are encountering while supporting farmers and communities at the grass-root level.

Data quality protocols/methodologies

The MEL departments ensure that quality data feeds into reporting from the field. There is a defined reporting mechanism placed that ensures a consistent and uninterrupted supply of data from sub-grantees to WorldFish. The WorldFish F4L team further checks and validates the data at different levels. Physical data collection is still a challenge due to ongoing conflict and instability through being confined into a limited township. However, by and large, data is collected and verified from almost all intervention townships. In the townships where physical data collection is not possible and there is no internet available, the field staff communicates through telephone calls and ensures the data is reported to the M&E team within the stipulated time. The F4L MEL team successfully collected verified data for the annual performance surveys that will feed into indicators results. In addition to this, the data collection (physical and telephonic) exercise in the scaling of seven townships is supervised by the F4L MEL team.

Baseline Data Collection in six F4L Townships:

The *Activity*, at the start of implementation, targets to implement activities in 30 townships. These townships are selected through a scoping study that followed criteria to select townships. For the baseline, in 2020, due to the COVID-19 pandemic, the data was collected through a telephonic survey. In FY 2022, the *Activity* plan is to collect baseline data from seven scaling townships. However, data were collected in six townships because the seventh township was inaccessible due to heightened security risks and unstable political conditions. Despite these challenges, the M&E team supervised baseline data collection from six townships. The data was further analyzed and commented on by WorldFish's academic partner, the Tokyo University research team.

Annual Performance Surveys:

The M&E team conducts four in-house surveys to collect data to report on four USAID standard indicators. These are annual performance surveys that feed the data to their respective indicators; yield, adoption of technologies and practices, adoption of WASH practices, and nutritional status of reproductive women through Minimum Diet Diversity – Women (MDDW). These surveys are critical to assess the performance of participants (SSA farmers and their family members) and provide robust evidence to the program team to take corrective actions and or decisions for successive years of implementation.

Fish for Livelihoods (F4L) Planning Meeting for FY 2023:

F4L conducted a two-day in-person Planning Meeting in Yangon, Myanmar. This is the first time that WorldFish and F4L sub-grantees (partners) assembled in person for an annual work planning session. The participants discussed the F4L past performance and planning for the upcoming year, FY 2023. The meeting was attended by 57 participants (Male= 28, Female=29).

WorldFish team members discussed the progress of F4L *Activity* Intermediate Results (IRs) I, II, and III with partners. Cross-cutting themes including Gender, Market systems, Climate, and Monitoring Evaluation and Learning (MEL) were discussed at a greater length with partners.

The planning meeting provided a rare opportunity for USAID, WorldFish, and partners to interact and exchange valued lessons learned throughout *Activity* implementation. The exchange of information and lessons learned among participants validated what worked well, what didn't and what needs improvement. It helps WorldFish and its partners build a successful approach that will continue in the forthcoming years of *Activity* implementation. USAID and WorldFish representatives gave recommendations and reflected on the partners' work plans so that F4L *Activity* ensures consistent and quality support to Small-Scale Aquaculture (SSA) farmers, their families, and the fish value chain market actors across Myanmar.



Figure 18: Group photograph of participants from F4L Planning meeting

MEL/CLA workshop for F4L Partners:

Fish for Livelihoods (F4L) *Activity* conducted a two-day in-person workshop in Yangon, Myanmar. The workshop was attended by WorldFish and F4L partners' key staff members who are involved and engaged in data management and reporting. The main objectives of the workshop are; To discuss the basics of Collaboration, Learning, and Adapting (CLA) and its components in the light of F4L implementation; to take a deep dive into what has been learned and how we adapted in the course of implementing F4L activities; & to develop a common understanding of MEL, Data Collection, and Reporting of F4L work to USAID.

The workshop was attended by 36 participants (Male=21, and Female=15) representing all seven F4L partners. On day 01, participants acquired knowledge of CLA and worked in groups to reflect on their organization’s practice in Collaboration, Learning, and Adapting. On day 2, participants discussed F4L “data tools package” and progress reporting with the WorldFish F4L MEL team. Group work along with individual brainstorming sessions was also part of the workshops spread over two days.



Figure 19: Group photograph of participants from CLA/MEL workshop

The CLA/MEL workshop built the capacity of F4L partners and key staff members in CLA and MEL aspects of F4L *Activity*. The participants learned how to apply CLA key concepts to their work and will develop a CLA plan for their organizations based on F4L *Activity* implementation. Moreover, the WorldFish MEL team discussed F4L “Data Tools Package” and reporting templates with participants. The participants now have clarity and lucidity on how to fill data and reporting templates – this will ensure the collection and then subsequent reporting of a high quality reliable and verified data.

8.4. Gender and Youth

Gender Equality & Inclusion, particularly women and youth empowerment approaches, has been at the center of the implementation from the beginning of the project activities on the ground because the F4L project goal is also to improve the lives of people in the project targeted areas by advancing gender equality and empowering women and youth to participate fully in, and equally benefit from, the development of their societies on the same basis as men. The project's original design stage carefully explored gendered lenses and perspectives, and all F4L activities were gender mainstreamed and integrated as a result.

As in Years 1 and 2, the F4L activity continues to empower women and young people by providing the same chances as male SSA farmers to take part in training and workshops and by giving them the opportunity of sharing their newly gained knowledge with other SSA farmers about fish farming.

Although it was difficult to change the prevalent social, cultural, and gender norms in the various contexts, the project implementing partners (IPs) carried out the following gender integration activities.

BRAC Myanmar in six townships and states/regions: Madaya (Mandalay), Khin U, Wetlet, Shwe Bo (Sagaing), and Taunggyi, Nanhsam (Southern Shan)

Although most of the fish farmers selected were men, BRAC Myanmar has aimed to ensure that female farmers are included in the *Activity*. In BRAC Myanmar's experience, it has been important to ensure that selection of men, who are often heads of the household, are included in the discussion to promote women's participation. With support from Aquaculture Promoters, BRAC Myanmar is collecting the necessary disaggregated data among different age groups of participants to provide additional information relating to youth. BRAC Myanmar is also supporting the fish farmers' family members, especially the women counterpart in the kitchen gardening/vegetable cultivation and nutrition through this project. Also, the project has brought women into leadership positions especially the top 2 layers are 100% female staff.

PACT Myanmar (in Salim, Seikphyu, Ngape, and Myothit of the Magway Region in Myanmar's Central Dry Zone)

Women and youth SSA farmers have equal access to small-scale aquaculture and the development of inclusive market mechanisms under PACT's work. PACT has made progress in encouraging female farmers to take part in F4L aquaculture training and workshops, although current norms and political obstacles make it challenging for the project team to identify female farmers, particularly young women, who require more individualized support at higher levels. During the reporting period, 12% (30 farmers out of the total 251) of farmers who started their entrepreneurial ventures as fish pond owners were female. PACT empowered female participants in F4L's nutrition-sensitive agriculture activities and approximately 25% of Y1 and Y2 female farmers are consuming a diet with minimum dietary diversity while enduring the effects of the economic collapse experienced across the country.

Rapid Gender Assessment

An F4L sub-grantee team conducted rapid gender research in June 2022 to identify why women's participation in the aquaculture sector has been low; it interviewed both men and women involved in fish farming, as well as women representatives not involved in fish farming. This rapid assessment interviewed a total of 62 respondents from four *Activity* townships, namely Myo Thit, Ngape, PwintByu, and Salin townships. The findings of the survey of women engaging in the aquaculture sector as farm owners and aquaculture promoters are as follows:

- Among the 17 women surveyed, 35% were serving in leading roles and the rest are in supporting roles within the aquaculture sector.
- When the team interviewed women, farmers who are registered as the business owners/lead farmer and asked why they had registered as such, the top three answers were: 41% reported being very interested in aquaculture farming, 21% reported having no men in their family, and 17% reported having the confidence to run the business well herself.

Reasons for women becoming business owners

- When asked what challenges they had faced in this sector, the surveyed women mentioned limited aquaculture knowledge, pond security, and technical know-how related to fish sampling. They managed to overcome these challenges by asking others such as family members and relatives to help and by attending fish farming training, coupled with self-learning. Three women reported hiring guards for their fish farms.
- It appears that for the surveyed women, the journey to becoming aquaculture farmers and

leaders was an arduous one which required them to dedicate a significant amount of time to acquire aquaculture knowledge and solicit additional human resources for pond security, fish feeding, and fish sampling. Some survey respondents mentioned record keeping and fish marketing as activities that required them to seek outside support.

- Women farmers reported improved income and success in fish farming (43%), as well as increased confidence (29%) as a result of participating in the program.
- The assessment solicited advice from two groups of women - women farm owners/leaders and wives of aquaculture farmers – regarding the best ways to promote women’s participation in fish farming. The top answers are as follows:

How should we promote the participation of women in the aquaculture sector?	
Responses from Women Business Owners	Responses from Wives of Male Business Owners
<ul style="list-style-type: none"> • 38% - share aquaculture knowledge with more women. • 16% - ask the community to assist with pond security. • 11% - from women-only farmers’ groups. • 11% - increase access to credit for women farmers. 	<ul style="list-style-type: none"> • 27% - share aquaculture knowledge with more women. • 18% - ask the community to assist with pond security. • 18% - from women-only farmers’ groups. • 11% - increase access to credit for women farmers.

Recommendation for adaptive management: These findings highlight the need to intentionally include more women in all stages, beginning with awareness raising, recruitment, and aquaculture training, as well as creating an environment where women feel comfortable acquiring aquaculture knowledge. The findings also reveal women’s interest in peer-based learning and sharing, as well as having access to credit for women farmers only to increase their financial independence beyond the small-scale aquaculture fund group that is now available for both men and women. Women felt that the loan sizes available, within the range of MMK 50,000-60,000, are not sufficient at times.

- In terms of **gender norms** that serve as barriers to women’s participation, the following causes were identified.
 - o Women do not have what it takes to be farm owners (30% among women respondents, compared to 18% among men).
 - o Fish farming is suitable only for men (26% among women respondents compared to 25% among men).
 - o Women are not supposed to go out to ponds that are far away due to security concerns (19% among women respondents compared to 12.5% among men).
 - o Culturally it is appropriate for husbands and men in the household to be known as family business leaders and owners even though women do all the work (15% among women respondents compared to 19% among men).
 - o These findings highlight the need to conduct community-based influencing work to address gender norms and create an enabling environment through which to improve women’s social position and daily conditions.
 - o These findings also underscore the fact that gender norms can sometimes appear to be self-imposed among women, who do not want to challenge the “status quo” and potentially upset male figures in the household and community. This seems to be correlated with variables such as women’s self-confidence/self-esteem, level of literacy, economic independence, and level of knowledge and skills.
 - o Of the women interviewed, 71% have participated in WASH and nutrition activities,

albeit in supporting roles. Comparing this finding to responses from male respondents, it becomes clear that men are dominating leadership positions even for simple awareness-raising activities and women find themselves in supporting roles. It has been observed that 44% of women aquaculture farmers are leading the improvement of their families' WASH and nearly half are leading the improvement of nutrition, indicating that empowering women as leaders in the WASH and nutrition sectors plays a critical role in household adoption of good WASH and nutrition practices.

Recommendation for adaptive management: These findings warrant more frequent gender-focused conversations with community members to increase the inclusion of women, from the mobilization stage in new villages to regular mentoring and coaching activities through innovative and peer-based/women-led approaches. F4L will work to integrate confidence and agency-building training and intentionally create leadership positions for women to become WASH and Nutrition Promoters in the coming years. This suggests more targeted discussions with women so they understand the difference between serving in leadership roles versus supporting roles and why women need to be seen as leaders. As such, F4L will factor in gender concepts and rights-based language across various stages of the project so that F4L becomes a catalyst for the acceleration of women's participation and leadership in decision-making processes, leading to participatory and inclusive governance in their communities.

The findings of the survey of men engaging in the aquaculture sector are as follows:

- The research team surveyed 17 men engaged in the aquaculture sector as lead business owners or aquaculture promoters operating their farms. Among them, a few men acknowledged not knowing that women can be registered as business owners. Additionally, 94% reported believing that women can become effective business leaders and farm owners – even though one-third of them said that their wives do not possess the necessary experience to lead and that they are not seen as leaders within the households. This emerges as an interesting finding as men were providing what appeared to be contradictory responses.
- The team interviewed both husbands and wives regarding why women are not registered as aquaculture business owners; their responses are presented in the table below:

Why are women not in leading roles in aquaculture farming?	
Responses from husbands	Responses from wives
<ul style="list-style-type: none"> o 18% - She has no experience like me. o 15% - I always take on a leadership role within our household. o 15% - She has no time because of household chores. o 12% - Usually only men in our village are doing fish farming. 	<ul style="list-style-type: none"> o 30% - I am not as experienced as my husband. o 13% - My husband always takes on a leadership role within our household. o 13% - Culturally it is appropriate for men to be known as leaders of family business though we do all the work.

- Among the men surveyed, 88% are involved in WASH and nutrition activities, with the majority of them in leading positions and their wives in supporting positions. This underscores cultural and gender issues facing the communities where women are not seen as leaders, women lack confidence in themselves, or women put themselves in secondary positions to adhere to cultural expectations.
- Husbands reported that their wives are supporting various aspects of their fish farming

businesses even though they are not in visibly leading roles. These aspects included fish feeding (24%), Fish sales (16%), Pond preparation (13%), managing cash (12%), and fish harvesting (10%).

- Although some of the men gave contradictory answers, all of them said that if their wives have the interest and desire to run fish ponds as lead farmers, then they will support them. They anticipate a range of improvements at the household and business levels if this endeavor becomes successful, including more income and success with fish farming, reduced workload for men, and confidence among their wives.
- Men noted the following barriers to women's entry into the sector as leaders: limited technical knowledge, limited leadership skills, and security concerns due to political instability as some fish ponds are located far away. Interestingly, women provided the same answers. Of the 16 women (wives) interviewed, 15 of them said that they would seize the opportunity to be registered as a pond owner, demonstrating interest and enthusiasm upon which the project can capitalize.
- In comparison, men were asked what type of support they would provide to their wives so that they can be taken on leading positions. Their responses included the following: having her attend aquaculture training to gain sectoral knowledge, assist with pond security, support fish harvesting, and help her with household chores.

KMSS-Kengtung (Tarlay and Mong Phyat Townships, Tachileik District, and Kengtung Township)

The training participants are expected to be the main person responsible to manage the aquaculture resource in the household. In all areas of the project, additional learning sessions were held to increase youth and women's involvement in fish farming activities.

During this year, the project team delivered training, workshops, and campaigns attended by 325 males and 211 females. Among them were 123 male and 87 female youth (between the ages of 16 and 35). A total of 536 people received short-term training or awareness of which 211 were women and 210 were youths.

MFF Kachin (Waing Maw, Myitkyina, Moe Kaung, Bhamo, and Momouk townships of Kachin State)

For Year 3, the female beneficiaries' participation was 27 and 2 female Community Facilitators and 1 Aquaculture Promoter were selected. A strong Gender-focused approach will ensure that the selection of farmers' group members and committee members by women inclusion.

MFF Pindaya (Pindaya and Inle, Nyaung Shwe townships from Southern Shan State)

The MFF team ensured gender equality, youth involvement and gender inclusion in every process of implementing the *Activity*, since its inception. Special emphasis was also placed on enabling young people and both women and men to participate in the *Activity*. The Shan State Fisheries Federation (SSFF) has implemented all the project activities with ways of all-inclusive approaches toward gender equality and youth participation. Thirty-seven percent of beneficiaries (16 women out of 37 farmers) were selected as participants at Participatory Community Appraisal (PCA) workshop to collaborate with the project team in the project activities. As per the result from the M&E data collection and analysis, even 54% of total beneficiaries are women who attended and participated in training sessions

in the point of fact that women seemed to be interested in attending training sessions, providing them technical support and knowledge. Gender training could drastically and positively change the perspectives and concepts of the varying Burmese patriarchal system. In addition, the project assured that all 10 out of 10 fish retailers were women in the fish market and after the Quarter 2 phase, 25 women of retailers could participate actively.

8.5. Environment/Climate Change

On July 1, 2022, the F4L M&E team organized and conducted virtual training on Environmental Mitigation and Monitoring Plan (EMMP) for F4L Field Coordinators and its IPs (BRAC, KMSS, MFF, and PACT) staff via the MS Teams. A total of 59 (Male= 31, and Female=28) attended the training.

8.6. Communications

The WorldFish Headquarters (HQ) communication department and IECT coordinator helped the program team to brand all information, education, communication, and training materials to comply with the branding and marking guidelines of Fish for Livelihoods, which has been approved by the USAID in the year 3. In the 2nd quarter of Year 3, USAID approved the following list of extension and training materials, awareness-raising materials, and incorporating informative messages on COVID-19 and its precautions in all products. The printing and distribution process of these extension and training materials for all key Fish for Livelihoods participants in year 3 (FY 2022) is continually produced in the 4th quarter, and the distribution list of IECT materials can be accessed in the Annex "Fish for Livelihoods IEC materials distributed to IPs_Y3". The rest of the major communication products developed are accessible in the Annex "Fish for Livelihoods IEC documentation list_Y3".

- Fish for Livelihoods factsheet
- Nutrition and COVID-19 pamphlet
- Small-Scale Aquaculture (SSA) and COVID-19 pamphlet
- Why fish pamphlet
- BMP for vegetable production systems
- Traditional Fish processing recipe
- Guide on dried fish processing
- Recipe card fish pumpkin ball
- Small Indigenous Species (SIS) partial harvest guide
- Small Indigenous Species (SIS) question and answer sheet
- Poster Important factors for a healthy and happy family
- Poster Toilet and sanitation
- Poster 1000 days
- Poster Myanmar Mola comic story
- Poster Ceramic water filter
- Small-Scale Aquaculture (SSA) farmer guidebook
- Good post-harvest practices for a fresh fish trading guidebook
- Good fish processing practices guidebook
- Production of dried small fish powder in the communities

Mobile phone application – Shwe Ngar (Golden Fish)

Fish for Livelihoods *Activity* through its IPs BRAC, KMSS, MFF, and PACT engaged F4L participants to register and to use the Shwe Ngar mobile application (app) to access information on SSA and improved human nutrition. Moreover, the app helps SSA farmers to make record-keeping on feeding and calculate the rate of feeding and recipes with local affordable raw materials for their ponds.

In October 2021, the F4L Chief of Party (CoP) and Component Leads had a meeting on the Shwe Ngar app review with a focal person (developer) from Single Spark BV. Challenges and feedback on the app used from the field were discussed.

In February 2022, the Single Spark BV delivered training on the Shwe Ngar app using WorldFish and IPs staff and a total of 46 (21 women) staff attended. With the great efforts of the F4L team and IECT Coordinator, six Shwe Ngar app video clips' introductions on how to download, register and use the app effectively were created. The USAID has approved the use of these video clips as promoting of using the app, and wisely distributing through its IPs among the field where the activity is implemented.

On Sep 30, 2022, there were a total of 1,646 members registered as users of the Shwe Ngar mobile phone app which includes 947 farmers in total. Moreover, the F4L FCs and IPs staff conducted monitoring visits on the Shwe Ngar app registration and use of the app to the trained participants.

There have been several problems with this mobile phone program due to the use of cloned (pirated) phones by farmers. Since the 1st quarter of year 3, all the issues faced so far are informed and made virtual meetings with the app developer from Single Spark BV, and they are trying to solve and improve some of the issues which they can fit with.

In May 2022, the app developer provided the test version of the updated Shwe Ngar app, and the IECT coordinator from Fish for Livelihoods *Activity* provided feedback again on the Knowledge Database module on the app, which is not working properly, and some sections of the Burmese version need to be improved. In addition, farmers are facing poor internet connection, using Keypad Mobile in the field, most are illiterate and not friendly with digital communication, and there are downloading and installation of software problems in the field.

In August 2022, the app developer made all requested improvements and redeployed the last updated version of Shwe Ngar app on the Google Play Store application again.

Mobile phone application – Htwet Toe

Fish for Livelihoods *Activity* through its IPs BRAC, KMSS, MFF, and PACT engaged F4L participants to register and to use the Htwet Toe mobile application (app) to access information on SSA and improved human nutrition.

In September 2021, the F4L CoP and Component Leads had a meeting with Village Link and discussed on challenges of using the digital platform in Myanmar, especially during the COVID-19 crisis and political issues. The training on using Htwet Toe app to WorldFish and IPs staff was provided in February 2022 and a total of 36 (16 women) staff attended.

In May and June 2022, the Village Link uploaded four video clips on Shwe Ngar (Golden Fish) mobile app introducing and using the Htwet Toe app's farmer group.

On September 30, 2022, Village Link had 2,779 farmers registered as Htwet Toe mobile app users. 323,279 people visited the 27 fish-related news, nutrition, and articles uploaded to the aquaculture page. There have been 44,160 visitors to the two Fish technical guidelines. The Htwet Toe app report can be accessed in the Annex "Village Link (Htwet Toe App) Report".

In addition, the Village Link promoted the Shwe Ngar mobile application using five States and Regions of the F4L areas to accomplish one of the deliverables, and 347 users downloaded and installed Shwe Ngar app on their mobile phones.

GPS locations of Fish for Livelihoods SSA farmers

With the support of the F4L field team and IPs BRAC, KMSS, MFF and PACT, the collection of GPS location data for year 1 (2019-20) 1,167 ponds, and year 2 (2020-21) 1,485 ponds were completed in September 2021. The collecting of GPS location data and verifying process for year 3 (2021-22) ponds are still in progress.

The SWAT model that integrates climate change analysis with water availability will provide an important tool in informing decisions on scaling pond adoption. It can also contribute to a Decision Support Tool to better target pond scaling, which IWMI and WF will consider for Year 4 of this project.

The water monitoring component also offers insights based on a comparison between how pond owners track and understand water quality on the one hand and the results provided by the monitoring protocol, using measurement devices. This component encompasses a participatory local knowledge dimension that can help us understand where local knowledge systems do and do not align with more rigorous monitoring, and potentially which are the key knowledge gaps that can impact pond management and yield performance.

In August 2022, WorldFish shared the F4L pond GPS data and information (year 1 and year 2) with IWMI for further reference. Farmers registering with Greenovator using the Green Way App can have their pond surface area measured via the phone's GPS.

8.7. Capacity Development

On December 8, 2021, the F4L Monitoring and Evaluation (M&E) team and IECT Coordinator conducted one-day virtual training on M&E and training data tools package to IPs (BRAC, KMSS, MFF, and PACT) staff via Microsoft Teams. A total of 47 (22 women) staff attended. The training delivered on the update of F4L *Activity* indicators and monitoring tools must follow and stick with by the F4L field staff.

On December 13, 2021, the Finance and Operations Manager conducted a refresh session on the USG and USAID rules and regulations to the focal person from IPs (BRAC, KMSS, MFF, and PACT) staff and shared information on the laws, regulations, and mandatory requirements for Fish for Livelihoods. A total of 11 (7 women) staff joined the session.

On January 6, 2022, the F4L Field Coordinator from Sagaing and Mandalay Regions conducted two days of online training on SSA technology, nutrition, and WASH key messages to BRAC staff from KhinU, Wetlet, and Madaya Townships via Skype. A total of 7 (3 women) staff attended. Again, the IPs staff will in turn train aquaculture promoters, demonstration farmers, and SSA farmers on how the importance of fish culture in a household pond, and vegetable culture on a fish dike or backyard, and enhance knowledge on good WASH practices.

In January 2022, the F4L M&E Coordinator delivered one day of virtual training on Kobo digital platform on monthly fish price, and flood and drought via Microsoft Teams to F4L Field Coordinators and IPs (BRAC, KMSS, MFF, and PACT) staff separately. A total of 42 (16 women) people attended.

From 22nd to 29th January 2022, Ms. Neelam Dhinsa Canto-Lugo, the US Volunteer from California, hired by the farmer-to-farmer (F2F) collaborative activity with Fish for Livelihoods conducted six days of virtual training on business planning for small-scale integrated aquaculture farmers to F4L Field Coordinators and IPs (BRAC, KMSS, MFF, and PACT) staff via Zoom. A total of 35 (17 women) people attended. All participants learned how to write a business plan after deciding to start a business and choose a business plan format, such as a traditional or a one-page business plan from the training. They are also expected to be trainer groups and/or host organizations and in turn train the Fish for Livelihoods beneficiaries including aquaculture farmers, farm managers, wholesalers and retailers, feed millers, street vendors, and backyard vegetable farmers who have grown on the embankment.

On February 1, 2022, the F4L M&E Coordinator conducted one day of virtual training on fresh fish vendor survey via Microsoft Teams. A total of 22 (14 women) staff from F4L Field Coordinators and IPs (BRAC, KMSS, MFF, and PACT) attended the training.

On February 2, 2022, Mr. Sam van Veluw, the Single Spark BV mobile application (app) developer from the Netherlands provided virtual training on Shwe Ngar (Golden Fish) mobile application using via Google Meet to staff from WorldFish and its IPs (BRAC, KMSS, MFF, and PACT) on how to install, register and use of the application on four modules 1) knowledge database, 2) find buyers and suppliers, 3) record keeping and 4) make fish feed recipes. A total of 46 (21 women) people attended.

From 3rd to 10th February 2022, the farmer-to-farmer (F2F) collaborative activity with Fish for Livelihoods assigned Ms. Neelam Dhinsa Canto-Lugo, the US Volunteer from California again to deliver six days of virtual training on record keeping to F4L Field Coordinators and IPs (BRAC, KMSS, MFF, and PACT) staff via Zoom. A total of 34 (18 women) people attended. The participants learned and enhanced their knowledge of the type of records, effective business practices, keeping and analysis of financial records, accessing record requirements, and calculating profit and loss for business from the training. Figure 20 shows the virtual training delivery on record keeping via zoom.

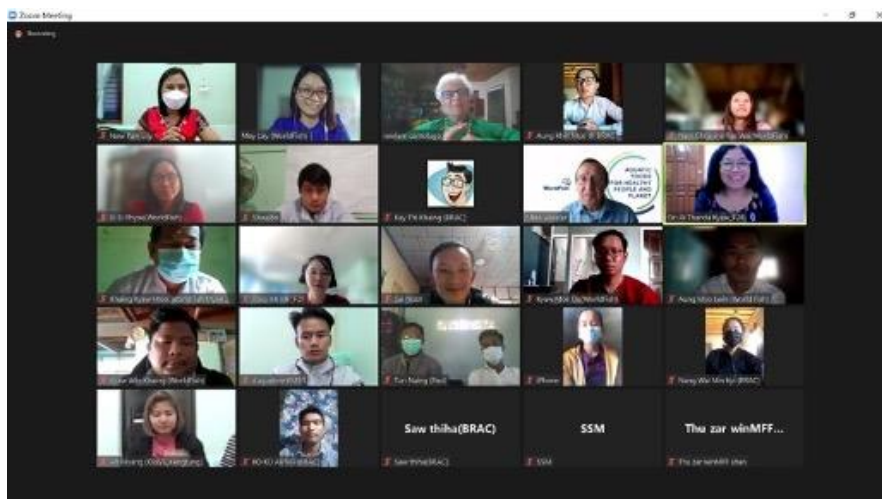


Figure 20: Virtual training on record keeping via zoom

On February 4, 2022, Ms. Myat Sandar and Ms. Khin Thuzar Hlaing from Village Link (Htwet Toe mobile application) delivered virtual training on Htwet Toe mobile application using via Microsoft Teams to staff from WorldFish and its IPs (BRAC, KMSS, MFF, and PACT) on how to install, register and use of the application, and a total of 36 (16 women) people attended.

In February and March 2022, the F4L M&E Coordinator delivered virtual training on the review and usage of the CBA format for demonstration farmers via Microsoft Teams. A total of 49 (23 women) staff from WorldFish and its IPs (BRAC, KMSS, MFF, and PACT) attended.

On February 17, 2022, with the lead of the F4L Monitoring Evaluation and Communication Specialist and M&E team, one day of the virtual workshop on Collaborating, Learning, and Adapting (CLA) was conducted via Microsoft Teams. A total of 29 (13 women) senior staff from IPs (BRAC, KMSS, MFF and PACT) attended and brainstormed the existence of their organization's collaborating methods and drafted the CLA self-assessment and action planning session report. All attendees actively participated and learned during the training.

From 21st to 25th February 2022, the farmer-to-farmer (F2F) collaborative activity with Fish for Livelihoods assigned Mr. Hugh Thomforde, the US Volunteer to deliver five days of virtual training on Risk Management of Integrated Aquaculture to F4L Field Coordinators and IPs (BRAC, KMSS, MFF, and PACT) staff via Zoom. A total of 42 (21 women) people attended. From the training, all participants learned and enhanced their knowledge of the risks of aquaculture in earthen ponds, which involved live animals living underwater, unpredictable sunlight, warm climate, and financial risk. In addition, the course was focused primarily on pond fertilization for semi-intensive integrated aquaculture and profitable and sustainable fish production in Myanmar.

In March 2022, F4L M&E Coordinator conducted a day-sharing session on the WASH survey questionnaire via Microsoft Teams. A total of 29 (13 women) staff from WorldFish and its IPs (BRAC, KMSS, MFF, and PACT) attended separately.

From 29th March to 1st April 2022, the farmer-to-farmer (F2F) collaborative activity with Fish for Livelihoods assigned Mr. Tyler Magnuson, the US Volunteer to deliver three days of virtual training on the vegetable nursery and seed production to F4L Field Coordinators and IPs (BRAC, KMSS, MFF, and PACT) staff via Zoom, and a total of 39 (18 women) people attended. The participants learned and enhanced their knowledge of soil and soil health, organic matters, pond sediments and compost making using sediments, vegetable cultivation on pond dykes, seed production, and asexual plant propagation. They well understood the importance of the carbon-nitrogen ratio in compost,

CEC, and soil cover crops to protect and refill the soil nutrient, types of vegetable cultivation, seed production and proper storage methods, air layering for plant propagation, and living things staying in the soil. The figure shows delivering virtual training on the vegetable nursery and seed production via zoom.

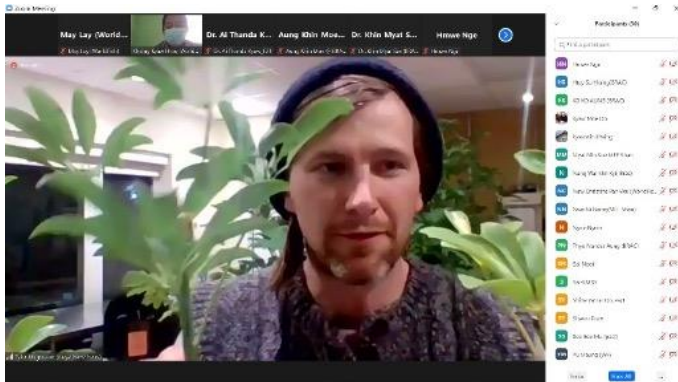


Figure 21: Virtual training on vegetable nursery and seed production via zoom

From 4th to 8th April 2022, Dr. Jean Schwaller, the US Volunteer, hired by the farmer-to-farmer (F2F) collaborative activity with Fish for Livelihoods conducted five days of virtual training on cluster fish farming (Market Strategy Planning). The training was a Training of Trainer (ToT) based training delivered to F4L Field Coordinators and IPs (BRAC, KMSS, MFF, and PACT) staff via Zoom. A total of 41 (20 women) people attended. In this training, the participants learned mainly about marketing and the importance of “market strategy planning” when the product is marketed to the marketplace.

From 25th to 27th April 2022, the farmer-to-farmer (F2F) collaborative activity with Fish for Livelihoods assigned Kellen Parrish, the US Volunteer to deliver three days of virtual training on community fish farming and production to WorldFish Field Coordinators and its IPs (BRAC, KMSS, MFF, and PACT) staff via Zoom, and a total of 37 (18 women) people attended. From the training, all participants learned and enhanced their knowledge of the risks of aquaculture in earthen ponds, which involved live animals living underwater, unpredictable sunlight, warm climate, and financial risk. In addition, the course was focused primarily on pond fertilization for semi-intensive integrated aquaculture and profitable and sustainable fish production in Myanmar.

From 2nd to 11th May 2022, the farmer-to-farmer (F2F) collaborative activity with Fish for Livelihoods assigned Ms. Neelam Dhinsa Canto-Lugo, the US Volunteer from California to deliver eight days of virtual training on module development and teaching guide training on business planning and record keeping to F4L Field Coordinators and IPs (BRAC, KMSS, MFF, and PACT) staff via Zoom. A total of 36 (17 women) people attended. The participants learned and enhanced their knowledge of the type of records, effective business practices, keeping and analysis of financial records, accessing record requirements, and calculating profit and loss for business from the training.

From 13th to 20th May 2022, the F4L trainer team delivered in-person training on Small-Scale Aquaculture (SSA) for improved human nutrition training of trainers (ToT) the first batch in Nyaung Shwe. Dr. Saw Eden, Nutrition Program Adviser from LEARN, was invited by the F4L *Activity* to deliver a nutrition and facilitation course. A total of 20 (11 women) staff from BRAC, KMSS Kengtung, MFF Shan, and PACT attended the training. Again, the second batch of the ToT training was conducted from 17th to 25th June in Kengtung Township, and the rest of the 27 (13 women) staff from IPs (MFF Kachin, BRAC, KMSS Pekhon, and PACT) who could not join in Nyaung Shwe attended. In Kengtung, with the USAID Project Management Assistant, the WorldFish F4L team and IPs staff conducted field visits and practical learning on the improved technical application of the demonstration pond, nursery pond, and hatchery supported by the F4L *Activity*. The figure shows ToT training at Kengtung Township.



Figure 22: ToT training on SSA for improved human nutrition in Kengtung

In May 2022, with the collaboration of one of the F4L *Activity* hatcheries, U Hla Kyaw Hatchery, F4L Field Coordinator from Southern Shan provided in-person training on hatchery operations on Carp species to staff from KMSS Kengtung, and a total of 5 (2 women) people attended. The participants learned about the well-designed hatchery, reliable good quality water, quality broodstock (parent fish), ponds, and hapas for spawning and effective management control from Ko Nyi Lin, U Hla Kyaw Hatchery Manager.

On July 1, 2022, the F4L M&E team organized and conducted virtual training on Environmental Mitigation and Monitoring Plan (EMMP) for F4L Field Coordinators and its IPs (BRAC, KMSS, MFF, and PACT) staff via the MS Teams. A total of 59 (28 women) people attended the training.

In August 2022, with the key implementing staff of the F4L team, hatchery and nursery owners attended the Tilapia Mass Production and Sex Reversal Technique (SRT) training in Nam Sai Farm, Thailand (Figure 23). A total of 13 (3 women) participants from 7 (2 women) WorldFish staff and 6 (1 woman) F4L key farmers attended the training to replicate the technique in Myanmar and to promote the national and international market linkages on GIFT Tilapia production.



Figure 23: Tilapia Mass Production and Sex Reversal Technique (SRT) training in Nam Sai Farms

Table 31: Number of WorldFish and Implementation Partners staff who received training

Training topic	From	To	# of men trained	# of women trained	Total # Trained
Nutrition awareness-raising activity at IDP camp	Nov 2021		2	-	2
Monitoring and Evaluation (M&E) and data tools package training	Dec 2021		25	22	47
the USG and USAID Rules and Regulations sharing session	Dec 2021		4	7	11
SSA Technology, Nutrition and WASH key messages training	Jan 2022		4	3	7
Kobo platform on monthly fish price, and Flood and Drought training	Jan 2022		26	16	42
Common Carp induced breeding training	Jan 2022		3	2	5
Business Planning for small scale integrated aquaculture farmers training (F2F and F4L joint activity)	Jan 2022		18	17	35
Fresh fish vendor survey training	Feb 2022		8	14	22
Shwe Ngar (Golden Fish) mobile application using training	Feb 2022		25	21	46
Record keeping training (F2F and F4L joint activity)	Feb 2022		16	18	34
Htwet Toe mobile application using training	Feb 2022		20	16	36
Review and usage of CBA format for demonstration farmers training	Feb 2022	Mar 2022	26	23	49
Carp nursery management training	Feb 2022		2	3	5
Collaborating, Learning and Adapting (CLA) workshop	Feb 2022		16	13	29
Risk Management of Integrated Aquaculture training (F2F and F4L joint activity)	Feb 2022		21	21	42
WASH survey questionnaire	Mar 2022		16	13	29

Training topic	From Date	To Date	# of men trained	# of women trained	Total # Trained
Vegetable nursery and seed production (F2F and F4L joint activity)	Mar 2022		21	18	39
Cluster fish farming (Market Strategy Planning) (F2F and F4L joint activity)	Apr 2022		21	20	41
Community fish farming and production training (F2F and F4L joint activity)	Apr 2022		19	18	37
Module development and teaching guide training on business planning and record keeping training (F2F and F4L joint activity)	May 2022		19	17	36
SSA for improved human nutrition training of trainer (ToT)	May 2022	Jun 2022	23	24	47
Hatchery operation training	May 2022		3	2	5
Feed miller management training	May 2022	Jun 2022	3	7	10
Environmental Mitigation and Monitoring Plan (EMMP) Training	Jul 2022		31	28	59
Nutrition Promotion Month Event	Aug 2022		16	7	23
Lessons Learned and Market System Workshop	Aug 2022	Sep 2022	26	16	42
Tilapia Mass Production and Sex Reversal Technique (SRT) training in Nam Sai Farm, Thailand	Aug 2022		5	2	7
CLA and MEL workshop Year 4	Sep 2022		23	14	37
Linkage Workshop & Meeting Peer learning	Sep 2022		-	5	5
Total			442	387	829

Participatory Community Appraisal (PCA) workshop

From November 2021 to September 2022, IPs (BRAC, KMSS, MFF, and PACT) staff conducted one day of face-to-face and virtual meetings via conference call on Participatory Community Appraisal (PCA) workshop to the selected new villages in several batches. A total of 559 (233 women) people from five Stages and Regions participated actively to explore key findings on PCA tools. Figure 24 shows a PCA gathering in Pindaya Township.



Figure 24: PCA in the Pindaya Township

In February 2022, with the support of F4L Coordinator in Eastern Shan State, KMSS Kengtung conducted a one-day face-to-face project orientation on the Fish for Livelihoods *Activity* session to new farmers in several batches. A total of 68 (13 women) people from Kengtung Township attended.

From November 2021 to June 2022, with the support of IPs (MFF) staff, F4L Field Coordinators conducted Nutrition awareness to IDP in Waingmaw Township and fisher folk and their family member in Nyaung Shwe and Pindaya Townships. A total of 146 (59 women) people attended actively.

Training on Small-Scale Aquaculture (SSA) modules 1, 2 and 3

From December 2021 to September 2022, with the support of F4L Field Coordinators, IPs (BRAC, KMSS, and MFF) staff, and one of the trained CBOs/CSOs, Shwe Inn Thu staff delivered training on SSA and improved human nutrition for three days. The training was conducted to project participants in several batches and the course is separated into three modules.



Figure 25: Delivering SSA module training at Shwebo

A total of 904 (392 women) people attended module 1 on pre-stocking management pond preparation and stocking management, 998 (424 women) people attended module 2 on post-stocking management and human nutrition part 1, and 860 (378 women) people attended module 3 on post-stocking management and human nutrition part-2. Figure 25 shows one of the SSA modules training in Shwebo Township.

In addition, IPs (BRAC, KMSS, and MFF) staff delivered one day of SSA modules refresher training to the F4L participant in Year 1 and Year 2. A total of 570 (232 women) people from Shan and Kachin States, and Sagaing Region attended in several batches.

Key Messages on SSA, Nutrition, and WASH

In Magway Region, the political situation happening in and around the F4L *Activity* area is serious. Luckily, the IPs staff from PACT Myanmar can continuously conduct the field implementation via remote and virtual contact with the Aquaculture Promoted in the villages. Hence, most of the training was conducted via mobile conference calls.

From March to September 2022, PACT Myanmar staff conducted virtual training on key messages on SSA, Nutrition, and WASH via mobile conference call to farmers in Magway Region. A total of 139 (13 women) people attended key messages on pre-stocking and fish stocking management, a total of

252 (31 women) people attended key messages on post-stocking and harvesting management, a total of 252 (31 women) people attended key messages on nutrition and WASH, a total of 371 (72 women) people attended key message on SSA and a total of 52 (5 women) people attended key message on SSA, nutrition and WASH in several batches.

In September 2022, KMSS Pekhon staff conducted one-day in-person training on key messages on nutrition and WASH separately in Pinlaung and Pekhon Townships. A total of 102 (38 women) people attended.

Farmer Record keeping training

From March to September 2022, IPs (BRAC, MFF Shan, and PACT) staff conducted training on farmer record keeping training to year 3 farmers in Southern Shan State and Magway Region. A total of 395 (95 women) participants attended. The SSA farmers learned how to make proper record keeping for their fishpond expenses from pond preparation to harvesting for each cycle of fish stocking.

From July to September 2022, PACT staff conducted in-person training on pond monitoring and reporting to Aquaculture Promoters (APs). A Total of 19 APs from Ngape, Myothit, and Salin Townships attended the training.

Two mobile applications training on Shwe Ngar (Golden Fish) and Htwet Toe

From December 2021 to July 2022, IPs (BRAC and MFF) staff delivered one day of face-to-face training on Shwe Ngar (Golden Fish) mobile application (app) to the F4L participants on how to download, install, register, and use the mobile app. A total of 148 (47 women) people from Southern Shan and Kachin States attended.

In May and July 2022, MFF Kachin staff delivered one day of in-person training on Htwet Toe mobile application (app) to the F4L farmers. A total of 95 (33 women) participants from Bhamo, Waingmaw, and Myitkyina Townships attended. From the mobile app, SSA farmers can benefit the aid of aquaculture related knowledge, news, article, and fish market price, and the farmer can also get the assistance from help desk which is incorporated into the Shwe Ngar (Golden Fish) mobile app for querying app using issues, and fish farming question and answer.

Training on Good Post-Harvest Practices and Good Fish Processing Practices

From January to June 2022, with the support of F4L Field Coordinators and the coaching of consultant Thura Kyaw, IPs (BRAC, KMSS Kengtung, MFF Shan, and PACT) staff conducted in-person training on good post-harvest practices for fresh fish trading to fresh fish vendors and good fish processing practices training to fish processors in Pindaya, Nyaung Shwe, Taunggyi, Kengtung and Salin Townships.

The participants enhanced their knowledge of improving the quality of fish to help them improve their income from sales and enhance their ability to provide safe and fresh fish to consumers. A total of 102 (69 women) participants attended the good post-harvest practices for fresh fish trading training and a total of 32 (27 women) participants attended the good fish processing practices training.

In September 2022, PACT staff conducted one day of virtual training on post-harvest management via mobile conference call in several batches. A total of 129 (8 women) participants from the Magway Region attended the training. The participants received information on how to manage food safe and fresh fish for consumers.

From July to September 2022, BRAC staff from Shwebo Township conducted one day of in-person training on making dried small fish powder. A total of 20 women participants attended actively. The

participants received on how to produce dried small fish powder at home for consumption and business.

On August 4, 2022, KMSS Pekhon staff conducted one day of face-to-face training on microfinance. A total of 15 (1 woman) participants from Pekhon Township attended.

From October 2021 to August 2022, with the support of IPs (PACT, BRAC, and MFF) staff, F4L Field Coordinators delivered one day of Carp nursery pond management training to nursery farmers in Southern Shan State and Magway Region. A total of 11 (2 women) participants and 5 (3 women) staff from IPs (BRAC and MFF) attended the training course on how to prepare nursery ponds for stocking, promoting both nursing in nursery ponds and nursing fish in cloth net hapas before releasing them into grow-out ponds.

On January 21, 2022, the F4L Field Coordinator, Eastern Shan State conducted one day of in-person training on Common Carp induced breeding at a nursery, demonstration, aquaculture promoter, and SSA farmers from Kengtung Township at Nam Khun Hatchery. A total of 32 (4 women) participants and 5 (2 women) KMSS Kengtung staff attended the training. Figure 26 shows the delivery of Common Carp-induced breeding training at Kengtung.



Figure 26: Delivering Common Carp induced breeding training at Kengtung

Feed Mill management training

In May and July 2022, the F4L Field Coordinators conducted in-person training on Feed Mill Management. A total of 19 (4 women) feed millers from Shan State and Sagaing Region and 10 (7 women) staff from MFF Shan and KMSS Kengtung attended. The participants learned how to select a good quality feed, which is available locally, different feeding methods, and how to operate a feed miller. The F4L *Activity* supported the feed miller and produced the supplementary feeding of good quality pellet feed. Figure 27 shows the delivery of feed mill management training in Tarlay Township.



Figure 27: Feed Mill management training in Tarlay Township

From August to September 2022, with the support of IP (BRAC, KMSS, and MFF) staff, the WorldFish Myanmar staff conducted lessons learned and market system workshops for the F4L participants from Year 1 to Year 3 (Figure 28). A total of 111 (30 women) participants from Kachin and Shan States attended. The workshop resulted in evidence from the field on what are the key challenges in terms of production, nutrition, training extensions, and related aspects that can be addressed with F4L intervention in the forthcoming years.



Figure 28: Lessons Learned workshop at Mongphyak and Nyaungshwe Townships

Strengthening capacities of CBOs and CSOs

F4L contracted a consortium of three partners (Fresh Studio Myanmar, MDF Asia Myanmar, and Sympathy Hands) to strengthen the capacities of 10 CBOs and CSOs (PHECAD, DFSS, Mawk Kon Local Development Organization, Hnalone Hla Inn Maung Mae, Alinn Bhamo, Shan Women Development Network, Dai Fai Social Service, Yawng Sin, Shwe Kanbawza and Shwe Inn Thu) in the five F4L *Activity* areas. The participants from 10 CBOs and CSOs enhanced their knowledge of aquaculture, organizational development, and microfinance-related capacity building. From February to June 2022, nine training sessions were conducted and a total of 418 (246 women) people attended in several batches.

Table 32: Number of men and women participants who received training/event/workshop

Training topic	From	To	# of men trained	# of women trained	Total # Trained
Carp nursery management training	Oct 2021		9	2	11
Participatory Community Appraisal (PCA)	Nov 2021	Sep 2022	326	233	559
Nutrition awareness	Nov 2021	Jun 2022	87	59	146
Shwe Ngar app using training	Dec 2021	Jul 2022	101	47	148
SSA modules refresh training	Dec 2021	Sep 2022	338	232	570
SSA moduel-1 training	Dec 2021	Jul 2022	512	392	904
SSA moduel-2 training	Jan 2022	Jul 2022	574	424	998
SSA moduel-3 training	Jan 2022	Sep 2022	482	378	860
Common Carp induced breeding training	Jan 2022		28	4	32
Good post-harvest practices training	Jan 2022	Jun 2022	33	69	102
Project orientation on the Fish for Livelihoods <i>Activity</i>	Feb 2022		55	13	68
Consent for fish integrated food production system workshop	Mar 2022		13	4	17
Good fish processing practices training	Mar 2022	Jun 2022	5	27	32
Farmer record keeping training	Mar 2022	Sep 2022	300	95	395
Key messages on SSA	Mar 2022		299	72	371
Key messages on pre-stocking and fish stocking management	Apr 2022	Aug 2022	126	13	139

Training topic	From	To	# of men trained	# of women trained	Total # Trained
Key messages on post-stocking and harvesting management	Apr 2022	Aug 2022	221	31	252
Key messages on SSA, Nutrition and WASH	Apr 2022	May 2022	47	5	52
Key messages on nutrition and WASH	May 2022	Sep 2022	285	69	354
Feed Miller management training	May 2022	Jul 2022	15	4	19
Htwet Toe app using training	May 2022	Jul 2022	62	33	95
Dried small fish powder training	Jul 2022	Sep 2022	-	20	20
Pond monitoring and reporting training for APs	Jul 2022	Sep 2022	19	-	19
Micro Finance training	Aug 2022		14	1	15
Nutrition promotion month event	Aug 2022		266	421	687
Lessons learned and market system workshop	Aug 2022	Sep 2022	81	30	111
Tilapia Mass Production and Sex Reversal Technique (SRT) training in Nam Sai Farm, Thailand	Aug 2022		5	1	6
Post-harvest management training	Sep 2022		121	8	129
Fish cold supply chain FGD meeting	Sep 2022		9	18	27
Exposure Trip	Sep 2022		22	9	31
Linkage Workshop & Meeting Peer learning	Sep 2022		25	20	45
Total			4,480	2,734	7,214

Activity Expenditure vs Budget: Year 3, 2022 (all figures in USD)

(In this section, please provide all the details of F4L budget in a tabular form)

	Budget Line Items	Approved Budget	Prior Period Cumulative Expenditure	Current Period Expenditure	Cumulative To Date Expenditures	Budget Balance	% spent as end of September 2022
			15 Sep 2021 - 30 June 2022	1 July 2022 to 30 September 2022			
			a	b			
I	Personnel (Salary and Benefits)	2,674,413.00	618,609.87	198,089.73	816,699.60	1,857,713.40	31%
II	Travel and Transportations	205,250.00	24,545.29	27,320.82	51,866.11	153,383.89	25%
III	Supplies	264,405.00	42,459.47	19,542.07	62,001.54	202,403.46	23%
IV	Contractual/Sub-grants	2,660,000.00	489,825.69	409,931.83	899,757.52	1,760,242.48	34%
V	Others	840,000.00	272,369.20	181,112.24	453,481.44	386,518.56	54%
	TOTAL DIRECT COSTS	6,644,068.00	1,447,809.52	835,996.69	2,283,806.21	4,360,261.79	34%
VI	TOTAL INDIRECT COSTS	1,355,932.00	295,471.33	170,611.57	466,082.90	889,849.10	34%
	GRAND TOTAL	8,000,000.00	1,743,280.85	1,006,608.26	2,749,889.11	5,250,110.89	34%

In USD

Obligated Amount in Year 3	Cumulative Disbursement as of 30th September 2022	Expenditure from 1st September 2022	Balance end of September 2022	% spent as end of September 2022
a	b	c	d=a-b-c	e=((b+c)/a)
3,000,000	2,283,304	466,585	250,111	92%

F4L WorldFish Staff List

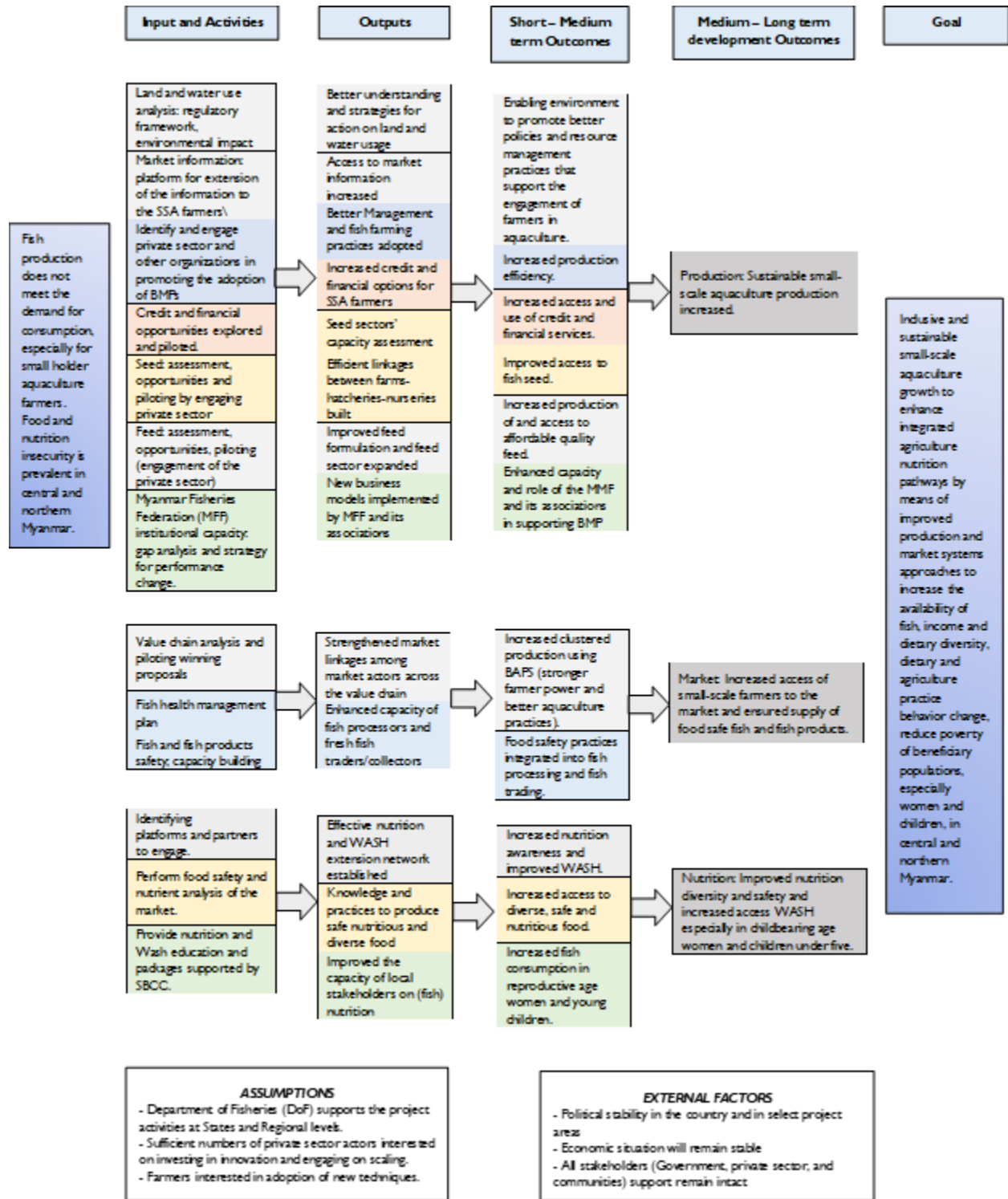
Name of Staff	Title	Duty Station	Status	Remarks
Michael J. Akester	Chief of Party	Yangon	Active	
Aung Zaw Win (Aubrey)	Deputy Chief of Party	Mandalay	Active	
Kyaw Moe Oo	Field Coordinator	Northern Shan State	Active	
Yu Maung	Field Coordinator	Kachin	Active	
Kyaw Win Khaing	Field Coordinator	Mandalay	Active	
Aung Myo Lwin	Field Coordinator	Sagaing	Active	
Sai Noot	Field Coordinator	Eastern Shan State	Active	
Quennie Vi Rizaldo	Human Nutrition Specialist	Yangon	Active	
Syed Aman Ali	Monitoring, Evaluation and Learning Specialist	Yangon	Active	
Hsu Myat Nway	Monitoring & Evaluation Coordinator	Yangon	Active	
Naw Christine Pan Wai	Monitoring & Evaluation Coordinator	Yangon	Active	
Su Su Mon	Field & Data Associate	Northern Shan State	Active	
Kay Khaing Soe	Administrative Assistant	Mandalay	Active	
Nay Zar Tun	Finance Officer	Mandalay	Active	
Lae Lae Kyaw	Finance Officer	Yangon	Active	
Thandar Soe	Senior Project Accountant	Yangon	Active	
May Thu Oo	Financial Controller	Yangon	Active	
New New Kyu	Cleaner	Mandalay	Active	
Than Than Win	Cleaner	Yangon	Active	
Aung Myat Thu	Market System Specialist	Yangon	Active	
Tin Tin Oo	Gender & Inclusion Specialist	Yangon	Active	
Hnin Wyut Hmone Soe	Information, Education, Communication & Training Assistant	Mandalay	Active	
Nang Tin May Win	Information, Education, Communication & Training Coordinator	Mandalay	Active	
Than Than Swe	Project Support Officer	Yangon	Active	
Htet Htet Khaing	Data Management Specialist	Yangon	Active	Will join on 1 Nov 2022

F4L Theory of change

Small-scale Aquaculture Investments for Livelihoods on Myanmar “Theory of Change” statement is;

“IF Small-Scale Aquaculture (SSA) farmers capacity developed on improved aquaculture management practices and they adopted Better Management Practices (BMPs) and market systems functions well, THEN this will improve production, income, and nutrition for rural poor, especially for women and children, in central and northern Myanmar”

F4L Logic Model



Logos of Lead and sub-guarantees



Details of Annexes:

[Annex 1 F4L Y3 Summary Participants Lsit.xlsx](#)

[Annex 2 F4L Year3 Nursery Database.xlsx](#)

[Annex 3 F4L Y3 Feed Maker Database.xlsx](#)

[Annex 4 F4L Y3 Hatchery Database Final.xlsx](#)

[Annex 5 Potential Farmers Database \(Non participants\).xlsx](#)

[Annex 6 Best Management Practices Survey for Year 2 Farmers Y3.xlsx](#)

[Annex 7 Combined Group Revolving Fund Database.xlsx](#)

[Annex 8 Combined Individual Revolving Fund Record book.xlsx](#)

[Annex 9 F4L participant format training database Y3.xlsx](#)

[Annex 10 Combined Participant who registered Shwe Ngar.xlsx](#)

[Annex 11 Progress Report\(APR\) IWMI Yr3.pdf](#)

[Annex 12 Nam Sai Farms training in Thailand report.pdf](#)

[Annex 13 F4L Activity Staff List \(WorldFish and IPs\).xlsx](#)

[Annex 14 F4L Summary Participant.xlsx](#)

[Annex 15 Fish for Livelihoods IEC documentation list Y3.pdf](#)

[Annex 16 a Village Link \(Htwet Toe App\) Report Y3.pdf](#)

[Annex 16 b Htwet Toe Report Y3 Q4.pdf](#)

[Annex 17 Photo Stories.docx](#)

[Annex 18 F4L Year3 Report Combined CBA.xlsx](#)

[Annex 19 Fish for Livelihoods IEC materials distributed to IPs Y3.pdf](#)

[Annex 20 Monthly Progress Reports \(MPR\) Oct'2021 to Sep'2022.xlsx](#)

[Annex 21 Production Database.xlsx](#)

[Annex 22 F4L WASH, Vegetables, etc. Record.xlsx](#)

[*Annex 23 Business Plan Training Report.pdf*](#)

[*Annex 24 Record Keeping Training Report.pdf*](#)

[*Annex 25 Risk Management Training Report.pdf*](#)

[*Annex 26 Vegetable Nursery and Seed Production Training Report.pdf*](#)

[*Annex 27 Cluster Fish Farming Production Training Report.pdf*](#)

[*Annex 28 Community Fish Farming Production Training Report.pdf*](#)

[*Annex 29 Module development Specialist Training Report.pdf*](#)

[*Annex 30 Final Completion Report for CSO CBO Capacity Building WF.pdf*](#)