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DEUTSCHE ZUSAMMENARBEIT

INLAND MYSAP

MYSAP
Myanmar Sustainable Aquaculture Programme
မြန်မာရေသတ္တဝါမွေးမြူရေးကဏ္ဍရေရှည် ဖွံ့ဖြိုးတိုးတက်ရေးစီမံကိန်း

Baseline Report

DEPARTMENT OF FISHERIES MYANMAR

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

WorldFish

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CAPI	Computer-assisted personal interviewing
DoF	Department of Fisheries
FAO	Food and Agriculture Organisation
GIFT	Genetically Improved Farm Tilapia
KII	Key Informant Interviews
LUC	Land Use Certificate
MDD-W	Mean Dietary Diversity for Women
SIS	Small Indigenous Species

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

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

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

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

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

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

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

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

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

Baseline Report 2018

1. Executive Summary

The report is concerned with the baseline study conducted by Mekong Economics for the project INLAND MYSAP titled 'Improving the production, nutrition, and market values of small-scale aquaculture in Myanmar's Shan State, Mandalay Region, and Sagaing Region'. The survey was executed in order to understand the current levels of aquaculture production of project beneficiaries, the level of access to important aquaculture inputs, and the population's dietary diversity.

The EU funded action 'Myanmar Sustainable Aquaculture Programme (MYSAP)' (DCI-ASIE/2015/038-078) is co-financed by the German Ministry of Economic Cooperation and Development (BMZ) and implemented through a Technical Cooperation (TC) agreement between the EU and GIZ Myanmar Country Office.

WorldFish is implementing the project INLAND MYSAP under a GIZ grant agreement as a component of MYSAP. The Department of Fisheries (DoF) R&D Division and the Shan State, the Sagain Region, and Mandalay Region DoF departments and the State and Regional Governments are the collaborating government institutions. INLAND MYSAP is contributing the MYSAP Output D, which will improve the availability and access to affordable, environmentally sustainable produced freshwater aquaculture products for disadvantaged people in Shan State, Sagaing Region, and Mandalay Region.

The development goal of INLAND MYSAP is to increase the availability and access of fresh water aquaculture products sustainably produced by small scale aquaculture producers, and to provide nutrition, affordable food and incomes for the poor and vulnerable in the project townships. Small-scale aquaculture producers (and micro-operators) are defined as those with access to a pond of under 2000m^2 (0.5 acres). The producers may be a holder of a land use certificate (LUC) or landless and renting a pond to farm fish.

INLAND MYSAP is being conducted in 5 townships: namely Kalay (ကလေး) and Shwebo (ရွှေဘို), Sagaing Region (စစ်ကိုင်း), Kyaing Tong (ကျိုင်းတုံ) and Pinlaung (ပင်လောင်း), Shan State (ရှမ်း) and Amarapura (အမရပူရ), Mandalay Region (မန္တလေး). The project aims to improve the livelihoods of 1,500 direct and 1,500 indirect beneficiaries through the following four objectives:

1. To increase the number, efficiency, resilience, and sustainability of small-scale freshwater aquaculture.
2. To improve the quality of seed available for small-scale freshwater aquaculture.
3. To increase the consumption of micronutrient-rich small fish especially by women and young children.
4. To strengthen the knowledge capacity of government, private sector, NGOs, and small-scale producers in inclusive, nutrient-rich, and gender sensitive sustainable freshwater aquaculture.

The baseline study was constructed over April to June 2018 and consisted of a mixed methodological approach. **Data was collected through three channels: (1) household survey, (2) market survey, and (3) qualitative semi-structured interviews with key stakeholders**. The household survey was distributed in township capital wards, rural villages, and producer hubs. The survey was aimed at both aquaculture producers, and those with no aquaculture involvement. **Data was collected from 847 respondents, of which 81 were aquaculture producers, some 9.6% of the total sample.**

The market survey was distributed in one main market and two smaller markets in each township capital in order to assess the baseline level of aquaculture sales volume in the region. The Key Informant Interviews (KII) concerned stakeholders such as the Department of Fisheries (DoF), private nurseries, and private hatcheries and fish traders, vendors and processors and specifically concerned the number of producers in the region and the supply and demand on improved fish seed. Data from the household survey was collected by a team of trained enumerators, whilst the latter two channels of data collection were obtained by two value chain and aquaculture experts. Results collected from the baseline household survey, market survey, and KIIs were used in order to assess the progress towards specific milestones, output indicators, and overall project impact of INLAND MYSAP.

Key findings from the baseline survey confirmed expected hypotheses, whilst others highlighted key areas of concern for project design and implementation:

- The location of aquaculture production ponds was **extremely localised and site specific with the availability of water** whether from rain-fed or irrigation sources being **a critical constraint**.
- Some project areas had **minimal or no existing aquaculture producers**. Whilst this was true at village and ward level for all 5 townships, it was also true for across the entire township for Amarapura and Pinlaung townships. This will have a significant impact on project design and the implementation of project activities in Amarapura and Pinlaung townships in particular.
- There was no record of any rice fields being converted to rice-fish production in any of the 5 townships.
- **There were significant input constraints** (fish feed, fish seed, etc.) that have been highlighted concerning the use of pelleted fish feed. Only 30% of producers currently were using pelleted feed, whilst even less were using pelleted feed year-round. Homemade substitutes are an alternative, but this will require technical project support to provide nutritious and beneficial pelleted feed suitable for aquaculture production.
- **The number of aquaculture producers who were integrating their fish systems with agriculture was minimal**, creating an important opportunity for producers to combine these processes. Of the 24% of producers that were, the most common practice was integrating ponds with pig pens.
- **There was no production of improved fish seed in the project townships**, whilst the demand was thought to be reasonably strong. Key informant interviews (KIIs) revealed that Amarapura had a supply of genetically improved carp fingerlings from Patheingyi Township, though the quantity was reported to be minimal and the quality will require verification.
- **Nearly 30% of producers used resources to prevent SIS from entering their ponds or to get rid of naturally occurring SIS from within their ponds**.
- The food scarcity of project regions was clearly reflected in the mean dietary diversity. **Respondents only achieved an average dietary diversity of 3.42 food groups over 24 hours, which was significantly under the recommended 5 or more food groups.**
- Gender disparity was prevalent in many producer activities. **Aquaculture decision-making and responsibilities were largely male-headed,** whilst females held responsibilities mainly in household nutrition and cooking.
- **Thirty six percent of respondents not currently involved in aquaculture said they would be willing to take up the practice** if there was adequate support from an experienced organisation. This presents an important opportunity for the project to assist rural households to move away from the informal sector.

The study found some limitations whilst assessing key baseline indicators regarding the willingness of respondents to disclose required information, and the capacity of aquaculture producers to accurately report production data. Respondent hesitation surrounding the collection of total household income data concerned the lack of prior knowledge and perceived relevance of the project, despite regional Department of Fisheries (DoF) offices and staff and village leaders being contacted before data collection began. Limitations concerning the capacity of producers to accurately report the level of production and sales reflects the need for financial and management capacity building activities to be included in project design.

The report consists of 6 further sections: (2) Introduction & Project Background, (3) Methodology and Survey Implementation, (4) Baseline Results, (5) Additional Comments & Key Findings, (6) Recommendations, and (7) Conclusions. The full table of baseline indicators, list of locations surveyed, and household questionnaire are Annexed to this report.

2. Introduction & Project Background

The Baseline Report highlights the findings from the household survey for INLAND MYSAP, constructed and implemented in April-June 2018 by Mekong Economics. The aim of the survey was to understand the current levels of aquaculture production of potential project beneficiaries, the level of access to important aquaculture production inputs, and the population's dietary diversity (especially of women and children under five). The survey collected this data from a total of 847 respondents, representing 3,000 direct and indirect beneficiaries over five townships: Kalay (ကလေး) and Shwebo (ရွှေဘို), Sagaing Region (စစ်ကိုင်း), Kyaing Tong (ကျိုင်းတုံ) and Pinlaung (ပင်လောင်း), Shan State (ရှမ်း) and Amarapura (အမရပူရ), Mandalay Region (မန္တလေး).

Further data was also collected from a market survey and key informant interviews (KIIs) with aquaculture stakeholders. The collection of this data is highly relevant due to the contextual importance of fish in the Myanmar population's diet, especially for poor households. Aquaculture development in these target areas is expected to provide an important contribution to current declining fish stocks in order to ensure the accessibility of adequate protein levels in diets.

The EU funded action 'Myanmar Sustainable Aquaculture Programme (MYSAP)' (DCI-ASIE/2015/038-078) is co-financed by the German Ministry of Economic Cooperation and Development (BMZ) and implemented through a Technical Cooperation (TC) agreement between the EU and GIZ Myanmar Country Office.

MYSAP will contribute to poverty reduction and improved food security and nutrition in selected areas of Myanmar. The main objective of MYSAP is to strengthen the sustainable management of aquaculture in Myanmar, which is addressed through six specific objectives, namely:

1. Establishing a conducive institutional and policy context for the inclusive and sustainable development of aquaculture.
2. Higher quality service provision in the aquaculture value chain including fish health and hygiene, curricula development, vocational training and organic certification.
3. Predictable, cost-effective availability of high quality inputs accessible to small-scale aquaculture farmers, promotion of natural, integrated farming systems and local hatcheries.
4. More efficient, resilient and sustainable coastal aquaculture value chains, including restoration of mangroves and promotion of smallholder shrimp polyculture systems.
5. Enhanced production and nutritional impact in fish deficient areas.
6. Creation of decent work opportunities for the most vulnerable, including women.

GIZ Myanmar will deliver MYSAP through four central fields of action: (A) strengthening of the institutional, strategic and legal framework; (B) promoting (vocational) education and training in aquaculture; (C) promoting brackish water aquaculture in the coastal zones (Ayeyarwady and Rakhine), particularly aiming on shrimp production; and (D) promoting sustainable inland freshwater aquaculture (Shan and Sagaing) focusing on carp species and tilapia production.

WorldFish is implementing the project INLAND MYSAP under a GIZ grant agreement as a component of MYSAP. The Department of Fisheries (DoF) R&D Division and the Shan State, the Sagaing Region and Mandalay Region DoF departments and the State and Regional Governments are the collaborating government institutions. INLAND MYSAP is contributing to MYSAP Output D, which will improve the availability and access to affordable, environmentally

sustainable produced freshwater aquaculture products for disadvantaged people in Shan State and Sagaing Region and Mandalay Region.

The development goal of INLAND MYSAP is to increase the availability and access of fresh water aquaculture products sustainably produced by small-scale aquaculture producers, and to provide nutritious, affordable food and incomes for the poor and vulnerable in the Shan State and Sagaing Region. Small-scale aquaculture producers (and micro-operators) are defined as those with access to a pond of under 2000 m^2 (0.5 acres). The producers may be a holder of a land use certificate (LUC) or landless and renting a pond to farm fish.

The project specifically focuses on vulnerable target groups such as financially poor people, ethnic minorities, landless persons, groups involved in conflict, and those affected by weak land tenure rights, among other things. The project overall aims to improve food security and dietary nutrition through the following four objectives:

1. To increase the number, efficiency, resilience, and sustainability of small-scale freshwater aquaculture
2. To improve the quality of seed available for small-scale freshwater aquaculture
3. To increase the consumption of micronutrient-rich small fish especially by women and young children
4. To strengthen the knowledge capacity of government, private sector, NGOs, and small-scale producers in inclusive, nutrient-rich, and gender sensitive sustainable freshwater aquaculture

The project has a number of cross cutting issues displayed in the following diagram:

Figure 1. Cross Cutting Issues of INLAND MYSAP

The Baseline Report will contribute to establishing the 'before' picture of the INLAND MYSAP project. The report concentrates on answering baseline indicators specified by the project. Additionally, findings that contribute to the 'bigger picture' are also be highlighted in order to facilitate the flow of information between potential beneficiaries and project coordinators. The report consists of 5 further sections: Methodology and Survey Implementation, Baseline Results, Additional Comments & Key Findings, Recommendations, and Conclusion. The distribution of respondents, baseline indicator table, and household survey can be found in the Annex.

3. Methodology and Survey Implementation

The methodology for constructing the baseline indicators consisted of a mixed-methods technique, consisting of both quantitative and qualitative data collection techniques. Data was collected through the following three channels:

1. Household survey for potential direct and indirect beneficiaries
2. Market survey questionnaire
3. Qualitative semi-structured interviews through key informant interviews

Results collected from the baseline household survey, market survey, and KIIs were used in order to assess the progress towards specific milestones, output indicators, and overall project impact of INLAND MYSAP.

Household Survey

The vast majority of data used for the baseline indicators was collected through the household survey using computer assisted personal interview (CAPI) software. The minimum statistical requirement of respondents equalled 750 and was exceeded by 97 respondents. The survey was designed to be answered by both aquaculture producers, and those having no aquaculture involvement. A range of topics were included, such as household employment and income, aquaculture production inputs and techniques, dietary diversity, and level of nutrient-rich fish consumption.

The household survey was implemented in 5 townships: Amarapura, Kalay, Kyaing Tong, Pinlaung, and Shwebo. Respondents were distributed between three types of location in order to acquire a representative sample of project beneficiaries. The three sample groups consisted of (1) Township Capitals, (2) Producer Hubs, and (3) Rural Villages. Each group was further broken into four wards or villages.

Township capitals were predefined by the project implementation areas. Data was collected from four wards within each township. Wards were defined using MIMU statistics and were subsequently randomised in order to determine survey location.

The producer hubs were defined as areas that have above-average or near-certain involvement of aquaculture production. The locations of producer hubs were determined by input from the DoF staff in the 5 respective townships and WorldFish aquaculture specialists. Most townships had producer hubs apart from Pinlaung which reportedly has no small-scale aquaculture involvement. In this case, producer hubs were selected as areas with greater potential, according to Department of Fisheries staff, for aquaculture.

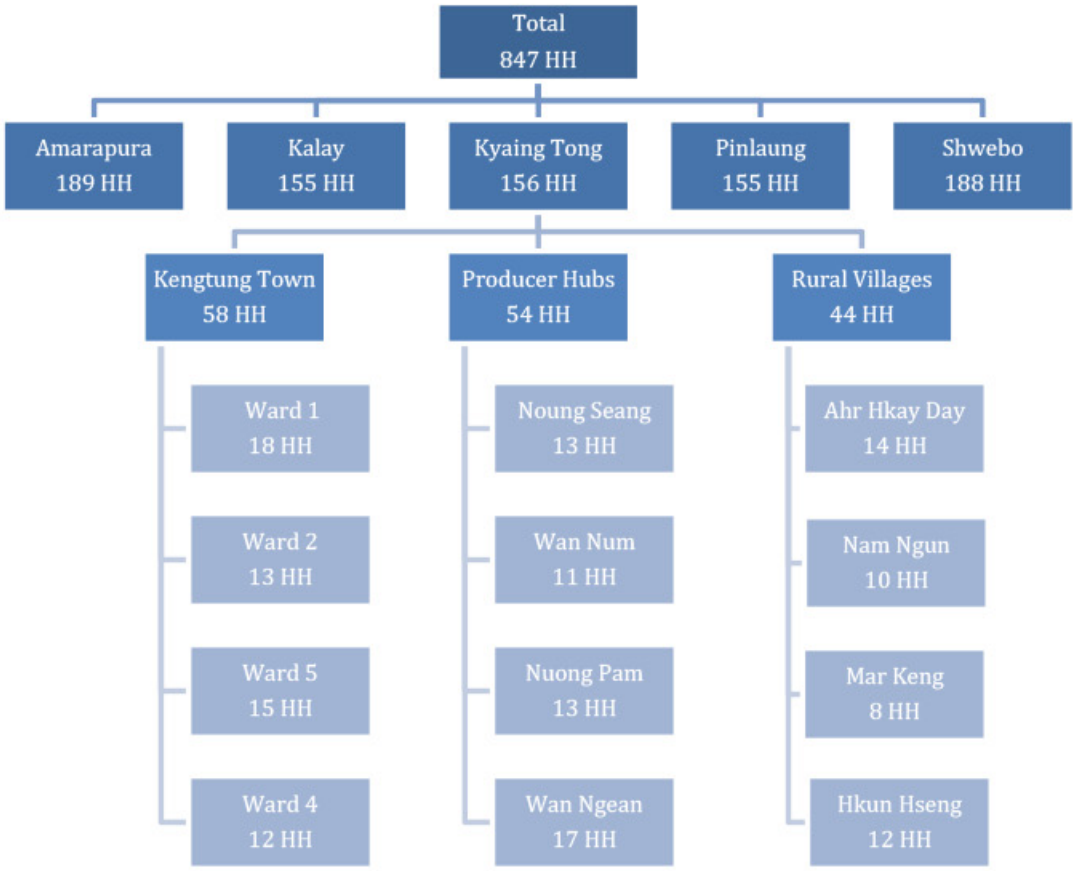
Lastly, rural villages were defined as any village within a village tract. Villages in this category were selected from MIMU statistics and subsequently randomised in order to select four rural villages per township. Some villages that were randomly selected were deemed inaccessible both prior to and during the data collection. These locations were identified as inaccessible by both national staff and national contacts in the townships. The villages that were omitted are presented in the following table:

Table 1. Villages replaced due to safety concerns

Township	Village Tract	Name (en)	Longitude	Latitude
Amarapura	Shwe Kyet Yet	Sein Kone	-	-
Kyaing Tong	Nawng Tawng	Pue Kway	99.4713897705078	21.0008602142334
Kyaing Tong	Mong Pat (Lower)	Nam Ping (Lower)	99.7254486083984	21.00456047
Kyaing Tong	Mong Pang	Pong Long	99.32411957	21.3335495

Villages that were omitted were subsequently randomly replaced in order for the number of villages and locations to be homogenous among the five townships. The final list of wards, hubs, and villages that were visited can be found in Annex II. The following figure diagrammatically demonstrates the spread of respondents, using Kyaing Tong as an example.

Figure 2. Methodology for Distributing Respondents in Kyaing Tong



In order for the to be representative involvement, village enquire as to the The proportion of reflected in the whilst also ensuring a within the region. aquaculture representing 9.6% of household survey of the level of aquaculture leaders were contacted in order to number of producers in the area. producers was subsequently sampling of individual households, geographical spread of respondents Subsequently, a total of 81 producers were surveyed, total respondents.

The survey was primarily piloted in the Mandalay region over two days, 9th and 10th of March 2018. Seven respondents of variable aquaculture involvement were surveyed. The level of income and geographical location of respondents also varied in order to cover a comprehensive mix of respondents. Changes made to the survey after this date were subsequently piloted during the enumerator training phase.

Five teams of enumerators were trained over a two- to three-day period in the relevant township locations. The enumerators were trained by experienced national Mekong Economics staff and tested frequently throughout the training process. Enumerators were found through local contacts and were assessed to be satisfactory to undertake data collection.

The collection of household data spanned over four weeks, from April 23rd to May 18th, requiring two weeks per township. The data was downloaded and analysed daily and any comments on data inconsistencies were directly fed

back to enumerators to ensure quality data collection was achieved. After this period, the household data was downloaded, cleaned, translated, and analysed.

Market Survey

A quantitative market survey was constructed and implemented in five townships in order to provide a reference point for the supply of aquaculture products. Three markets were selected in each township, one large and two small. The large markets were determined by project location and number of vendors. Two smaller markets were also chosen by location and vendors with suggestions from the relevant township DoF. The market survey was undertaken by experienced national aquaculture and value chain experts.

Qualitative interviews with hatcheries, nurseries, & Department of Fisheries

Qualitative interviews with aquaculture stakeholders were required in order to confirm a variety of baseline indicators covering the supply and demand of improved fish seed and total number of aquaculture producers. Questions to guide the semi-structured interviews were constructed by the baseline team with feedback provided by WorldFish staff. The qualitative interviews were undertaken by national aquaculture and value chain consultants. The DoF, hatcheries, nurseries, traders, and processors were the target respondents for interviews due to the expert knowledge and understanding of the regional aquaculture market. By ensuring qualitative data was collected from multiple sources, answers were cross checked with each other to triangulate, determine credibility and improve data reliability.

Quality Assurance and Research Ethics

Quality assurance and research ethics was of significant importance during the survey design and data collection phases. Enumerator training was carried out meticulously with multiple opportunities for enumerators to practise and pilot the survey. Enumerators were scrutinised and assessed and replaced when necessary in order to maximise the quality of data collection. The field work teams were in constant communication in order to ensure that the survey was implemented uniformly across the five townships. Using three management teams, led by experienced full time Mekong International national and international staff over five regions contributed to the heterogeneity of survey implementation across locations.

4. Baseline Results

This section presents the findings for INLAND MYSAP baseline indicators as well as highlighting trends and important findings relevant to the specific indicator. Other findings that are not directly related to specific indicators are presented in the following section: Additional Comments and Key Findings. Many indicator results have been extrapolated to reflect the total number of aquaculture producers over the five project townships, 1,289. The total number of aquaculture producers was derived from KIIs with the DoF, as well as Traders, Producers, Hatcheries, Nurseries, and Processors.

This section is divided into and addresses INLAND MYSAP Objectives 1-3:

1. Objective 1: To increase the number, efficiency, resilience, and sustainability of small-scale freshwater aquaculture
2. Objective 2: To improve the quality of seed available for small-scale freshwater aquaculture
3. Objective 3: To increase the consumption of micronutrient-rich small fish especially by women and young children

Objective 1: To increase the number, efficiency, resilience, and sustainability of small-scale freshwater aquaculture.

INLAND MYSAP ref.	EU/BMZ ref.		Indicator	Baseline	Milestone 2018	Milestone 2019	Target +2020
1.4.	1.4.2.		Increase in acreage of paddy land converted into paddy cum fish or freshwater ponds	692	706	726	761

Respondents reported that a total of 43.5 acres of paddy land had been converted into freshwater ponds to date, derived from 21 out of 67 freshwater ponds. This number was calculated only from freshwater ponds, as **there were no recorded paddy cum fish ponds in these townships**. The total of 43.5 acres of converted paddy land is subsequently representative of 81 aquaculture producers, equalling a 0.54 acre average per producer. Extrapolating this average to reflect the estimated 1,289 total producers in project townships, total acreage for the whole townships can be estimated at 692 acres. A worked example of the extrapolation technique can be found in Box 1.

Box 1: Extrapolation Example of Converted Paddy Land

No. of respondent aquaculture producers (question respondents): 81
No. of reported total aquaculture producers in project townships (from KIIs): 1289
Recorded acres of paddy land converted into freshwater ponds: 43.5

43.5 / 81= 0.54 = average converted paddy land per producer

0.54 x 1289 = 692 = total estimated converted paddy land over project township

This method of extrapolation can be assumed to be similar for other extrapolated indicators.
The total reported area for aquaculture production of respondents was 136 acres. Extrapolated across the whole township in regards to total estimated number of aquaculture producers equates to 2,346 acres.

INLAND MYSAP ref.	EU/BMZ ref.		Indicator	Baseline	Milestone 2018	Milestone 2019	Target +2020
1.6.	1.4.9.		Increased number of integrated agri-aquaculture ponds in target regions	313	313 + X%	313 + X%	313 +X%

The number of agri-aquaculture ponds in target regions totalled 17, 24.3% of question respondents. A total of 24.3% of aquaculture producers in all townships equates to an estimated 313 aquaculture producers using integrated agri-aquaculture ponds. The majority agri-aqua process employed was integration with pig pens, followed by integration with chicken pens, and vegetable crops (agriculture) grown on pond banks. One other agri-aquaculture system was reported, concerning the use of banana plant by-products (leaves and stems) in the fish system.

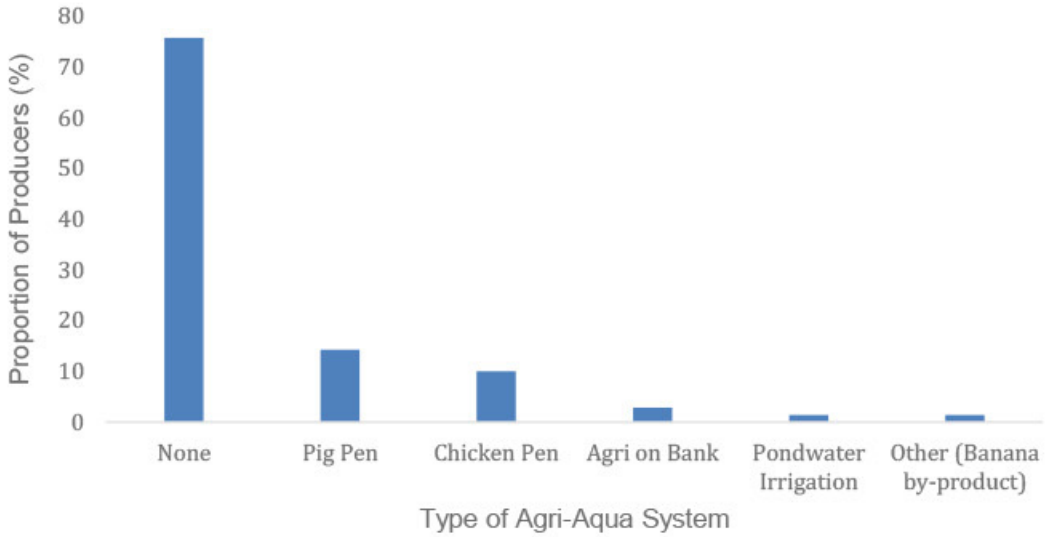


Figure 3. The Type of Agri-Aquaculture Systems Employed by Producers

Some 82.4% of aquaculture producers employing agri-aquaculture systems only implemented one type of system and the remaining 17.7% of aquaculture producers were using multiple agri-aquaculture systems. There was no significant difference in pond size between those practising single or multiple agri-aquaculture systems.

An Integrated Pig Pen Fish System in Kalay

INLAND MYSAP ref.	EU/BMZ ref.		Indicator	Baseline 2017	Milestone 2018	Milestone 2019	Target +2020
1.7.	1.5.1.1.		Increase in aquaculture production in selected fish-deficit areas	981	1,001	1,030	1,079

Each project township is defined as being a fish-deficit area. The total aquaculture production for respondents was recorded at 73,582 viss[1] over the five townships. This equates to an average annual production of 981 viss (1,599 kg) per producer. The average production of one aquaculture producer was used as the baseline indicator in order to reflect changes in production on an individual level. If this average is extrapolated for the total estimated number of aquaculture producers in all townships, the total annual aquaculture production equates to 1,264,625 viss (2,061 metric tons).

INLAND MYSAP ref.	EU/BMZ ref.		Indicator	Baseline 2017	Milestone 2018	Milestone 2019	Target +2020
1.8.	1.5.1.2.		Number of producers that report at least 10% increase in fish production and incomes	0	300	600	900

Whilst the baseline is zero for this project indicator, baseline data is needed. Increases by 10% in the level of fish production and income are subjective to each aquaculture producer. Nevertheless, understanding the current level of production and income will contribute to whether this indicator is achieved by the project end. As was presented in the previous indicator, the average level of fish production for producers was estimated to be 981 viss per year (1,599 kg). The average annual income reported by aquaculture questionnaire respondents was MMK 8,114,746[2]. This is equivalent to an annual income of USD 5,975. The average annual income for non-aquaculture respondents was reportedly lower, at MMK 6,294,738 (USD 4581). This solidifies the importance of encouraging the adoption of aquaculture.

INLAND MYSAP ref.	EU/BMZ ref.		Indicator	Baseline 2017	Milestone 2018	Milestone 2019	Target +2020
1.9.1.	I.D.1	I.D.1.1.	The number of micro-operators of production facilities of carp in target areas	923	923 + X%	923 + X%	923 +X%

The number of micro-operators of carp in the target area was 58 respondents, 71.6% of all aquaculture producers. Extrapolated, this equates to 923 aquaculture producers producing carp species over the five townships. Fifty-six per cent of carp producers stock and sell multiple species of carp. The following diagram shows the share of carp species stocked.

[1] A viss is 1.63 kg.

[2] Average annual household income for aquaculture producers was calculated by totalling reported annual income and dividing by the number of respondents. In this case, only 60 producers reported their exact level of income. A similar methodology was applied to calculating average annual household income for non-aquaculture respondents.

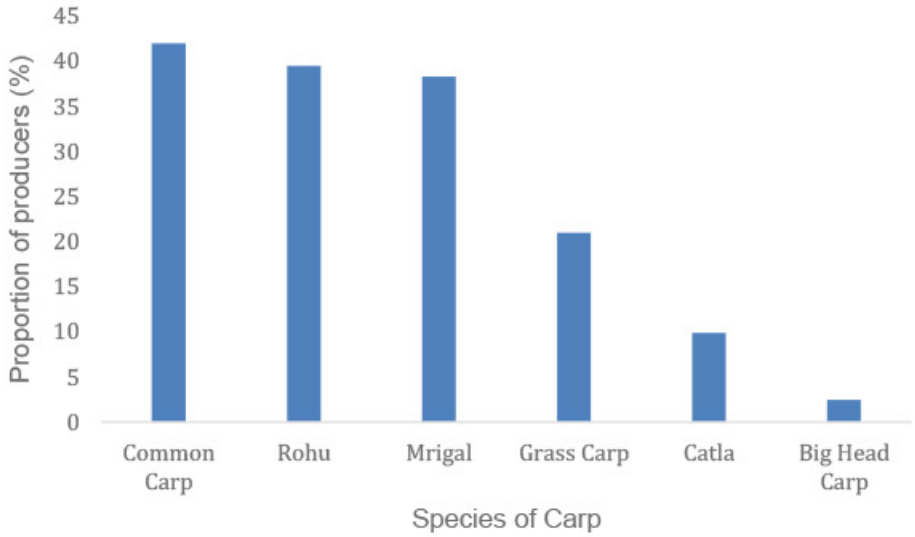


Figure 4. Share of Carp Species Produced in Target Areas

INLAND MYSAP ref.	EU/BMZ ref.	Indicator	Baseline 2017	Milestone 2018	Milestone 2019	Target +2020
1.9.2.	I.D.1.2.	The number of micro-operators of production facilities of tilapia in target areas	621	621 + X%	621+ X%	621 +X%

The number of respondents who produce tilapia across the five townships was 39 out of 81, or 48.2% of aquaculture producers. This equates to a total of 621 when extrapolated for total number of aquaculture producers. The vast majority of aquaculture producers raise mixed sex tilapia, with only one respondent reporting that they stocked both mixed tilapia, but also had a pond with all male tilapia.

INLAND MYSAP ref.	EU/BMZ ref.	Indicator	Baseline 2017	Milestone 2018	Milestone 2019	Target +2020
1.9.3.	I.D.1.3.	The number of micro-operators of production facilities of SIS in target areas	255	255 + X%	255 + X%	255 +X%

Sixteen out of 81 aquaculture producer respondents actively stock small indigenous species (SIS) species in their freshwater ponds, representing 19.8% of producers. Extrapolated, this equates to around 255 producers in the project townships. However, it is important to note that 75.3% of respondents recorded that SIS naturally occur in their systems. Nearly 30% of aquaculture producers, however, use techniques to prevent the entry or get rid of existing SIS in their fish systems. Only Six respondents reported actively stocking SIS. This is an important finding when understanding the current attitude towards investing into SIS production.

Objective 2: To Improve the Quality of Seed Available for Small-Scale Freshwater Aquaculture

INLAND MYSAP ref.	EU/BMZ ref.		Indicator	Baseline 2017	Milestone 2018	Milestone 2019	Target +2020
2.2.1.		1.3.4.1.	Number of improved carp fingerlings and fry produced	0	+ 5%	+ 10%	+15%

The number of improved carp seed (fry and fingerlings) produced in the townships was assumed to be zero. KIIs with private hatcheries, nurseries, and the DoF confirm this assumption. Whilst the production of improved seed (fry and fingerlings produced is zero, it has been confirmed that Amarapura has a supply of genetically improved rohu carp, produced outside the township. The DoF hatchery purchases genetically improved rohu carp fry from Patheingyi Township and subsequently sells to producers in Amarapura as fingerlings.

INLAND MYSAP ref.	EU/BMZ ref.		Indicator	Baseline 2017	Milestone 2018	Milestone 2019	Target +2020
2.2.2.		1.3.4.2.	Number of improved tilapia fingerlings and fry produced	0	+ 20%	+ 40%	+60%

The number of improved tilapia seed (fry and fingerlings) produced are assumed to be zero. KIIs with the townships DoF and private hatcheries both confirmed the assumption. One private nursery in Shwebo reported that they heard of GIFT tilapia being supplied within the township, but this remains unverified. They importantly noted that the demand is very high for this fish seed. It must be highlighted that many rumours of different supply sources have been disproved by interviews with the supplier. It can be assumed that the number of improved tilapia seed (fry and fingerlings) produced in the project areas is zero.

INLAND MYSAP ref.	EU/BMZ ref.		Indicator	Baseline 2017	Milestone 2018	Milestone 2019	Target +2020
2.2.3.		1.3.4.3.	Number of improved SIS fingerlings and fry produced	0	+ 20%	+ 40%	+ 60%

The number of improved SIS seed (fry and fingerlings) produced are assumed to be zero. All KIIs with the DoF, private hatcheries, and private nurseries confirmed this assumption. There were no reported improved SIS fish seed (fry and fingerlings) being reported in the project townships.

INLAND MYSAP ref.	EU/BMZ ref.		Indicator	Baseline 2017	Milestone 2018	Milestone 2019	Target +2020
2.3.1.	I.D.2	I.D.2.1.	The number of operators of freshwater aquaculture enterprises with access to (i.e. using) fish fry	652	652 + X%	652 + X%	652 + X%

Some 50.6% of aquaculture producer respondents stocked fish fry, equating to 652 total producers in the five townships. The vast majority of aquaculture producers were knowledgeable about which country their fish fry came from, reporting

Myanmar to be the most common supplier. The breakdown of country and type of supplier can be seen in the following figures.

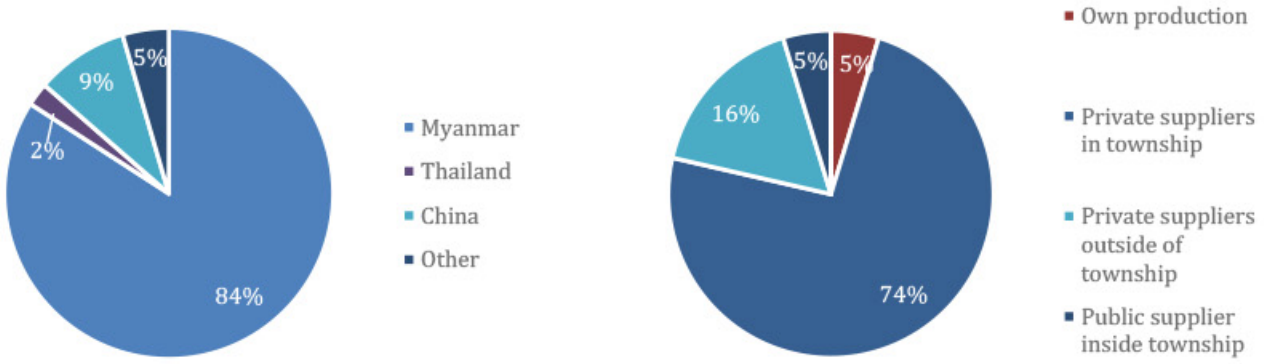
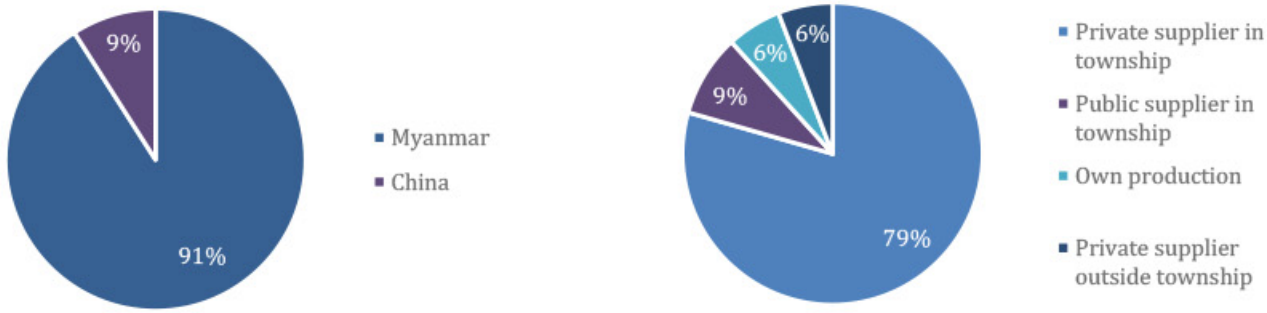


Figure 5 The Country of Origin and Distribution of Fish Fry Supply

INLAND MYSAP ref.	EU/BMZ ref.	Indicator	Baseline 2017	Milestone 2018	Milestone 2019	Target +2020
2.3.2.		The number of operators of freshwater aquaculture enterprises with access to (i.e. using) fish fingerlings	525	525 + X%	525 + X%	525 +X%

40.7% of aquaculture producer respondents stocked fish fingerlings in the past 12 months. Extrapolated, this totals 525 producers over the five townships. Only 4 producers reported using both fry and fingerlings. The spilt between the use of fry and fingerlings was fairly even, with fry slightly taking the majority. Similarly to what was seen for fish fry, the vast majority of fish fingerling were from Myanmar, specifically from private suppliers within the township. This is demonstrated in the following figures.



INLAND MYSAP ref.	EU/BMZ ref.	Indicator	Baseline 2017	Milestone 2018	Milestone 2019	Target +2020
2.3.3.		The number of operators of freshwater aquaculture enterprises with access to (i.e. using) pelleted feed	398	398 + X%	398 + X%	398 +X%

The number of operators of freshwater aquaculture enterprises with access to pelleted feed was 25 out of 81 aquaculture producer respondents, representing 30.9% of all producers. This equates to 398 aquaculture producers in all townships. Interestingly, the number of months that aquaculture producers use pelleted fish feed varied as shown in the following figure. Whilst around 30% of producers can access and use pelleted fish feed, only 15% of producers could access this input for over half a year, as demonstrated in Figure 8.

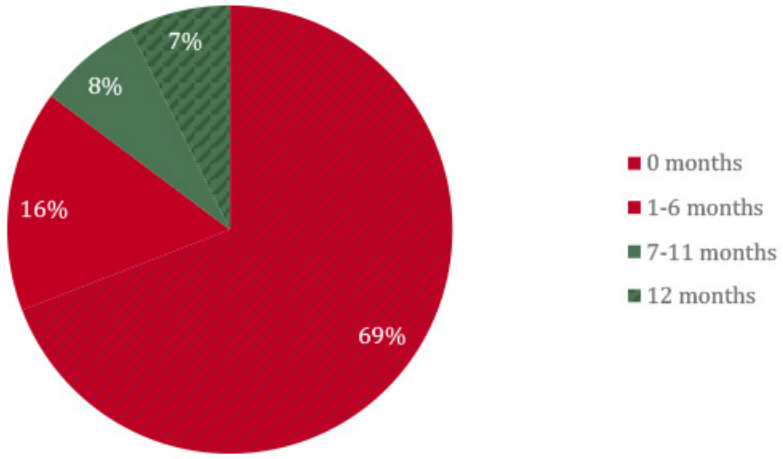


Figure 7 No. of Months That Aquaculture Producers Access Pelleted Fish Feed (Months by Aq. Producers)

In contrast to what is expected, regression analysis concluded that the relationship between the use of pelleted fish feed and income is significantly minimal.

Use of Pelleted Fish Feed = 1.79 +7.31E-08 (*Total Household Income*).

Whilst this regression is statistically significant [p-value=0.012], it compromises intuition that suspects the two variables have a relationship. The R-squared value for these two variables shows that the level of total household income only explains 10% of the consumption of pelleted fish feed. The relationship between total annual income from fish production and the number of months that pelleted fish feed is even less correlated. Whilst this could be due to other external factors determining the consumption of pelleted feed, for instance availability, location, or the ability to produce fish feed, these findings should also take two things into consideration: the limitations of the number of observations and the qualitative input of the importance of pelleted fish feed. Due to the small sample size, the accuracy of findings can be expected to be limited. However, respondents highlighted the importance of pelleted fish feed and the nutritional advantages that the food source gives to fish production. Therefore, it can be assumed that improving the availability and accessibility of pelleted fish feed will be met with corresponding demand and an increase in usage.

A fish farmer feeding his stock with homemade fish feed

Objective 3: To Increase the Consumption of Micronutrient-Rich Small Fish Especially by Women and Young Children

INLAND MYSAP ref.	EU/BMZ ref.	Indicator	Baseline 2017	Milestone 2018	Milestone 2019	Target +2020
3.2.	1.5.2.2. I.D.3 MOI 4	Increase in the sales volume of aquaculture products at local markets in the two project areas affected by food insecurity	2,248	2,360	2,473	2,585

The baseline has been revised to define all five project areas as being food insecure. The total sales volume of aquaculture products at local markets (one main market and two smaller markets sampled per township) recorded totalled 2,248 viss in a typical day in the past month[3]. The following table displays the variation of market production per township.

Table 2. Market Aquaculture Sales Volume

Township	Proportion of reported market aquaculture sales (%)	Estimated total market aquaculture sales volume on a typical day in the last month (viss)[4]
Amarapura	11.4 (256 viss)	8.51 (958 viss)
Kalay	4.29 (96.5 viss)	3.36 (378 viss)
Kyaing Tong	7.72 (178 viss)	2.66 (300 viss)
Pinlaung	12.2 (274 viss)	4.25 (478 viss)
Shwebo	64.2 (1,443 viss)	81.2 (9,144 viss)
Total	2,248	11,258

The overwhelming majority of market sales recorded originated from Shwebo's central market. Producers reported selling around 100 viss of Rohu and 100 viss of Tilapia, whereas other township markets often reported selling viss of under 10 per producer. The main reason for the difference in market production size is due to Shwebo's central market also selling to vendors as well as consumers.

INLAND MYSAP ref.	EU/BMZ ref.	Indicator	Baseline 2017	Milestone 2018	Mileston e 2019	Target +2020
3.4.	1.5.3.	Increase in the share of aquaculture products consumed by low-income consumers	40%	42%	45%	50%

[3] Sales volume of aquaculture products at local markets was calculated through the market survey. Sales volume of a typical day in the past month was collected per 'common aquaculture species from a sample of vendors. Common aquaculture species consisted of 7 species of carp, tilapia, and 6 species of SIS.

[4] Total aquaculture sales volume was calculated by estimating the proportion of vendors sampled and multiplying reported sales volume accordingly.

Low income is defined as those with an annual household income of less than MMK 3,717 per day, or MMK 1,356,705 annual income. The number of respondents who were low income totalled 360, or 42.5% of total respondents. The definition of low-income cannot be compared to Myanmar's national poverty rate due to non-monetary factors being used in calculation, however it can be compared to international rates of poverty, namely that used in the Millennium Development Goals, USD 1.25 PPP per day per person. Assuming there is a minimum of 2 working adults in the house, this only totals an average USD 1095 per year (MMK 1,253,866). Based on this crude definition of poverty, the level of low income households would not change. It is important to note however that the geographical location of the project specifically is aimed at those with a lower income, partially explaining why the percentage of low-income respondents is over that of the Myanmar poverty rate of 2015, This can contribute the percentage of low-income respondents, 42.5% is largely over that of the Myanmar Government's poverty rate in 2015, 19.4%[5].

The following table displays the average number of meals containing aquatic species over seven days, broken down into four categories.

Table 3. Consumption of Aquatic Species

Underwater species type	No. of meals over 7 days
Common aquaculture species	1.67
Common wild-caught species	1
SIS	0.87
Other aquatic species	0.64

Common aquaculture products represent the largest category of aquatic species consumed, at 40% (1.67 meals out of 4.18 meals containing aquatic species). Using the average number of meals per day of low-income households (2.9), meals containing aquatic species only amount means that only 20.6% of all meals or 1 in 5 for low-income families included aquatic products. Common aquaculture species only amounted to 8.23% of all meals. For low-income consumers, only 101 out of 360 respondents had consumed fish in the past 24 hours. The average weight of fish consumption for those who had, was 5.51 Kyatthar (90 g)[6].

The proportion of respondents who reported to have consumed fish in the past seven days varied between aquaculture respondents and non-aquaculture respondents. Eighty-nine percent of aquaculture respondents consumed fish in the past seven days, averaging 4.67 meals over this time period that contained fish. For non-aquaculture respondents, 76.9% consumed fish in the past seven days, averaging four meals that contained fish.

INLAND MYSAP ref.	EU/BMZ ref.	Indicator	Baseline 2017	Milestone 2018	Milestone 2019	Target +2020
3.5.1.	1.5.4.1.	Increased average food supply diversity in target areas	3.42	TBD	TBD	TBD

The average dietary diversity of all respondents (male and female) was 3.42 food groups over a 24-hour period. The most common food groups are ranked below in the following table:

[5] MoPF; WBG, (2017), *An Analysis of Poverty in Myanmar: Trends Between 2004/05 and 2015*, Ministry of Planning and Finance; World Bank Group

[6] Local Myanmar weight. One Kyatthar = 16.3 g.

Table 4. Dietary Diversity

Food Group	No. of respondents who consumed this food group in the past 24 hours (%)	Rank (1=most common)
Grains, white tubers, plantains	96.7 (n=819)	1
Meat, Poultry, and Fish	56.7 (n=480)	2
Dark green leafy vegetables	50.3 (n=426)	3
Pulses	36.5 (n=309)	4
Other vegetables	30.9 (n=262)	5
Dairy	20.2 (n=171)	6
Eggs	18.7 (n=156)	7
Other Vitamin A rich fruit and vegetables	17.2 (n=146)	8
Other fruits	10.6 (n=90)	9
Nuts and Seeds	4.25 (n=36)	10

The normal minimum mean dietary diversity of women (MDD-W) recommended by the Food and Agriculture Organization of the United Nations (FAO) is five food groups. In this case, the average MDD is significantly lower. The difference between dietary diversity between men and women was negligible, being slightly better for men (3.52 compared to 3.34). Surprisingly, the average dietary diversity was largely similar for low-income households (3.43), as was found for non-low-income households (3.40). This suggests that dietary restrictions are embedded in availability and accessibility of different food groups and perhaps are influenced by cultural norms. Income cannot be ruled out as an important factor however.

Differences in dietary diversity were found between the townships, as displayed in the following table. Importantly, Amarapura and Pinlaung have significantly minimal dietary diversity.

Table 5. Dietary Diversity per Township

	Respondents with 5 or more food groups (%)	Average no. of food groups
Amarapura	4.20	2.17
Kalay	51.9	4.91
Kyaing Tong	40.8	3.38
Pinlaung	11.6	3.43
Shwebo	31.2	3.47

Future monitoring of dietary diversity should take into account the time of year that the data was collected. Not only is this important in reflecting harvesting and seasonal consumption patterns, but attention should be drawn to the data being collected during Lent, Ramandan, and other religious celebrations.

INLAND MYSAP ref.	EU/BMZ ref.		Indicator	Baseline 2017	Milestone 2018	Milestone 2019	Target +2020
3.5.2		1.5.4.2.	Number of producers that report increased consumption of nutrient-rich fish and/or increased dietary diversity	0 [1.35 nutrient rich fish] [3.85 MDD]	600	1,200	1,800

Whilst the baseline indicator is zero, data still needed to be collected. The dietary diversity of aquaculture producers was higher that the respondent average, at 3.85 food groups over 24 hours. Consumption of nutrient rich fish was calculated by the amount of meals in the past seven days that contained whole fish (including eyes, head, and bones). This typically concerns steamed fish and SIS, usually fried. Producers reported that 1.35 meals per week contain nutrient-rich fish.

5. Additional Comments & Key Findings

Prevalence of aquaculture production in each township

The level of aquaculture involvement as expected varied across the five townships. The number of aquaculture respondents in each township is shown in the following table, alongside the number of expected total aquaculture producers in each township. The latter data has been collected through KIIs with aquaculture stakeholders in each region.

Table 6. Aquaculture Involvement Per Township

Township	Proportion of aquaculture respondents (%)	Proportion of reported no. of producers (%)[7]
Amarapura	2.65 (n=5)	0.02 (n=50)
Kalay	11.0 (n=17)	0.05 (n=239)
Kyaing Tong	22.4 (n=35)	0.08 (n=300)
Pinlaung	0 (n=0)	0 (n=0)
Shwebo	12.8 (n=24)	0.05 (n=700)
Total	9.56 (n=81)	0.05 (n=1289)

[7] Proportion of reported no. of producers is calculated as the proportion of aquaculture producers per township population. Township population data was sourced from: MoIP, (2015), *The 2014 Myanmar Population and Housing Consensus,* Department of Population; Ministry of Immigration and Population.

For the purpose of data extrapolation, a total of 1,289 producers was used. Whilst the DoF responsible for Amarapura reported that the number of producers from this township was zero, there were five producer respondents in the household survey and local hatcheries reported supplying seed to at least 50 producers in the township. Similar DoF statistics were presented for Pinlaung, however there was minimal evidence that producers existed. Only 39% of sampled producers reported having a licence. Therefore the official government DoF statistics on the total number of aquaculture producers are likely to be an underestimate of the actual number of producers. It is also likely that some producers have misreported having a licence for fear of government follow up, if the data collected was not confidential. Whilst the estimated total number of producers already factors in a percentage that are not licensed and recorded, this figure should still be treated as a minimum.

Fish Consumption

Fish consumption was measured by the number of respondents who ate fish in the last seven days, and for how many meals. Amarapura was the township with the most respondents who consumed fish in the past seven days, and also the township with the most frequent fish consumption. The average number of meals containing fish was around 1-2 meals more in Amarapura. This can be seen in the following table.

Table 7. Consumption of Fish by Township

Township	Proportion of respondents who consumed fish in the past 7 days	Average number of meals containing fish
Amarapura	88.4%	5.17
Kalay	65.8%	3.60
Kyaing Tong	79.6%	3.78
Pinlaung	66.5%	3.29
Shwebo	86.4%	3.96
Total	78.0%	4.07

The consumption of SIS was reportedly higher for household who were not low-income. Whilst 33.9% of low-income households had consumed SIS in the past seven days, SIS consumption in non-low-income households was only five percentage points higher, at 38.8%. The disparity in number of meals SIS was consumed across these two income groups was minimal at 2.72 for low-income households and 2.50 for non-low-income households. This suggests that the consumption of SIS is not heavily linked to income, and is plausibly influenced by taste preferences, accessibility, and price. Variability of SIS consumption is highlighted in the following table.

Table 8. Consumption of SIS by Township

Township	Proportion of respondents who consumed SIS in the past 7 days	Av. no. of meals containing SIS
Amarapura	64.6%	2.89
Kalay	22.6%	2.43
Kyaing Tong	25.5%	2.80
Pinlaung	34.2%	1.79
Shwebo	31.9%	2.64
Total	36.7%	2.58

Only 22.2% of aquaculture respondents reported consuming SIS in the past seven days, the average number of meals containing SIS was 2.33 meals. The rate of consumption is interestingly lower than that of non-aquaculture respondents who reported an average of 2.60 meals containing SIS in the past seven days. The proportion of non-aquaculture respondents who consumed SIS in the past seven days was 38.3%.

Water Accessibility

For 96.3% of producer respondents, water for aquaculture production was accessible at some point in the past 12 months. However, only 34.6% of respondents were able to access water as an aquaculture input for all 12 months. The following table displays the number of producers that accessed water for all 12 months, versus those that accessed for any amount of time in the past 12 months.

Table 9. Water Accessibility for Aquaculture Production

Township	Proportion of producers accessing water	Proportion of producers accessing water for 12 months
Amarapura	--	--
Kalay	88.2%	11.8%
Kyaing Tong	100.0%	45.7%
Pinlaung	80.0%	20.0%
Shwebo	100.0%	37.5%
Total	96.3%	34.6%

The table shows that aquaculture producers in Kalay and Pinlaung in particular had water accessibility constraints. Kyaing Tong had the highest proportion of aquaculture producers with year-round access.

Gender

Fifty eight percent of survey respondents were female. More often than not however, the main respondent was accompanied by their spouse. As expected, the vast majority of household heads were male (75.1%). Female-headed

households (13.5%) were often divorcees, or widows. For 11.4% of respondents, the gender of the head of household could not be collected.

A series of gender specific questions highlighted the roles that gender was playing in aquaculture production and nutrition in the townships. Men were more heavily involved and had more influence in aquaculture production, whereas women had more influence in nutrition. The majority of aquaculture producers who hired labour reported that they hire more males than females, with only 15% reporting hiring an equal number of males and females. It can be concluded that the aquaculture production sector at the household level is heavily male-dominated. The following figure diagrammatically displays the imbalance of gender in regards to various roles.

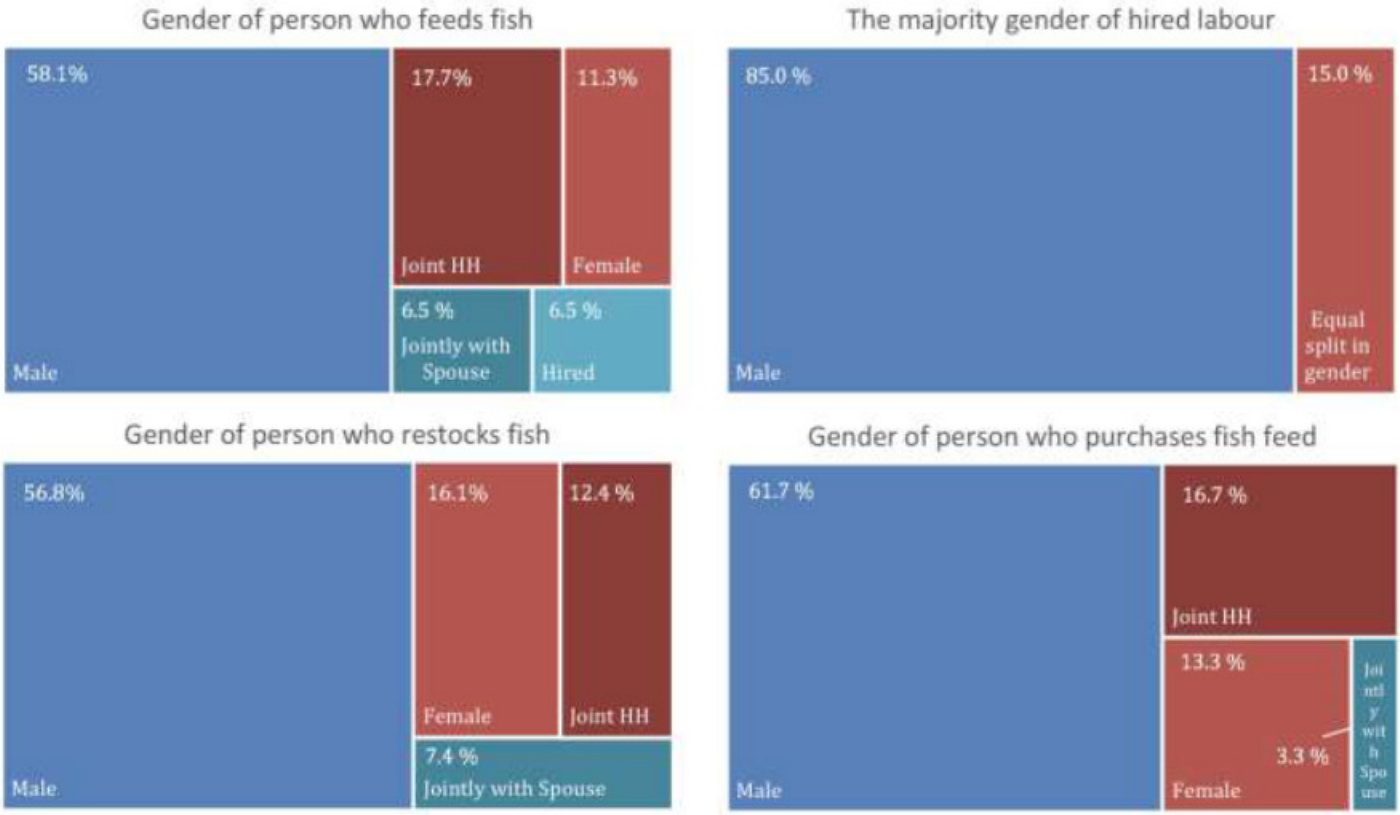


Figure 8. The Gender Split of Aquaculture Production and Nutrition

Aquaculture as an opportunity

The household survey investigated not only the current level of aquaculture involvement in the project area, but also the level of aquaculture involvement over the past 10 years, the reasons for no current or previous involvement, and the willingness of the population to start participating in aquaculture.

Whilst 81 out of 847 respondents were conducting aquaculture, a 20 further respondents had conducted aquaculture in the last 10 years but had subsequently stopped. Water shortages were cited as the most common cause for ceasing production (four respondents) followed by unprofitability (three respondents) and low fish survival (two respondents). Other reasons included poor health and flooding problems.

Some 36.4% of respondents (279/766) not currently conducting aquaculture said they would start if there was adequate financial and capacity building support from an experienced aquaculture organisation. The following table presents the main reasons why the remaining proportion of respondents were still unwilling to culture fish and can be considered in the design of project interventions and their implementation.

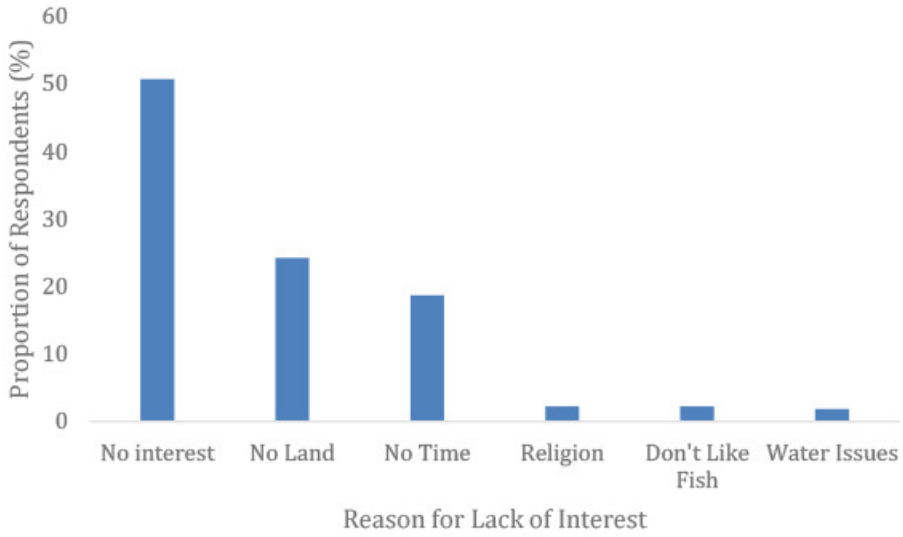


Figure 9. Reasons Why Respondents Would Not Participate in Aquaculture Production

Ten out of the 11 respondents who cited religion as a reason against aquaculture production were Buddhists. As Buddhists make up a significant proportion of the population of these townships, this should be regarded as an important constraint to reaching additional households. All the respondents who cited water constraints were located in Pinlaung. The availability of water whether from rain-fed or irrigation sources is a critical constraint to the ability to culture fish and this is particularly evident and crucial in Pinlaung township.

Transitioning informal sectors

A key finding from the INLAND MYSAP baseline field work was the opportunity for aquaculture to contribute to the transformation of regions to the formal sector. In some locations, households earned a significant proportion of their income from alternate and often informal livelihoods, which were not seen as being sustainable by the population. Respondents viewed direct assistance with aquaculture production as an important opportunity to not only improve livelihoods, but to also specifically do so through sustainable and legitimate livelihood options.

Key Findings

- The location of aquaculture production ponds is extremely localised and site specific with the availability of water whether from rain-fed or irrigation sources being a critical constraint. Some project townships have areas within them with minimal or no existing aquaculture producers. Whilst this was true at village and ward level for all townships, it was also true across two townships, namely Amarapura and Pinlaung. This will have a significant impact on project intervention design and implementation in these regions.
- There are significant input constraints that have been highlighted concerning the use of pelleted fish feed. Only around 30% of producers currently use pelleted feed, whilst even less use pelleted feed all year round. There is an opportunity for the project to support on-farm pellet feed production that is nutritious and economically affordable for aquaculture production.
- The number of aquaculture producers who are currently integrating their fish systems with agriculture was low, which presents an important opportunity for producers to combine these processes. Of the 24% of producers that were practicing agriculture integration with aquaculture the most common practice was the integration of pig pens adjacent to the pond.

- There was no production of improved fish seed in the project townships, though the demand for improved seed is thought to be reasonably strong. KIIs revealed that Amarapura has a supply of genetically improved carp fingerlings from Patheingyi Township, but the quantity supplied is minimal and the quality needs verifcation.
- Nearly 30% of producers used resources to prevent the entry of or remove naturally occurring SIS in their fish system.
- The food insecurity of the five project townships was clearly reflected in the dietary diversity data. The average respondent dietary diversity score was only 3.42 food groups over 24 hours, which is significantly under the recommendation minimum of 5 or more food groups.
- Gender disparity was prevalent across many aquaculture producer activities. Aquaculture decision making and responsibilities were largely male-oriented, whilst females were mainly responsible for household nutrition and cooking.
- 36% of respondents not currently involved in aquaculture said they were willing to take up the practice if there was adequate support from an experienced organisation. This presents an important opportunity for many rural villages to move away from less informal and often unsustainable livelihoods options.

Limitations

One limitation encountered during data collection concerned the willingness of respondents to disclose personal information. This limitation was overwhelmingly concentrated in collecting total household income data. Despite contacting the DoF and village leaders to raise the awareness of the project, to explain the purpose of the household survey, and how the survey data would be used, many participants were wary of disclosing this information. Whilst enumerators were trained to disclose that all data collected would be kept anonymous and confidential, respondents remained wary that this would not be the case. Due to this limitation, income ranges were included as an option where exact data could not be collected. This limitation resulted in only 63.5% of survey respondents providing sufficient data to allow calculation of their total household income. It is unknown whether concerns of data privacy has skewed the income data that was disclosed.

Another important limitation of data concerned general lack of knowledge on finance and income calculation, operation size, and levels of production for most respondents whether aquaculture producers or not. Whilst many aquaculture producers were familiar with their total level of fish production, acquiring data on specific species production levels was more difficult. This was because many aquaculture producers culture several fish species (polyculture) in each pond to take advantage of different fish species feeding on different natural feeds. In some cases, traders often played such an important role in the harvesting and selling of the fish that the producer was only able to estimate how much fish was harvested and sold the previous year. This lack of knowledge explains some disparities in recording total fish production and the reported production of specific fish species. This also provides an important opportunity for the project for capacity building.

6. Recommendations

Recommendation 1: Gender empowerment activities

It is clear from the household data that there is a significant separation of production involvement between men and women. Whilst this was to be somewhat expected, the data clearly highlights this disparity. The opportunity that aquaculture may bring to improve livelihoods in the project area is at risk of disproportionately benefiting males. Incorporating gender specific training into the project will be highly important in maximising the distribution of benefits equally among direct and indirect project beneficiaries. There is a significant risk that the split of gender in these areas is ingrained within the project beneficiaries culture, and therefore should be approached with conscious ethical consideration.

Recommendation 2: Financial and production capacity building

Data collection was somewhat limited due to the capacity of producers regarding the levels of species-specific production and income. It is highly recommended that not only should the project support producers on techniques and input supply, but that training should also be provided on financial production management. Improving aquaculture producers' (and fellow household members') knowledge on the revenue, costs, and level of harvest figures will sustainably improve the livelihoods and production techniques of project beneficiaries and maximise the financial advantages of the project.

Recommendation 3: Using project influence to ease the constraints of fish pond registration

The number of registered/licenced aquaculture production sites in certain project areas was minimal. This was reportedly due to the complexity of pond registration, as well as the concerns regarding the financial limitations and management that this may impose on producers. If the project were to encourage the adoption of fish system licences, the project should encourage channels of communication between the government and project beneficiaries regarding the concerns felt by the producers.

Recommendation 4: Providing sustainable water management infrastructure

Certain project areas expressed concerns about the current level of water. An in-depth analysis of water constraints in the project areas should be undertaken before implementation as this is likely to have a large effect on the productivity and success of aquaculture production. INLAND MYSAP should work with local authorities to discuss water shortage solutions such as integrating water pipes to the shortage areas.

Monitoring and Evaluation Recommendations:

- Wherever possible, the extrapolation of results should be avoided due to the current level of accessibility regarding the number of producers in each township. Estimations of the level of aquaculture producers in each township only rely on those licenced, plus an estimation of the proportion who are not. The nature of the project concerns increasing the level of information and registration of aquaculture producers, therefore the estimation of total aquaculture producers is likely to change over the project period. It is therefore highly recommended that indicators and measurements of the project use per (respondent) producer averages, instead of extrapolating the data to arrive at one figure for all producers.
- It is important that future monitoring of dietary diversity over the project period takes place at the same time of year, as close to the baseline data collection period (April 18th – May 23rd) as possible. Not only is this important due to the seasonality of crops, but also due to the timing of religious festivals.
- It is recommended that both total fish production per aquaculture producer and fish production per species per aquaculture producer is monitored throughout the project period. This inherently contradicts typical survey techniques that advise not to use two methods to obtain the same answer, due to issues with validity. However, many aquaculture producers lacked the capacity to report per species production in detail due to the use of one fish pond with many species. Therefore, whilst recording total fish production is more likely to be accurate, asking a separate per species production is also important in assessing the prevalence of specific species over the project period.
- The accessibility of pelleted fish feed should not be measured as the number of producers that can access this over 12 months. Using this method would falsely imply that around 30% of aquaculture producers had no issues of accessibility. However, only 7.40% of producers used pelleted fish feed for 12 months whereas 69.1% had no access at all. It is therefore recommended that access to pelleted fish feed is measured by the percentage of aquaculture producers that have over six months access to pelleted fish feed in the past 12 months, 14.8%.
- Assessing the attitudes towards SIS could be defined as the number of producers that actively deter or kill SIS in their fish systems. The natural occurrence of SIS could cloud the assessment of attitudes towards the species. This is due to the number of producers that may harvest them alongside the main species. In these cases, it is difficult to determine whether producers actively seek to harvest these fish, or whether this happens as a by-product of another species production. It will therefore be interesting and important to monitor the proportion aquaculture producers are using resources to deter and kill SIS over the project period. The data collected should be a proportion as the number of aquaculture producers is expected to grow over the project period.

Pinlaung Township

7. Conclusions

Baseline data were collected through a mixed methodology using two quantitative surveys at household and market level, and KIIs directed towards DoF, nurseries, and hatcheries and fish traders, vendors and processors. The data were collected over a 4-week period using CAPI software and translated and analysed by Mekong Economics staff.

The baseline report outlines the key findings and considerations in reference to the three main baseline objectives, as well as many other 'bigger picture' factors.

Objective 1: To increase the number, efficiency, resilience, and sustainability of small-scale freshwater aquaculture.
The number of small-scale aquaculture producers varies across the five project townships with producer numbers being minimal or non-existent in Amarapura and Pinlaung townships. Positively however, there seems to be clear interest by households to take up aquaculture production if technical and financial support can be provided, with the hopes of income generation and a sustainable method of transitioning from the informal sector.

Objective 2: To improve the quality of seed available for small-scale freshwater aquaculture
The majority of aquaculture producers currently access fish seed (fry or fingerlings) from private suppliers within their township. The production and supply of improved fish seed however is minimal to non-existent, which some respondents reporting a supply in Amarapura township. Whilst the current access to improved fish seed is minimal, it was reported that the demand for the improved inputs is strong.

Objective 3: To strengthen the knowledge capacity of government, private sector, NGOs, and small-scale producers in inclusive, nutrient-rich, and gender sensitive sustainable freshwater aquaculture.
The current nutritional mean dietary diversity score of project respondents at 3.4 was less than the recommended daily 5 or more food groups. Low-income consumers did not have a significantly lower than average MDD, suggesting that a significant proportion of inaccessibility was due to local accessibility and availability of food group products and perhaps cultural norms, though income may also have been an important factor. The consumption of nutrient-rich fish was also low, providing an important opportunity for the project to enhance nutrition levels through this method.

List of References

MoIP, (2015), *The 2014 Myanmar Population and Housing Consensus,* Department of Population; Ministry of Immigration and Population.

MoPF; WBG, (2017), *An Analysis of Poverty in Myanmar: Trends Between 2004/05 and 2015*, Ministry of Planning and Finance; World Bank Group

Annex

Annex I: Full Table of Baseline Indicators

EU			Sustainably intensified aquaculture contributing to poverty reduction and improved food security and nutrition in selected areas of Myanmar				
BMZ			The sustainably managed aquaculture sector is strengthened.				
MYSAP-Inland			**Objective 1:** To increase the number, efficiency, resilience, and sustainability of small-scale freshwater aquaculture				
INLAND MYSAP ref.	**EU/BMZ ref.**		**Indicators**	**Baseline 2017**	**Milestone 2018**	**Milestone 2019**	**Target +2020**
1.1.	I.3.6.1.		Number of aquaculture producers who have directly benefited from improved aquaculture production systems, and pre- and post-harvest practices (direct beneficiaries)	0	500	1,000	1,500
1.2.1.	I.3.6.2.	I.3.6.2.1.	Number of aquaculture producers who have access to high quality fish seeds and extension services (direct and indirect beneficiaries)	0	1,000	2,000	3,000
1.2.2.		I.3.6.2.2.	Number of aquaculture producers (60% of total)[1] who adopt the technologies promoted by the project	0	600	1,200	1,800
1.3.	I.4.1.		Number of farmers accessing loans for investments in technological advances and resilience	0	100	250	500
1.4.	I.4.2.		Increase in acreage of paddy land converted into paddy cum fish or freshwater ponds	692	706	726	761
1.5.	I.4.8.		Number of Micro, Small and Medium Enterprises (MSMEs) applying Sustainable Consumption and Production practices with EU support	0	300	600	900
1.6.	I.4.9.		Increased number of integrated agri-aquaculture ponds in target regions	313	313+X%	313+X%	313+X%
1.7.	I.5.1.1.		Increase in aquaculture production in selected fish-deficit areas	981	1,001	1,030	1,079
1.8.	I.5.1.2.		Number of producers that report at least 10% increase in fish production and incomes	0	300	600	900
1.9.1.	I.D.1	I.D.1.1.	The number of micro-operators of production facilities of carps in	923	923 +X%	923 + X%	923+X%

			target areas				
1.9.2.		I.D.1.2.	The number of micro-operators of production facilities of tilapia in target areas	621	621 +X%	621 + X%	621 +X%
1.9.3.		I.D.1.3.	The number of micro-operators of production facilities of small indigenous species (SIS) in target areas	255	255 +X%	255 + X%	255 +X%
1.10.			No. of aquaculture systems tested and/or selected (including rice-fish systems)	0	2	3	6
1.11.			Smallholder population in Shan and Sagaing that will be impacted directly and indirectly by improved aquaculture production systems and pre-and post-harvest practices	0	4,000	8,000	12,000

EU			Sustainably intensified aquaculture contributing to poverty reduction and improved food security and nutrition in selected areas of Myanmar				
BMZ			The sustainably managed aquaculture sector is strengthened.				
MYSAP-Inland			**Objective 2:** To improve the quality of seed available for small-scale freshwater aquaculture				
INLAND MYSAP Ref.	**BMZ/EU Ref.**		**Indicators**	**Baseline 2017**	**Milestone 2018**	**Milestone 2019**	**Target +2020**
2.1.1.	I.3.3.	I.3.3.1.	Number of backyard hatcheries developed to provide quality fingerlings and fry	0	2	4	4
2.1.2.		I.3.3.2.	Number of nurseries distributing improved fingerlings	0	25	50	100
2.2.	I.3.4.		Total number of improved fingerlings and fry produced in Myanmar				
2.2.1.		I.3.4.1.	Number of improved carp fingerlings and fry produced	0	+5%	+10%	+15%
2.2.2.		I.3.4.2.	Number of genetically improved tilapia fingerlings and fry produced	0	+20%	+40%	+60%
2.2.3.		I.3.4.3.	Number of improved small indigenous species (SIS) fingerlings and fry produced	0	+20%	+40%	+60%
2.3.1.	I.D.2	I.D.2.1	The number of operators of freshwater aquaculture enterprises with access to (i.e. using) fish fry	652	652 +X%	652 + X%	652 +X%
2.3.2.			The number of operators of freshwater aquaculture enterprises with access to (i.e. using) fish fingerlings	525	525 +X%	525 + X%	525 +X%
2.3.3.			The number of operators of freshwater aquaculture enterprises with access to (i.e. using) pelleted feed	398	398 +X%	398 + X%	398+X%
2.4.			Number of existing private and public hatcheries producing GIFT tilapia[8]	0	1 DoF; 1 MFF	2 DoF; 2 MFF	2 DoF; 2 MFF

EU	Sustainably intensified aquaculture contributing to poverty reduction and improved food security and nutrition in selected areas of Myanmar
BMZ	The sustainably managed aquaculture sector is strengthened.

[8] This indicator captures the extent of cooperation with the Myanmar Fisheries Federation (MFF).

MYSAP-Inland			Objective 3: To increase the consumption of micronutrient-rich small fish especially by women and young children.				
INLAND MYSAP Ref.	BMZ/EU Ref.		Indicators	Baseline 2017	Milestone 2018	Milestone 2019	Target +2020
3.1.	I.5.2.1.		Total number of beneficiaries that receive nutrition-sensitive awareness training	TBD	TBD	TBD	TBD
3.2.	I.5.2.2. I.D.3 MOI 4		Increase in the sales volume of aquaculture products at local markets in the two project areas affected by food insecurity[9]	2,248	2,360	2,473	2,585
3.3.	I.5.2.3.		Number of trade and marketing groups supported by the project	0	20	40	60
3.4.	I.5.3.		Increase in the share of aquaculture products consumed by low-income consumers	40%	42%	45%	50%
3.5.1.		I.5.4.1.	Increased average food supply diversity in target areas[10]	3.42	TBD	TBD	TBD
3.5.2.		I.5.4.2.	Number of producers that report increased consumption of nutrient-rich fish and/or increased dietary diversity	0	600	1,200	1,800
3.6.1.	I.5.5.	I.5.5.1.	Number of women of reproductive age benefitting from nutrition-related interventions	0	500	1,000	1,500
3.6.2.		I.5.5.2.	Number of children under 5 benefitting from nutrition-related interventions	0	400	800	1,200

EU	Enhanced nutritional impact of aquaculture (Result 5)				
Result 5	- 2.6 DEVCO Results Framework 2.7: number of people receiving rural advisory services with EU support (through MYSAP)				
BMZ	The availability and access of low-cost aquaculture products produced in an ecologically sound way for disadvantaged population groups in the Shan State and Sagaing Region are improved. (Output D)				
MYSAP -Inland	**Objective 4: T**o strengthen the knowledge capacity of government, private sector, NGOs and small-scale producers in inclusive, nutrient-rich and gender sensitive sustainable freshwater aquaculture				
INLAND MYSAP Ref.	Indicator	Baseline 2017	Milestone 2018	Milestone 2019	Target 2020
4.1.	Number of entrepreneurs, who engage in backyard hatcheries, nurseries, feed mill operators with support of the project.	0	35	65	125
4.2.	Number of government staff (DoF, DoA) trained in fish seed and extension inputs through project supported hatcheries	0	25	50	100
4.3.	Number events (learning forum, workshop, thematic discussion group) that promote knowledge sharing and learning of aquaculture and value chain best practices	0	10	10	20
4.4.	Number of private and or public investments into small-scale aquaculture influenced by project	0	3	5	6

Annex II: List of Locations Surveyed

Amarapura – Total no. of respondents: 189

Group	Village Tract/Township	Name (en)	Name (mya)	No. of respondents

[9] This indicator measures the increase in sale volume in selected project townships.

	Capital			
Rural Villages	Shwe Kyet Yet	Kan Taw	ကံတော်ကျေ	16
	Hpa Ye Kyun	Hpa Ye Kyun (Ah Nauk)	ဖရဲကျွန်း (အနောက်ကျ)	14
	Kyee Myin Daing	Myin Taw	မွတ်တော်ကျေ	16
	Sar Toe	Set Kwayt	မိုင်သစ်မိုင်ကုလား/စကျက်ကုန်	16
Producer Hubs	A Moke Soe	Kan Yoe	ကန်ကြိုး	17
	U Yin Taw	Thar Yar Aye	သာယာအေး	15
	Nat Yae Kan	Mont Pale (Moke Ta Ke)	မုံပုလဲ	16
	Yae Poke	Yae Poke	ရေပုတ်	16
Township Capital	Amarapura Town	Kyan Tan Ward	ကြံတန်းရပ်ကွက်	16
	Amarapura Town	Taung Gyi Ward	တောင်ကြီးရပ်ကွက်	17
	Amarapura Town	Sin Swei Put Ward	ဆင်စွယ်ပုတ်ရပ်ကွက်	15
	Amarapura Town	Oe Taw Ward	အိုးတော်ရပ်ကွက်	15
Enumerator Pilot				

Kalay – total no. of respondents: 155

Group	Village Tract/Township Capital	Name (en)	Name (mya)	No. of respondents
Rural Villages	Pyin Taw U	Nyaung Kone	ညောင်ကုန်း	14
	Nan Kyin Saung	Mya Sein	မြစိမ်း	12
	Kyaung Taik	Nyaung Taw	ညောင်တော	12

	Htauk Kyant	Kyun Chaung	ကျွန်းခြောင်း	12
Producer Hubs	Nat Gyi Kone (Pyin Khon Lay)	Nat Gyi Kone (Chin)	နတ်ကြီးကုန်း (ခရင်း)	16
	Nat Gyi Kone (Pyin Khon Lay)	Pyin Khon Lay	ပဲခြုံလေး	12
	Nat Gyi Kone (Pyin Khon Lay)	Min Hla (Nat Gyi Kone)	မင်းလှ (နတ်ကြီးကုန်း) (မွန်မာ)	12
	Nat Gyi Kone (Pyin Khon Lay)	Doe Wine Chaung Village	ဒိုးဝိုင်းခြောင်း	13
Township Capital	Kale Town	Aung Zaya Ward	အောင်ဇေယျရပ်ကွက်	13
	Kale Town	Mingalar U Yin Ward	မင်္ဂလာဥယျဉ်ရပ်ကွက်	13
	Kale Town	Nyaung Pin Thar Ward	ညောင်ပင်သာရပ်ကွက်	13
	Kale Town	Myo Thar Ward	မြို့သာရပ်ကွက်	13
Enumerator Pilot				

Kyaing Tong – total no. of respondents: 156

Group	Village Tract/Township Capital	Name (en)	Name (mya)	No. of respondents
Rural Villages	Mong Da Hkun	Ahr Hkay Day	အားခဒေး	14
	Ka Htike	Mar Keng		8
	Loi Mway	Hkun Hseng (Middle)	ခုန်းဆိုင်း (လယ်)	12
	Mon Kai	Nam Ngun		10
Producer Hubs	-	Noung Seang	-	13
	-	Wan Num	-	11
	-	Nuong Parn	-	13
	-	Wan Ngean	-	17
Township Capital	Kengtung Town	No (1) Ward	အမှတ်(၁)ရပ်ကွက်	18

	Kengtung Town	No (2) Ward	အမှတ်(၂)ရပ်ကွက်	13
	Kengtung Town	No (5) Ward	အမှတ်(၅)ရပ်ကွက်	15
	Kengtung Town	No (4) Ward	အမှတ်(၄)ရပ်ကွက်	12
Enumerator Pilot				

Pinlaung – total no. of respondents: 155

Group	Village Tract/Township Capital	Name (en)	Name (mya)	No. of respondents
Rural Villages	Nang Toke	Loi Kyein	လွယ်ကိုန်း	13
	Hpa Yar Hpyu	Pin Sein Pin	ပဇိန်းပဇ	14
	Hti Pawng	Pyar Dein	ပွာဒိန်	13
	Pinlaung Gyi	Pinlaung Gyi (East)	ပဇလောဂျီး (အရှေ့ဝိုင်း)	14
Producer Hubs	MinDwin	Pat Ta Lay	ပတ်တလည်	14
	Lone Poe	Lone Poe Myo Thit	လုံးပိုးမြို့သစ်	13
	Paw In	Hti Ywel	ထီရွယ်	13
	Lone Pin	Lone Pin	လုံးပျဉ်လယ်	13
Township Capital	Pinlaung Town	Yone Win Ward	ရုံးဝင်းရပ်ကွက်	10
	Pinlaung Town	Ah Nauk Ward	အနောက်ရပ်ကွက်	11
	Pinlaung Town	Kan Thar Oo Ward	ကန်သာဦးရပ်ကွက်	13
	Pinlaung Town	Min Ga Lar Kwet Thit Ward	မင်္ဂလာကွက်သစ်ရပ်ကွက်	14

Enumerator Pilot				

Shwebo – total no. of respondents: 188

Group	Village Tract/Township Capital	Name (en)	Name (mya)	No. of respondents
Rural Villages	Myin Chin	Zee Kone	ဇီးကုန်း	16
	Pi Tauk Khaung	Pi Tauk Khaung	ဝိတာကျခေါင်း	16
	Hna Ma Sar Yit	Hna Ma Sar Yit	နှမစားရစ်	16
	Wun Si	Yae Taw Mu	ရတောမြို့	16
Producer Hubs	Nyaung Pin Thar	Kan Thar Kone	ကန်သာကုန်း	14
	Hpoke Kone	Hpoke Kone	ဖုတ်ကုန်း	16
	Pi Tauk Khaung	U Yin Taw north	ဥယျဉ်တောမြို့ (မွောက်)	17
	Ywar Taw	Kone Thar	ကုန်းသာ	16
Township Capital	Shwebo Town	No (10) Ward	အမှတ်(၁၀) ရပ်ကွက်	14
	Shwebo Town	No (4) Ward	အမှတ်(၄) ရပ်ကွက်	16
	Shwebo Town	No (7) Ward	အမှတ်(၇) ရပ်ကွက်	17
	Shwebo Town	No (6) Ward	အမှတ်(၆) ရပ်ကွက်	14
Enumerator Pilot				

Details of Pilot Location

Group	Village Tract/ Township Ward	Name (en)	Name (mya)	No. of respondents
Survey Pilot				

Household Questionnaire

Please note only relevant questions were displayed in response to previous answers given (i.e. if a household did not participate in aquaculture, most or all of the questions in Section D – Fish System Roster, Section E – Inputs, Section F – Production & Consumption, and Section G – Logistics VC, were not displayed in the CAPI system.

Start of Section A: Basic Information

1. Date of interview (DD/MM/YYYY) *
2. Interview start time *
3. Name of enumerator *
4. Township *
    1. Kyiang Tong
    2. Kalay
    3. Shwebo
    4. Amarpura
    5. Pinlaung
5. Village tract/Ward *
6. Village name *
7. Name of respondent *
8. Sex of respondent *
    1. Male
    2. Female
9. Age of respondent *
10. Marital status of respondent *
    1. Single
    2. Married
    3. Divorced
    4. Separated
    5. Widowed
11. Phone number of respondent (if any)
12. Is the respondent the head of the household? *
    1. Yes
    2. No
13. If NO, what is the relationship of the respondent, to the head of the household? *
    1. Spouse
    2. Child
    3. Parent
    4. Parent-in-law
    5. Sibling
    6. Child-in-law
    7. Grandchild
    8. Niece/Nephew
    9. Other relative (specify)
    10. Not relative (specify)
14. If OTHER RELATIVE, please specify *
15. If NOT RELATIVE, please specify *
16. What is the name of the head of household? * [only appears if respondent is not head of HH]
17. Sex of the head of household *
    1. Male
    2. Female

18. Does your household grow fish or shrimp to eat or sell? * [understanding whether they are involved in aquaculture or not]
    1. Yes
    2. No
19. If YES, does your household only produce fish, or does your household produce aquaculture products? (e.g. shrimp or prawns) * [aquaculture vs fish production]
    1. Aquaculture
    2. Fish only
20. Has your household caught wild fish to eat or sell in the past 12 months? *
    1. Yes
    2. No
21. If NO, has your household partaken in aquaculture in the past 10 years? *
    1. Yes
    2. No
22. If YES, why has your household stopped partaking in aquaculture? *
    1. Unprofitable
    2. Other more profitable income generation
    3. High costs
    4. Low survival rate of fish
    5. Other
23. If OTHER, please specify *
24. If NO, why has your household not partaken in aquaculture in the past 10 years? *
    1. Lack of Experience
    2. Associated costs
    3. Lack of input supply
    4. Not suitable for region
    5. Other
25. If OTHER, please specify *
26. Given the direct financial and capacity building support from an experienced aquatic organisation, would you be interested in starting aquaculture production on a household level? *
    1. Yes
    2. No
27. If NO, why not? *
    1. Time constraints
    2. No interest in aquaculture
    3. Lack of adequate land
    4. Do not like consuming aquaculture
    5. Bad past experiences with aquaculture production
    6. Other
28. If OTHER, please specify *

Start of Section B: Household Roster

29. Total number of household members * [warn that this section will repeat for the number of HH members]
30. Begin for HH member repeat
31. Name of household member *
32. What is the relationship of [NAME] to the head of the household? *
    1. Head of household
    2. Spouse
    3. Child
    4. Parent
    5. Parent-in-law
    6. Sibling
    7. Child-in-law

8. Grandchild
9. Niece/Nephew
10. Other relative (specify)
11. Not relative (specify)

33. If OTHER RELATIVE, please specify *
34. If NOT RELATIVE, please specify *
35. Is [NAME] male or female? *
    1. Male
    2. Female
36. How old is [NAME] in years? *
37. How old is name in months? (for children under 2 years) *
38. Marital status of [NAME] *
    1. Single
    2. Married
    3. Divorced
    4. Separated
    5. Widowed
39. What is [NAME]'s ethnicity? *
    1. Bamar
    2. Shan
    3. Chin
    4. Lahu
    5. Akha
    6. Kayah
    7. Kayin
    8. Kachin
    9. Pa-O
    10. Wa
    11. Other
40. If OTHER, please specify *
41. What is [NAME]'s religion? *
    1. Buddhist
    2. Christian
    3. Muslim
    4. Hindu
    5. Animist
    6. Other religion
    7. None
42. If OTHER, please specify *
43. What is the highest level of education that [NAME] has completed? *
    1. Kindergarten
    2. Primary school (completed grade 4)
    3. Middle school (completed grade 8)
    4. High school (completed grade 10)
    5. University
    6. Bachelors
    7. MBBS
    8. Master's
    9. PhD
    10. Vocational Training
    11. Monastic school/ Other religious school
    12. Other (specify)
    13. None
44. If OTHER, please specify *
45. What is [NAME]'s primary occupation? *

1. Crop farmer
2. Fish farmer
3. Fisher
4. Fish processing and/or trading
5. Livestock farmer
6. Off-farm labour (specify)
7. Own business (specify)
8. Salary Job/Employee (specify)
9. Student
10. Housewife/ Husbehusband
11. Dependent/Unemployed [Dependent also means small children who are not in school]
12. Retired
13. Other (specify)

46. If OFF-FARM LABOUR, please specify *
47. If OWN BUSINESS, please specify *
48. If SALARY JOB/EMPLOYEE, please specify *
49. If OTHER, please specify *
50. What is [NAME]'s secondary occupation? *
    1. Crop farmer
    2. Fish farmer
    3. Fisher
    4. Fish processing and/or trading
    5. Livestock farmer
    6. Off-farm labour (specify)
    7. Own business (specify)
    8. Salary Job/Employee (specify)
    9. Student
    10. Housewife/ Husbehusband
    11. Dependent/Unemployed [Dependent also means small children who are not in school]
    12. Retired
    13. Other (specify)
51. If OFF-FARM LABOUR, please specify *
52. If OWN BUSINESS, please specify *
53. If SALARY JOB/EMPLOYEE, please specify *
54. If OTHER, please specify *
55. What is [NAME]'s role on the fish farm? (if applicable) *
    1. Owner - investor and owner of equipment and/or land [Try and find out if the husband or wife owns the fish farm. Trying to understand a gender disparity]
    2. Renter - investor and renter of land/water area
    3. Manager - responsible for rearing decisions
    4. Worker - responsible for feeding, cleaning and/or harvesting
    5. Other (specify)
    6. None
56. If OTHER, please specify *

Start of Section C: Income

57. What was your total household income in the past 12 months? MMK * [Will have income brackets]
58. What was your total household income from fish production in the past 12 months? *
59. Which of the following months would you consider to be 'very bad' in regards to total household income level? *
    1. January
    2. February
    3. March
    4. April

5. May
6. June
7. July
8. August
9. September
10. October
11. November
12. December
13. All months equal

60. What was your total household income from aquaculture in the past 12 months? (MMK) *
61. Which of the following months would you consider to be 'very bad' in regards to total household income level? *
    1. January
    2. February
    3. March
    4. April
    5. May
    6. June
    7. July
    8. August
    9. September
    10. October
    11. November
    12. December
    13. All months equal
62. What was your total income from wild caught aquatic species in the past 12 months (MMK)? *
63. What was your total household income from non-aquatic sources in the past 12 months (MMK)? *
64. Please specify main source of non-aquaculture income in the past 12 months *
65. What was the main source of your household income in the past 12 months?(MMK) *
    1. Monthly salary job
    2. Casual labour
    3. Sale of agriculture produce in raw form
    4. Sale of product from agriculture
    5. Sale of aquaculture products
    6. Small business - trading
    7. Small business - service
    8. Remittances
    9. Regular assistance from NGO/Gov
    10. Pension
    11. Other (specify)
66. If OTHER, please specify *

Start of Section D: Fish System Roster

67. Who controls the fish systems? i.e. the decision to construct, purchase land, and general decisions * [gender]
    1. Self
    2. Spouse
    3. Jointly with spouse
    4. Jointly with other household members
    5. Other (specify)
68. If OTHER, please specify *
69. What was the area of land from which you harvested aquaculture produce from in the past 12 months? (preferred unit) *
70. UNIT *
    1. Acre

2. Hectare
3. Metres squared
4. Other (specify)

71. If OTHER, please specify *
72. What was the area of land from which you harvested aquaculture produce from 3 years ago? (preferred unit) *
73. UNIT *
    1. Acre
    2. Hectare
    3. Metres squared
    4. Other (specify)
74. If OTHER UNIT, please specify *
75. Type of System * [Select all types that they own]
    1. Pond
    2. Rice-Fish
    3. Other fish system (specify)
76. How many different types of fish systems does you currently operate? (i.e. pond, rice-fish, etc.) * [This is TYPES of fish systems, not individual ponds. Enumerator can manually input this as it determines the amount of times this section is asked]
77. If OTHER, please specify *
78. Fish Systems
79. Specific Type of system *
    1. Pond
    2. Rice-Fish
    3. Other fish system (specify)
80. If POND, was this previously paddy land? *
    1. Yes
    2. No
81. If RICE FISH, what is the area of the paddy land? * [Area of paddy field, not area of fish system]
82. UNIT *
    1. Acre
    2. Hectare
    3. Metres squared
    4. Other (specify)
83. If OTHER UNIT, please specify *
84. If RICE-FISH system, have you registered this system? *
    1. Yes
    2. No
85. What is the predominant usage of this fish system? * [Predominant = main]
    1. Nursery pond
    2. Combined nursery/growout
    3. Grow out pond
    4. Broodstock pond
    5. Domestic use (no fish stocked)
    6. Domestic use (fish stocked)
    7. Other (specify)
86. If OTHER, please specify *
87. What is the area of this system? *
88. UNIT *
    1. Acre
    2. Hectare
    3. Metres squared
    4. Other (specify)
89. If OTHER, please specify *
90. Year of construction (YYYY) *
91. Is this a system in your homestead? *

1. Yes
2. No

92. Do you use anything from your agricultural production to benefit your aquaculture production and vice versa? * [Respondents will need to be probed about this question as many do not realise. This can be done with the following list]
    1. Yes
    2. No
93. If YES, what type of agri-aquaculture system do you use?
    1. Integration with chicken pen
    2. Integration with pig pen
    3. Integration with agriculture grown on banks of fish system
    4. Using pondwater to irrigate vegetables
    5. Other (specify)
94. If OTHER, please specify *
95. Do you currently hold a certificate of registration, license, or land use certificate for this system? *
    1. Yes
    2. No
    3. Not Applicable
96. If NO, have you ever been penalised or fined for not having the correct form of documentation? *
    1. Yes
    2. No

Start of Section E: Inputs

97. For how many of the previous 12 months did the fish system have water/water supply? *
98. From where did you source water for aquaculture production in the past 12 months? *
    1. Irrigation canal
    2. River or stream
    3. Ground water
    4. Rain water tank
    5. Reservoir
    6. Pond used just for storage
    7. Other (specify)
99. If OTHER, please specify *
100. For how many of the previous 12 months did the pond have energy/energy supply? *
101. From where did you source energy for aquaculture production? *
    1. Grid
    2. Diesel
    3. Petrol
    4. Solar
    5. Wind
    6. Other (specify)
102. If OTHER, please specify *
103. For what was the energy used for, in terms of aquaculture production? *
    1. Pumping water in and out of the fish system
    2. Processing fish feed
    3. Excavating/maintaining pond structure
    4. Processing Fish
    5. Other (specify)
104. If OTHER, please specify
105. For how many of the previous 12 months did you employ labour for aquaculture production? *
106. From where did you source your labour for aquaculture production in the past 12 months? *
    1. Unpaid family
    2. Hired

3. Other (specify)

107. If OTHER, please specify *

108. What gender was the majority of your employed labour for aquaculture production? * [gender]

1. Male
2. Female
3. 50/50

109. For how many of the previous 12 months did you use organic fertiliser for aquaculture production in the past 12 months? * [fertilisers in pond help pond algae and plankton to grow]

110. From where did you source your fertiliser for aquaculture production in the past 12 months? *

1. Own livestock
2. Trader in local market [Not to be confused with nearest town/city]
3. Trader without fixed premises
4. Nearest town/city
5. Other farmer
6. Government staff
7. Friends/relatives
8. Other

111. If OTHER, please specify *

112. For how many of the previous 12 months did you use chemical fertiliser for aquaculture production in the past 12 months? * [fertilisers in pond help pond algae and plankton to grow]

113. From where did you source your chemical fertiliser for aquaculture production in the past 12 months? *

1. Own livestock
2. Trader in local market [Not to be confused with nearest town/city]
3. Trader without fixed premises
4. Nearest town/city
5. Other farmer
6. Government staff
7. Friends/relatives
8. Other

114. If OTHER, please specify *

115. For how many of the previous 12 months did you use piscicides for aquaculture production? * [Piscicides kill off SIS]

116. From where did you source your piscicides for aquaculture production in the past 12 months? *

1. Own livestock
2. Trader in market [Not to be confused with nearest town/city]
3. Trader without fixed premises
4. Nearest town/city
5. Other farmer
6. Government staff
7. Friends/relatives
8. Other

117. If OTHER, please specify *

118. For how many of the previous 12 months did you use lime for aquaculture production *

119. From where did you source your lime for aquaculture production in the past 12 months? *

1. Own livestock
2. Trader in local market [Not to be confused with nearest town/city]
3. Trader without fixed premises
4. Nearest town/city
5. Other farmer
6. Government staff
7. Friends/relatives
8. Other

120. If OTHER, please specify *

121. For how many of the previous 12 months did you use bleach for aquaculture production? * [bleach kills algae and bacteria]

122. From where did you source bleach for aquaculture production over the past 12 months? *
    1. Own livestock
    2. Trader in local market [Not to be confused with nearest town/city]
    3. Trader without fixed premises
    4. Nearest town/city
    5. Other farmer
    6. Government staff
    7. Friends/relatives
    8. Other
123. If OTHER, please specify *
124. For how many of the previous 12 months did you use preservatives for aquaculture products? * [preservatives are sprayed on harvested fish to prolong the lifetime of the food]
125. From where did you source the preservatives for aquaculture products in the past 12 months? *
    1. Own livestock
    2. Trader in local market [Not to be confused with nearest town/city]
    3. Trader without fixed premises
    4. Nearest town/city
    5. Other farmer
    6. Government staff
    7. Friends/relatives
    8. Other
126. If OTHER, please specify *
127. For how many of the previous months did you use fish seed? * [If they use fish seed they must be asked whether this was fry or fingerling. Highly important to the survey]
128. From where did you source fish seed in the past 12 months? *
    1. Own production
    2. Private suppliers in the township
    3. Private suppliers outside the township (specify)
    4. Public suppliers in the township
    5. Public supplier outside the township (specify)
129. If PRIVATE SUPPLIERS OUTSIDE THE TOWNSHIP, please specify *
130. If PUBLIC SUPPLIERS OUTSIDE OF THE TOWNSHIP, please specify *
131. Do you know the country of origin of your fish seed?
    1. Myanmar
    2. Thailand
    3. China
    4. Other (specify)
    5. Don't know
132. Was the fish seed, fish fry or fish fingerling? * [If neither, as what it was, and how long it was – this could fall into our definition of fry and fingerling]
    1. Fry
    2. Fingerling
    3. Neither
133. If OTHER, please specify *
134. For how many of the previous 12 months did you use fish fry? *
135. From where did you source fish fry in the past 12 months? *.
    1. Own production
    2. Private suppliers in the township
    3. Private suppliers outside the township (specify)
    4. Public suppliers in the township
    5. Public supplier outside the township (specify)
136. If PRIVATE SUPPLIERS OUTSIDE THE TOWNSHIP, please specify *
137. If PUBLIC SUPPLIERS OUTSIDE OF THE TOWNSHIP, please specify * [This source is especially important for baseline and must be filled in in detail]
138. Do you know the country of origin of your fish fry?

1. Myanmar
2. Thailand
3. China
4. Other (specify)
5. Don't know

139. If OTHER, please specify *
140. For how many of the previous 12 months did you use fish fingerlings? *
141. From where did you source fish fingerlings in the past 12 months? *

1. Own production
2. Private suppliers in the township
3. Private suppliers outside the township (specify)
4. Public suppliers in the township
5. Public supplier outside the township (specify)

142. If PRIVATE SUPPLIERS OUTSIDE THE TOWNSHIP, please specify *
143. If PUBLIC SUPPLIERS OUTSIDE OF THE TOWNSHIP, please specify * [This source is especially important for baseline and must be filled in in detail]
144. Who stocked the fish in the past 12 months? (if applicable) * [gender]

1. Self
2. Spouse
3. Jointly with spouse
4. Jointly with other household members
5. Hired labour
6. Other (specify)
7. Not applicable

145. If OTHER, please specify *
146. Do you know the country of origin of your fish fingerlings?

1. Myanmar
2. Thailand
3. China
4. Other (specify)
5. Don't know

147. If OTHER, please specify *
148. For how many of the previous 12 months did you use pelleted fish feed? *
149. From where did you source your pelleted fish feed? *

1. Own livestock
2. Trader in local market [Not to be confused with nearest town/city]
3. Trader without fixed premises
4. Nearest town/city
5. Other farmer
6. Government staff
7. Friends/relatives
8. Other

150. If OTHER, please specify *
151. Do you know the country of origin of the pelleted fish feed?

1. Myanmar
2. Thailand
3. China
4. Other (specify)
5. Don't know

152. If OTHER, please specify *
153. How much have you spent on fish feed in the past 12 months? *
154. Who purchases fish feed? (if applicable) [gender]

1. Self
2. Spouse
3. Jointly with spouse

4. Jointly with other HH members
5. Others (specify)

155. If OTHER, please specify *

156. Who feeds the fish? * [gender]

1. Self
2. Spouse
3. Jointly with spouse
4. Jointly with other household members
5. Hired worker
6. Other (specify)

157. If OTHER, please specify *

158. What was the total cost of aquaculture production in the last 12 months? (MMK) * [prompt on any costs they may have forgotten, energy, water, feed, labour, transport, piscicides etc]

159. From the total cost of aquaculture production in the past 12 months, what was the cost associated with transportation to market? (MMK) *

160. Who transports the fish to market? * [gender]

1. Self
2. Spouse
3. Jointly with spouse
4. Jointly with household members
5. Hired labour
6. Collectors/traders/middleman
7. Other (specify)

161. If OTHER, please specify *

162. From the total cost of aquaculture production in the past 12 months, what was the cost associated with storage before sale? (MMK) * [storage after harvest and before going to point of sale]

163. What was the total cost associated with catching wild fish over the past month? (MMK) * [Costs include bait, transport, fishing rods etc.]

Start of Section F: Production and/or Consumption

164. What species of fish (or prawn/shrimp) did you rear in the last 12 months? *

1. Rohu
2. Mrigal
3. Catla
4. Common Carp
5. Grass Carp
6. Silver Carp
7. Big head carp
8. Tilapia - mixed
9. Tilapia - all male
10. Silver barb
11. Streaked prochilod/Airplane fish/Hilly hilsa
12. Striped river catfish
13. Pacu
14. Snakeskin gourami
15. Climbing perch
16. Giant freshwater prawn
17. Mola; mola carplet
18. Striped snakehead
19. Inle Carp
20. Asian seabass; baramundi
21. Zig zag eel
22. Bronze featherback

23. Banded Gourami
24. Three spot Gourami
25. Spotted barb
26. Burmese flying barb
27. Malabar loach, common spiny loach
28. Indian glassy fish
29. Other (specify)

165. If OTHER, please specify *
166. What species of fish would you prefer to raise/stock? *

1. Rohu
2. Mrigal
3. Catla
4. Common Carp
5. Grass Carp
6. Silver Carp
7. Big head carp
8. Tilapia - mixed
9. Tilapia - all male
10. Silver barb
11. Streaked prochilod/Airplane fish/Hilly hilsa
12. Striped river catfish
13. Pacu
14. Snakeskin gourami
15. Climbing perch
16. Giant freshwater prawn
17. Mola; mola carplet
18. Striped snakehead
19. Inle Carp
20. Asian seabass; baramundi
21. Zig zag eel
22. Bronze featherback
23. Banded Gourami
24. Three spot Gourami
25. Spotted barb
26. Burmese flying barb
27. Malabar loach, common spiny loach
28. Indian glassy fish
29. Other (specify)

167. If OTHER, please specify *
168. Did you have any naturally occurring SIS in your system?

1. Yes
2. No

169. If YES, did you sell or consume any of these SIS?
170. In the past 12 months, did you use any techniques to deter the entry of SIS into your fish systems, or to get rid of SIS already in your system? * [Check if they have SIS if put no. If they don't, ask how they deterred them]

1. Yes
2. No

171. In the past 12 months, did you deliberately stock SIS? *

1. Yes
2. No

172. What was your total aquaculture production in the last 12 months? (preferred unit) *
173. UNIT *

1. Kg
2. Viss

3. Single piece
4. Thousand
5. Lakh
6. Other

174. If OTHER UNIT, please specify *

175. Has your aquaculture produce increased, decreased, or stayed the same compared to 3 years ago? *
1. Increased
2. Decreased
3. Remained the same

176. Which three months (or under) are the most productive in terms of aquaculture production? *
1. January
2. February
3. March
4. April
5. May
6. June
7. July
8. August
9. September
10. October
11. November
12. December

177. Which three months (or under) are the least productive in terms of aquaculture production? *
1. January
2. February
3. March
4. April
5. May
6. June
7. July
8. August
9. September
10. October
11. November
12. December

178. What was your total aquaculture production of Carp in the last 12 months? (preferred unit) *
[Respondents may need assistance by breaking this down month by month]

179. UNIT *
1. Kg
2. Viss
3. Single piece
4. Thousand
5. Lakh
6. Other

180. If OTHER UNIT, please specify *

181. Has this amount increased, decreased, or remained the same in comparison to 3 years ago? *
1. Increased
2. Decreased
3. Remained the same

182. To what extent does this amount vary depending on the season? *
1. Very much
2. Quite a lot
3. A little bit
4. Not at all

183. What was your total aquaculture production of Tilapia in the last 12 months? (preferred unit) *
[Respondents may need assistance by breaking this down month by month]
184. UNIT *
1. Kg
2. Viss
3. Single piece
4. Thousand
5. Lakh
6. Other
185. If OTHER UNIT, please specify *
186. Has this amount increased, decreased, or remained the same in comparison to 3 years ago? *
1. Increased
2. Decreased
3. Remained the same
187. To what extent does this amount vary depending on the season? *
1. Very much
2. Quite a lot
3. A little bit
4. Not at all
188. What was your total aquaculture production of SIS in the last 12 months? (preferred unit) *
[Respondents may need assistance by breaking this down month by month]
189. UNIT *
1. Kg
2. Viss
3. Single piece
4. Thousand
5. Lakh
6. Other
190. If OTHER UNIT, please specify *
191. Has this amount increased, decreased, or remained the same in comparison to 3 years ago? *
1. Increased
2. Decreased
3. Remained the same
192. To what extent does this amount vary depending on the season? *
1. Very much
2. Quite a lot
3. A little bit
4. Not at all
193. What was your total aquaculture production of all fish in the last 12 months? (preferred unit) *
[Respondents may need assistance by breaking this down month by month]
194. UNIT *
1. Kg
2. Viss
3. Single piece
4. Thousand
5. Lakh
6. Other
195. If OTHER UNIT, please specify *
196. Has this amount increased, decreased, or remained the same in comparison to 3 years ago? *
1. Increased
2. Decreased
3. Remained the same
197. To what extent does this amount vary depending on the season? *
1. Very much
2. Quite a lot

3. A little bit
4. Not at all

198. Who harvested these fish? * [gender]
1. Self
2. Spouse
3. Jointly with spouse
4. Jointly with household members
5. Hired labour
6. Other (specify)

199. If OTHER, please specify
200. What was the total amount of wild fish that you caught in the past month? (preferred unit) *
201. UNIT *
1. Kg
2. Viss
3. Single piece
4. Thousand
5. Lakh
6. Other

202. If OTHER UNIT, please specify *
203. Has this amount increased, decreased, or remained the same in comparison to 3 years ago? *
1. Increased
2. Decreased
3. Remained the same

204. To what extent does this amount vary depending on the season? *
1. Very much
2. Quite a lot
3. A little bit
4. Not at all

205. How much of the fish that you caught in the wild, in the past month, did you sell? (preferred unit) *
206. UNIT *
1. Kg
2. Viss
3. Single piece
4. Thousand
5. Lakh
6. Other

207. If OTHER UNIT, please specify *
208. How much of the total aquaculture produce that you harvested did you sell in the last 12 months? (preferred unit) * [This question aims to understand whether there was any consumption or waste of produce. If sold all, repeat answer to production]
209. UNIT *
1. Kg
2. Viss
3. Single piece
4. Thousand
5. Lakh
6. Other

210. If OTHER UNIT, please specify *
211. How much of the total fish produce that you harvested did you sell in the last 12 months? (preferred unit) * [This question aims to understand whether there was any consumption or waste of produce. If sold all, repeat answer to production]
212. UNIT *
1. Kg
2. Viss
3. Single piece

4. Thousand
5. Lakh
6. Other

213. If OTHER UNIT, please specify *

214. How much of the Carp produce that you harvested did you sell in the last 12 months? (preferred unit) *[This question aims to understand whether there was any consumption or waste of produce. If sold all, repeat answer to production]

215. UNIT *

1. Kg
2. Viss
3. Single piece
4. Thousand
5. Lakh
6. Other

216. If OTHER UNIT, please specify *

217. How much of the total Tilapia produce that you harvested did you sell in the last 12 months? (preferred unit) * [This question aims to understand whether there was any consumption or waste of produce. If sold all, repeat answer to production]

218. UNIT *

1. Kg
2. Viss
3. Single piece
4. Thousand
5. Lakh
6. Other

219. If OTHER UNIT, please specify *

220. How much of the total SIS produce that you harvested did you sell in the last 12 months? (preferred unit) * [This question aims to understand whether there was any consumption or waste of produce. If sold all, repeat answer to production]

221. UNIT *

1. Kg
2. Viss
3. Single piece
4. Thousand
5. Lakh
6. Other

222. If OTHER UNIT, please specify *

223. In the last month, what was the average price at which you sold your Carp? (per preferred unit) *

224. UNIT *

1. Kg
2. Viss
3. Single piece
4. Thousand
5. Lakh
6. Other

225. If OTHER UNIT, please specify *

226. In the last month, what was the average price at which you sold your Tilapia? (per preferred unit) *

227. UNIT *

1. Kg
2. Viss
3. Single piece
4. Thousand
5. Lakh
6. Other

228. If OTHER UNIT, please specify *

229. In the last month, what was the average price at which you sold your SIS? (per preferred unit) *
230. UNIT *
1. Kg
2. Viss
3. Single piece
4. Thousand
5. Lakh
6. Other
231. If OTHER UNIT, please specify *
232. Has the price of Carp increased, decreased, or stayed the same compared to 3 years ago? *
1. Increased
2. Decreased
3. Remained the same
233. To what extent does this amount vary depending on the season? *
1. Very much
2. Quite a lot
3. A little bit
4. Not at all
234. Has the price of Tilapia increased, decreased, or stayed the same compared to 3 years ago? *
1. Increased
2. Decreased
3. Remained the same
235. To what extent does this amount vary depending on the season? *
1. Very much
2. Quite a lot
3. A little bit
4. Not at all
236. Has the price of SIS increased, decreased, or stayed the same compared to 3 years ago? *
1. Increased
2. Decreased
3. Remained the same
237. To what extent does this amount vary depending on the season? *
1. Very much
2. Quite a lot
3. A little bit
4. Not at all
238. Who decides when, how much, and for what price to sell the aquaculture products? * [gender]
1. Self
2. Spouse
3. Jointly with spouse
4. Jointly with other household members
5. Other (specify)
239. If OTHER, please specify *
240. Who decides what the money is spent on after the sale of these aquaculture/fish products? * [gender]
1. Self
2. Spouse
3. Jointly with spouse
4. Jointly with other household members
5. Other (specify)
241. If OTHER, please specify *
242. Does a collector, trader, or middleman purchase your aquaculture produce directly from your house? *
1. Yes
2. No
243. Does your household directly sell aquaculture produce at the market? * [This should be YES, if the answer to the previous question was NO]

1. Yes
2. No

244. If YES, who in the household sells at the market? * [gender]

1. Self
2. Spouse
3. Jointly with spouse
4. Jointly with other household members
5. Other (specify)

245. If OTHER, please specify *

246. If you purchase Carp, what is the average price, in MMK, that you paid in the last month? (preferred unit)

247. UNIT *

1. Kg
2. Viss
3. Single piece
4. Thousand
5. Lakh
6. Other

248. If OTHER UNIT, please specify *

249. If you purchase Tilapia, what is the average price, in MMK, that you paid in the last month? (preferred unit)

250. UNIT *

1. Kg
2. Viss
3. Single piece
4. Thousand
5. Lakh
6. Other

251. If OTHER UNIT, please specify *

252. If you purchase SIS, what is the average price, in MMK, that you paid in the last month? (preferred unit)

253. UNIT *

1. Kg
2. Viss
3. Single piece
4. Thousand
5. Lakh
6. Other

254. If OTHER UNIT, please specify *

255. How much of the total aquaculture produce that you harvested did you consume in the past 12 months? (preferred unit) * [If total harvested = total sold, this should be 0]

256. UNIT *

1. Kg
2. Viss
3. Single piece
4. Thousand
5. Lakh
6. Other

257. If OTHER UNIT, please specify *

258. How much of the total fish produce that you harvested did you consume in the past 12 months? (preferred unit) * [If total harvested = total sold, this should be 0]

259. UNIT *

1. Kg
2. Viss
3. Single piece
4. Thousand

5. Lakh
6. Other

260. If OTHER UNIT, please specify *

261. How much of the Carp produce that you harvested did you consume in the past 12 months? (preferred unit) * [If total harvested = total sold, this should be 0]

262. UNIT *

1. Kg
2. Viss
3. Single piece
4. Thousand
5. Lakh
6. Other

263. If OTHER UNIT, please specify *

264. How much of the Tilapia produce that you harvested did you consume in the past 12 months? (preferred unit) * [If total harvested = total sold, this should be 0]

265. UNIT *

1. Kg
2. Viss
3. Single piece
4. Thousand
5. Lakh
6. Other

266. If OTHER UNIT, please specify *

267. How much of the SIS produce that you harvested did you consume in the past 12 months? (preferred unit) * [If total harvested = total sold, this should be 0]

268. UNIT *

1. Kg
2. Viss
3. Single piece
4. Thousand
5. Lakh
6. Other

269. If OTHER UNIT, please specify *

270. In the past 12 months, did your fish spawn produce hatchlings? * [If one species of fish, this question should be same]

1. Yes
2. No

271. If YES, what species? *

1. Rohu
2. Mrigal
3. Catla
4. Common Carp
5. Grass Carp
6. Silver Carp
7. Big head carp
8. Tilapia - mixed
9. Tilapia - all male
10. Silver barb
11. Streaked prochilod/Airplane fish/Hilly hilsa
12. Striped river catfish
13. Pacu
14. Snakeskin gourami
15. Climbing perch
16. Giant freshwater prawn
17. Mola; mola carplet

18. Striped snakehead
19. Inle Carp
20. Asian seabass; baramundi
21. Zig zag eel
22. Bronze featherback
23. Banded Gourami
24. Three spot Gourami
25. Spotted barb
26. Burmese flying barb
27. Malabar loach, common spiny loach
28. Indian glassy fish
29. Other (specify)

272. If OTHER, please specify
273. If YES, how many hatchlings did your fish produce within the last 12 months? (preferred species) *
274. UNIT *

1. Kg
2. Viss
3. Single piece
4. Thousand
5. Lakh
6. Other

275. If OTHER UNIT, please specify *
276. Did you engage in processing your fish products in the past 12 months? *

1. Yes
2. No

277. If YES, what kind? *

1. Drying
2. Salting
3. Fermenting
4. Smoking
5. Scraping for fish balls
6. Other (specify)

278. If OTHER, please specify *
279. If YES, from where did you source labour for processing your aquatic products in the past 12 months? *

1. Unpaid family
2. Hired Worker
3. Other

280. If OTHER, please specify *

Start of Section G: Logistics VC

281. To what extent did you face difficulty with the quality of road infrastructure whilst transporting your aquaculture produce to the point of sale in the past 12 months? *

1. Very difficult
2. Quite difficult
3. Quite easy
4. Very easy

282. If VERY DIFFICULT, or QUITE DIFFICULT, how do you address this issue? *
283. To what extent did you face difficulty with the suitability of vehicles whilst transporting your aquaculture produce to the point of sale in the past 12 months? *

1. Very difficult
2. Quite difficult
3. Quite easy
4. Very easy

284. If VERY DIFFICULT, or QUITE DIFFICULT, how do you address this issue? *
285. To what extent did you face difficulty with the distance of the market whilst transporting your aquaculture produce to the point of sale in the past 12 months? *
    1. Very difficult
    2. Quite difficult
    3. Quite easy
    4. Very easy
286. If VERY DIFFICULT, or QUITE DIFFICULT, how do you address this issue? *
287. To what extent did you face difficulty with cooling your aquaculture produce with ice before sale in the past 12 months? *
    1. Very difficult
    2. Quite difficult
    3. Quite easy
    4. Very easy
    5. Not applicable
288. If VERY DIFFICULT, or QUITE DIFFICULT, how do you address this issue? *
289. Where there any other logistical challenges that you faced between harvesting and selling your aquaculture produce in the past 12 months? How did you address this issue?
290. When expanding aquaculture production, what were the top three difficulties you faced regarding the following?
    1. Production technology
    2. Accessing capital
    3. Land tenure regulation & policies
    4. Acquiring labour
    5. Accessibility of fish feed
    6. Price of fish feed
    7. Weather conditions
    8. Availability of water
    9. Other
    10. Quality of fish seed
291. If OTHER, please specify *
292. Pick three out of the following that you regard as the most helpful for expanding your aquaculture production *
    1. Proximity to water resources
    2. Better access to capital/finance
    3. Better access to market
    4. Better availability of labour
    5. Technical support from the DoF or other organisations
    6. Better access to fish seed
    7. Policy

Start of Section H: Nutrition

293. Was the last 24 hours a good representative of your average daily food consumption? i.e. if you fasted, or ate above an average amount, maybe due to a festival, this would not be a good representative * [
    1. Yes
    2. No
294. Did you have anything to eat or drink when you woke? If yes, what? Anything else? (24hrs) *
    1. Grains, white tubers, plantains
    2. Pulses
    3. Nuts and Seeds
    4. Dairy
    5. Meat, poultry, and fish
    6. Eggs

7. Dark Green leafy vegetables
8. Other Vitamin A rich fruit and vegetables
9. Other vegetables
10. Other fruits
11. Other (specify)
12. Nothing

295. If OTHER, please specify *

296. Did you have anything to eat or drink late in the morning? If yes, what? Anything else? (24hrs) *

1. Grains, white tubers, plantains
2. Pulses
3. Nuts and Seeds
4. Dairy
5. Meat, poultry, and fish
6. Eggs
7. Dark Green leafy vegetables
8. Other Vitamin A rich fruit and vegetables
9. Other vegetables
10. Other fruits
11. Other (specify)
12. Nothing

297. If OTHER, please specify *

298. Did you have anything to eat or drink at mid-day? If yes, what? Anything else? (24hrs) *

1. Grains, white tubers, plantains
2. Pulses
3. Nuts and Seeds
4. Dairy
5. Meat, poultry, and fish
6. Eggs
7. Dark Green leafy vegetables
8. Other Vitamin A rich fruit and vegetables
9. Other vegetables
10. Other fruits
11. Other (specify)
12. Nothing

299. If OTHER, please specify *

300. Did you have anything to eat or drink during the afternoon? If yes, what? Anything else? (24hrs) *

1. Grains, white tubers, plantains
2. Pulses
3. Nuts and Seeds
4. Dairy
5. Meat, poultry, and fish
6. Eggs
7. Dark Green leafy vegetables
8. Other Vitamin A rich fruit and vegetables
9. Other vegetables
10. Other fruits
11. Other (specify)
12. Nothing

301. If OTHER, please specify *

302. Did you have anything to eat or drink in the evening? If yes, what? Anything else? (24hrs) *

1. Grains, white tubers, plantains
2. Pulses
3. Nuts and Seeds
4. Dairy
5. Meat, poultry, and fish

6. Eggs
7. Dark Green leafy vegetables
8. Other Vitamin A rich fruit and vegetables
9. Other vegetables
10. Other fruits
11. Other (specify)

303. If OTHER, please specify *

304. Did you have anything to eat or drink in the evening before going to bed or during the night? If yes, what? Anything else? (24hrs) *

1. Grains, white tubers, plantains
2. Pulses
3. Nuts and Seeds
4. Dairy
5. Meat, poultry, and fish
6. Eggs
7. Dark Green leafy vegetables
8. Other Vitamin A rich fruit and vegetables
9. Other vegetables
10. Other fruits
11. Other (specify)
12. Nothing

305. If OTHER, please specify *

306. How many meals do you consume on a typical day? *

307. How many meals that you have consumed in the past 7 days, have contained items from Photo set 1? *

308. Has your consumption of these items increased, decreased, or remained the same in comparison to 3 years ago? *

1. Increased
2. Decreased
3. Remained the same

309. How many meals that you have consumed in the past 7 days, have contained items from Photo set 2? *

310. Has your consumption of these items increased, decreased, or remained the same in comparison to 3 years ago? *

1. Increased
2. Decreased
3. Remained the same

311. How many meals that you have consumed in the past 7 days, have contained items from Photo set 3? *

312. Has your consumption of these items increased, decreased, or remained the same in comparison to 3 years ago? *

1. Increased
2. Decreased
3. Remained the same

313. How many meals that you have consumed in the past 7 days, have contained items from Photo set 4? *

314. Has your consumption of these items increased, decreased, or remained the same in comparison to 3 years ago? *

1. Increased
2. Decreased
3. Remained the same

315. How many meals that you have consumed in the past 7 days, have contained items from Photo set 5? *

316. Has your consumption of these items increased, decreased, or remained the same in comparison to 3 years ago? *

1. Increased
2. Decreased
3. Remained the same

317. How many meals that you have consumed in the past 7 days, have contained items from Photo set 6?
318. Has your consumption of these items increased, decreased, or remained the same in comparison to 3 years ago? *
1. Increased
2. Decreased
3. Remained the same
319. How many meals that you have consumed in the past 7 days, have contained items from Photo set 7?
320. Has your consumption of these items increased, decreased, or remained the same in comparison to 3 years ago? *
1. Increased
2. Decreased
3. Remained the same
321. How many meals that you have consumed in the past 7 days, have contained items from Photo set 8?
322. Has your consumption of these items increased, decreased, or remained the same in comparison to 3 years ago? *
1. Increased
2. Decreased
3. Remained the same
323. How many meals that you have consumed in the past 7 days, have contained items from Photo set 9?
324. Has your consumption of these items increased, decreased, or remained the same in comparison to 3 years ago? *
1. Increased
2. Decreased
3. Remained the same
325. How many meals that you have consumed in the past 7 days, have contained items from Photo set 10?
326. Has your consumption of these items increased, decreased, or remained the same in comparison to 3 years ago? *
1. Increased
2. Decreased
3. Remained the same
327. Have you consumed fish in the past 24 hours? *
1. Yes
2. No
328. What was the estimate weight of the portion of fish that you individually consumed *? [Respondents may need to be helped to divide the total weight by their individual portion]
329. UNIT *
1. Gram (g)
2. Kg
3. Viss
4. Single piece
5. Thousand
6. Lakh
7. Other
330. If OTHER UNIT, please specify *
331. In the past 7 days, how many meals containing fish have you consumed? *
332. Which of the following species of fish did you consume in the past 7 days? *
1. Rohu
2. Mrigal
3. Catla
4. Common Carp
5. Grass Carp
6. Silver Carp

7. Big head carp
8. Tilapia - mixed
9. Tilapia - all male
10. Silver barb
11. Streaked prochilod/Airplane fish/Hilly hilsa
12. Striped river catfish
13. Pacu
14. Snakeskin gourami
15. Climbing perch
16. Giant freshwater prawn
17. Mola; mola carplet
18. Striped snakehead
19. Inle Carp
20. Asian seabass; baramundi
21. Zig zag eel
22. Bronze featherback
23. Banded Gourami
24. Three spot Gourami
25. Spotted barb
26. Burmese flying barb
27. Malabar loach, common spiny loach
28. Indian glassy fish
29. Other (specify)

333. In the past 7 days, how many meals did you have where you consumed whole fish? (including eyes, bones, etc.) * [This is more in reference to SIS]
334. In the past 7 day, how many meals did you have where you consumed SIS? *
335. Which of the following criteria did the majority of SIS consumed in the past 7 days fit? *
    1. Whole fish (including eyes, bones, and head)
    2. Fish with bones but head removed
    3. Head and bones removed
    4. Other
336. If OTHER, please specify *
337. In the past 7 days, how many meals did you have where you consumed processed fish? *
338. Do you have any preference in terms of consuming wild caught, locally farmed, or Yangon farmed fish? *
    1. Wild caught
    2. Locally caught fish
    3. Yangon farmed fish
    4. No preference
339. What is the reason for this preference? *
    1. Price
    2. Quality
    3. Species
    4. Location of fish source
    5. Other
340. If OTHER, please specify *
341. When do you eat fish more commonly? *
    1. Morning (breakfast)
    2. During the day
    3. Evening time
342. In which circumstances does this meal commonly take place? *
    1. At home (home cooked)
    2. At home (cooked outside/purchased)
    3. At restaurant/rice shop
    4. At friends/relatives

5. Other (specify)

343. What proportion of your total fish consumption is provided through these meals? *
1. Less than 25%
2. Between 25% and 50%
3. Between 50% and 75%
4. More than 75%

344. Would you say that this proportion is increasing or decreasing with time? *
1. Increasing
2. Decreasing
3. Stable

345. If increasing or decreasing, could you mention the main (one) reason for this change? *

346. If OTHER, please specify *

347. Who decides what and what quantity of food the household consumes? *
1. Self
2. Spouse
3. Jointly with spouse
4. Jointly with household members
5. Other (specify)

348. If OTHER, please specify *

349. Who cooks the majority of the meals that you eat? *
1. Self
2. Spouse
3. Jointly with spouse
4. Jointly with household members
5. Other (specify)

350. If OTHER, please specify *

Section I: Nutrition of women of reproductive age

351. If the current respondent a woman between 15 and 59 years of age? * [Current respondent does not have to be the same as initial respondent]
1. Yes
2. No

352. If NO, is there a woman between the age of 15-49 that we may specifically ask about their level of nutrition? *
1. Yes
2. No

353. The rest of the questionnaire is to be answered by a woman between 15 and 49.

354. Was the last 24 hours a good representative of your average daily food consumption? i.e. if you fasted, or ate an above average amount, maybe due to a festival, this would not be a good representative. *
1. Yes
2. No

355. Did you have anything to eat or drink when you woke? If yes, what? Anything else? (24hrs) *
1. Grains, white tubers, plantains
2. Pulses
3. Nuts and Seeds
4. Dairy
5. Meat, poultry, and fish
6. Eggs
7. Dark Green leafy vegetables
8. Other Vitamin A rich fruit and vegetables
9. Other vegetables
10. Other fruits
11. Other (specify)

12. Nothing

356. If OTHER, please specify *

357. Did you have anything to eat or drink late in the morning? If yes, what? Anything else? (24hrs) *

1. Grains, white tubers, plantains
2. Pulses
3. Nuts and Seeds
4. Dairy
5. Meat, poultry, and fish
6. Eggs
7. Dark Green leafy vegetables
8. Other Vitamin A rich fruit and vegetables
9. Other vegetables
10. Other fruits
11. Other (specify)
12. Nothing

358. If OTHER, please specify *

359. Did you have anything to eat or drink at mid-day? If yes, what? Anything else? (24hrs) *

1. Grains, white tubers, plantains
2. Pulses
3. Nuts and Seeds
4. Dairy
5. Meat, poultry, and fish
6. Eggs
7. Dark Green leafy vegetables
8. Other Vitamin A rich fruit and vegetables
9. Other vegetables
10. Other fruits
11. Other (specify)
12. Nothing

360. If OTHER, please specify *

361. Did you have anything to eat or drink during the afternoon? If yes, what? Anything else? (24hrs) *

1. Grains, white tubers, plantains
2. Pulses
3. Nuts and Seeds
4. Dairy
5. Meat, poultry, and fish
6. Eggs
7. Dark Green leafy vegetables
8. Other Vitamin A rich fruit and vegetables
9. Other vegetables
10. Other fruits
11. Other (specify)
12. Nothing

362. If OTHER, please specify *

363. Did you have anything to eat or drink in the evening? If yes, what? Anything else? (24hrs) *

1. Grains, white tubers, plantains
2. Pulses
3. Nuts and Seeds
4. Dairy
5. Meat, poultry, and fish
6. Eggs
7. Dark Green leafy vegetables
8. Other Vitamin A rich fruit and vegetables
9. Other vegetables
10. Other fruits

11. Other (specify)
12. Nothing

364. If OTHER, please specify *

365. Did you have anything to eat or drink in the evening before going to bed or during the night? If yes, what? Anything else? (24hrs) *

1. Grains, white tubers, plantains
2. Pulses
3. Nuts and Seeds
4. Dairy
5. Meat, poultry, and fish
6. Eggs
7. Dark Green leafy vegetables
8. Other Vitamin A rich fruit and vegetables
9. Other vegetables
10. Other fruits
11. Other (specify)
12. Nothing

366. If OTHER, please specify *

367. How many meals do you consume on a typical day? *

368. How many meals that you have consumed in the past 7 days, have contained items from Photo set 1? *

369. Has your consumption of these items increased, decreased, or remained the same in comparison to 3 years ago? *

1. Increased
2. Decreased
3. Remained the same

370. How many meals that you have consumed in the past 7 days, have contained items from Photo set 2? *

371. Has your consumption of these items increased, decreased, or remained the same in comparison to 3 years ago? *

1. Increased
2. Decreased
3. Remained the same

372. How many meals that you have consumed in the past 7 days, have contained items from Photo set 3? *

373. Has your consumption of these items increased, decreased, or remained the same in comparison to 3 years ago? *

1. Increased
2. Decreased
3. Remained the same

374. How many meals that you have consumed in the past 7 days, have contained items from Photo set 4? *

375. Has your consumption of these items increased, decreased, or remained the same in comparison to 3 years ago? *

1. Increased
2. Decreased
3. Remained the same

376. How many meals that you have consumed in the past 7 days, have contained items from Photo set 5? *

377. Has your consumption of these items increased, decreased, or remained the same in comparison to 3 years ago? *

1. Increased
2. Decreased
3. Remained the same

378. How many meals that you have consumed in the past 7 days, have contained items from Photo set 6? *
379. Has your consumption of these items increased, decreased, or remained the same in comparison to 3 years ago? *
    1. Increased
    2. Decreased
    3. Remained the same
380. How many meals that you have consumed in the past 7 days, have contained items from Photo set 7? *
381. Has your consumption of these items increased, decreased, or remained the same in comparison to 3 years ago? *
    1. Increased
    2. Decreased
    3. Remained the same
382. How many meals that you have consumed in the past 7 days, have contained items from Photo set 8? *
383. Has your consumption of these items increased, decreased, or remained the same in comparison to 3 years ago? *
    1. Increased
    2. Decreased
    3. Remained the same
384. How many meals that you have consumed in the past 7 days, have contained items from Photo set 9? *
385. Has your consumption of these items increased, decreased, or remained the same in comparison to 3 years ago? *
    1. Increased
    2. Decreased
    3. Remained the same
386. How many meals that you have consumed in the past 7 days, have contained items from Photo set 10? *
387. Has your consumption of these items increased, decreased, or remained the same in comparison to 3 years ago? *
    1. Increased
    2. Decreased
    3. Remained the same
388. Have you consumed fish in the past 24 hours? *
    1. Yes
    2. No
389. What was the estimate weight of the portion of fish that you individually consumed *
390. UNIT *
    1. Gram (g)
    2. Kg
    3. Viss
    4. Single piece
    5. Thousand
    6. Lakh
    7. Other
391. If OTHER UNIT, please specify *
392. In the past 7 days, how many meals containing fish have you consumed? *
393. Which of the following species of fish did you consume in the past 7 days? *
    1. Rohu
    2. Mrigal
    3. Catla
    4. Common Carp
    5. Grass Carp

6. Silver Carp
7. Big head carp
8. Tilapia - mixed
9. Tilapia - all male
10. Silver barb
11. Streaked prochilod/Airplane fish/Hilly hilsa
12. Striped river catfish
13. Pacu
14. Snakeskin gourami
15. Climbing perch
16. Giant freshwater prawn
17. Mola; mola carplet
18. Striped snakehead
19. Inle Carp
20. Asian seabass; baramundi
21. Zig zag eel
22. Bronze featherback
23. Banded Gourami
24. Three spot Gourami
25. Spotted barb
26. Burmese flying barb
27. Malabar loach, common spiny loach
28. Indian glassy fish
29. Other (specify)

394. If OTHER, please specify *
395. In the past 7 days, how many meals did you have where you consumed whole fish? (including eyes, bones, etc.) *
396. In the past 7 day, how many meals did you have where you consumed SIS? *
397. Which of the following criteria did the majority of SIS consumed in the past 7 days fit? *

1. Whole fish (including eyes, bones, and head)
2. Fish with bones but head removed
3. Head and bones removed
4. Other

398. If OTHER, please specify *
399. In the past 7 days, how many meals did you have where you consumed processed fish? *
400. Interview end time *
401. Thank you very much for taking the time to fill out this questionnaire!