MYSAP Inland

Reporting Period:
06 April 2017 – 31 July 2021

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Myanmar Sustainable Aquaculture Programme

Result 4 – MYSAP Inland

Implemented by:

Programme Details

Project Title: Improving the production, nutrition and market values of small-scale aquaculture in Myanmar's Shan State and Sagaing Region (MYSAP Inland)

CRIS No:	DCI-ASIE/2015/038-078 (Grant agreement # AG10391)
Country:	Myanmar
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Implemented by:	WorldFish Myanmar
Reporting period	06 April 2017 to 31 July 2021
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Submitted to:	*Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH*
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List of abbreviations

BMZ	German Federal Ministry for Economic Cooperation and Development
CDM	Civil disobedience movement
COVID-19	Corona Virus Disease 2019 (the contagious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2))
dbh	Direct beneficiary household
DoF	Department of Fisheries
EU	European Union
FCR	Feed Conversion Ratio
FRDN	Fisheries Research and Development Network
GAD	General Administration Department
GIFT	Genetically improved farmed tilapia
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
IEC	Information, Education and Communication
MFF	Myanmar Fisheries Federation
MIMU	Myanmar Information Management Unit
MKE	Mekong Economics Limited
MoHS	Ministry of Health and Sports
MOU	Memorandum of Understanding
MYSAP Inland	Myanmar Sustainable Aquaculture Programme – inland component
PCR	Polymerase chain reaction
SGA	Sub-grant agreement
SIS	Small indigenous fish species
SSA	Small-scale aquaculture
SUN CSA	Scaling-Up Nutrition Civil Society Alliance
TiLV	Tilapia Lake Virus
TOR	Terms of reference

1 Executive summary

The Myanmar Sustainable Aquaculture Programme inland component (MYSAP Inland) contract #81209660, commenced on 06 April 2017, had a total value of € 3,008,602 and ended on 31 July 2021. This report is the ninth technical progress report or the completion report, and it covers the entire implementation period from 06 April 2017 to 31 July 2021 inclusive.

The Multiannual Indicative Programme (2014-2020) identified that approximately one third of children in Myanmar suffered chronic undernutrition (stunting), the nationwide prevalence of moderately underweight children was 32% and the mean proportion of total household expenditure on food was 68%. Fish provided more than 70% of animal protein, with mean consumption levels estimated to be from 20 to over 40 kg per person per year. However, compared to other neighbouring countries aquaculture only provided a small proportion of the total fish consumed because of localized production, relatively high prices, difficult logistics and high post-harvest handling losses. Seasonality, poor infrastructure (transport and electricity) and lack of post-harvest technology, meant that a large part of fish consumed was either dried or as fish pastes, with some nutritional loss compared to fresh or frozen fish.

MYSAP addressed the following constraints to aquaculture:

- Provision of extension and training services on aquaculture and nutrition;
- Promotion of enabling policy and legislation;
- Making quality aquaculture inputs readily available;
- Supporting hatchery and nursery production facilities;
- Promotion of improved biosecurity and disease management and control;
- Facilitating the involvement of small-scale producers in the value chain;
- Sustainable intensification of small-scale aquaculture;
- Promotion of climate change smart aquaculture production systems; and,
- Support for vocational and higher aquaculture education, training and extension services.

By doing the above, MYSAP increased the proportion of fish available in Myanmar from aquaculture which improved the household nutrition, livelihoods, health, income and security of direct beneficiaries and had other impacts on indirect beneficiaries, while also making cultured fish more readily available in local markets.

From its commencement in 06 April 2017 until 31 May 2020 the inland component of MYSAP conducted field activities in five townships, namely:

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.

For the costed extension year, 01 June 2020 to 31 May 2021, approved by the 3rd supplement to the grant agreement, MYSAP conducted field activities in only three townships, namely:

i) Kale (ကလေး - MMR005027) Township, Sagaing Region

ii) Shwebo (ရွှေဘို - MMR005004) Township, Sagaing Region

iii) Kengtung (ကျိုင်းတုံ - MMR016001) Township, Eastern Shan State.

During the 2018-19 culture season MYSAP delivered training and extension services on small-scale[1] freshwater aquaculture (SSA) and improved human nutrition to 648 direct beneficiary households each with a pond of less than 0.5 acres (0.2 hectares) in area. Extension services were provided under sub-grant agreements with three non-government organizations (NGO's) namely by Ar Yone Oo, BRAC Myanmar and Malteser International to 151, 256 and 241 direct beneficiary households (dbh) respectively in Kale, Shwebo and Kengtung Townships.

In the 2019-20 culture season MYSAP delivered training and extension services on SSA and improved human nutrition to 1,264 direct beneficiary households (dbh) through the same 3 NGO's in Kale, Kengtung and Shwebo Townships and the Department of Fisheries (DoF) in Pinlaung Township.

In the third and final 2020-21 culture season, MYSAP delivered training and extension services on small-scale aquaculture (SSA) and improved human nutrition to 1,255 dbh through the same 3 NGO's in Kale, Kengtung and Shwebo Townships, including, 1,075 dbh, and 180 households sharing the benefits from 2 community ponds in Kengtung Township.

From the start (06 April 2017) to the end (31 July 2021) of the inland component of MYSAP period, training and extension services on small-scale aquaculture (SSA) and improved human nutrition have been delivered to 1,504 different dbh and this was despite operating for 15 months during the novel coronavirus 2 (COVID-19) pandemic with lockdown, travel and meeting size restrictions, and operating for 4 months under the state of emergency that began on 01 February 2021, following the detention of Aung San Suu Kyi by the military and the resulting curfews, internet cuts at night and reduced internet speeds during the day time and the Civil Disobedience Movement (CDM) and street protests.

While the inland component of MYSAP activities were impacted at all locations by the COVID-19 pandemic, the inland component of MYSAP operated in a COVID-19 smart-manner and followed all government imposed restrictions on travel, face-to-face meetings and limitations on group size for meetings, trainings and workshops, imposed to reduce the risk of COVID-19 contagion and spread.

Availability and access to inputs

The inland component of MYSAP successfully delivered four key inputs that previously constrained sustainable freshwater aquaculture development in Myanmar, namely i) extension and training services, ii) promotion of improved aquaculture technologies, iii) improved quality fish seed was made available, and, iv) sinking fish pellets were locally produced and sold.

The inland component of MYSAP enhanced the capacity of a cadre of 37 (17 ♀; 46%) NGO staff who following Training of Trainer (TOT) training by aquaculture, medical and nutrition advisors from WorldFish and Save the Children on *Small-scale aquaculture, integrated vegetable and fruit production and improved human nutrition and the benefits of eating a balanced and diverse diet*, have between 1-3 years of experience of delivering season-long extension and training services to direct beneficiary households. These trained staff, remain in Myanmar.

[1] MYSAP defined a small-scale freshwater pond as being a pond of less than 0.5 acres (2,023 m^2) which held water for at least six months per year.

The capacity of Ar Yone Oo, BRAC Myanmar and Malteser International to deliver extension and training services on small-scale aquaculture, integrated vegetable and fruit production and improved human nutrition has also been enhanced following 3 years of interaction with MYSAP and this has resulted in Ar Yone Oo and BRAC Myanmar obtaining more donor funds for delivery of aquaculture and nutrition activities in the field.

MYSAP funded technical support with international consultant input, technical training of staff, equipment and running cost support to develop the DoF Nad Yay Kan Hatchery and the Aung Zay Ya Hatchery, Shwebo as satellite hatcheries producing and selling all-male genetically improved farmed tilapia (GIFT). GIFT is a fast growing fish that reaches market size in 3-4 months, even in climate change foreshortened grow-out seasons. To 31 May 2021, the 2 GIFT satellite hatcheries sold a total of 536,180 all-male GIFT seed to 374 farmers. MYSAP also contributed to international consultant input and technical staff training, equipment and running cost support for the DoF Hlawgar and the Daedaye Hatcheries as the nuclear breeding population locations for GIFT.

MYSAP supported and trained a total of 28 (2 ♀) specialized nursery farmers that nursed and supplied a total of 914,956 fish seed locally to grow-out farmers. In addition the inland component of MYSAP promoted the short-term (1 month) nursing of fish seed in nylon cages or hapas within grow-out ponds, rather than direct stocking of fish into grow-out ponds following transportation.

MYSAP supported the stocking of 339,885 fish seed into 454 direct beneficiary ponds in the 2018-19 fish culture season, the stocking of 601,943 dbh ponds in the 2019-20 culture season and the stocking of 708,291 fish seed into 711 dbh ponds in the 2020-21 culture season, i.e. MYSAP funded the stocking of 1,650,119 fish seed into small-scale freshwater ponds during 3 years of fish culture season support, with 55.4% of the stocked fish supplied by MYSAP supported nursery farmers.

MYSAP equipped, supported and trained a total of 60 (6 ♀) feed millers that produced and sold a total of 33,042 viss (53,858.5 kg) of sinking pelleted fish feed from locally available raw ingredients which had a crude protein content of 20%. The total value of the feed produced by MYSAP supported feed millers was MMK 36.68 million (€ 22,925) and it was sold to 765 different farmers, including 697 MYSAP direct beneficiary households.

The inputs supported by MYSAP resulted in a cumulative production of 175,394 kg of fish being produced by the direct beneficiary households from their small-scale freshwater aquaculture ponds during the 3 culture seasons of MYSAP support.

Food security and nutrition

MYSAP supported the development of a cadre of 37 (17 ♀; 46%) NGO staff who have had Training of Trainer (TOT) training by medical and nutrition advisors from Save the Children and WorldFish on *Improved human nutrition and the benefits of eating a balanced and diverse diet*, and who have between 1-3 years of experience of delivering season-long extension and training services on improved human nutrition and the benefits of eating a balanced and diverse diet to direct beneficiary households. These trained staff remain in Myanmar.

MYSAP funded a Barrier Analysis Study to identify what was the key constraint to mothers of children under 5 years of age from feeding their children more fish and thereafter promoted measures to reduce the fear of, and the likelihood of children choking on bones by promoting recipes for the production of fish balls and the production of powdered small indigenous fish species.

The small-scale freshwater ponds were the entry point for the delivery of MYSAP extension and training services on food security, with 1,504 dbh, with over 7,500 household members, receiving improved human nutrition and integrated fish, vegetable and fruit culture system training delivered by the same NGO's, in training sessions delivered at appropriate times in the culture season of the fish, vegetables and fruit. The 1,504 dbh that benefitted

from MYSAP support had a total of 1,913 women of reproductive age, 197 adolescent girls and 389 children under 5 years of age. 238 of the 1,504 dbh that MYSAP supported shared the benefits of fish production from four different community ponds in Kengtung Township. 50 of these households had family members with leprosy and 46 were female headed households that were extremely vulnerable.

Additionally MYSAP funded nutrition awareness training delivery via 3 the NGO's and their staff to 1,820 people (1,774 ♀; 97.5%) at pre- and post-natal health clinics attended by pregnant women and women with children under the age of 5 and micro-credit receipt and repayment locations.

MYSAP has also supported the development of a significant number of Myanmar information, education and communication (IEC) materials on nutrition related topics, some of which have been translated into Shan, Lahu, Arka and Pa'O languages. A total of 8,070 people visited the 4 nutrition related IEC materials uploaded onto the Greenovator Green Way mobile phone application.

During the implementation period of the inland component of MYSAP, vegetable and fruit seeds and cuttings were supplied to a total of 1,266 dbh.

The above MYSAP supported activities have also contributed to the minimum dietary diversity scores increasing from a mean baseline score 3.34 in 2018, to a mean score of 4.87 during the MYSAP inland component endline survey in 2021 for direct beneficiary households, and this was after a full year of the COVID-19 pandemic.

In addition MYSAP funded the following innovative and valuable activities to promote and stimulate nutrition and to improve post-harvest practices of fish and food safety:

- 90 people (63 ♀) attended 3 training courses on fish preservation by i) drying, ii) salting, iii) pickling/fermentation in Shwebo, Kengtung and Kale townships.
- 60 women in Kale, Shwebo and Kengtung townships community tested a low-cost portable fish drier to reduce fly and insect infestation and produced a dried fried small indigenous fish species (SIS) powder. Food safety tests and proximate analysis conducted at the DoF QCRS Analytical Laboratory confirmed that the dried powdered SIS was food safe and could be fed as a complementary feed for infants above six months of age.
- Conducted a stacked value chain analysis of smoked fish and contracted international consultant input to remotely oversee the construction of and training on, the operation of 2 improved fish smokers in Kale Township, Sagaing Region, which used one third of the fuel and smoked the fish several hours quicker.
- Supported trade and marketing groups, wholesalers, vendors and processors with post-harvest innovation consultancy input that developed a guide manual entitled *Good post-harvest practices for fresh fish trading* translated into Myanmar and Big Shan languages and training for 10 vendors and 20 NGO staff.
- Arranged collaborative production by nutrition, horticulturalists, livelihoods and communication specialist staff from the inland component of MYSAP, and the Fish for Livelihoods programme of English and Myanmar versions of a booklet entitled, *Best management practices (BMP) for vegetable production systems* covering 15 key vegetable species that were important for human nutrition.
- Supported National Nutrition Promotion Month activities at national and township level in August each year for 3 years.
- Trained NGO staff on and implemented minimum dietary diversity for women (MDD-W) and fish consumption surveys.
- Trained NGO staff on and implemented fish market sampling surveys.
- Arranged a parasite screening study that found potential parasite species in 10 of 41 (24%) of the analyzed paste samples, and which highlighted the need to sufficiently cooking fish and shrimp pastes before consumption, to kill the parasite life-cycle stages.

2 Relevance of action

MYSAP Inland was largely aligned with the Agricultural Development Strategy and Investment Plan for Myanmar and the approved National Aquaculture Development Plan.

MYSAP Inland activities increased the resilience and the ability of poor and vulnerable households to produce essential food items including fish, vegetables and fruit, and within the COVID-19 pandemic context, were of even greater relevance, because eating a more diverse diet strengthens the immune system and natural resistance of the human body to disease pathogens.

"It is a basic human right to have regular access to sufficient diverse and safe food and a healthy diet is the first line of defence against disease. …. A strong immune system across the lifespan, supported by a healthy diet and clean environment, is imperative to fight off the COVID-19[2]. It is imperative to ensure that the agriculture sector as a source of livelihood/income and source of food is not disrupted" to prevent a major shift towards non-diversified diets and food insecurity.

MYSAP Inland contribution to MYSAP

Chapter 4 of this report, details inland component of MYSAP progress and contribution towards planned MYSAP Results and log frame indicators.

3 MYSAP Inland activities and achievements

3.1.1 Grant agreement, sub-grants and audits

The 1st Supplement to the Grant Agreement, contract number 81209660, with a revised total value of € 2,608,602 was signed on 28 August 2018 and included € 214,332 for sub-grant agreements with Ar Yone Oo, BRAC Myanmar and Malteser International to provide extension and training services until 31 March 2019 to 656 households in Kale and Shwebo Townships, Sagaing Region and Kengtung Township, Shan State respectively.

A 2nd Supplement to the Grant Agreement dated 27 June 2019, approved internal movement of funds to continue extension and training service provision by NGO's for a second season and extended the MYSAP Inland period from 06 May 2019 until 31 May 2019.

MYSAP Inland was originally planned to end on 31 May 2020, but under the 3rd supplement to the grant agreement, dated 23 June 2020, a costed € 400,000 one year extension of MYSAP Inland was approved to conduct activities in Kale, Shwebo and Kengtung Townships until 31 May 2021, with a total MYSAP Inland grant agreement of € 3,008,602.

The 4th supplement to the grant agreement, approving a no-cost extension of the inland component of MYSAP until 31 July 2021 and the charging of a limited number of staff to close the component in a profession manner, was submitted by GIZ to WorldFish for signing on 20 July 2021.

Season long extension and training activity support on small-scale aquaculture, integrated vegetables and improved human nutrition was delivered to poor and vulnerable direct beneficiary households in Kale, Shwebo and Kengtung Townships via sub-grant agreements with Ar Yone, BRAC Myanmar and Malteser International respectively. The table overleaf summarizes the SGA arrangements.

During the MYSAP Inland implementation period the following GIZ audits were conducted:

GIZ audit of MYSAP Inland 2017 transactions - 19-23 March 2018.

[2] Nutrition-Sensitive Guidance in the Context of COVID-19 in Myanmar. Strategic Advisory Group (SAG)* of the Myanmar Nutrition in Emergencies (NIE) Working Group, under Myanmar Nutrition Technical Network. September 2020.

GIZ audit of MYSAP Inland 2018 transactions – 04-11 March 2019.

GIZ audit of MYSAP Inland 2019 transactions – 22 June – 03 July 2020.

GIZ audit of MYSAP Inland 2020 transactions – 31 May – 02 July 2021.

GIZ audit of MYSAP Inland 2021 transactions – provisionally scheduled for 26-30 July 2021.

SGA contract	Agency	Township	SGA start date Household # Value (€)	SGA modifications & end date
PLA11916	Ar Yone Oo	Kale	06 August 2018 150 hh's € 49,659	31 March 2019 No cost extension to 30 June 2019
			260 hh's € 130,511	Costed extension to 30 April 2020 No cost extension to 31 May 2020
			240 hh's € 201,159	Costed extension to 30 April 2021
PLA11850	BRAC Myanmar	Shwebo	14 May 2018 256 hh's € 82,341	31 March 2019; No cost extension to 30 April 2019; No cost extension to 30 June 2019
			426 hh's € 189,337	Costed extension to 30 April 2020 No cost extension to 31 May 2020
			426 hh's € 243,939	Costed extension to 30 April 2021
PLA11917	Malteser International	Kengtung	06 August 2018 250 hh's € 82,333	31 March 2019 No cost extension to 30 June 2019
			€ 134,801 391 hh's	Costed extension to 30 April 2020 No cost extension to 31 May 2020
			€ 262,637 391 hh's	Costed extension to 30 April 2021

The MYSAP Inland Team Leader and the WorldFish Myanmar Country Director joined a MYSAP meeting on 12 May 2021 to discuss how to close the MYSAP Inland component in a professional manner.

The Senior Finance Officer returned to Mandalay for the week of 24-28 May 2021 and conducted administrative procedures including receipt of equipment to close out the contracts of 3 MYSAP Inland staff that finished working for WorldFish on 31 May 2021. Seven of eight MYSAP Inland staff were taken on by WorldFish from 01 June 2021, to work on other donor supported projects.

The MYSAP vehicle (IO-1076) was collected from MYSAP Inland office Mandalay on 27 May 2021, and driven back to Yangon on 29 May 2021 by the MYSAP driver. On 31 May 2021, the Team Leader instructed WorldFish

Myanmar and Ar Yone Oo, BRAC Myanmar and Malteser International by email to continue to productively use the equipment held by them for the benefit of poor and vulnerable households until further notice or until countermanding instructions were received from MYSAP. On 28 July MYSAP instructed the inland Team Leader that all component equipment was to be returned to GIZ office in Yangon.

3.1.2 Township and partner selection processes

In Q4 of 2017, GIZ Myanmar requested that MYSAP Inland rank potential townships against five criteria:

1) Nutrition, 2) Fish consumption, 3) Number and area of ponds, 4) NGO coverage, and 5) Travel approval requirements and security.

The available data on the above criteria were presented by the MYSAP Inland Team Leader at a meeting in Nay Pyi Taw with the DoF and MYSAP on 13 December 2017. It was evident that there was a severe shortage of township level data on nutrition and fish consumption in Myanmar and that the townships with the worst levels of malnutrition and lowest levels of fish consumption were locations with the least availability of water for agriculture and aquaculture. In addition, while the DoF had township level data on the numbers of farmers licenced to conduct aquaculture and the area of licenced ponds, the DoF had little or no data on the numbers and area of small-scale ponds of < 0.5 acres in area or 2,023 m^2 and there were no data at all on unlicensed pond numbers and area.

At meeting on 13 December 2017, Kale Township and Shwebo Township, Sagaing Region and Kengtung Township, Eastern Shan State were selected, while Tamu, Sagaing Region was rejected because of logistical remoteness, having too few ponds and limited NGO coverage. At the request of DoF, Amarapura Township, Mandalay Region was selected because tilapia and rohu seed could be supplied from the DoF Nad Yay Kan Hatchery and MYSAP Inland staff from the Mandalay office would be able to support grow-out farmers in collaboration with DoF staff. It was agreed that the fifth township would be either Pekon or Pinlaung Township in the southern Shan State, after further scoping was conducted.

At a meeting on 28 February 2018 attended by MYSAP and the inland component of MYSAP it was agreed that Pinlaung Township, Southern Shan State would be the fifth inland component of MYSAP township.

MYSAP Inland networked with both JICA of Japan which was implementing the Small-scale Aquaculture Extension Project, and KOICA of South Korea which was funding the Project for Development of Inland Fish Farming Technology in Myanmar, to minimise activity overlap and to maximise possible areas of synergy.

MYSAP Inland conducted an assessment of the capacity of different government and NGO agencies, including local, national and international NGO's to deliver extension and training services to direct beneficiary households in the selected five MYSAP Inland townships. The assessment process included the following stages:

1. NGO's previously contracted by WorldFish Myanmar to deliver extension and training services under the LIFT funded and WorldFish implemented MYCulture project, namely PACT, GRET and NAG were first asked if they if they were interested and had the experienced staff available to deliver similar services to small-scale aquaculture households in the five MYSAP Inland townships on a contract basis. All 3 agencies said, "No".
2. The Myanmar Information Management Unit (MIMU) website was used to identify which agencies were conducting livelihoods, nutrition and health activities in the field in the Sagaing and Mandalay Regions and the Shan State and which were operating in the five MYSAP Inland townships or in nearby townships. Over 30 different agencies were contacted by email to determine if there was interest in, and capacity to deliver extension and training services to small-scale aquaculture households under contract.
3. At the same time field visits were made to check on field activities and experience of agencies operating in the MYSAP Inland townships and which might be capable of delivering extension and training, and micro-credit services to small-scale aquaculture farmer households. Once agencies were identified for different townships, confidential feedback on previous performance was requested from funding donors.

4. A series of meetings were then held with positively evaluated entities to introduce MYSAP Inland and to discuss possible collaboration mechanisms.
5. Thereafter shortlisted entities were asked to provide a quotation to reach a specified target number of direct and indirect beneficiaries to 31 March 2019, encompassing an 11 month growing season from June 2018 to April 2019 and to report on activities conducted.

Figure 01. MYSAP Inland coverage.

From 14 May 2018 to 30 May 2020 MYSAP inland component activities were conducted the following in 5 townships:

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

From 01 June 2020 onwards, MYSAP Inland conducted field activities in only Kale, Shwebo and Kengtung Townships.

After completion of the assessment process in early 2018, Ar Yone Oo, BRAC Myanmar and Malteser International were selected as NGO's to deliver extension and training services to 150, 256, and 250 direct beneficiary households with small-scale[3] ponds in Kale, Shwebo and Kengtung Townships respectively.

The Field Manager and the Administrative Assistant met U Paw Lwin, DoF Director Mandalay Region on 28 January 2019 to discuss conducting extension and training activities in Amarapura Township with DoF staff acting as extension agents to deliver extension and training services. The Mandalay Director said there were very few ponds of less than 0.5 acres in Amarapura Township, that there were issues with drought in the dry season and poor water quality even when there was sufficient water available. As a result no MYSAP funded field activities were conducted in Amarapura Township with direct beneficiary households.

In 2019, the Department of Fisheries (DoF) were identified as the collaborating partner to deliver small-scale aquaculture extension and training services in Pinlaung Township, Southern Shan State.

3.1.3 Diagnostic assessment

WorldFish fielded multi-disciplinary consultant teams including international and national consultant specialists on aquaculture, social economics, M&E, gender, and nutrition to conduct diagnostic assessment activities and scoping missions to the Southern Shan State, 05-15 June 2017, to the Eastern Shan State, 05-15 June 2017 and to the Sagaing Region 28-31 August 2017. The Team Leader also visited MYCulture field activities in Monywa and Meikhtila 18-23 September 2017 to gather lessons from implementing field activities through NGO's like PACT, and made fact finding field trips to both the Eastern Shan State, 21-27 October 2017 and the Southern Shan State,

[3] A small-scale household pond was defined as being a pond of less than 0.5 acres (2,023 m^2) in area, which held water for at least six months per year.

21-24 November 2017. Additional data was collected and stakeholder consultation workshops were held at both locations to identify the preferred fish species for small-scale aquaculture.

The Field Coordinator based in Kengtung Township, Eastern Shan State, mapped and photographed over 500 small-scale ponds using a Garmin Montana 680 GPS device purchased by MYSAP Inland.

A report summarising the activities and key findings of the 10 months (from mid-April 2017 until mid-February 2018) of diagnostic assessment work conducted by WorldFish Myanmar and MYSAP Inland was submitted to MYSAP on 18 March 2018.

3.1.4 MYSAP Inland baseline survey

Mekong Economics Limited conducted the MYSAP Inland baseline survey between April and June 2018 and presented the baseline survey findings and the final MYSAP Inland baseline survey report at a workshop in Nay Pyi Taw, 26 June 2018. Seventy MYSAP Inland stakeholders including government representatives, donors, NGO's and fish hatchery, grow-out and processors attended presentations of the baseline survey findings, and value chain reports for rohu, tilapia and small indigenous fish species (SIS) and a MYSAP Inland organizational planning workshop, the output of which was an operational working plan for MYSAP Inland to 05 May 2020.

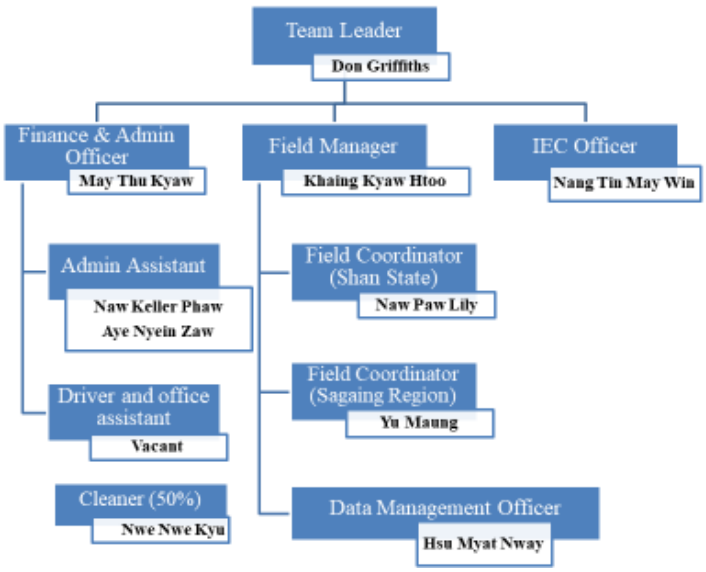
The baseline survey and the rohu, tilapia and SIS value chain reports for Kale, Kengtung, Shwebo, Amarapura and Pinlaung townships were widely disseminated in the public domain.

On 28 May 2021 the MYSAP Inland baseline survey and fish value chain reports for Amarapura, Kale, Shwebo, Pinlaung and Kengtung Townships were uploaded onto the MIMU website as the following link: http://themimu.info/assessments-and-publications.

3.1.5 Staff positions, work locations and COVID-19

MYSAP Inland staff had a full time staff complement of nine positions (see the MYSAP Inland organogram below), with seven based in the Mandalay office, while the Field Coordinators for the Sagaing Region and the Shan State were embedded in the offices of Ar Yone Oo and Malteser International at Kale and Kengtung Townships respectively.

MYSAP Inland - organogram



The COVID-19 pandemic first began having impact on MYSAP Inland activities in March 2020. The Team Leader was instructed by WorldFish to depart Mandalay on 21 March 2020 because he was considered to be at higher risk for COVID-19, being 65 years old and asthmatic. The Team Leader worked virtually from Thailand until the end of MYSAP Inland implementation. On 26 March 2020, the MYSAP Inland office in Mandalay was closed on WorldFish Myanmar instructions, and thereafter until the end of MYSAP Inland implementation, all staff based there worked virtually from home. The 2 Field Coordinators continued to operate from the Ar Yone Oo and BRAC Myanmar offices in Kale and Kengtung Townships.

While BRAC were able to conduct face-to-face meetings in small groups with prior General Administration Department (GAD) approval, following the confirmation of a fish wholesaler testing COVID-19 positive on 20 September 2020 further COVID-19 restrictions were imposed and face-to-face meetings were curtailed for a time.

After virtual training for 3 staff on 08 October 2020, MYSAP Inland began online CB Bank transfer payments, to reduce the risk of COVID-19 contagion by staff having to visit the bank.

The Malteser International office in Kengtung was closed from 22 October until 09 November 2020 and all staff worked virtually from home for 2 weeks, after one staff member returned to the office from Mongpin Township, where there were COVID-19 cases.

In November COVID-19 cases were confirmed in Tat Oo Thida Ward of Kale Township adjacent to the Ar Yone Oo office. One AYO MYSAP Inland staff member living in that ward was quarantined and worked virtually from home for 14 days. There were no COVID-19 issues in either Shwebo or Kengtung townships in November 2020.

Mandalay was under strict COVID-19 movement restrictions with no movement between wards from 05-18 December 2020 inclusive.

Following an outbreak of COVID-19 cases in Shwebo Township, on 10 December 2020 the Chief Minister of Sagaing Region announced a strict stay at home order in Shwebo Township 11-24 December 2020. All BRAC Myanmar worked virtually from home during that period.

A semi-lock down was imposed in Kale Township from 14-31 December inclusive, during which time all field visits and training were suspended for Ar Yone Oo staff.

In January 2021, COVID-19 movement restrictions were eased in Kale, Shwebo, Mandalay and Kengtung Townships, so training and extension activities went ahead as planned in the field, until the end of January 2021. Meetings of up to a maximum of 30 people were allowed in January 2021, under COVID-19 restrictions.

Malteser International stopped all visits to villages in Kengtung Township from 15 February to 12 March 2021 inclusive. Junior staff worked from home and senior staff worked 50% from home and 50% from the office to maintain a skeleton staff at the office.

The EU subsidized the purchase 44,200 kg of commercial pelleted feed costing € 24,000 to offset the impact of COVID-19 on MYSAP Inland dbh. 10,160 kg, 17,200 kg and 16,840 kg of the pelleted feed was shipped to Kale, Shwebo and Kengtung Townships respectively in late January 2021 by MYSAP and was distributed 40 kg to each of 1,075 dbh with small-scale households ponds and to the Naung Kan and Joe Phyu community ponds in Kengtung Township with benefits shared by a further 180 households, by 12 February 2021.

The EU also funded 1,500 surgical masks that were provided to beneficiaries at MYSAP events and 100 N95 masks with disposable liners, which were disseminated to the collaborating NGO staff in early February 2021.

On 01 February 2021 a state of emergency was announced and a night time curfew was imposed from 20.00 – 04.00 hours in Myanmar. On 08 February 2021 evening the MYSAP Head of Programme notified MYSAP Inland that GIZ had instructed MYSAP to suspend all field activities for 4 weeks and until further notice thereafter, unless there were other instructions. On 09 February 2021 the MYSAP Inland Team Leader instructed its staff and collaborating NGO's to suspend all field activities until after 07 March 2021, except on-going activities under service contracts which could continue, if the ground situation was assessed as being safe.

Effective 01 March 2021, Notification # (28/2021) by the Central Bank of Myanmar (CBM), Section 2 limited (i) ATM withdrawal to a maximum of MMK 500,000 per day; (ii) Bank withdrawal amounts were limited to a maximum of MMK 2,000,000 per week for individuals, and MMK 20,000,000 per week for organizations or companies.

On 15 March 2021, following enactment of Act 419 giving greater control to the military, telephone data internet services were stopped in certain areas of Myanmar, with only Wi-Fi working. This negatively impacted the MYSAP Inland end-line survey being conducted in Wetlet, Kale and Shwebo Townships, but not in Kengtung and Tachileik Townships.

On 24 March 2021 BMZ ordered the immediate cessation of all MYSAP activities and the professional closure of the inland component by 31 May 2021.

MYSAP Inland activities were impacted by the COVID-19 restrictions on travel, face-to-face meetings and limitations on group size for meetings, trainings and workshops, quarantine requirements, and the state of emergency which began on 01 February 2021.

To offset COVID-19 restrictions on travel, and limits on group sizes that could meet, and face-to-face training, MYSAP Inland made increased use of social media, digital and internet platforms to share key information and messages on small-scale aquaculture and integrated vegetable and fruit production and improved human nutrition.

3.1.6 Office leasing

MYSAP Inland rented office space at Apartment 5C, Building 4, Thirimingalar Condominium, in Mandalay from 09 April 2018 until 18 August 2018.

MYSAP Inland then rented office space at Room 5-B, Building 5, Thirimingalar Condominium, Between 26 & 27 Street and 73 & 74 Street, Chanayethazan Township, Mandalay Region, Myanmar, from 19 August 2018 until 18 August 2019.

MYSAP finally moved to rented office space at # A2, 65th Street, between 31st and 32nd Street, Yadana Mandalay Housing, Chan Aye Tharzan Township, Mandalay Region, Myanmar from 19 August 2019 until 31 May 2021, when MYSAP Inland closed.

3.1.7 MYSAP management and reporting

Throughout the majority of the MYSAP Inland implementation period, 18 progress reports were submitted each year, being eight monthly, and four quarterly reports sent to MYSAP for translation into Myanmar language for the DoF, four quarterly progress reports against indicators for MYSAP and two six month technical progress reports for the donor. In addition MYSAP Inland also contributed to the separate annual EU and BMZ reports.

All MYSAP Inland technical progress reports were submitted largely on time. To fulfil the reporting requirement without cutting back on technical MYSAP Inland activities, the Team Leader worked 6 days per week throughout his contract. The Team Leader provided feedback on the heavy reporting load to MYSAP, but no action was taken.

3.2 GIFT activities

Prior to MYSAP commencement, in collaboration with the Department of Fisheries, WorldFish imported 2,200 genetically improved farmed tilapia (GIFT) from the WorldFish Jitra facility, Malaysia in August 2016. The GIFT were held and grown-on at the DoF Hlawgar and Daedaye hatcheries, which were operated as nuclear breeding hatcheries supported by the LIFT funded and WorldFish implemented MYCulture project for the production of future GIFT broodstock by natural cohort breeding.

Following scoping visits to freshwater hatcheries in the MYSAP townships by the MYSAP Inland Team Leader in September 2017, it was agreed that MYSAP Inland and MYCulture would share the consultancy and renovation costs to redesign and upgrade the DoF Nad Yay Kan Hatchery, Mandalay, and the Aung Zay Ya (MFF) Hatchery, Shwebo as satellite GIFT hatcheries for the production and sale of all-male GIFT tilapia seed and this was ratified by signed Memoranda of Understanding with the Department of Fisheries of Myanmar on 03 May 2018 and the Myanmar Fisheries Federation (MFF) on 16 June 2018.

MYSAP support for GIFT has primarily included:

1) International consultancy input (funded 50:50 by MYSAP and the MYCulture project) to provide technical advice on hatchery modification, biosecurity improvement, tilapia genetics, training on GIFT tilapia synchronized breeding, sex-reversal and all-male fry production, and hatchery design, and equipment specifications.

    - Site measurements were taken at the DoF Nad Yay Kan Hatchery, Mandalay and Aung Zay Ya (MFF) Hatchery, Shwebo on 17-18 February 2018 before international consultancy inputs were provided to oversee renovation, redesign and upgrading of the DoF Nad Yay Kan Hatchery, Mandalay and the Aung Zay Ya (MFF) Hatchery, Shwebo, 26 April to 15 May 2018, 09 July to 04 August 2018, 19 September to 15 October 2018 and 16-23 March 2019. Redesign, renovation and equipping of the DoF Nad Yay Kan and the Aung Zay Ya (MFF) Hatchery, Shwebo was completed by the end of Q3 of 2018.
    - In May 2018, theoretical training on hatchery biosecurity and on tilapia hatchery operation was delivered by the international consultant and the Team Leader for nine people, being seven DoF staff (four from the DoF Nad Yay Kan hatchery Mandalay, one from the DoF Hlawgar hatchery and two DoF staff from Shwebo) and two Aung Zay Ya Hatchery, Shwebo.
    - A practical hands-on training course on GIFT tilapia mass-fry production and all-male tilapia seed production was delivered by an international consultant and the Team Leader 02-09 October 2018 at the Aung Zay Ya (MFF) Hatchery, Shwebo hatchery for seven people (all ♂) being 5 Aung Zay Ya (MFF) Shwebo Hatchery staff and 2 staff from the DoF Nad Yay Kan hatchery. Two MYSAP Inland Field Coordinators also joined the training from 06-09 October 2018.
    - The first all-male GIFT seed produced at the Aung Zay Ya (MFF) Hatchery, Shwebo were sold on 16 November 2018, while DoF Nad Yay Kan staff that attended the MYSAP supported hands-on GIFT training course bred and produced GIFT seed for the first time in November 2018.
    - In 18-22 March 2019, the international consultant and the Team Leader delivered hands-on refresher GIFT hatchery operation, GIFT breeding, incubation and sex-reversal and aceto-carmine squash testing to determine percentage of male fish. Ten participants (4 ♀) attended, including 3 (1 ♀) from the DoF Nad Yay Kan hatchery, 2 women from the DoF Ku Mae hatchery, 1 woman from the DoF Thayet Kone Hatchery and 4 men from the MFF Shwebo hatchery;

2) Renovation costs for the DoF Nad Yay Kan and the Aung Zay Ya (MFF) Hatchery Shwebo (funded 50:50 by MYSAP, with the MYCulture project);

3) The Team Leader[4] developed, field tested and finalized a hatchery biosecurity auditing checklist and conducted baseline biosecurity audits of the Aung Zay Ya (MFF) Hatchery, Shwebo, the DoF Hlawgar Hatchery and the DoF Nad Yay Kan Hatchery in April and May 2018. The baseline biosecurity reports, were used to identify actions for the international GIFT hatchery consultant to address. Follow-on biosecurity audits at the DoF Nad Yay Kan Hatchery and the Aung Zay Ya (MFF) Hatchery Shwebo, (05-06 July 2018) found significant biosecurity improvements, with both achieving over 80% against the biosecurity audit checklist;
4) Provision of key equipment items, including tags for marking individual GIFT broodstock and 3 tag readers to confirm each unique fish tag number, weighing balance and scales, air blowers, chemicals, laboratory glassware and breeding and nursing hapas[5];
5) A training course on PCR detection of Tilapia Lake Virus (TiLV) at Mahidol University, Thailand for 3 people (2 from the DOF and 1 from Yangon University), 11-13 December 2017;
6) Supported taking and testing of samples to confirm the status of key tilapia disease pathogens, including Tilapia Lake Virus (TiLV), *Streptococcus agalactiae* and *S. iniae* samples in December 2017, July 2018 (Daedaye), August 2018 (Hlawgar), June 2019 (TiLV at Aung Zay Ya, Shwebo), September 2019 (Hlawgar and Daedaye), and for TiLV, *Streptococcus iniae*, *Streptococcus agalactiae* and infectious spleen and kidney necrosis virus (ISKNV) for the DoF Nad Yay Kan and Aung Zay Ya (MFF) Shwebo hatcheries in November 2020. On each occasion the GIFT populations were confirmed disease-free for all pathogens tested;
7) MYSAP Inland funded the extension and renovation of the roof covering a set of eight (08) external concrete tanks at the DoF Nad Yay Kan GIFT satellite hatchery, which were used to nurse GIFT seed during the sex-reversal process in 2020;


Photos 01 and 02. The renovated and extended roof over external concrete tanks at the DoF Nad Yay Kan hatchery which has been used for nursing and sex-reversal of GIFT seed.

8) After confirmation of disease-free status, MYSAP supported the transfer on 23 July 2018 of 736 future GIFT broodstock (469 female and 267 male) from the DoF Daedaye Hatchery to the Aung Zay Ya Hatchery (MFF). 620 (84%) survived transportation;

[4] ISO9001: 2008 Lead auditor certified; GlobalGAP version 5 - all farms and aquaculture auditor; Global Aquaculture Alliance Best Aquaculture Practices certified for i) Shrimp hatcheries; ii) Finfish and crustacean farms (land based ponds and freshwater and brackish water cage culture); iii) Finfish, crustacea, and mollusc hatcheries; iv) Marine cage farms; and, Seafood processing plants; Aquaculture Stewardship Council tilapia hatchery and farm auditor.

[5] A hapa is a blue nylon rectangular net cage which is set up on bamboo poles in a pond and which looks like an upside down mosquito net. Fish are cultured inside the hapa in fish ponds.

9) After confirmation of disease-free status on 28 September 2018, MYSAP supported the transfer of 1,099 future GIFT broodstock (775 female and 324 male) from the DoF Hlawgar Hatchery to the DoF Nad Yay Kan Hatchery, Mandalay. 836 (76.1%) survived transportation. 915 future GIFT broodstock (730 female and 185 male) were also transported to the Aung Zay Ya (MFF) Hatchery, Shwebo on the same day. 642 (70.2%) survived transportation;
10) After confirmation of disease-free status, MYSAP funded transportation of 640 future GIFT broodstock from Daedaye on 07 July 2020. 633 (99%) fish survived transportation. 223 future GIFT broodstock were given to the DoF Nad Yay Kan hatchery and 410 to the Aung Zay Ya hatchery, Shwebo;
11) In-country technical visits and regular virtual and email technical support follow-up, funded by MYSAP were provided by the WorldFish GIFT genetics advisor. A GIFT broodstock replacement protocol produced by the GIFT genetics advisor was translated into Myanmar language. The DoF Nad Yay Kan Hatchery produced 5,000 replacement GIFT broodstock from within and sold 2,000 to the USAID funded Fish for Livelihoods to develop a GIFT hatchery in Madaya Township. Training on how to tag broodstock fish was also provided by the WorldFish GIFT genetics advisor, during a MYSAP funded visit 23-28 February 2020 for 10 (2 ♀ – 20%) DoF hatchery staff from ten different DoF hatcheries;

Photo 03. Dr Trinh Quoc Trong, WorldFish tilapia geneticist demonstrating how to insert a PIT tag into the body cavity of a broodstock GIFT tilapia, at the DoF Hlawgar hatchery.

12) Demonstrated that air shipment of GIFT seed from the DoF Nad Yay Kan hatchery from Mandalay to Kengtung was cost effective, adding only MMK 8 per fish to the price. Survival was 100%;
13) MYSAP supported the cost of repairing some leaks in the DoF Nad Yay Kan GIFT hatchery incubation system in May and June 2020;
14) Development of key information, education and communication (IEC) materials on tilapia for example:

Myanmar and English language versions of a *Practical training manual: Tilapia breeding and all-male fry production.*

Myanmar and English language versions of a *Protocols for taking, fixing and shipping fish tissue samples for PCR testing and histopathology*.

Myanmar and English language versions of the informatics *Tilapia: The Plain Truth.*

The introduction and distribution of Genetically Improved Farmed Tilapia (GIFT) in Myanmar: A WorldFish internal review of progress on 23 October 2018 with immediate, short-term and long-term recommendations to improve the genetic management and dissemination of GIFT in Myanmar.

PowerPoint presentations covering:

Hatchery biosecurity – Myanmar and English language versions.
Tilapia hatchery operation – Myanmar and English language versions.
The status of GIFT in Myanmar – English language version.
Capacity building & improved farm management for GIFT in Myanmar – English language version.

GIFT tilapia introduction to Myanmar and the status of GIFT dissemination – English language version.
A successful mass tilapia fry production facility and the potential for joint venture enterprises in Myanmar – English language version;

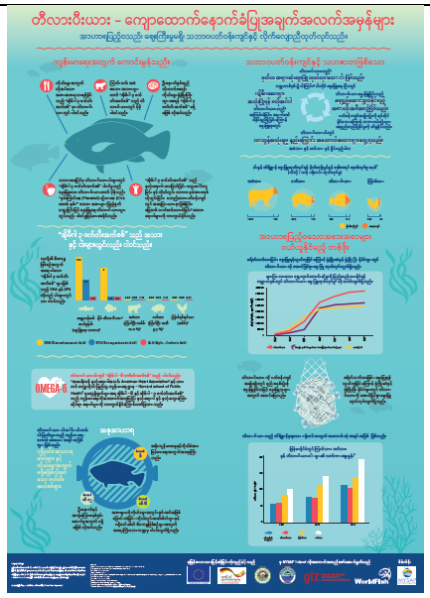


Figure 02. Myanmar language translation of the WorldFish infographic, *Tilapia: The plain truth.*

Figure 03. *Tilapia Major Clinical Signs* to enhance the capacity of hatcheries, nurseries, grow-out farmers and extension service providers to recognize and report tilapia diseases – MM & ENG language versions.

15) International consultancy input by a specialist tilapia mass fry producer and updating of *Practical training manual: Tilapia breeding and all-male fry production*;
16) Further renovations and repairs of the DoF Nad Yay Kan GIFT hatchery funded by MYSAP Inland were completed in November 2020;

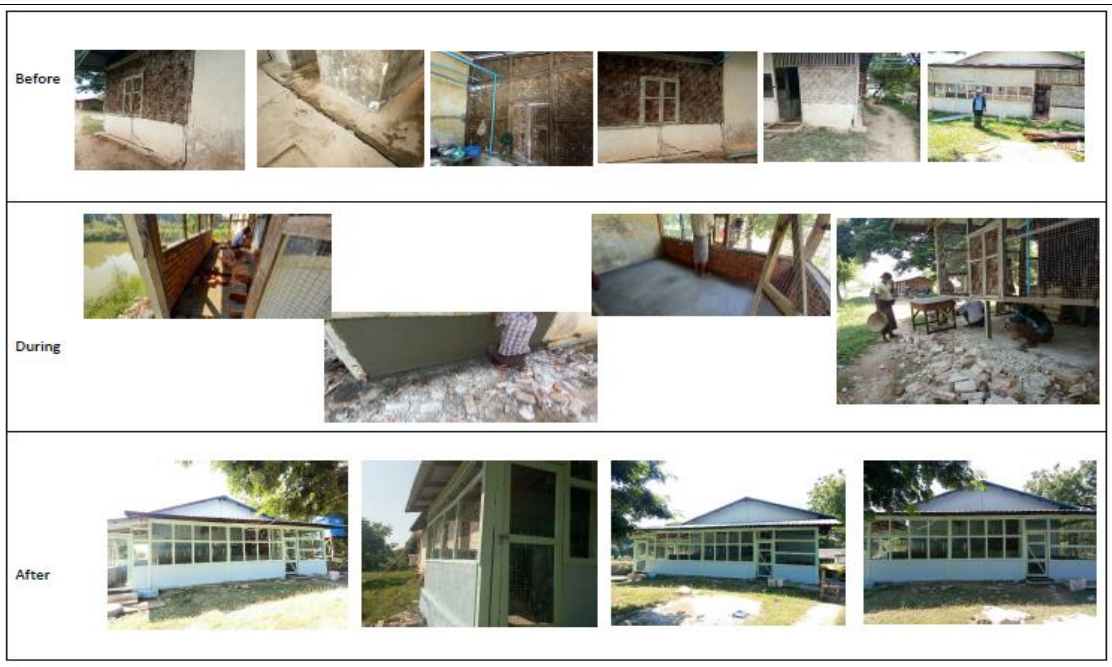


Photo 04. Renovations at the DoF Nad Yan Kan satellite GIFT hatchery facility.

17) Six Myanmar staff (3♀) being the Deputy Director, DoF Laboratory, 2 Yangon University staff, and 2 MYSAP AAH staff and the Team Leader to attend a virtual on-line training on *Fish population based epidemiology* by the Norwegian Veterinary Institute (NVI) on 09-10 December 2020, arranged by WorldFish;
18) Throughout 2020, MYSAP Inland staff conducted weekly mobile phone interviews of 2 GIFT hatcheries and monthly phone interviews of 3 GIFT nursery farmers and 14 GIFT grow-out farmers (3 of which are also interviewed as nursery farmers), to assess the impact of COVID-19 on GIFT seed production and marketing of tilapia. WorldFish staff (including MYSAP inland staff as co-authors) have written a manuscript titled, *Effects of covid-19 on tilapia seed systems: evidence from high-frequency surveys in Bangladesh, India, Myanmar, and Timor-Leste*. The manuscript is currently under review by the co-authors before submission to Aquaculture Reports peer review journal for publication;
19) Supported different levels of running costs for GIFT hatchery, nursery and broodstock operations, including feed and cage materials at the DoF Nad Yay Kan, Hlawgar and Daedaye Hatcheries;
20) The owner of the Aung Zay Ya Shwebo Hatchery expanded the GIFT seed production and sales capacity in April 2021 by stocking 38 breeding hapas with 60 female and 25 males broodstock each. The increased capacity should be between 200,000 – 300,000 all-male GIFT fry per month;

	**Photo 05**. Expanded GIFT breeding hapa set up at Aung Zay Ya Hatchery, Shwebo Township.

21) The GIFT tilapia hapa breeding and hatchery system were replicated in Madaya Township, Mandalay Region, following a visit on 14 May 2021 of a farmer and USAID funded Fish for Livelihoods staff to the DoF Aung Zay Ya satellite GIFT hatchery. Construction of the hatchery was on-going at the time of report drafting and breeding was planned for August 2021; and,
22) To 31 May 2021 a cumulative total of 536,180 all-male GIFT fingerlings produced with MYSAP support have been were sold to a total of 374 grow-out farmers.

Photo 06. Social distancing and use of PPE at the DoF Nay Yay Kan hatchery when checking the GIFT all-male tilapia seed transportation bags.	

	
Photo 07. GIFT all-male seed arrive safely on 07 April 2020, at Thee Kone Village, Shwebo Township.	**Photo 08**. Equalizing the water temperature in the transportation bags with water temperature in the pond before release of the GIFT all-male tilapia seed into nursing hapas.

Unfortunately planned international consultant input to deliver 10 days of hands-on practical training at the Nam Sai Farms commercial facility, Thailand on i) tilapia swim-up fry nursing, ii) sex-reversal, and ii) conditioning before transportation and packing, was cancelled because of the COVID-19 pandemic. The USAID funded Fish for Livelihoods, will however take this initiative forward when travel is safe.

3.3 Carp activities

Stakeholder consultation workshops in October and November 2017 identified that the preferred top 3 small-scale aquaculture species in Kengtung Township, Eastern Shan State were 1) rohu, 2) hilly hilsa or aeroplane fish[6] (*Prochilodus lineatus*) and 3) tilapia. In the Southern Shan State the preferred top 5 species for small-scale aquaculture were identified as 1) grass carp, 2) common carp, 3) silver barb, 4) rohu and 5) tilapia.

The MYSAP Inland baseline survey conducted in April 2018 by Mekong Economics Limited indicated that the majority of households stocked a mixture (polyculture) of different fish species in their ponds with rohu and common carp, being the two most popular stocked carp species.

The rohu value chain reports for Kale, Kengtung, Shwebo, Amarapura and Pinlaung townships were submitted by Mekong Economics Limited in June 2018. Rohu was chosen as one of the three key fish species for which MYSAP Inland conducted a value chain report, because it contributed 70% of the freshwater fish production by weight in Myanmar. The other 2 value chain species chosen were tilapia and small indigenous fish species (SIS).

Early during MYSAP Inland implementation it was decided to focus hatchery activities on key strategically located larger DoF and private hatcheries, rather than small backyard hatcheries to enhance impact on a) the

[6] 600,000 *Prochilodus lineatus* seed were imported from Kyin Hon city China, via Mongla city Myanmar into Kengtung Township by farmers named Mr Eik Mar and Mr Law Mar in 2003. In 2009, 10,000 fingerlings were transferred to DoF facilities in Mandalay. The DoF facilities at Thayet Kone, Mandalay and Hlawgar hatchery in Yangon were also spawning the species. There was one private hatchery in NyaungDon Township in the Ayeyarwady Delta which was also reported to be disseminate hilly hilsa seed.

availability of improved quality seed, b) the absolute amount of fish seed produced and available for stocking, and c) enhancement of hatchery biosecurity status.

MYSAP funded WorldFish carp geneticist Dr Matthew Hamilton 26 August to 02 September 2018 to make a fact finding visit to 11 hatcheries (seven Department of Fisheries hatcheries and four private sector hatcheries in the Ayeyarwady Delta, the central dry zone, the Inlay Lake catchment area and the Sagaing and Mandalay Regions of Myanmar), to assess the genetic quality of Indian major carp rohu (*Labeo rohita*) in Myanmar. The consultancy report detailed the status of rohu breeding, management and genetic improvement practices, and identified key issues, gaps and constraints at the key government DoF and private sector hatcheries sampled.

The report formed the basis for the development of training materials that were translated into Myanmar language and delivered by the consultant in a one and a half day training workshop at Hlawgar Hatchery, Yangon Division entitled, *Management of Inbreeding in Carp Hatcheries in Myanmar*, 10-11 April 2019. 31 participants (9 ♀) attended, including technical staff from 17 key DoF carp hatcheries producing approximately 80% of the government produced carp seed in the country and 5 representatives (all ♂) from 2 private commercial carp hatcheries. This training topic was extremely important, because inbreeding of broodstock fish can lead to 10% loss of growth performance per generation of fish bred.

The final soft copy version of the training materials were shared with the DoF and were uploaded and are available online at the Fisheries Information Centre website at the web link below:

http://dof-myanmar-fic.org/Multimedia/Research%20Reports/174.%20Management%20of%20Inbreeding%20in%20Carp%20Hatcheries%20in%20Myanmar.pdf

The WorldFish Myanmar Country Director wrote to the Director General of the DoF in May 2019, asking if the hatcheries that received MYSAP Inland supported training could provide monthly data on seed sales to nurseries and grow-out farmers, so that a sample could be followed up in the field to collect feedback on seed quality. Despite MYSAP following up with the DoF in August 2019, with the exception of Kume (Myitthar) Hatchery which reported data on 2 occasions, no seed sales data was provided by the 17 DoF hatcheries that received training on fish seed quality from the MYSAP Inland.

In September 2020, MYSAP agreed a list of factors that impact on fish seed quality, including improved hatchery management, biosecurity, disease testing practices and inbreeding prevention. MYSAP Inland Team Leader and MYSAP's Development Adviser for the Inle Lake region and MYSAP's M&E team developed a follow-up questionnaire survey to assess MYSAP hatchery support impact. MYSAP translated the questionnaire into Myanmar language and sent it to DoF hatcheries by the end of 2020. The DoF hatcheries were ask to provide feedback on the outcome of MYSAP Inland training and support to improve fish seed quality, including Dr Matthew Hamilton's missions in 2018 and 2019. Staff relocation, the State of emergency and poor internet connections delayed the analysis of the data by MYSAP and the results were unavailable when the MYSAP Inland component implementation period ended on 31 July 2021.

In the 2018-19 fish culture season MYSAP Inland funded 454 direct beneficiary households to stock a total of 339,885 fish seed. 442 of the 454 direct beneficiary households stocked carp species. The main species supported by MYSAP included 272,060 rohu (*Labeo rohita*), 42,645 silver barb (*Barbonymus gonionotus*), 24,130 common carp (*Cyprinus carpio*), 300 mrigal (*Cirrhinus cirrhosus*), and 750 grass carp (*Ctenopharyngodon idella*).

In the 2019-20 culture season MYSAP Inland funded 714 (108 ♀ leading aquaculture activities) households to stock a total of 601,943 fish seed, supplied from either MYSAP Inland supported nursery farmers or purchased from local hatcheries, into 65.5 hectares (161.9 acres) of small-scale fish ponds. Much of the carp was sourced from government hatcheries that had had inbreeding prevention training supported by MYSAP Inland.

Township	Rohu	Common carp	Silver barb	Grass carp	Catla	SIS species	GIFT	Total #
Kale	137,750	29,250	15,050	8,350	1,350	1,900	1,000	194,650
Shwebo	200,500	7,900	75,250			2,400	5,550	291,600
Kengtung	43,870	40,030				5,550	17,683	107,133
Pinlaung	8,560							8,560
TOTAL	**390,680**	**77,180**	**90,300**	**8,350**	**1,350**	**9,850**	**24,233**	**601,943**

In the 2020-21 culture season, which was the third and final season of MYSAP support, MYSAP Inland first prioritized the sourcing from both government and commercial fish hatcheries of Indian major carps (rohu and mrigal) and Chinese carp species (common carp and grass carp) fry for stocking into MYSAP Inland supported nursery farmer ponds. Thereafter, following grow-out pond preparation and refilling by monsoon rains, the field staff of the 3 NGO collaborating partners, Ar Yone Oo, BRAC Myanmar and Malteser International prioritized the stocking of Indian major and Chinese carp species fry sourced from government and commercial fish hatcheries, and MYSAP Inland supported nursery farmers into the small-scale grow-out ponds of MYSAP Inland direct beneficiary households (dbh). This activity was strategically critical, because stocked grow-out ponds provided the households with a degree of nutritional, food security and income resilience during COVID-19 restrictions and particularly for poor and vulnerable households who were most likely to be impacted by COVID-19 lockdown restrictions, with their ability to seek labouring work being much reduced.

In the 2020-21 culture season, MYSAP supported the stocking of a total of 708,291 fish seed into the grow-out ponds of 711 dbh's and two community ponds including 362,957 carp species (being 275,450 rohu, 63,781 common carp, 19,126 grass carp, and 4,600 mrigal), 231,884 tilapia, 103,950 silver barb, and 9,500 SIS. The summary table below gives details by species and township.

Township	Rohu	Mrigal	Common carp	Grass carp	Tilapia	Silver barb	SIS species	Total #
Kale	171,250	4,600	34,850	11,150	0	42,850	2,100	266,800
Shwebo	104,200	0	25,600	0	32,600	61,100	2,600	226,100
Kengtung	0	0	3,331	7,976	199,284	0	4,800	215,391
TOTAL	**275,450**	**4,600**	**63,781**	**19,126**	**231,884**	**103,950**	**9,500**	**708,291**

All the fish species that MYSAP supported for stocking into small-scale ponds feed low in the food chain and were therefore energy efficient, with lower environmental impact than stocking predatory species. During 3 years of fish culture season support, MYSAP funded the stocking of a total of 1,650,119 fish seed in freshwater ponds, of which 1,374,652 (83.3%) were carp species.

The only non-carp species that MYSAP Inland supported stocking into small-scale beneficiary grow-out ponds were SIS and GIFT tilapia (16.7%) which were stocked for nutrition and climate change reasons respectively.

MYSAP Inland conducted 3 training courses on breeding of fish species that were suitable for backyard hatchery farmers, being 1 course on common carp spawning in Kengtung Township in 2020 and 2 courses on spawning common carp in Kale, and Kengtung Townships in 2021. The training course in Kale Township, also covered induced breeding of silver barb.

MYSAP funded the purchase and conditioning of mature male and female broodstock common carp in separate sex hapas for two weeks in early January 2020. A three-day training course on *Induced breeding of common carp*, was conducted by six Shan State DoF staff from 19-21 January 2020 with all costs supported by MYSAP. 23 people (2 ♀) being 9 MYSAP Inland farmers (1 ♀), 3 (1 ♀) BSc students from Kengtung University Zoology Department and 11 farmers (all male) selected by the DoF, successfully induced common carp to spawn and produced a significant number of eggs that were incubated on floating water hyacinth, and hatched to give a large number of common carp larvae. The farmer who hosted the common carp breeding training, stocked and sold an estimated 20,000 common carp fry into his ponds.

Photos 09 and **10.** *Common carp spawning training* delivered by the Department of Fisheries, Shan State staff for 23 farmers in Kengtung Township, 19-21 January 2020.

U Sai Yi Noie (KTG-0104) who attended the MYSAP sponsored induced breeding training in January 2020, thereafter put a bamboo frame into his pond and filled the frame with water hyacinth. This induced the mature common carp broodstock to breed and lay their eggs on the water hyacinth roots on 25 February 2020. Following the training he was therefore able to successfully breed his own common carp and produce common carp fry.

Photo 11. Common carp (*Cyprinus carpio*) eggs attached to water hyacinth roots after spawning.

Photo 12. Common carp fry produced on the *Common carp spawning* training course in January 2020.

The MYSAP Inland Sagaing Region Field Coordinator delivered common carp and silver barb artificial breeding training for 9 people (all ♂) in Kale Township on 12 and 15 March 2021.

The Malteser International Aquaculture Technical Officer, conducted common carp artificial breeding training in Kengtung Township on 18-19 and 22 March 2021, which was attended by 20 people (06 ♀), who successfully induced breeding of common carp using Ovaprim and Suprefact and produced a large number of common carp seed.

U Sai Sum (KTG-0379) who attended the MYSAP Inland induced breeding of common carp training in January 2020, bred common carp again in late 2020 and to the end of April 2021 had earned over MMK 2.24 million from selling 56,000 common carp fingerlings.

Unfortunately the common carp breeding training course planned for Shwebo Township in 2021 was cancelled, because it was deemed to be unsafe for the BRAC Myanmar staff and the trainees to attend.

In addition to supporting the improvement of carp species quality produced by key hatcheries, and delivery of backyard hatchery training courses, MYSAP Inland has also promoted and supported the nursing of carp species seed in both earthen ponds and in nylon hapas, to make carp seed more readily available in rural areas and these activities are detailed in section **3.5 Nursery activities** of this report.

3.4 Small indigenous fish species (SIS)

MYSAP Inland efforts to promote the sustainable culture and consumption of small indigenous fish species (SIS) have primarily included:

1) Barrier Analysis study conducted to identify constraints to feeding children under 5 years of age more fish. See section **3.7.1 Barrier analysis study** for details;
2) Advocacy for and promotion of the nutritional benefits of eating SIS at policy level. See section **3.7.2 Food security and nutrition extension and training service delivery**;
3) Demonstration of the production and financial benefits of SIS in combination with larger carp species in small-scale household ponds;
4) The development and dissemination of information, education and communication materials in different ethnic languages on the benefits of eating SIS, and SIS production and harvest systems;
5) Promotion of and training on the use of a floating gill net to regularly and selectively harvest SIS from small-scale fish ponds. See section **3.6 Value chain activities**;
6) Support for a collaborative trial to produce and confirm the food safety of a dried powdered SIS to be used as a complementary feed for children above 6 months of age (See section **3.7.8 Community testing of a low cost fish drier and powdered SIS**); and,
7) Support research to develop applied breeding systems to produce SIS seed for stocking into fish culture production systems.

MYSAP supported polyculture of SIS with carps

In April 2018 when Mekong Economics Limited conducted the MYSAP Inland baseline survey there were no government or commercial hatcheries producing small indigenous fish species (SIS) seed for stocking into grow-out ponds and no farmers reported deliberately stocking SIS into their grow-out ponds for culture. Similarly the value chain reports for SIS conducted by Mekong Economics Limited found no culture of SIS in Kale, Kengtung, Shwebo, Amarapura and Pinlaung townships, where only small quantities of wild captured SIS was found on sale in markets.

MYSAP funded Dr Manjurul Karim, WorldFish Myanmar, Program Manager, Sustainable Aquaculture to attend the First Shan State Forum for Sustainable Fish Production at Taunggyi University, on 06 December 2018 workshop, where he presented on, *Adoption of small-scale aquaculture technologies by farmers in Myanmar: Challenges and opportunities*, which covered 3 years of WorldFish Myanmar MYCulture experiences on promoting the culture of SIS.

Since no government or commercial fish hatcheries were spawning and selling SIS seed, MYSAP began sourcing SIS seed for stocking into small-scale household fish ponds in Q2 of 2019 by contracting local fishers from Kale, Shwebo and Kengtung Townships and equipping them with battery powered aerators, air stones and tubing to catch and transport locally available SIS species. MYSAP Inland also trained and equipped nursery farmers to nurse SIS seed.

In 2019 MYSAP supported the stocking of 9,850 SIS into 70 ponds, including 67 demonstration ponds. 4,700 of the SIS stocked, were from MYSAP Inland supported nursery farmers and the balance were supplied by MYSAP contracted fishers. MYSAP supported demonstration grow-out farmers, to stock both SIS and other larger sized fish carp species in their grow-out ponds to demonstrate the financial and nutritional value of regular partial harvesting of SIS. There was no negative impact found on the growth and survival of large carp species in the demonstration ponds that were stocked with SIS in the 2019-20 culture season.

MYSAP supported the stocking of SIS in combination with carp species into demonstration ponds again in 2020. A total of 9,500 SIS fry were stocked into 69 demonstration ponds in Kale, Shwebo and Kengtung Townships. The SIS species stocked were sourced from contracted fishers, MYSAP supported nursery farmers and 2,600 SIS (being 800 flying barb, 750 swamp barb, 550 Indian glass fish and 500 mola carplet) from the SIS breeding trial conducted at the Aung Zay Ya Hatchery, Shwebo.

MYSAP funded the stocking of a total of 19,350 SIS seed during 2 years of promoting the stocking of SIS into small-scale freshwater grow-out ponds in combination with larger carp fish species. At the end of MYSAP Inland implementation, the demonstration farmer ponds that had not finally harvested their ponds were continuing to grow SIS on with larger fish species and were regularly harvesting, consuming, giving to friends and selling SIS.

MYSAP supported SIS breeding trials

In 2019 the SIS species captured and nursed by MYSAP supported nursery farmers included Burmese barb (*Esomus* sp.), flying barb (*Esomus danrica*), mola carplet (*Amblypharyngodon mola*), spotted barb (*Barbodes binotatus*), mosquito fish (*Gambusia* sp.), thick lipped gourami (*Trichogaster labiosa*) and Burmese badis (*Badis badis*).

In September 2019 MYSAP Inland posted an open tender call to conduct applied SIS breeding trials on both the WorldFish website and the MIMU website with a closing deadline of 20 October 2019. After review by a selection committee MYSAP Inland issued a service contract to the Aung Zay Ya Hatchery and Shwebo University in January 2020 to conduct breeding trials with 4 SIS species, being Indian glass fish (*Parambassis ranga*), mola carplet (*Amblypharyngodon mola*), swamp barb (*Puntius chola*), and, flying barb (*Esomus danrica*).

After buying the 4 species of SIS from fishers in January 2020 the fish were stocked and conditioned in i) tarpaulin tanks and ii) hapas within ponds with regular feeding, water sampling, and water exchange. While the SIS matured, they had not spawned at the end of May 2020, so the service contract with Aung Zay Ya and Shwebo University was extended to 31 August 2020, to see if the monsoon rains would trigger the SIS species to spawn.

By the extended trial end, all 4 SIS species in the breeding trial, had successfully spawned and produced seed, i.e. flying barb (*Esomus danrica*), the swamp barb (*Puntius chola*), mola carpet (*Amblypharyngodon mola*) and Indian glass fish (*Parambassis ranga*). However, while all 4 of the SIS species produced young, the seed output was low and the current method requires further study before it will be economically viable proposition for a commercial hatchery.

Photos 13 and **14**. SIS breeding systems in a) tarpaulin tanks and b) in hapas at Aung Zay Ya hatchery, Shwebo University.

With MYSAP approval, the *Small indigenous fish species (SIS) breeding trial report*, conducted under a MYSAP Inland service contract from 01 January to 31 August 2020, was uploaded onto the DoF Fisheries Information Centre website on 21 October 2020.

3.5 Nursery activities

MYSAP supported nursery promotion activities have primarily included:

1) Training, equipment provision and 2 months of running cost support for innovative grow-out farmers to become specialized nursery farmers and to sell nursed seed locally to MYSAP direct beneficiary households on a priority basis;
2) Support to transport fish seed from strategic hatcheries to nursery farmers in villages;
3) Promotion of both nursing fish seed in ponds and in nylon cloth hapas within ponds; and,
4) Production and dissemination of IEC materials on fish nursing in ponds and hapas.

MYSAP Inland fish nursery activities commenced in 2019 when innovative grow-out farmers from the first fish culture season (2018-19) were identified and offered MYSAP training, consumable equipment items like blue nylon netting to fence nursery ponds to prevent the entry of predatory fish, and nursery pond running cost support for 2 months.

The MYSAP Inland Field Coordinator, Sagaing Region and 2 Department of Fisheries staff delivered nursery training to a total of 17 participants (5 ♀), being 9 (1 ♀) pond nursery farmers, 1 interested observer and 7 BRAC Myanmar (4 ♀) staff in Shwebo Township on 17 May 2019. MYSAP Inland supported nursery pond preparation and the stocking of rohu, silver barb and common carp fry for 7 male farmers in June and July 2019.

The MYSAP Inland Field Coordinator, Sagaing Region and 2 Department of Fisheries staff delivered nursery training to a total of 16 people (5 ♀) being 7 (all ♂) pond nursery farmers, 3 interested observers (2 ♀) and 6 (3 ♀) Ar Yone Oo staff, in Kale Township on 17 June 2019. MYSAP supported nursery pond preparation and stocking costs in the first week in June 2019.

The Aquaculture Technical Officer, Malteser International delivered nursery training for 10 (2 ♀) pond nursery farmers in Kengtung Township on 10 June 2019. MYSAP supported nursery pond preparation costs for one nursery farmer Yang Kyauk Village and transported 10,000 GIFT seed, average weight of 0.1 g, from the DoF Nad Yay Kan hatchery to Kengtung by road, a journey taking 42 hours on 05 August 2019. On arrival the GIFT were stocked into nursing hapas in a pond.

MYSAP supported the second road transportation of 9,900 all-male GIFT seed from the DoF Nad Yay Kan Hatchery to Kengtung Township on 22 September 2019 and nursing in hapas by MYSAP trained nursery farmers. The nursed GIFT were distributed and stocked into the small-scale grow-out ponds of 198 MYSAP direct beneficiary households.

In 2019, a total of 26 (2 ♀) nursery pond farmers from Kale, Shwebo and Kengtung Townships were selected and trained. Of the 26 nursery farmers trained, 23 (2 ♀) stocked their nursery ponds with common carp, silver barb, GIFT tilapia, rohu and small indigenous fish species (SIS) and all 23 that stocked fish made a cash profit from their nursing activities.

A total of 100 nylon cloth hapas were supplied in August 2019 (35 for BRAC Myanmar, Shwebo, 35 for Malteser International, Kengtung and 30 for Ar Yone Oo for Kale). The hapas were given to demonstration farmers to practice short-term nursing of fish seed within their grow-out ponds, following transportation. This allowed confirmation of the number of fingerlings that had survived transportation, which were then counted from the nursing hapas into the grow-out pond. Nursing hapas were also supplied to nursery farmers.

MYSAP Inland finalized and disseminated Myanmar language leaflets on i) nursing carp species in ponds (200 copies) and ii) nursing fish in hapas (1,200 copies). The MYSAP produced IEC materials on fish nursing were also uploaded onto the Greenovator Green Way mobile phone app' on 12 September 2019.

https://greenwaymyanmar.com/posts/nursery_management_of_carp_species

In 2020, MYSAP Inland trained, and supported 28 (2 ♀) nursery farmers, including 7 new nursery farmers, being 10 (all ♂) from Kale, 10 (2 ♀) from Shwebo and 8 (all ♂) from Kengtung Townships.

In July 2020 Malteser International requested 200,000 all-male tilapia seed to stock in its small-scale grow-out household ponds and at the time neither the DoF Nad Yay Kan or the Aung Zay Ya Hatchery, Shwebo were breeding GIFT and producing all-male GIFT seed because of unfavourably hot pre-monsoon season weather. It was therefore decided to import all-male tilapia with confirmed disease-free status from Thailand taking the following biosecurity measures:

1) Nam Sai Farms Company Limited (registration number - TH2522050001) has been Tilapia Lake Virus free for over 2 years. Nam Sai Farms was inspected on 29 May 2020 and certified on 10 July 2020 by the Thai Department of Fisheries as following best management and sanitation practices and being TiLV-free. The certificate was valid until November 2020.
2) Nam Sai Farms supplied a Thai Department of Fisheries certificate of health, issued by the Aquatic Animal Health Research and Development Division within the Thai DoF with each batch of fish, issued within 7 days before seed transportation, confirming that the tilapia were free of all OIE notifiable diseases.
3) Each incoming shipment of tilapia from Mae Sai, Thailand to Tachileik, Myanmar was inspected at the border by the relevant Myanmar government authorities and issued with an appropriate Product Movement Document by the Myanmar Department of Fisheries.
4) The receiving nursery ponds owners followed MYSAP Inland recommendations for proper nursery pond preparation, including pond bottom drying out until cracking and the application of lime and chemical fertilizers and the filtration of incoming water through a fine cloth net to exclude entrance of wild fish including predators. The earthen nursing ponds were static system ponds, with no water flow through.
5) On arrival in Kengtung Township the seed were quarantined and nursed for 4 weeks in nursing hapas within static water earthen ponds by MYSAP trained nursery farmers. During the quarantine and nursing period the fish will fed and checked twice daily for any mortalities and abnormalities.
6) If any tilapia seed died, they were removed from hapas at least twice daily and buried in an earthen pit, sited away from the pond and any water source and were covered with lime and soil.

Fifty nursing hapas fabricated in Shwebo Township were transported by bus to Kengtung Township on 23 July 2020, for use by 8 MYSAP supported nursery farmers. Following nursery pond preparation and the erection of nursing hapas, a trial run batch of 36,000 all-male tilapia seed (2.5 cm in length and 0.25 g) from Nam Sai Farms, Thailand were imported via Tachileik and delivered to 3 nursery farmers in Wan Latt Village, Kengtung Township on 06 August 2020.

After fabricating an additional 50 nursing hapas fabricated in Shwebo Township and delivering them to Kengtung Township by bus on 17 August 2020, a further 108,000 and 106,200 (2.5 cm in length and 0.25 g in weight) all-male tilapia fry from Nam Sai Farms, Thailand were imported via Tachileik and delivered to Kengtung Township on 19 and 24 August 2020 respectively.

The 8 MYSAP supported nursery farmers in Kengtung Township nursed a total of 250,200 all-male tilapia in 139 hapas (1,800 per hapa) for a month from August to September 2020. The hapa nursing survival of tilapia of the 8 nursery farmers ranged from 76 - 92%, with the mean survival being 81.9%. After a month of nursing 205,004 all-male tilapia were stocked into 258 small-scale household grow-out ponds and two community ponds. All 8 nursery farmers in Kengtung Township made a cash profit in 2020 ranging from MMK 163,900 to MMK 320,535 (€ 109.3 to € 213.7) nursing fish seed for 1-2 months. Additionally, stocking of all MYSAP ponds by Malteser International was completed 2 months ahead of that achieved in 2020 and was as a result of a) importing all-male tilapia seed from Nam Sai Farms, Thailand where the breeding cycle commences earlier, and b) nursing the fish locally in nylon cloth hapas, a new technology for the MYSAP townships. Earlier grow-out pond stocking increased the growing season duration for the MYSAP direct beneficiary households grow-out ponds.

Photos 15 and **16**. Nursery farmer in Wan Latt Village, Kengtung receiving MYSAP funded tilapia fry on 06 August 2020, for stocking into blue nylon nursing hapas.

Following MYSAP funded technical training and pond preparation and inputs costs in 2020, 28 (2 ♀) nursery farmers from Kale, Shwebo and Kengtung townships supplied a total of 398,554 nursed fish for stocking into MYSAP farmer grow-out ponds. The main species nursed in 2020 were rohu, common carp, silver barb, SIS and tilapia. MYSAP supported nursery farmers supplied 56.3% of the total amount of 708,291 fish seed that MYSAP supplied for stocking into beneficiary ponds in the 2020-21 culture season.

The table below shows the production of nursed fish seed produced by MYSAP supported farmers by township and by year. In total MYSAP supported nursery farmers supplied a total of 914,965 nursed fish seed to MYSAP grow-out farmers of the total amount of 1,650,119 fish seed supported by MYSAP for stocking in grow-out ponds i.e. 55.4% of all the seed stocked into MYSAP supported grow-out ponds was from MYSAP supported nursery farmers.

Township	2018	2019	2020	2021	TOTAL
Kale	0	131,525	250,200	0	381,725
Shwebo	0	108,400	136,840	0	245,240
Kengtung	0	115,000	173,000	0	288,000
TOTAL	**0**	**354,925**	**560,040**	**0**	**914,965**

Farmers were identified for MYSAP Inland fish nursing training and support in January 2021, but thereafter field activities were suspended on MYSAP instructions.

3.6 Value chain activities

The service contract for BRAC Myanmar to deliver extension and training services to 250 households, each with a small-scale pond, in Shwebo Township, Sagaing Region, was signed by WorldFish and BRAC Myanmar on 18 May 2018. The contract format was then revised to a sub-grant agreement on MYSAP recommendation and signed on 12 July 2018.

MYSAP Inland delivered its first Training of Trainers (TOT) training course on *Small-Scale Aquaculture and Improved Human Nutrition* at the DoF, Thayet Kone hatchery, Freshwater Aquaculture Research and Extension Centre, Mandalay, 04-08 June 2018. Sixteen trainees (8 ♀), including 8 DoF staff, 7 BRAC Myanmar staff and the MYSAP Inland Field Coordinator for the Shan State attended the course delivered by WorldFish specialists and resource people, MYCulture staff and staff from LEARN Save the Children.

A second TOT training course on *Small-Scale Aquaculture and Improved Human Nutrition* was delivered by MYSAP Inland at the DoF Mandalay Region office, Thayet Kone, 30 July to 03 August 2018. The course trainers again included WorldFish specialists and resource people, MYCulture staff and staff from LEARN Save the Children. Sixteen people (8 ♀) attended the TOT training, including 6 DoF staff, 7 from Malteser International and 3 from Ar Yone Oo.

Table 01. Training of Trainers (TOT) Training on *Small-Scale Aquaculture and Improved Human Nutrition*

Date	Number trained	NGO staff	DoF staff	MYSAP staff
04-08 June 2018	16 (8 ♀)	7 BRAC	8	1
30 July – 03 Aug 2018	16 (8 ♀)	7 Malteser International 3 Ar Yone Oo	6	0
Total	**32 (16 ♀)**	**17**	**14**	**1**

The delivery of season-long extension and training service delivery on small-scale aquaculture, integrated vegetable and fruit production and improved human nutrition by the 3 NGO's in the 2018-19 culture season was specified in the sub-grants agreements, where each NGO had to:

1) Select direct beneficiary households with a pond of less than 0.5 acres (2,023 m^2) that held water for at least six months per year;
2) Form a small-scale aquaculture and improved human nutrition group in each selected village;
3) With the agreement of the group select a direct beneficiary household pond and location to be used as a demonstration pond and training location;

4) With the agreement of the group select a direct beneficiary household for MYSAP support with training and equipment to produce sinking pelleted feed to be sold to group members on a priority basis;
5) Make weekly visits to each SSA group to provide technical support;
6) Provide training on small-scale aquaculture, integrated vegetable and fruit production and improved human nutrition modules at different times of the year appropriate for the local fish and vegetables and fruit growing seasons;
7) Support all direct beneficiaries to record all pond and integrated vegetable plot inputs and all outputs; and,
8) Support each direct beneficiary household to keep a record of vegetable inputs and harvests and income from any sales.

In the 2018-19 culture season MYSAP funded the following support:

1) All the pond preparation costs and all input costs for one demonstration pond per group where training sessions were held for each small-scale aquaculture group;
2) A Salter spring balance for each demonstration group used for fish sampling and to weigh pond inputs and outputs;
3) Feed production equipment for one demonstration farmer per group to make sinking pelleted feed. The demonstration household and the feed milling household could be, but did not necessarily have to be the same household;
4) Fish seed for each direct beneficiary household, with the number stocked to follow MYSAP recommendations for stocking density and fish species;
5) Vegetable seeds for each direct beneficiary household engaged in integrated vegetable production on pond embankments or in a homestead garden;
6) pH paper for each group member;
7) Information education and communication (IEC) materials for each direct beneficiary household including:
    a. A hand book for each SSA farmer;
    b. Frequently asked question sheet on SIS;
    c. MYSAP Inland fact sheet;
    d. Farmer daily record book; and,
    e. First 1,000 days poster.
8) The loan of one hand held GPS for each NGO and training for 2-3 staff on how to use the GPS meter to take geo-referenced photos of direct beneficiary household ponds;
9) A prize for the best small-scale aquaculture production system per township; and,
10) A prize for the best pond bank vegetable and fruit garden per township.

In 2019 MYSAP funded training of trainer (TOT) training on feed milling for a total of 72 participants (18 ♀), including 43 farmers selected as demonstration feed millers who produced sinking pelleted fish feed for the MYSAP direct beneficiary households under the 47 SSA groups. The training schedule was as shown in **Table 02** below.

Table 02. Feed miller training of trainer (TOT) training delivery in 2019.

Dates	Township	Total # trained	Farmers trained	DoF staff trained	NGO staff trained
12-13 Feb 2019	Kale	15 (3 ♀)	10 (1 ♀)	1	4 (2 ♀)
14-15 Feb 2019	Kengtung	32 (10 ♀)	23 (5 ♀)	1 (1 ♀)	8 (4 ♀)
18-19 Feb 2019	Shwebo	25 (5 ♀)	16 (2 ♀)	2	7 (3 ♀)
	TOTAL	**72 (18 ♀)**	**49 (8 ♀)**	**4 (1 ♀)**	**19 (9 ♀)**

Photo 17. Feed mixing and pelleted fish feed milling equipment.

The feed miller TOT training was delivered by Kyaw Win Khaing from the LIFT funded and WorldFish Myanmar executed MYCulture project, assisted by a MYCulture feed miller from Meikthila, U Myint Kyaw.

MYSAP funded the purchase of six Garmin Montana 680 GPS machines, three of which were loaned to Ar Yone Oo, BRAC Myanmar and Malteser International for the duration of their sub-grant agreements. Two staff from each NGO were trained by MYSAP Inland Field Coordinators on how to use the GPS machines to record the GPS location of the selected direct beneficiary ponds and to take geo-referenced photographs of small-scale ponds to record the location of and measure the area of each direct beneficiary small-scale freshwater aquaculture pond supported by MYSAP.

Ms Shwu Jiau Teoh, WorldFish HQ, Scientist entered the pond GPS data for 155 ponds provided by the Shan State Field Coordinator and produced the map below (**Figure 04**) which identifies areas with the greatest number of small-scale ponds. Malteser International staff were trained by the Shan State Field Coordinator how to take

geo-referenced photographs and by 01 March 2019 had completed taking GPS locations and geo-referenced photographs of all 241 MYSAP Inland pond locations in Kengtung Township. Ar Yone Oo and BRAC Myanmar have also since collected GPS location data for their direct beneficiary households' freshwater small-scale ponds and with WorldFish HQ Shwu Jiau Teoh's input funded by MYSAP have mapped all the direct beneficiary SSA ponds for Kale, Kengtung and Shwebo Townships.

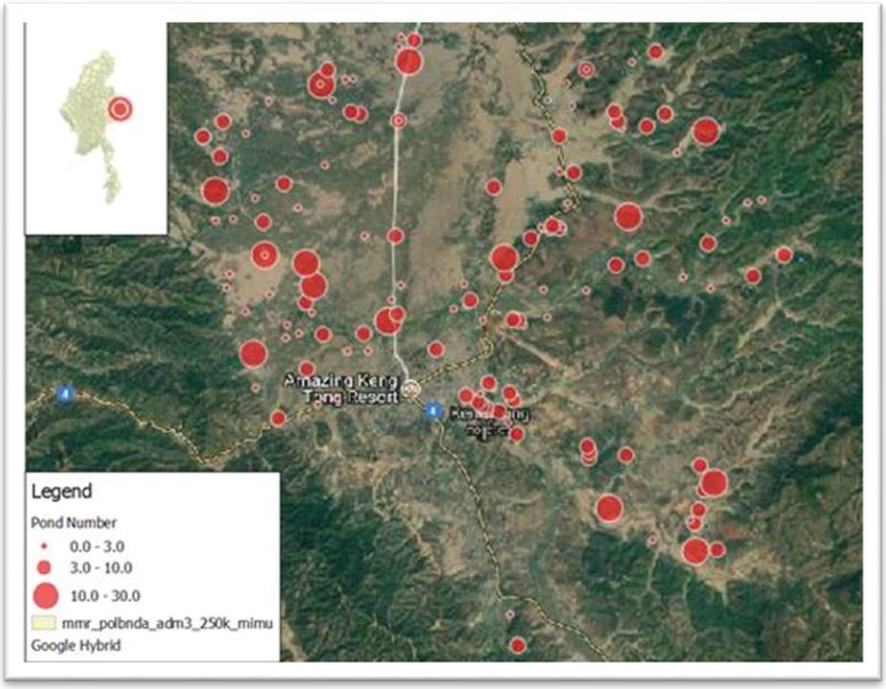


Figure 04. Location of direct beneficiary households SSA in Kengtung Township.

MYSAP funded Shwu Jiau Teoh, WorldFish HQ Scientist, to travel from Penang, Malaysia to deliver a hands-on training course on GPS mapping and the use of the Garmin Montana 680 device. Seven people were trained including 03 NGO and 04 MYSAP Inland staff. The four day course was delivered 08-12 April 2019. MYSAP also funded six days of FTE time for Shwu Jiau Teoh to create a Quantum GIS (QGIS – open access platform) file for each of the four townships where MYSAP Inland was conducting field work and mapped the small-scale direct beneficiary household ponds. MYSAP Inland staff and staff of NGO's uploaded the GPS data into the QGIS file produced by Shwu Jiau Teoh.

On 05 May 2021, the MYSAP Inland IEC Officer and the M&E Coordinator completed checking of the MYSAP Inland QGIS pond location data for Kale, Shwebo, Pinlaung and Kengtung and Kale Townships and confirmed that the GPS locations all 1,266 small-scale household ponds and 3 community ponds were correct. Using the GPS data provided, on 21 May 2021, Shwu Jiau Teoh, Scientist (GIS), Sustainable Aquaculture, WorldFish HQ, supplied MYSAP with one overall map and 4 individual townships maps of freshwater pond locations for Kale, Shwebo, Pinlaung and Kengtung Townships.

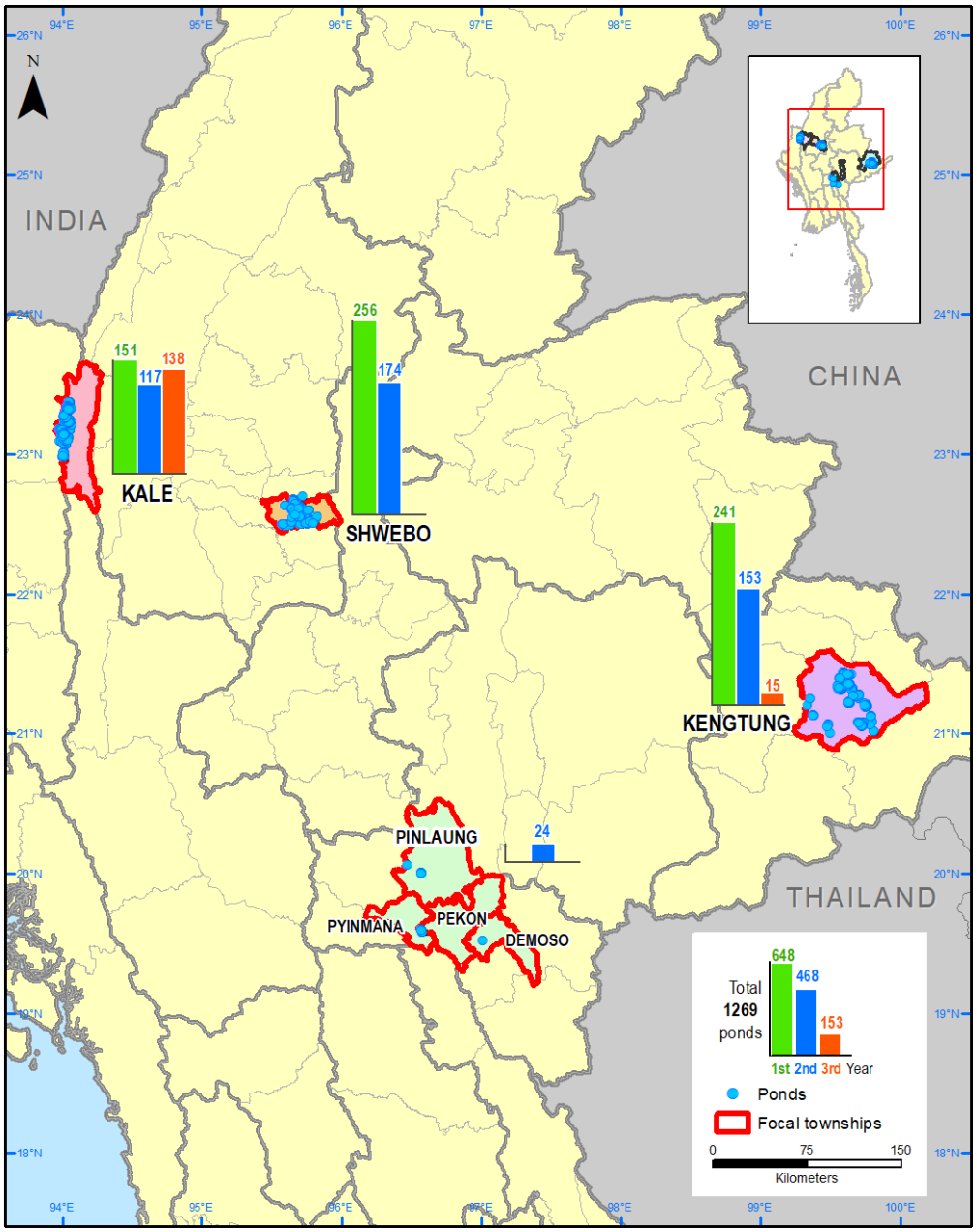


Figure 05. MYSAP freshwater small-scale ponds (1,266) and community ponds (03) GPS locations.

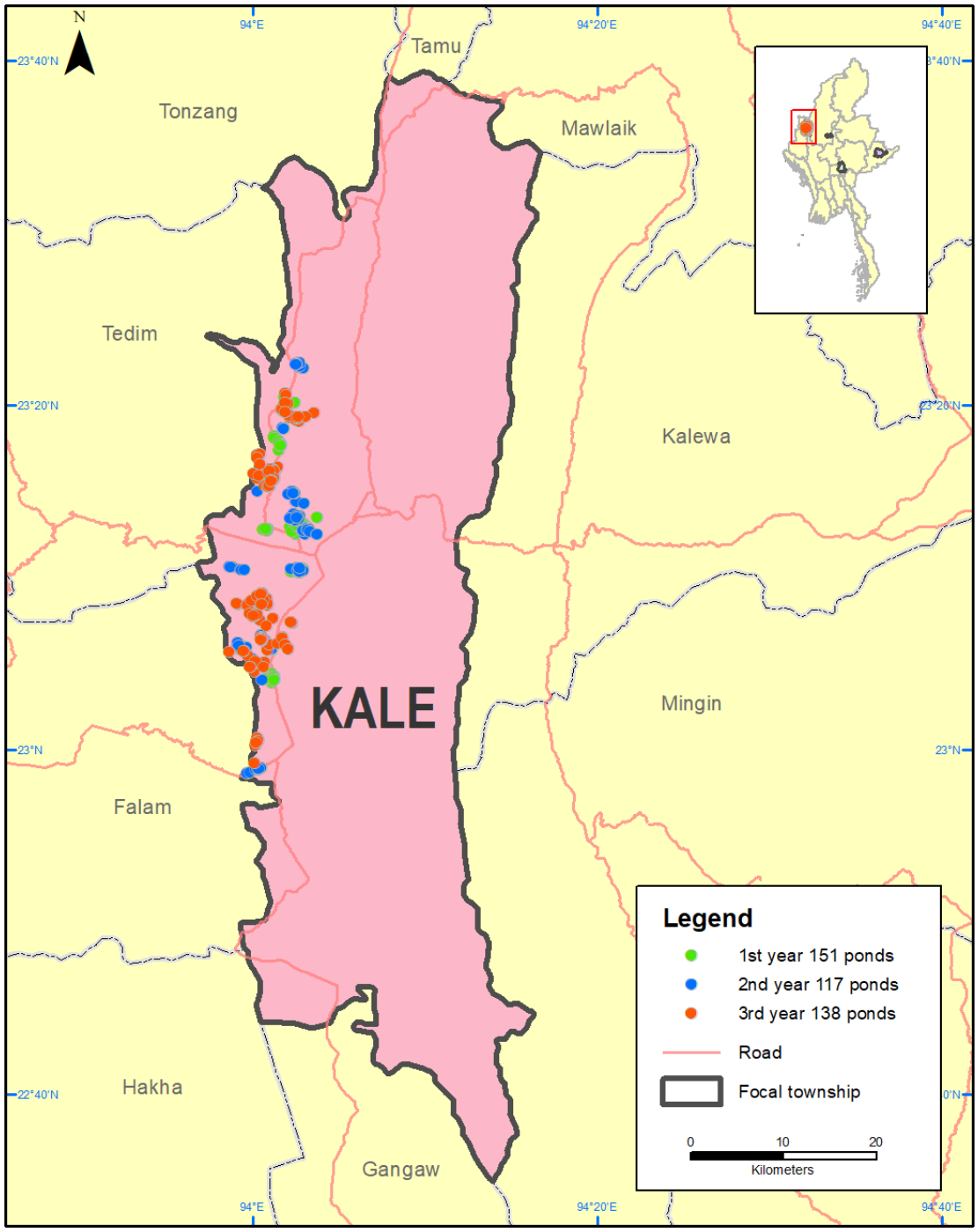


Figure 06. MYSAP freshwater small-scale ponds (406) in Kale Township, Sagaing Region.

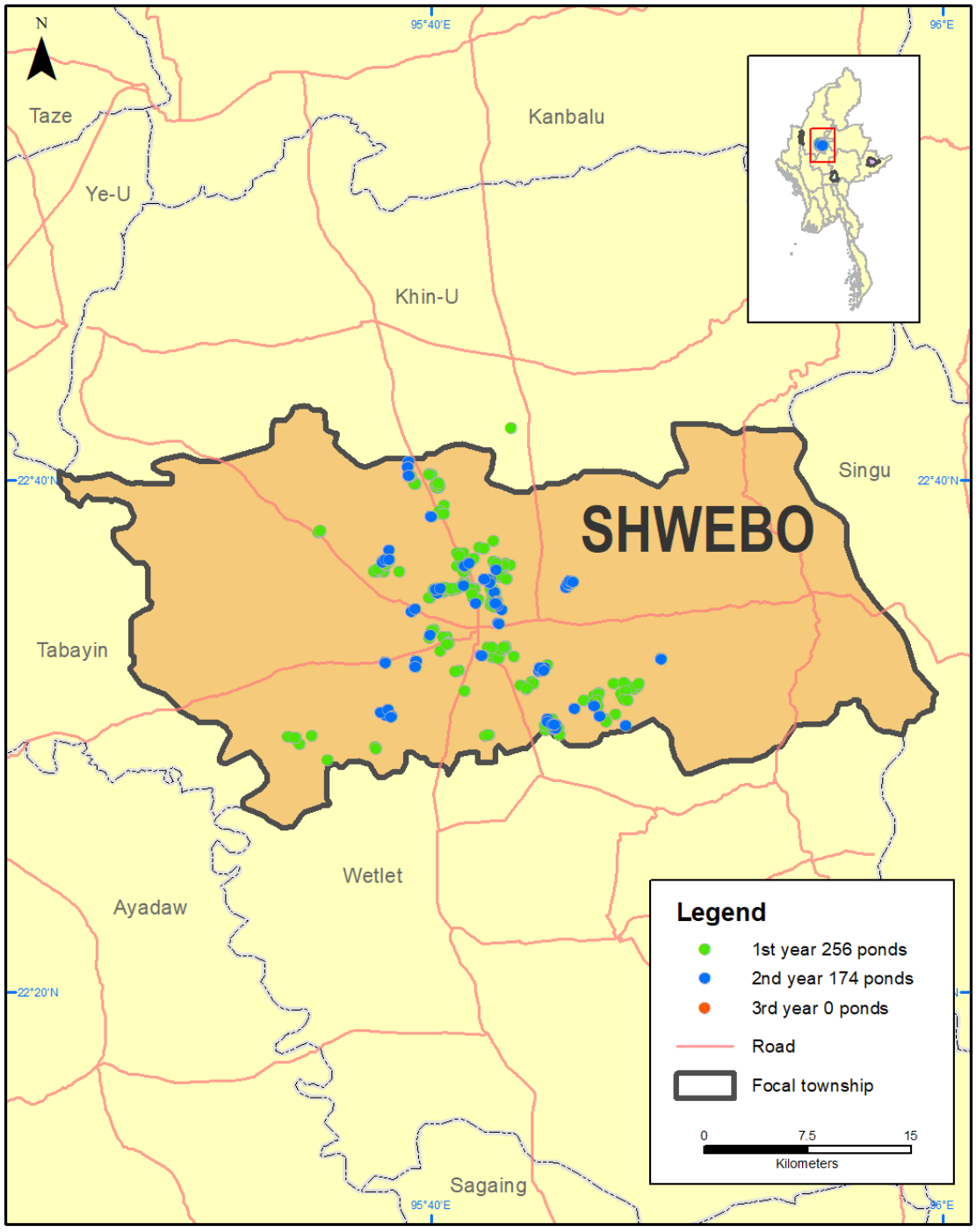


Figure 07. MYSAP freshwater small-scale ponds (430) in Shwebo Township, Sagaing Region.

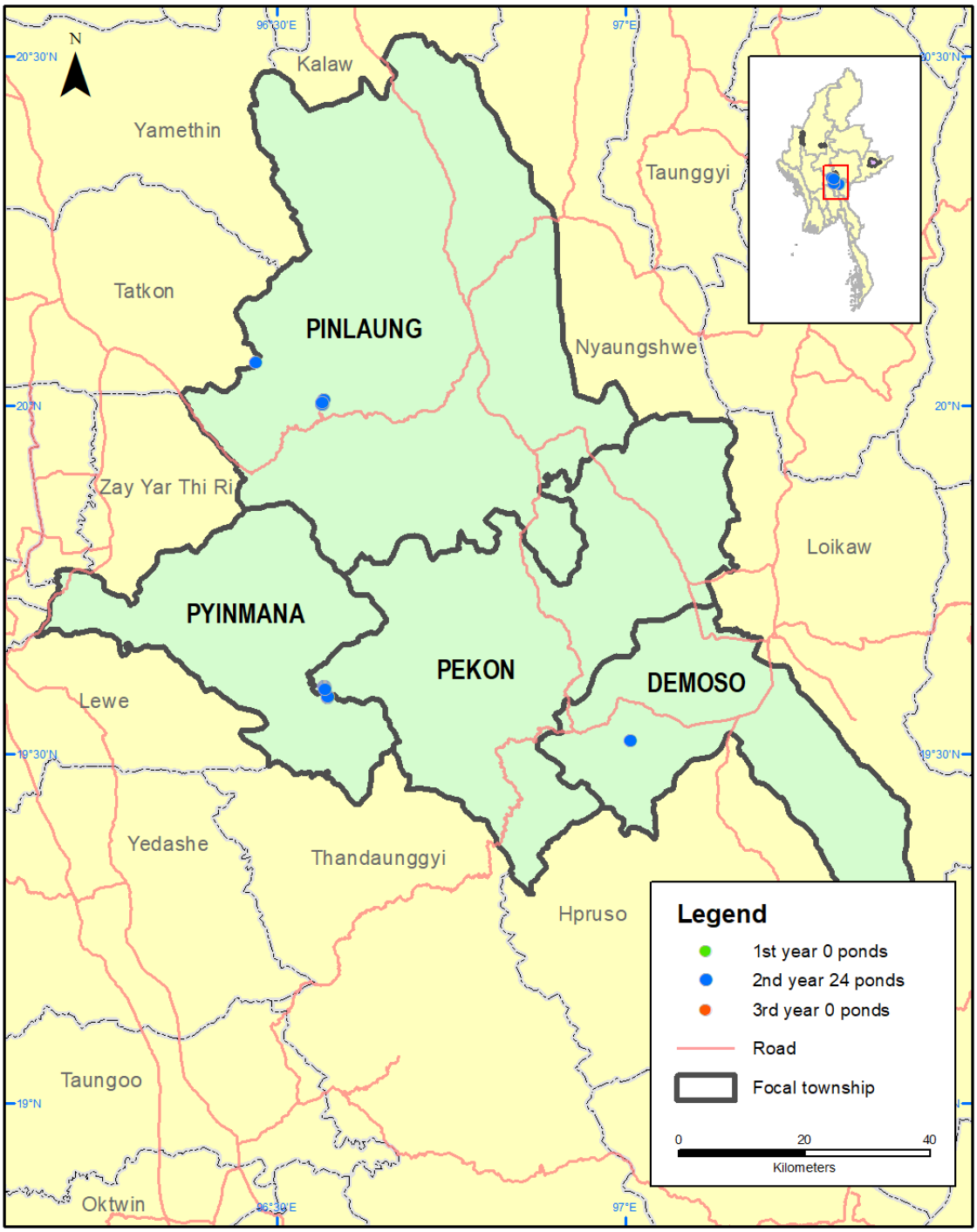


Figure 08. MYSAP freshwater small-scale ponds (24) in Pinlaung Township, Shan State.

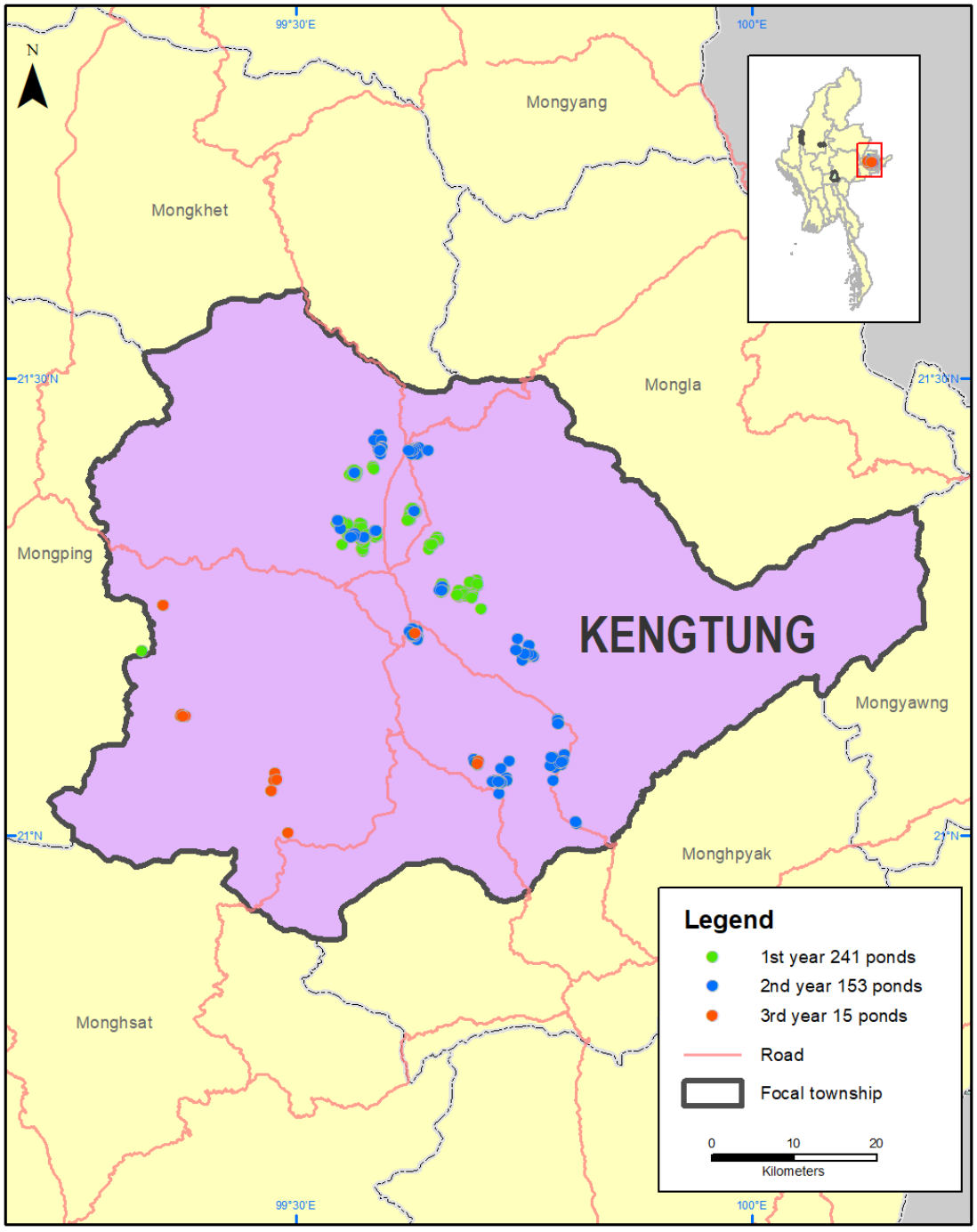


Figure 09. MYSAP freshwater small-scale ponds (406) and community ponds (03) in Kengtung Township, Shan State[7].

[7] The maps Figures 05 – 09 were produced by Shwu Jiau Teoh, Scientist (GIS), Sustainable Aquaculture, WorldFish HQ, using GPS data collected by the MYSAP Inland Field Coordinators for the Sagaing Region and the Shan State and the field staff of Ar Yone Oo, BRAC Myanmar and Malteser International.

MYSAP Inland delivered a monitoring and training course, with input from the WorldFish Myanmar M&E officer, covering data collection, entry, storage, analysis and reporting formats required to report progress and impact to the EU and BMZ donors, for a total of 7 people (5 ♀) being 2 Ar Yone Oo, 3 BRAC Myanmar (one funded by BRAC Myanmar) and 2 Malteser International staff, plus the Sagaing Region and the Shan State Field Coordinators in Mandalay on 04-05 October 2018.

During the 2018-19 culture season MYSAP Inland delivered training and extension services on small-scale aquaculture and improved human nutrition to a total of 648 direct beneficiary households each with a pond of less than 0.5 acres (2,023 m^2) in area that held water for at least six months per year. Extension services were provided under sub-grant agreements (SGA's) by Ar Yone Oo, BRAC Myanmar and Malteser International to 151, 256 and 241 households respectively in Kale, Shwebo and Kengtung townships.

Table 03. NGO sub-grant agreement contracts

NGO	Township	Beneficiary households	Groups[8]	Contract signed	Contract ends
BRAC Myanmar	Shwebo, Sagaing Region	256	15	18 May 2018	30 April 2019
Ar Yone Oo	Kale, Sagaing Region	151	10	16 Aug 2018	30 April 2019
Malteser International	Kengtung, Shan State	241	22	17 Aug 2018	30 April 2019
	Total	**648**	**47**		

MYSAP Inland supplied fish seed to 454 households for stocking into their pond. Of those, 418 households harvested their ponds by the end of April 2019, while 36 households chose to continue growing their fish on. The 2018-19 season data was analyzed and presented and discussed in Lessons Learned workshops held in Shwebo, Kengtung and Kale townships on 26 August, 19-20 September and 24 September 2019 respectively. In summary:

- The mean fish production was 80.8 kg from a mean pond size of 948 m^2.
- The 418 farmers that harvested produced a total of 33,769 kg of fish.
- This was equivalent to a mean fish productivity of 2,035 kg ha^{-1} $year^{-1}$.
- Mean fish productivity in Kengtung was 43% lower than the mean at 1,163 kg ha^{-1} $year^{-1}$.
- The productivity of MYSAP Inland supported **demonstration** farmers was 31% higher than the mean at 2,675 kg ha^{-1} $year^{-1}$.
- The mean net cash profit per household pond was MMK 65,070 or US$ 41.98 or equivalent to US$ 766 ha^{-1} $year^{-1}$.
- 340 of 418 farmers (81.3%) made a cash profit, excluding family labour costs.
- The number of households with loans from banks and micro-finance institutions in the first culture season was only 11.

[8] Small-scale aquaculture (SSA) and improved human nutrition groups have between 05-30 members.

Table 04. Direct beneficiaries households accessing loans.

Organization	Township	# of direct beneficiary households	# of dbh's with loans
Ar Yone Oo	Kale	141	3
BRAC Myanmar	Shwebo	256	8
Malteser International	Kengtung	251	0
TOTAL		**648**	**11**

In the 2019-20 culture season, MYSAP Inland provided extension and training services on small-scale aquaculture and improved human nutrition to a total of 1,264 direct beneficiary households (see **Table 05** below), working via Ar Yone Oo, BRAC Myanmar, and Malteser International under extended and revised SGA's to 30 April 2020 in Kale, Shwebo and Kengtung townships respectively and through the Shan State DoF in Pinlaung Township. The SGA's of Ar Yone Oo, and BRAC Myanmar were revised to additionally include the delivery of micro-finance training to a total of 600 households.

Table 05. Summary of MYSAP Inland field extension and training activities with collaborating partners.

Agency	Township	2019-20 culture season		Total # of households	Comment
		Old households	New households		
Ar Yone Oo	Kale	144[9]	117	261	Included 2 rice-fish farmers who were SSA group members
BRAC Myanmar	Shwebo	256	172	428	Rice-fish pilot farmers who were NOT SSA group members
Malteser International	Kengtung	241	150	391	
		0	101	101	Community pond #1
		0	58	58	Community pond #2
Department of Fisheries	Pinlaung	0	25	25	
TOTAL		**641**	**623**	**1,264**	

In preparation for the second season of extension and training in the field MYSAP Inland delivered a TOT training course 18-25 June 2019 in Kale T/S for a total of 33 staff (16 ♀), see **Table 06** below. The training course covered small-scale aquaculture, integrated vegetable and fruit production, improved human nutrition, and training on how to train farmers on the use of the Green Way mobile phone app.

Table 06. Training of Trainers (TOT) Training on *Small-Scale Aquaculture and Improved Human Nutrition*.

Date	Organization	Staff trained	Women trained
18-25 June 2019	DoF	02	01 (50%)
	Ar Yone Oo	06	03 (50%)
	BRAC Myanmar	10	06 (60%)
	Malteser International	10	04 (40%)
	MYSAP	05	02 (40%)
	TOTAL	**33**	**16 (49%)**

[9] Seven 2018-19 Ar Yone Oo households dropped out in the 2019-20 culture season.

At the start of the 2019-20 culture season, after confirming which 2018-19 households would continue for a second season, new direct beneficiary households were selected, new small-scale aquaculture groups formed and demonstration farmers selected, the NGO's then:

i) Developed village profiles for each village;
ii) Collected household profiles and baseline fish production data;
iii) Facilitated development of seasonal agricultural calendars by group members highlighting any differences in work seasonality between women and men;
iv) Verified how many households had taken loans;
v) Identified areas within villages that were at risk of theft, flooding and ponds drying out; and,
vi) Assessed the interest in and opportunities for fish preservation and post-harvest processing and value addition.

To support extension and training activities of NGO staff in the field the Information Education and Communication (IEC) officer developed laminated A4 flash card sets, each set with 49 cards. Eleven sets were printed and given to the NGO's for training farmers.

https://cgiar-my.sharepoint.com/:f:/g/personal/n_win_cgiar_org/Er5obUV1moBOo7BQihDxWWMBc8OMH_c58SHC6Mq2_DzB2A?e=xPIL7S

In the second (2019-20) culture season MYSAP funded the following support:

1) Season long extension and training on small-scale aquaculture, integrated vegetable and fruit production and improved human nutrition.
2) Monthly technical back-stopping visits to each producer group.
3) All pond preparation costs and all input costs for one demonstration pond per group where training sessions and technical follow-up meetings were held.
4) Stocking of small indigenous fish species into all demonstration ponds.
5) A hapa nursing cage for each demonstration farmer.
6) Stocking of fish seed for all direct beneficiary households including rohu (*Labeo rohita*), silver barb (*Barbonymus gonionotus*), common carp (*Cyprinus carpio*), mrigal (*Cirrhinus cirrhosus*), grass carp (*Ctenopharyngodon idella*), tilapia (*Oreochromis niloticus*) and SIS.
7) Vegetable seeds for all direct beneficiary household for integrated vegetable production on pond embankments or in homestead gardens.
8) pH paper for all new direct beneficiary households.
9) Information education and communication (IEC) materials for all direct beneficiary households.

With input from Kyaw Win Khaing, WorldFish Myanmar, MYSAP Inland updated the Myanmar versions of i) *Feed Production Technology* and ii) *Fish Nutrition and Feeding* training manuals ahead of training courses for feed millers delivered in Kale, Shwebo and Kengtung in Q1 of 2020. A total of 18 new feed millers were trained. However only 17 feed millers were supported with equipment, and raw materials to make pelleted feed being 07, 05, 04 and 01 from Kale, Kengtung, Shwebo and Pinlaung Townships respectively. In total MYSAP supported a total of 60 feed millers to produce on-farm sinking pelleted feed.

In the 2019-20 culture season Ar Yone Oo and BRAC Myanmar commenced providing financial literacy training in Kale and Shwebo townships respectively to a total of 564 (179 ♀) people.

In the 2019-20 culture season, the 663 MYSAP Inland farmers that completely harvested their MYSAP supported small-scale ponds produced a total of 43,556 viss (70,996 kg) of fish, from 156.8 acres (63.5 ha) of small-scale ponds. The mean per household production was 66 viss (107.1 kg) of fish.

Township	2019-20 Mean Production (viss/acre/season)	2019-20 Mean Production (viss/acre/year)	2019-20 Mean Production (kg/ha/year)
Kale	372.9	567.7	2,285.5
Kengtung	250.5	451.4	1,817.4
Shwebo	290.7	514.3	2,070.8
Overall	**302.3**	**512.4**	**2,063.0**[10]

The mean production per unit area per year in the 2019-20 culture season improved in Kale and Kengtung townships compared to the 2018-19 culture season, but was lower in Shwebo Township. Despite this, the overall mean production per unit of pond area increased 1.4% across the 3 townships, rising from 2,035.2 kg ha^{-1} $year^{-1}$ in the 2018-19 culture season to 2,063.0 kg^{-1} $year^{-1}$ in the 2019-20 culture season.

In the 2019-20 culture season the productivity of MYSAP Inland supported demonstration farmers was 33.4% higher than the mean at 2,752.3 kg ha^{-1} $year^{-1}$.

Township	Mean Production (viss/acre/season)	Mean Production (viss/acre/year)	Mean Production (kg/ha/year)
Kale	459.5	672.3	2,706.7
Kengtung	614.7	792.1	3,189.1
Shwebo	550.6	592.7	2,386.1
Overall	**547.0**	**683.6**	**2,752.3**[11]

629 (94.9%) of the 663 dbh made a net cash profit, with the mean cash profit being MMK 107,096 (€ 72) per dbh. Thirty four (5.1%) made a net cash loss in the 2019-20 culture season. The main fish production constraints identified were a weaker than normal monsoon in 2019, ponds drying up and a shorter 2019-20 culture season, and insufficient cash to fertilize ponds and feed fish.

From April to July 2020 MYSAP Inland continued to support 2019-20 culture season households to partially and finally harvest ponds and to sell fish, to support functioning food value chains for essential food items including rice, eggs, fish, vegetables and fruit. This was done in a COVID-smart manner to minimize the risk of COVID infection and spread, by MYSAP support for and implementation of the following practices:

- Compulsory temperature checks and asking any people with a temperature above 37.8 C and with any COVID-19 symptoms to return home and to self-quarantine for 14 days.
- Social distancing of at least 2 m at all times.
- Compulsory wearing of face masks at all times during fish netting, grading and packing.
- Limiting the number of people meeting and netting the fish.
- Compulsory hand washing with soap for 20 seconds before activity commencement.
- Use of disposable plastic gloves when handling fish.
- Regular use of hand sanitizer (at least 70% alcohol), every 30 minutes, during activities.
- Use of ice (food safe if available) to allow less people to grade fish and to maintain fish quality and extend fish shelf life.

[10] The overall mean reflects the different number of direct beneficiary households in each of the 3 townships.
[11] The overall mean reflects the different number of direct beneficiary households in each of the 3 townships.

Where possible, advance announcement of the pond harvest was done and pre-orders were taken for fish, followed by home delivery, so that people did not congregate in groups at the pond side.

In the third and final season 2020-21 culture season, the 3 NGO's delivered technical support and training to a total of 1,255 direct beneficiary farmers including, 1,075 dbh of which 154 were new dbh and 180 households sharing the benefits of 2 community ponds in Kengtung Township.

	NGO	2018-19 dbh	2019-20 dbh	2020-21 dbh	TOTAL dbh
Kale	Ar Yone Oo	0	116	138	254
Shwebo	BRAC Myanmar	256	172	2	430
Kengtung	Malteser International	237	140	14	391
	Naung Kan community pond	0	101	0	101
	Joe Phyu community pond	0	0	79	79
		493	**529**	**233**	**1,255**

In May and June 2020 the MYSAP Inland Field Manager and IEC Officer updated and improved the technical content of the MYSAP Inland Training of Trainers (TOT) Training Manual. New sections were added on COVID-19 awareness and the benefits of integrated rice-fish production and rice-fish system configurations. The WASH section was also strengthened in light of COVID-19 and included coverage of the following topics:

- The importance of hand washing;
- Important times to wash your hands;
- Steps in proper hand washing;
- Use of soap or ash for hand cleaning, if soap was not available;
- Tippy tap making and proper hand washing;
- Steps and use of the tippy tap;
- Keeping the environment clean;
- Safe storage and food handling; and,
- The key WASH messages (water, hand washing, safe food and toilet hygiene and sanitation).

The final revised TOT manual was finished on 17 June 2020 and 50 copies were printed.

Complete sets of farmer record books (900 copies), note books, pens, posters including the SIS comic cartoon poster and the 1000 day poster, and leaflets including nursing carp species in ponds, nursing fish seed in hapas, partial harvesting of SIS using a gill net, rice-fish production, and a recipe for fish-pumpkin balls, were transported to Kale, Shwebo and Kengtung Townships on 22 July 2020 for distribution to direct beneficiary households in the 2020-21 culture season by Ar Yone Oo, BRAC Myanmar and Malteser International respectively. pH paper was shipped to Kale, Shwebo and Kengtung townships in September for distribution to farmers.

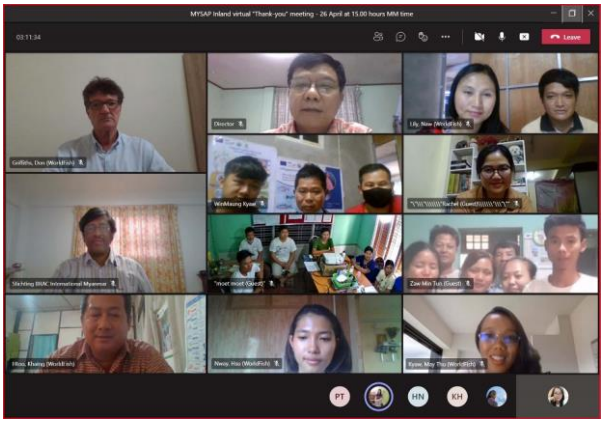
MYSAP used budget savings from the inland component travel between townships, workshops and face-to-face trainings due to COVID-19 restrictions, to provide 32,250 viss (52,567.5 kg) of sinking pelleted feed, being 30 viss (48.9 kg) of fish feed to all 1,075 direct beneficiary households in October 2020.

MYSAP Inland delivered training of trainers (TOT) training on *Small-scale aquaculture and integrated vegetable and fruit production* virtually via Zoom on 23-26 November 2020. A total of 36 (17 ♀) people, including 11 (4 ♀) Malteser International staff, 10 (5 ♀) BRAC Myanmar staff, 6 (4 ♀) Ar Yone Oo staff, 6 (3 ♀) MYSAP Inland and 3 (1 ♀) Fish 4 Livelihoods staff attended the TOT training.

MYSAP Inland arranged for 5 staff (3 ♀) from Ar Yone Oo, BRAC Myanmar and Malteser International and the MYSAP Inland Field Coordinator, Shan State to join a Fish 4 Livelihoods arranged virtual training course delivered by Save the Children staff entitled, *Facilitator's and negotiation skills*, on 09-11 December 2020.

In the 2020-21 culture season Ar Yone Oo and BRAC Myanmar commenced providing financial literacy training in Kale and Shwebo townships respectively to a total of 511 (112 ♀) people.

On 26 April 2021 MYSAP Inland hosted a virtual webinar attended by a total of 37 people (18 ♀) including 29 NGO staff (13 ♀) and 8 MYSAP Inland staff (5 ♀) to say "Thank you" and "Goodbye" to the Ar Yone Oo, BRAC Myanmar and Malteser International organizations and their staff for the efforts to deliver extension and training services on small-scale aquaculture and improved human nutrition to a total of 1,504 different dbh across 3 culture seasons (2018-19, 2019-20 and 2020-21). The 3 NGO sub-grant agreements all ended on 30 April 2021.



In May 2021 a total of 455 MYSAP direct beneficiary households continued to grow fish on in their small-scale household ponds, including 190, 40 and 225 small-scale household ponds in Kale, Shwebo and Kengtung Townships respectively. In addition fish were being grown on in the 2 community ponds in Kengtung and a total of 4 pilot rice-fish plots (2 each in Kale and Shwebo).

Production unit growing fish on	Kale	Shwebo	Kengtung	Total
Grow-out ponds	190	40	225	**455**
Community pond	0	0	2	**2**
Pilot rice-fish plots	2	2	0	**4**

On 10 May 2021, Malteser International submitted the first draft of their final report for the period 06 August 2018 to 30 April 2021, to MYSAP Inland. Following editing and incorporation of MYSAP Inland feedback, the Malteser International final technical progress report was approved on 17 May 2021.

BRAC Myanmar submitted their final technical progress report for the period 14 May 2018 to 30 April 2021 to MYSAP Inland on 21 May 2021. Following revision and editing in response to Team Leader feedback the BRAC Myanmar final technical progress report was approved on 27 May 2021.

Ar Yone Oo, submitted their final report, 06 August 2018 to 30 April 2021 to MYSAP Inland on 17 May 2021. Following revision and editing in response to Team Leader feedback, the report was approved on 31 May 2021.

3.6.1 Green Way mobile phone application testing

In November 2018, MYSAP and the LIFT MYCulture project began co-financing (50:50) the development of an aquaculture webpage on the gratis Greenovator, Green Way mobile smart phone application, to provide virtual aquaculture extension services.

Table 07 below shows that there in September 2018 there were a total of 430 registered users of the Greenovator mobile phone app called Green Way (www.greenwaymyanmar.com), in the 5 MYSAP Inland townships of which 54 (12.6%) were women. On checking it was confirmed that none of the 430 registered users of the Green Way app' in the 5 MYSAP inland component townships were MYSAP direct beneficiary households.

Table 07. Registered Greenovator Green Way app users by Township.

Township	State / Region	Green Way app registered ♂	Green Way app registered ♀	Green Way app total registered
Kale	Sagaing	56	7	63
Shwebo	Sagaing	173	19	192
Kengtung	Shan (East)	25	11	36
Pinlaung	Shan (South)	75	9	84
Amarapura	Mandalay	47	8	55
TOTAL		**376 (87.4%)**	**54 (12.6%)**	**430**

In Kale, Kengtung and Shwebo Townships where Ar Yone, Malteser International and BRAC Myanmar were operating under SGA contracts, there were 291 farmers registered as users of the Greenovator, Green Way app of which 37 (12.7%) were women. NGO and MYSAP Inland staff attempted to contact the 291 registered Green Way app users by mobile phone. Of the 174 (59.8%) people who answered the call, only 8 (4.6%) had a pond, i.e. 95.4% of the registered Green Way app users who answered the incoming mobile phone call in Kale, Kengtung and Shwebo Townships did not have a fish pond (see **Table 08** below).

Table 08. Registered Green Way app users with a pond by Township

Township	State / Region	Green Way app total registered	Number who did not answer IP staff call	Number who answered IP staff call	Number who answered the call, with a pond
Kale	Sagaing	63	27 of 63	36 of 63	1 of 36
Shwebo	Sagaing	192	74 of 192	118 of 192	3 of 118
Kengtung	Shan	36	16 of 36	20 of 36	4 of 20
Pinlaung	Shan	84	Not contacted	Not contacted	Not contacted
Amarapura	Mandalay	55	Not contacted	Not contacted	Not contacted
TOTAL		**430**	**117 of 291 (40.2%)**	**174 of 291 (59.8%)**	**8 of 174 (4.6%)**

With so few of the registered Green Way app users having a pond, it was decided to pilot the introduction of the Greenovator Green Way mobile app with 2 village groups (21 people – all ♂) in Shwebo for one month in October 2018 and to seek their feedback on the app. BRAC Myanmar field staff assisted the pilot farmers to download the app, showed them how to utilize it and left the farmers to experiment with the app for 4 weeks.

On 08 November 2018, BRAC Myanmar, Shwebo Township staff arranged focused discussion groups in #5 Ward with 11 participants (1 ♀ – attending instead of her father who was at a funeral) and on 09 November 2018 in Min Kone Village with 10 participants (all ♂) to get feedback on the Green Way App. The Field Manager, the Team Leader, 3 staff from Greenovator and BRAC Myanmar staff and Mr Myint Naing, DoF District Officer, Shwebo attended the FGD's. Key findings from the FGD were that:

- Downloading the Green Way app needed to be made simpler.
- Updating the Green Way app version needed to be made easier.
- The application needed to be made more user-friendly for non-technical farmers.

Thereafter MYSAP supported the testing of the beta version of the phone application through its NGO partners working with farmers in the field in Kale, Shwebo and Kengtung Townships.

MYSAP Inland contracted Greenovator to develop training materials and to deliver a two-day Training of Trainer (TOT) training course on *Training Farmers on Using the Green Way Mobile Phone App* (www.greenwaymyanmar.com) in Kale on 24 and 25 June 2019. A total of 33 trainees (16 ♀) were trained including DoF (02), NGO (26), and MYSAP (05).

From 08 July until 30 September 2019 the staff of WorldFish Myanmar, the inland component of MYSAP, MYCulture and one private sector member piloted how much effort was involved in having an 11 member working group of aquaculture specialists answer technical questions sent in by farmers on a weekly basis to the web page of the Green Way mobile phone app.

The aquaculture working group included the following specialists:

1) Dr Khin Maung Soe, WF MM consultant;
2) Aye Aye Lwin, MYCulture;
3) May Wah, MYCulture
4) Nang Tin May Win, MYSAP Inland, Information, Education and Information Officer
5) Khaing Kyaw Htoo, MYSAP Inland, Field Manager
6) Don Griffiths, MYSAP Inland, Team Leader
7) Xavier Tezzo, Programme Coordinator, WF MM
8) Dr Manjurul Karim, Aquaculture Programme Manager, WF MM
9) Kyaw Win Khaing, MYCulture
10) Yu Maung, MYSAP Inland Field Coordinator, Sagaing Region
11) Thet Htoon, MFF Shwebo Hatchery.

It was agreed that to continue a sustainable question and answer protocol Greenovator would need to engage and involve DoF staff in the process and to pay them for input.

On 30 April 2021, there were a total of 695 (146 ♀ – 21%) direct beneficiary household members registered as users of the Greenovator Green Way mobile phone app, being 328 (83 ♀), 192 (23 ♀), and 175 (40 ♀) in Kale, Shwebo and Kengtung Townships respectively.

On 14 May 2021, Greenovator had 345,642 registered users of the Green Way mobile phone app, of which 20% were women. 26,837 people visited the 20 aquaculture and nutrition articles uploaded to the aquaculture page by the inland component of MYSAP.

Greenovator have committed to upload all 77 small-scale aquaculture and improved human nutrition training videos produced by the inland component of MYSAP, onto the Green Way mobile phone application, by 31 July 2021.

3.6.2 Aquaculture system business models

MYSAP Inland and MYCulture jointly drafted TOR and openly advertised to engage an international consultant on 30 April 2018 to develop four business models for small-scale aquaculture, namely i) hatcheries, ii) nurseries, iii) grow-out production systems and iv) feed mills and then to create tools to effectively transfer the knowledge of the business models to target groups.

The international consultant Peter Silvester visited Myanmar 06-17 May 2018 and made field trips to both the Irrawaddy Delta region and the central dry zone, visiting 35 target enterprises to conduct primary research on their business models. Data was collected via key informant interviews and group discussions through translation on operations and financial aspects, as well as key information on the impact of the business on nutrition, livelihoods, and resilience. All the interviews were audio recorded, except one.

Following the field research, written notes were collated to assess what a typical or average case of the business model looked like, and basic financial modelling of that business was done to assess the business model's profitability and impact. Notes were also made about businesses with better practices.

The business model was then written up as a feature for the communication document for target groups. It provided the target groups with a real-life case study of the business owner's story, operations, financial position, risks, impacts, and tips for improving the business. The communication document included an introduction on what a business model was and its key elements, and a do-it-yourself business modelling tool for target group members to follow steps to develop key aspects of their own business model.

Final deliverables included Business Model Guides for building the capacity of the target groups to better understand the business model types, and to help them to get started in planning their own new business with this knowledge. This included an Excel spreadsheet with calculations of the average business model.

After it was agreed that there was insufficient data to develop a hatchery business model, the international consultant submitted final versions of Business Model Guides for i) nurseries, ii) grow-out production systems and iii) feed mills on 04 December 2018.

3.6.3 Weak and late monsoon – climate change impact?

The sub-grant agreements of the 3 three NGO's in the 2019-20 culture season, were modified to contract them to assess flood, drought, and theft risks before selecting new direct beneficiary households. Thereafter anecdotal feedback from the field was that the 2019 monsoon was both late and weak. Of the 1,080 direct beneficiary households selected in 2019 by the 3 NGO's, 389 (36.1%) farmers did not stock fish seed supported by MYSAP. There were 3 main reasons for this, being i) insufficient rain and water for stocking – 192 households, ii) couldn't wait for MYSAP Inland to supply seed, or didn't like the stocking density or species – 154 households, and iii) other reasons, including growing fish on from last year, received fish seed from relatives, no time to prepare pond, etc. – 43 households.

115 of the 426 (26.4%) households selected in Shwebo Township and 77 of the 391 (19.7%) households selected in Kengtung Township were unable to stock fish seed because of insufficient water.

MYSAP Inland obtained Department of Meteorology data that confirmed the anecdotal farmer feedback, i.e. that there was much less rain in Shwebo Township, Sagaing Region in 2019 than in 2018. The Department of Meteorology data showed that in 2019 the annual rainfall was only 17.6 inches (447 mm), or 57% of the 30.7 inches (780 mm) of rain which fell in 2018.

To mitigate against climate change impacts, the Team Leader of the inland component of MYSAP drafted an English text leaflet entitled, *Climate change and shortened season fish culture options* and collected feedback from ten national and international technical specialists. The leaflet was translated into Myanmar language and

after MYSAP approval, was disseminated to direct beneficiary households. The leaflet has also been widely disseminated to other stakeholders via internet locations, including the MYSAP Facebook website, and the DoF Fisheries Information Centre.

http://www.dof-myanmar-fic.org/elib/cgi-bin/opacexe.exe?op=dig&lang=0&db=FIC&pat=climate%20change%20and%20options%20for&cat=tit&skin=u&lpp=50&catop=&scid=zzz&ref=T:@681&nx=2

The inland component of MYSAP has continued to promote fish species like GIFT tilapia, silver barb and SIS which can reach market size in shortened culture seasons, which is the norm in the central dry zone of Myanmar, and promoted management practices like nursing of fish in irrigated rice-fish fields to produce an advanced fingerling for stocking into monsoon rain fed grow-out ponds immediately there was sufficient depth, to maximise shorter culture seasons going forward that are likely to occur as a result of climate change.

3.6.4 Ar Yone Oo Social Development Association – Kale Township

2018-19 culture season (season 1 of MYSAP support)

The Team Leader and the Field Manager travelled 15-17 August 2018 to Kale Township for a kick-off meeting with Ar Yone Oo to discuss plans for field training and extension service delivery, and MYSAP requirements for progress and financial reporting.

Ar Yone Oo staff visited all their selected villages to introduce MYSAP activities and finalized the selection of 151 households by 30 August 2018. Ar Yone Oo formed ten small-scale aquaculture groups with between 12 and 20 members per group, with each household having a pond of less than 0.5 acres (2,023 m^2) in area. Module 1 training on small-scale aquaculture and improved human nutrition training was provided to all 151 Ar Yone Oo direct beneficiary households that were able to attend at the time by 14 September 2018.

The table below summarizes the fish species stocked in Kale Township with MYSAP support in 2018-19. Stocking was completed by 08 January 2019.

Rohu	Common carp	Silver barb	Grass carp	Mrigal	Total #
15,370	8,110	4,495	750	300	29,025

The sub-grant agreement (SGA) with Ar Yone Oo in Kale Township for the delivery of extension and training on small-scale aquaculture, integrated vegetable and fruit production and improved human nutrition to 150 direct beneficiary households expired on 30 April 2019 and was extended on a no-cost basis until 30 June 2019. **Table 09** below summarizes the training delivered to the 150 direct beneficiary households in the 2018-2019 culture season.

Table 09. Ar Yone Oo direct beneficiary training

Training course	Start date	Finish	Groups trained	Men trained	Women trained	Dbh trained
Aqua Module 1	04 Sept 18	14 Sept 18	10	80	8	88
Aqua Module 2	09 Oct 18	21 Oct 18	10	74	33	107
Nutrition	12 Nov 18	22 Nov 18	10	81	41	122
Aqua Module 3	08 Jan 19	31 Jan 19	10	89	48	137
Feed Making	12 Feb 19	13 Feb 19	10	9	1	10
Refresher	06 Mar 19	18 Mar 19	10	117	27	144

Thereafter the Ar Yone Oo SGA was revised and extended to service a total of 260 direct beneficiary households until 30 April 2020 in the second season (2019-20) of support.

The Field Manager visited Kale Township 20-23 May 2019 to witness pond harvests in Aung Thit Sar Ward, and Nat Gyi Gone Village, and check on the small-scale aquaculture and improved human nutrition activities being conducted by Ar Yone Oo staff under their sub-grant agreement.

The Field Coordinator, Sagaing Region provided training on 09 August 2019 on feed milling for 36 trainees (6 ♀), including DoF staff and DoF selected farmers in Kale Township, as part of a DoF Good Aquaculture Practices (GaqP) training course.

On 24 September 2019, MYSAP Inland and Ar Yone Oo conducted a Lessons Learned Workshop at the Majestic Hotel (Min Thar Gyi Hotel), in Kale Township. Eight five people (42 ♀ – 49%) attended the workshop, including 54 dbh (28 ♀ - 52%), 4 (2 ♀ – 50%) DoF staff, 2 Department of Agriculture staff, 2 fish vendors (1 ♀ - 50%), 14 Ar Yone Oo staff (7 ♀ - 50%), 1 MFF, 1 observer and 7 MYSAP staff (4 ♀ – 57%).

The objective of the workshop and two others held at Kengtung and Shwebo townships was to seek farmer feedback to identify positives or things which went well in the field activities in the township in the 2018-19 culture season and that were to be increased and focused on in the 2019-20 culture season. Similarly farmers provided feedback on things that did not go well in the 2018-19 culture season that required improvement in the 2019-20 culture season.

2019-20 culture season (season 2 of MYSAP support)

In the second culture season (2019-20) of MYSAP support, Ar Yone Oo staff, and the MYSAP Inland Field Coordinator, Sagaing Region, provided training on small-scale aquaculture, integrated vegetable and fruit production on pond embankments and in homestead gardens, improved human nutrition and financial literacy to a total of 261 dbh, being 144 old dbh and 117 new dbh. Two of the group members also piloted rice-fish with MYSAP support.

A total of 19 demonstration farmers (10 old and 9 new) were selected in Kale Township, with MYSAP supporting all pond preparation and input costs in the 2019-20 culture season. MYSAP Inland supported a total of 182 farmers to stock their ponds with 195,800 fish seed, supplied from either MYSAP Inland supported nursery farmers or purchased from local hatcheries.

The table below summarizes the fish species stocked in Kale Township with MYSAP support in 2019-20. Stocking was completed by 23 August 2019.

Rohu	Common carp	Silver barb	Grass carp	SIS species	Catla	GIFT	Total #
137,750	29,500	15,250	8,350	1,900	1,350	1,000	195,100

Tables 10 and **11** below summarize the training delivered in by Ar Yone Oo to the 261 direct beneficiary households supported under their SGA in the 2019-20 culture season.

Table 10. New farmer training status, Kale T/S 01 October 2019 to 31 March 2020.

			# of participants				DBH trained
Small-Scale Aquaculture and Improved Human Nutrition Promotion	**Start Date**	**Finish Date**	**# of groups trained**	**# of men trained**	**# of women trained**	**Total # Trained**	
Module2_Session 15 to 18	25-Oct-19	21-Nov-19	10	73	61	134	114
Module3_Session 19, 20	9-Dec-19	17-Dec-19	10	73	55	128	116
Module3_Session 21 to 23	19-Dec-19	On going	5	41	28	69	58
Module3_Session 21 to 23	3-Jan-20	13-Jan-20	5	44	40	84	58
Module3_Session 24 to 27	12-Dec-19	18-Dec-19	10	73	62	135	116
Green Way Usage Training	25-Oct-19	21-Nov-19	10	73	61	134	114
Fish Preservation	5-Nov-19	6-Nov-19	4	2	3	5	5
Financial literacy and awareness raising_M2	4-Oct-19	11-Oct-19	10	72	59	131	104
Financial literacy and awareness raising_M3	19-Oct-19	25-Oct-19	10	61	55	116	97
Financial literacy and awareness raising_M4	25-Oct-19	8-Nov-19	10	62	47	109	95
Feed Making Training	8-Jan-20	9-Jan-20	8	9	7	16	11
SIS Partial harvesting training	10-Jan-20	10-Jan-20	2	12	14	26	23

Table 11. Old farmer training status, Kale T/S 01 October 2019 to 31 March 2020.

			# of participants				DBH trained
Small-Scale Aquaculture and Improved Human Nutrition Promotion	**Start Date**	**Finish Date**	**# of groups trained**	**# of men trained**	**# of women trained**	**Total # Trained**	
Module1_Session 1 to 10	7-Oct-19	16-Oct-19	9	72	56	128	128
Module2_Session 11 to 18	20-Nov-19	27-Nov-19	10	91	60	151	139
Fish Preservation	5-Nov-19	6-Nov-19	6	4	14	18	15
Green Way Usage Training	20-Nov-19	27-Nov-19	10	91	60	151	139
Financial literacy and awareness raising_M2	4-Oct-19	11-Oct-19	10	70	63	133	117
Financial literacy and awareness raising_M3	19-Oct-19	1-Nov-19	10	66	63	129	116
Financial literacy and awareness raising_M4	1-Nov-19	8-Nov-19	10	66	54	120	110
Module 1 to 3_Refresher	20-Jan-20	27-Jan-20	10	72	79	151	143
Module3_Session 19 to 27	13-Jan-20	20-Jan-20	10	81	70	151	139
Feed Making Training	8-Jan-20	9-Jan-20	9	8	6	14	11
SIS Partial harvesting training	10-Jan-20	10-Jan-20	1	3	7	10	8

Delivery of all planned training in Kale Township for the 2019-20 culture season was completed by the end of January 2020.

The first two-day feed miller training course in 2020 entitled *Fish nutrition and feeding and fish pellet production*, was conducted by Kyaw Win Khaing, WorldFish Myanmar for MYSAP Inland in Kale Township on 08-09 January 2020. Thirty people (14 ♀ - 46.8%) attended the training course.

Photos 18 and **19**. *Fish nutrition and feeding and fish pellet production training*, attended by 30 farmers in Kale Township, 08-09 January 2020.

In 2019-20, 7 different types of vegetable seeds and/or cuttings (*Acacia pennata*, long green beans, carrots, mustard, drumstick, okra, and red gourd) were supplied to direct beneficiary households in Kale Township to grow on their pond embankments and/or homestead gardens.

Kyaw Win Khaing conducted two half-day training courses for MYSAP Inland in two villages (morning and afternoon) on 10 January 2020 on *How to partially harvest SIS from a small-scale pond using a floating gill net*. Thirty six people (21 ♀ – 58.3%) attended the SIS partial harvest courses, being 20 people (12 ♀ – 60%) from Pyin Khone Gyi Village and 16 people (9 ♀ – 56.3%) from Pyin Khone Lay Village respectively.

Photos 20 and **21**. *Partial harvesting of SIS using a floating gill net*, attended by 20 farmers in Pyin Khone Gyi Village, Kale Township, 10 January 2020.

On 11 January 2020 the IEC officer conducted a video interview of Cin Lian, Director, Ar Yone Oo Social Development Association on the history of AYO development, its micro-credit activities and the establishment based on lessons learned from collaboration with MYSAP of a MMK 50 million (US$ 32,000) micro-credit fund for fish culture for individual loans with an upper limit of MMK 500,000 per loan and group loans, with 28%

interest per annum. However the finalised video footage in Myanmar language with English sub-titles, and success story articles in English and Myanmar languages were not approved for dissemination by MYSAP Head of Programme.

The MYSAP Inland Data Management officer visited Kale Township 20-24 January 2020, and mentored key Ar Yone Oo staff on monitoring and evaluation data entry, cleaning, analysis and reporting.

Ar Yone Oo had an underspend against its sub-grant agreement on promotion and visibility, so with the approval of the Team Leader of the inland component of MYSAP, Ar Yone Oo subsidized the production and distribution of 10 viss (16.3 kg) of sinking pelleted feed in March 2020, to 240 direct beneficiary households in Kale Township, i.e. MYSAP supported 2,400 viss (3,912 kg) of pelleted feed for dbh's.

After the announcement of a confirmed COVID-19 case in in Tedim, northern Chin State close to Kale Township, Ar Yone Oo took the internal decision, based on information from the local authorities and concerned health departments, and instructed all non-essential staff, including MYSAP Inland staff to work from home from home in March and April 2020. MYSAP staff communicated with direct beneficiary households by mobile phone to confirm their well-being, to share advice on COVID-19 and to gather information on their small-scale aquaculture pond production. A farmer exchange visit planned in Kale Township for 01-05 April 2020 was cancelled.

By the end of April 2020 the Ar Yone Oo staff had pre-selected 120 new direct beneficiary households and 1 rice-fish nursery farmer for third and final culture season (2020-21).

	**Photo 22**. Feed bag design for subsidized pelleted feed provided to direct beneficiary households in Kale Township, March 2020.

To the end of April 2020, the 179 dbh's in Kale Township that completely harvested 43.8 acres (17.7 ha) of small-scale ponds produced 15,716 viss (25,617 kg) of fish, with a mean household production of 87.8 viss (143.1 kg) of fish from the 2019-20 culture season.

The mean production for the 179 dbh's that completely harvested in the 2019-2020 culture season was 567.7 viss per year (2,285.5 kg per year). The mean production rate in the 2019-2020 culture season was 11.2% higher than the 509.6 viss acre^{-1} year^{-1} (2,055.5 kg^{-1} ha^{-1} year^{-1}) in the 2018-19 culture season.

All 179 dbh (100%) made a net cash profit in the 2019-20 culture season. The overall mean net cash profit was MMK 205,140 (€ 136) per dbh.

On 02 April 2020, under the remote guidance of Khaing Kyaw, MYSAP Inland Field Manager (based at home in Mandalay), two Ar Yone Oo Community Facilitators oversaw the partial harvest of the demonstration pond at Hakhalay Village, Kale Township. A total of 44 viss (71.7 kg) of common carp, grass carp and silver barb were

caught from the 0.14 acre (0.06 ha) pond and sold to neighbours within the village at MMK 6,000 per viss (€ 2.44 per kg) for a total income of MMK 264,000 (€ 174.24). There were still more fish in the pond for later harvest. The fish was pre-ordered by villagers when the demonstration farmer announced the decision to conduct a partial harvest. The pre-ordered fish was packed, and delivered to each household and left at the door, to reduce the need for people to congregate in groups at the pond or go to crowded markets.

2020-21 culture season (season 3 of MYSAP support)

In the final 2020-21 fish, vegetable and fruit culture season Ar Yone Oo worked with 116 second season direct beneficiary households (dbh) and 138 new dbh, making a total of 254 dbh. Despite the difficulties of operating under COVID-19 restrictions, 230 dbh small-scale grow-out ponds were stocked in a timely manner with 266,800 fish seed sourced from 10 MYSAP Inland supported nursery farmers, and commercial hatcheries and the DoF hatchery. All the demonstration ponds were stocked with SIS and traditional carp species including rohu, mrigal, common carp and silver barb.

The table below summarizes the fish species stocked in Kale Township with MYSAP support in 2020-21. Stocking was completed by 26 August 2020.

Rohu	Silver barb	Common carp	Grass carp	Mrigal	SIS species	Total #
171,250	42,850	34,850	11,150	4,600	2,100	266,800

Photo 23. MYSAP supported temperature check, hand washing with soap, hand sanitizer, face masks and disposable gloves.

Photo 24. Netting team maintaining social distancing when harvesting a MYSAP freshwater demonstration pond in Hakhalay Village, Kale Township.

Photo 25. Market sized silver barb after six months of grow-out.

Photo 26. Much needed fresh fish pre-ordered and packed for distribution to neighbours within the village, to be left at the front door of houses.

Table 12. New farmer training status, Kale Township from 03 September 2020 to 26 March 2021.

Training session	Start Date	Finish Date	# of ♂ trained	# of ♀ trained	% of ♀ trained	Total # trained
Module1_Session 1 to 5	3-Sep- 20	16-Sep- 20	80	6	7%	86
Module1_Session 6 to 10	21-Sep- 20	26-Oct- 20	74	11	12.9%	85
Module1_Session 11 to 13	19-Oct- 20	27-Oct- 20	72	10	12.2%	82
Module2_Session 14 to 18	10-Nov- 20	18-Nov- 20	70	9	11.4%	79
Module3_Session 19 to 23	5-Jan- 21	8-Jan- 21	66	8	10.8%	74
Module3_Session 24 to 27	11-Jan- 21	15-Jan- 21	63	10	15.9%	73
Financial literacy and awareness raising_M1	20-Mar- 21	24-Mar- 21	34	2	5.6%	36
Financial literacy and awareness raising_M2	22-Mar- 21	25-Mar- 21	34	2	5.6%	36
Financial literacy and awareness raising_M3	26-Mar- 21	26-Mar- 21	7	2	22.2%	9

Table 13. Old farmer training status, Kale Township from 03 December 2020 to 26 March 2021

Training session	Start Date	Finish Date	# of ♂ trained	# of ♀ trained	% of ♀ trained	Total # trained
Module1_Session 1 to 10	3-Dec- 20	11-Dec- 20	42	14	33.3%	56
Module2_Session 11 to 18	17-Dec- 20	29-Dec- 20	40	15	37.5%	55
Module3_Session 19 to 27	18-Jan- 21	22-Jan- 21	40	13	32.5%	53
Green Way Usage Training	18-Jan- 21	22-Jan- 21	40	13	32.5%	53
Financial literacy and awareness raising_M1	20-Mar- 21	24-Mar- 21	36	9	25%	45
Financial literacy and awareness raising_M2	22-Mar- 21	25-Mar- 21	36	9	25%	45
Financial literacy and awareness raising_M3	26-Mar- 21	26-Mar- 21	21	6	28.6%	27

To 31 December 2020, Ar Yone Oo staff distributed a total of 11,328.5 viss (18,465.5 kg) of sinking pelleted feed to 256 dbh, including 21 demonstration farmers, 231 grow-out farmers and 4 pilot rice-fish famers for the 2020-21 fish culture season, valued at MMK 11,264,950 (€ 6,920).

Ar Yone Oo delivered financial literacy training modules 1, 2 and 3 to 258 households in March and April 2021 being 10 old farmer groups and 11 new farmer groups from 19 targeted villages. Module 4 was only delivered to new farmers in April 2021.

Type of farmer	# of groups	Module 1			Module 2			Module 3			Module 4		
		♂	♀	T	♂	♀	T	♂	♀	T	♂	♀	T
Old farmers	10	59	62	120	59	62	120	59	62	120			
New farmers	11	86	52	138	86	52	138	86	52	138	86	52	138
Total	**21**	**145**	**114**	**258**	**145**	**114**	**258**	**145**	**114**	**258**	**86**	**52**	**138**

Two pilot rice-fish nursery farmers and 190 dbh in Kale Township were growing their fish on in their small-scale grow-out ponds at the end of May 2021 when the MYSAP Inland implementation period ended.

Accessing micro-finance loans for fish culture

To the end of 30 April 2021, 29 SSA farmers took loans totalling MMK 15.5 million (€ 9,462) from the Ar Yone Oo Microfinance Company for expansion of fish culture and, for bulk buying of fish from local fish farmers and to sell in local retail markets. Moreover, another 115 Ar Yone Oo Microfinance Company clients in Kale township took loans totalling MMK 46.5 million (€ 28,927) for fish related business activities like fish vending, dried fish making and retail shops in local markets.

3.6.5 BRAC Myanmar – Shwebo Township

2018-19 culture season (season 1 of MYSAP support)

Under the first SGA BRAC Myanmar provided extension and training service support on small-scale aquaculture, integrated vegetable and fruit production and improved human nutrition to 256 direct beneficiary households in the 2018-19 culture season.

The table below shows that MYSAP supported the stocking of a total of 225,800 fish seed into the small-scale grow out ponds of 237 direct beneficiary households in Shwebo Township in the 2018-19 culture season. Stocking was completed by 24 August 2018, with the fish seed was supplied from the DoF hatchery and the Aung Zay Ya hatchery.

Rohu	Silver barb	Total #
188,950	36,850	225,800

Table 14 below details the training on small-scale aquaculture, integrated vegetable and fruit production and improved human nutrition delivered by BRAC Myanmar for farmers in Shwebo Township in the first season, 2018-19 with MYSAP support.

Table 14. BRAC Myanmar direct beneficiary training status (Up to **31 March 2019**).

Training course	Start date	Finish	Groups trained	♂ trained	♀ trained	Dbh trained
Aqua Module 1	10 July 18	31 July 18	15	193	44	237
Aqua Module 2	04 Sept 18	17 Sept 18	15	216	26	242
Nutrition Module	24 Sept 18	05Oct 18	15	221	26	247
Aqua Module 3	31 Oct 18	15 Nov18	15	223	28	251
Feed Making	18 Feb 19	19 Feb 19	15	14	02	16

The BRAC Myanmar sub-grant agreement (SGA) to provide training and extension services on small-scale aquaculture, integrated vegetable and fruit production and improved human nutrition for 256 direct beneficiary households was extended on a no-cost basis until 30 June 2019, before being revised and extended to work with a total of 428 direct beneficiary households, being 256 first season dbh from 2018-19 and 172 new second season dbh, until 30 April 2020.

2019-20 culture season (season 2 of MYSAP support)

BRAC Myanmar conducted an end line evaluation in April 2019 of its SSA activities in the 2018-19 culture season with MYSAP Inland. The finalized report was submitted in October 2019.

On 26 August 2019, MYSAP Inland and BRAC Myanmar conducted a Lessons Learned workshop at the Eden Restaurant in Shwebo Township. 111 people (45 ♀ - 41%) attended, including 67 dbh (27 ♀ – 40%), 5 (2 ♀ – 40%) DoF staff, 3 male representatives from the Myanmar Fisheries Federation, Shwebo District, 18 BRAC Myanmar staff (9 ♀ – 50%), 4 vendors (2 ♀ - 50%), 5 observers (2 ♀ - 40%), 1 male observer and 7 MYSAP Inland staff (4 ♀ – 57%).

In the 2019-20 culture season, MYSAP supported all the pond preparation and input costs for 24 demonstration farmers (15 old and 09 new). The table below shows that MYSAP supported 312 farmers to stock a total of 291,600 fish seed of five different fish species, with stocking completed by 14 November 2019. The fish seed was sourced from 10 MYSAP supported nursery farmers or purchased from the local DoF or the Aung Zay Ya hatcheries.

Rohu	Silver barb Mrigal	Common carp	GIFT tilapia	SIS species	Total #
200,500	75,250	7,900	5,550	2,400	291,600

Eight different types of vegetable seeds and cuttings (pumpkin, *Acacia pennata*, watercress, okra, long green beans, bitter gourd, carrots and drumstick) were supplied to direct beneficiary households to grow on their pond embankments and/or homestead gardens in 2019-20.

A Mandalay University MSc student conducted key informant interviews of BRAC Myanmar, DoF and MYSAP Inland staff and MYSAP dbh in November 2019. The MSc thesis study entitled, *A Study of Women's Participation in Fish Culture of Shwebo Township* was finalized in Q4 of 2019 and the study report and thesis was successfully defended by the Mandalay University student in January 2020.

Tables 15 and **16** below summarize the training on small-scale aquaculture, integrated vegetable and fruit production, improved human nutrition and financial literacy delivered by BRAC Myanmar for old and new farmers in Shwebo Township in the second season, 2019-20 of MYSAP support.

Table 15. New farmers trained in Shwebo Township in the 2019-20 culture season.

Training course	Start date	Finish	Groups trained	Men trained	Women trained	Households trained
Module1_Session 1 to 3	22-Jul-19	29-Jul-19	11	152	52	166
Module1_Session 4 to 7	29-Jul-19	9-Aug-19	11	159	47	167
Module1_Session 8 to 10	6-Aug-19	13-Aug-19	11	156	51	169
Module2_Session 11 to 14	3-Sep-19	12-Sep-19	11	155	51	169
Module2_Session 15 to 18	6-Sep-19	17-Sep-19	11	158	53	171
Module3_Session 19, 20	20-Sep-19	3-Jan-20	11	157	53	171
Module3_Session 21 to 23	20-Nov-19	7-Jan-20	11	158	53	172
Module3_Session 24 to 27	27-Nov-19	8-Jan-20	11	161	50	154
Green Way Usage Training	10-Dec-19	23-Dec-19	11	150	22	172
Feed Making Training	24-Jan-20	25-Jan-20	6	7	4	8
SIS Harvesting Training	26-Jan-20	26-Jan-20	1	14	1	15
Preservation Training	22-Oct-19	23-Oct-19	3	1	2	3
Training on financial literacy and awareness raising_M1	10-Dec-19	30-Dec-20	11	150	24	172
Training on financial literacy and awareness raising_M2	5-Feb-20	18-Feb-20	11	120	84	172

Table 16. Old farmers trained in Shwebo Township in the 2019-20 culture season.

Training course	Start date	Finish	Groups trained	Men trained	Women trained	Households trained
Module1_Session 1 to 10	10-Sep-19	23-Sep-19	15	224	32	256
Module2_Session 11 to 18	17-Sep-19	19-Dec-19	15	224	32	256
Module3_Session 19 to 27	24-Sep-19	9-Jan-20	15	224	36	256
Module 1 to 3_Refresher	19-Nov-19	14-Jan-20	15	224	32	172
Green Way Usage Training	9-Dec-19	30-Dec-19	15	224	32	256
Feed Making Training	24-Jan-20	25-Jan-20	13	16	8	22
SIS Harvesting Training	26-Jan-20	26-Jan-20	1	7	1	8
Preservation Training	22-Oct-19	23-Oct-19	7	3	16	18
Training on financial literacy and awareness raising_M1	9-Dec-19	30-Dec-19	15	224	32	256
Training on financial literacy and awareness raising_M2	6-Feb-20	19-Feb-20	15	159	114	256

To the end of April 2020, 312 MYSAP supported dbh in Shwebo Township completely harvested 88.9 acres (36.0 ha) of small-scale household ponds in the 2019-20 culture season. 305 (97.8%) of the 312 dbh made a mean net cash profit of MMK 90,230 (€ 59.9) per dbh. Seven (2.2%) made a net cash loss in the 2019-20 culture season.

The 312 dbh harvested a total of 23,848.1 viss (38,872.4 kg) of fish, with a mean household production of 76.4 viss (124.6 kg) of fish during the 2019-20 culture season. The mean production for the 312 dbh that fully harvested in the 2019-2020 culture season was 514.3 viss acre^{-1} year^{-1} (2,070.8 kg^{-1} year^{-1}). The mean production rate in the 2019-2020 culture season was lower than the 606.2 viss acre^{-1} year^{-1} (2,444.9 kg^{-1} ha^{-1} year^{-1}) in the 2018-19 culture season. This may have been because BRAC supported 172 new dbh's in the 2019-20 culture season and 256 first season dbh's, and the new dbh had less fish culture experience, which lowered the mean annual fish production per unit of pond area.

The MYSAP Inland Data Management officer visited Shwebo Township 08-10 January 2020, and mentored key BRAC Myanmar staff on monitoring and evaluation data entry, cleaning, analysis and reporting, to assist with quarterly reporting against the BRAC Myanmar sub-grant agreement.

A two-day feed miller training was conducted by the Field Coordinator, Sagaing Region in Shwebo Township on 24-25 January 2020. The training course was attended by 18 dbh (12 ♀ – 33.3%) being 13 first year (2018-19) and 4 second year 2019-20 households from Shwebo Township and 1 household from Pinlaung Township. In addition 4 (2 ♀) DoF staff, and 10 (6 ♀) BRAC Myanmar staff attended the course, which was delivered by 4 inland component MYSAP staff.

Photo 27. *Fish nutrition and feeding and fish pellet production training*, attended by 18 farmers in Shwebo Township, 24-25 January 2020.

Photo 28. *Partial harvesting of SIS for family consumption and sale training*, attended by 23 farmers in Pan Hlaing Village, Shwebo Township, 26 January 2020.

The Field Coordinator, Sagaing Region conducted a short training course for MYSAP Inland in Pan Hlaing Village, Shwebo Township on 26 January 2020 on *Partial harvesting of small indigenous fish species (SIS) from a small-scale pond using a floating gill net*. Twenty three people (2 ♀ – 9%) attended the SIS partial harvest course.

In February 2020 BRAC Myanmar staff delivered module 2 of financial literacy training to 428 (198 ♀ – 46.3%). All planned training in Shwebo Township for MYSAP Inland direct beneficiary households in the 2019-20 culture season was completed by the end of February 2020.

Some pond harvests were arranged in Shwebo Township 24-28 March 2020. Because of COVID-19 concerns, group size was kept small, all participants wore face masks, used hand sanitizer provided by MYSAP and maintained social distancing of at least 3 feet between participants. Ice was also bought, so that fewer people were

able to grade the fish and to pack it for transportation to market, while maintaining social distancing. The MYSAP Field Manager and the IEC Officer also attended the harvests and interviewed farmers for success story articles.

On 25 March 2020, MYSAP Inland supported U Khin Maung Tin, Chi Par Village to conduct a second partial harvest of his demonstration pond. The partial harvest yielded a total of 49 viss (80 kg) of rohu, silver barb and common carp. (80 kg).

On 26 March 2020 morning, MYSAP supported U Myo Myint Maung of Min Kone Village to conduct a final harvest of his demonstration pond. The harvest gave 245 viss (400 kg) of tilapia, silver barb and common carp. The household made a cash profit of MMK 564,000 (€ 360) in the 2019-20 fish culture season.

On 26 March 2020 afternoon, MYSAP supported U Chit Moe, Thee Kone Village to complete his rice harvest and to partially harvest of fish from the rice-fish plot. The rice-fish farmer stated that his rice production from the rice-fish system was more than from rice culture system alone. Normally his income from the 0.5 acre (0.2 ha) rice field was about MMK 200,000, but he stated that that year he expected his income to be about MMK 350,000 from the rice-fish plot. 5.7 (9.3 kg) viss of tilapia, silver barb and common carp were removed in the partial harvest, but many more fish still remained in the system.

Within township cross-visits planned for 06-09 April 2020 of small-scale aquaculture and improved nutrition group leaders visit harvesting of successful ponds within Shwebo Township were cancelled because of the COVID-19 pandemic.

2020-21 culture season (season 3 of MYSAP support)

In the final 2020-21 culture season BRAC Myanmar provided extension and training services on small-scale aquaculture, integrated vegetable and fruit production, improved human nutrition and financial literacy to a total of 430 dbh, being 256 first season (2018-19) dbh, 172 second season (2019-20) dbh and 2 new third season (2020-21) dbh. A total of 25 demonstration farmers (15 old and 10 new) were selected in Shwebo Township, though one selected demonstration household had insufficient water at the end of the monsoon to be able to stock fish.

BRAC Myanmar staff responded flexibly to the COVID-19 restrictions imposed on the ground in Shwebo Township. For example in April and May 2020, when no face-to-face visits were allowed, the BRAC staff kept in touch with demonstration farmers by mobile phone to obtain updates on the local COVID-19 status, the health of dbh members and to keep abreast of any partial and final harvesting of fish ponds and fish sales.

The MYSAP Inland Field Manager provided training for the BRAC Myanmar Aquaculture Technical Officer on the use of Microsoft Teams for virtual meetings on 15 July 2020.

In the 2020-21 culture season MYSAP supported the stocking of a total of 226,100 fish seed of five different fish species into the small-scale grow out ponds of 224 direct beneficiary households in Shwebo Township. Stocking was completed by 27 November 2020 with the seed sourced from the DoF hatchery, the Aung Zay Ya hatchery and 10 MYSAP Inland supported nursery farmers.

Rohu	Silver barb	Tilapia	Common carp	SIS species	Total #
104,200	61,100	32,600	25,600	2,600	226,100

GIFT tilapia grew so well in 25 direct beneficiary household grow-out ponds that MYSAP Inland agreed to support partial harvesting of the large GIFT to provide a faster income stream and the partial restocking in November 2020 of replacement GIFT all-male fingerlings into the 25 grow-out ponds to maximize production across the culture season.

To the end of December 2020, BRAC Myanmar staff had delivered small-scale aquaculture training (sessions 10-

18) to members of 437 (137 ♀; 31.4%) dbh's, and grow-out pond stocking was complete before the emergency COVID-19 lock-down on 11-24 December 2020 stopped face to face training delivery in Shwebo Township.

To 31 December 2020, BRAC Myanmar staff distributed a total of 12,629.5 viss (20,586.1 kg) of sinking pelleted feed to 426 dbh including 25 demonstration farmers, 314 grow-out farmers and 2 pilot rice-fish famers for the 2020-21 fish culture season, valued at MMK 12,463,150 (€ 7,656).

BRAC Myanmar staff completed all planned dbh training for the 2020-21 culture season by 18 January 2021. **Table 17** below details the small-scale aquaculture, integrated vegetable and fruit production, improved human nutrition and financial literacy training delivered by BRAC Myanmar for dbh in Shwebo Township in the third season, 2020-21 of MYSAP support.

Table 17. Training sessions delivered by BRAC Myanmar in Shwebo Township in 2020-21.

Training course	Start date	Finish	Groups trained	Men trained	Women trained	Households trained
Modules 1, 2, 3, & refresher training (256 dbh - first season farmers)	10-Nov-20	07-Jan-21	15	205	51	256
Module 1, 2, 3, & refresher training (172 dbh – second season farmers)	10-Nov-20	06-Jan-21	11	134	40	174
Financial literacy and awareness training all farmers	08-Jan-21	18-Jan-21	26	333	97	430

To 30 April 2021 BRAC Myanmar staff delivered financial literacy training to 430 (97 ♀) MYSAP Inland dbh members in Shwebo Township.

Two pilot rice-fish nursery farmers and 40 dbh in Shwebo Township were growing their fish on in their small-scale grow-out ponds at the end of May 2021 when the MYSAP Inland implementation period ended.

3.6.6 Malteser International – Kengtung Township

2018-19 culture season (season 1 of MYSAP support)

The Team Leader, Field Manager, Finance and Administration Officer and the WorldFish Monitoring and Evaluation Officer travelled 22-24 August 2018 to Kengtung Township for a kick-off meeting with Malteser International to discuss plans for field training and extension service delivery, monitoring and evaluation data collection and analysis and MYSAP requirements for progress and financial reporting. Malteser International staff visited all their selected villages in the week of 27-31 August 2018 to introduce the inland component of MYSAP activities, to explain how the component would support small-aquaculture and improved human nutrition groups and finalized the selection of 250 direct beneficiary households.

Malteser International then formed a total of 20 small-scale aquaculture groups with between 5 to 15 members per group, with each household owning a pond of less than 0.5 acres (2,023 m^2) in area. Malteser International staff commenced delivery of module 1 of training on small-scale aquaculture and improved human nutrition training on 17 September 2018 to all 250 direct beneficiary household members that were able to attend at the time. Only 2 of 241 MYSAP Inland direct beneficiary households in Kengtung Township in the 2018-19 culture season had a DoF license to culture fish.

The table below shows that MYSAP supported the stocking of a total of 57,770 fish seed of rohu or common carp into dbh small-scale ponds in Kengtung Township in the 2018-19 culture season and stocking was completed by 11 December 2018.

Rohu	Common carp	Total #
45,330	12,440	57,770

Table 18 below summarizes the training delivered by Malteser International in Kengtung Township. All planned training delivery was completed by 18 February 2019.

Table 18. Malteser International dbh training in Kengtung Township, 2018-19 culture season.

Training course	Start date	End date	Groups trained	Men trained	Women trained	Households trained
Aqua & nutrition module 1	18 Sept 18	20 Nov 18	21	158	77	235
Aqua & nutrition module 2	18 Oct 18	05 Dec 18	22	155	78	233
Aqua & nutrition Module 3	12 Dec 18	17 Dec 18	16	96	73	169
Aqua & nutrition Module 4	20 Dec 18	31 Jan 19	06	36	36	72
Refresher Training	29 Jan 19	18 Feb 19	22	118	123	241
Feed Making	14 Feb 19	15 Feb 19	22	18	5	23

The SGA with Malteser International for 250 direct beneficiary households expired on 30 April 2019 and was extended on a no-cost basis until 30 June 2019. Thereafter the SGA was revised and extended to work with a total of 391 direct beneficiary households until 30 April 2020. This included 241 second year dbh from the 2018-19 culture season and 150 new households.

2019-20 culture season (season 2 of MYSAP support)

On 19-20 September 2019, MYSAP Inland and Malteser International conducted a Lessons Learned Workshop at the Amazing Kengtung Hotel, in Kengtung Township. The workshop was attended by 123 people (53 ♀ – 43%), including 88 dbh members (35 ♀ - 38%), 2 (1 ♀ – 50%) DoF staff, 6 fish vendors (all ♀), 11 Malteser International staff (3 ♀ - 27%), 4 university staff (all ♀), 2 observers (both ♂) and 10 MYSAP staff (4 ♀ – 40%), including the Head of Programme.

A total of 24 demonstration farmers (7 ♀) were selected for the 2019-20 season being 17 old farmers (4 ♀) from 2018-19 and seven new farmers (3 ♀) in Kengtung Township. All pond preparation and input costs for demonstration farmers were supported by MYSAP.

The table below shows that MYSAP supported the stocking of a total of 123,289 fish seed of 4 different fish species into small-scale dbh ponds in Kengtung Township in the 2019-20 culture season. The fish were supplied from either MYSAP supported nursery farmers or purchased from local hatcheries and stocking was completed by 25 November 2019.

Rohu	Common carp	GIFT tilapia	SIS species	Total #
57,842	42,318	19,079	4,050	123,289

After weak and late monsoon rains, some households had insufficient water in their ponds to stock fish, while 45 MYSAP supported ponds in Kengtung Township had declining water levels and were drying out in early January 2020. Water was added to 17 ponds by pumping, fish from 22 ponds were moved into other ponds with sufficient water, 5 ponds were harvested and the fish processed (2 fish paste and 3 fish drying) and the fish in 1 pond died.

MYSAP Inland and Malteser International recommended that dbh consider the following options if their ponds were drying up more quickly than usual in the dry season and the culture season was significantly shortened:

- Partial harvest and selling of any market sized fish as soon as possible. Growing the remaining fish on longer, until the water levels become too low and then sell the remainder.
- Where a farmer owns another pond besides the MYSAP supported pond, then partial harvest of the largest fish from the MYSAP pond and pumping (if not too costly) or siphoning of the water from the MYSAP pond into the non-MYSAP pond. Using a filter to make sure that no unwanted fish were transferred with the water. Transfer and record the weight and number of fish of each species moved from the MYSAP pond into the non-MYSAP pond.
- Harvest the fish and sell the fish as advanced fingerlings to other households that have sufficient water in their grow-out ponds.
- Harvest the fish and process them into a value-added fish paste and sell the fish paste.

Tables 19, **20** and **21** below summarize the training on small-scale aquaculture, integrated vegetable and fruit production, improved human nutrition and financial literacy delivered by Malteser International for old and new farmers in Kengtung Township in the second season, 2019-20 of MYSAP support. Malteser International completed all planned training for its new and old direct beneficiary households in the 2019-20 culture season on 6 March 2020.

Table 19. Training sessions for new farmers (134) in the 2019-20 culture season.

Training course	Start date	Finish	Groups trained	Men trained	Women trained	Households trained
Module1_Session 1 to 3	15-Jul-19	14-Aug-19	7	66	66	129
Module1_Session 4 to 7	18-Jul-19	16-Aug-19	7	74	58	125
Module1_Session 8 to 10	7-Aug-19	20-Aug-19	7	74	63	133
Module2_Session 11 to 14	7-Aug-19	28-Aug-19	7	73	61	132
Module2_Session 15 to 18	26-Aug-19	31-Aug-19	7	69	65	134
Module3_Session 19, 20	6-Sep-19	26-Nov-19	7	69	65	134
Module3_Session 21 to 23	30-Sep-19	27-Nov-19	7	69	65	134
Module3_Session 24 to 27	7-Oct-19	28-Nov-19	7	70	64	134
Fish Processing Training	29-Oct-19	30-Oct-19	2	3	5	7
Induced Breeding of Common Carp Training	19-Jan-20	21-Jan-20	4	3	1	4
Feed Making Training	19-Feb-20	20-Feb-20	4	7	4	5
SIS Partial Harvesting Training (am)	21-Feb-20	21-Feb-20	1	1	0	1
SIS Partial Harvesting Training (pm)	21-Feb-20	21-Feb-20	4	7	1	7

Table 20. Training sessions for old farmers (241) in the 2019-20 culture season.

Training course	Start date	Finish	Groups trained	Men trained	Women trained	Households trained
Fish Processing Training	29-Oct-19	30-Oct-19	7	2	9	11
Module1_Session 1 to 10	3-Dec-19	16-Dec-19	22	99	142	241
Module2_Session 11 to 18	13-Jan-20	20-Jan-20	22	99	142	241
Induced Breeding of Common Carp Training	19-Jan-20	21-Jan-20	4	4	0	4
Module3_Session 19 to 27	5-Feb-20	14-Feb-20	22	101	140	241
Green Way Usage Training	26-Feb-20	6-Mar-20	22	91	150	241
Module 1 to 3 Refresher Training	26-Feb-20	6-Mar-20	22	91	150	241
Feed Making Training	19-Feb-20	19-Feb-20	19	17	13	26
SIS Partial Harvesting Training (am)	21-Feb-20	21-Feb-20	10	7	5	10
SIS Partial Harvesting Training (pm)	21-Feb-20	21-Feb-20	3	4	1	3

Table 21. Training sessions for new farmers (16) in the 2019-20 culture season.

Training course	Start date	Finish	Groups trained	Men trained	Women trained	Households trained
Module1_Session 1 to 10	3-Dec-19	10-Dec-19	8	6	10	16
Module2_Session 11 to 18	13-Jan-20	20-Jan-20	8	7	9	16
Module3_Session 19 to 27	5-Feb-20	14-Feb-20	8	5	11	16
Induced Breeding of Common Carp Training	19-Jan-20	21-Jan-20	1	1	0	1
Green Way Usage Training	26-Feb-20	6-Mar-20	8	7	9	16
Module 1 to 3 Refresher Training	26-Feb-20	6-Mar-20	8	7	9	16
Feed Making Training	19-Feb-20	19-Feb-20	2	2	0	-
SIS Partial Harvesting Training	21-Feb-20	21-Feb-20	1	1	0	-

Sixteen varieties of vegetable and fruit seeds and cuttings were supplied to 391 direct beneficiary households in Kengtung Township in the 2019-20 culture season.

The MYSAP Inland Data Management officer visited Kengtung Township 28-31 January 2020, and mentored key Malteser International staff on monitoring and evaluation data entry, cleaning, analysis and reporting.

A two-day feed miller training was conducted at Naung Shan Wan Kan Village by the Field Coordinator, Sagaing Region in Kengtung Township on 19-20 February 2020. The training course was attended by 26 MYSAP Inland dbh, being 21 old households (2018-19) and 5 new (2019-20) households. In addition 2 (both ♂) DoF staff, 8 (4 ♀) Malteser International staff and 5 (1 ♀) MYSAP Inland staff attended the training course.

The Field Coordinator, Sagaing Region conducted a short training course for MYSAP Inland in Wan Nam Village, Kengtung Township on 21 February 2020 on *Partial harvesting of small indigenous fish species (SIS) from a small-scale pond using a floating gill net*. 13 people (5 ♀ – 39%) attended the SIS partial harvest course.

Photo 29. *Fish nutrition and feeding and fish pellet production training*, attended by 26 dbh in Kengtung Township, 19-20 February 2020.

Photo 30. *Partial harvesting of SIS for family consumption and sale training*, attended by 13 farmers in Wan Nam Village, Kengtung Township, 21 February 2020.

Ms Phong Phoo, Malteser International Field Coordinator conducted a short training course for MYSAP support dbh in Young Vo Village, Kengtung Township on 21 February 2020 on *Partial harvesting of small indigenous fish species (SIS) from a small-scale pond using a floating gill net*. 13 people (3 ♀ – 23%) attended the SIS partial harvesting training course.

U Shee Mon (KTG-287) conducted a partial harvest of his 0.32 acre pond, Pin Tauk Village on 31 January 2020. 73.3 viss (119.5 kg) of fish were consumed or given away by the household to that day, 44.6 viss (72.7 kg) of fish were moved and stocked into another pond and 32.0 viss (52.1 kg) were sold, making a total harvest to that point of 149.9 viss (244.3 kg). Some of the GIFT tilapia were 1 viss (1.63 kg) in weight after four (04) months of grow-out. Assigning a cash value to the fish eaten and given away, U Shee Mon had already made a cash profit, even assuming there were no more fish remaining in the pond and discounting the fish he had moved into another pond for further grow-out. The remaining fish in the pond will provide increased household resilience for U Shee Mon's household within the COVID-19 context.

Photo 31. GIFT tilapia harvested by U Shee Mon, Pin Tauk Village, Kengtung Township were over 1 kg in weight after 4 months grow-out.

Based on the local COVID-19 context, Malteser International made the internal decision that all Malteser International staff, including MYSAP staff would work from the office and not travel to visit direct beneficiary households from 23 March 2020 until the end of May 2020. The staff used mobile phones to provide awareness raising on COVID-19, share appropriate response strategies (social distancing, hand washing and avoiding crowds) and to collect data on household member well-being and on small-scale pond production and harvest from direct beneficiary households. The Malteser International staff also used the lock-down time due to COVID-19 to record video training sessions in Akha, Lahu and Shan languages.

By 30 April 2020, 172 MYSAP Inland dbh in Kengtung Township completely harvested 20.8 acres (8.4 ha) of small-scale household ponds in the 2019-20 culture season. The 172 dbh harvested a total of 3,992 viss (6,506 kg) of fish, with a mean household production of 23.2 viss (37.8 kg) of fish during the 2019-20 culture season. The mean production for the 172 dbh that completely harvested in the 2019-2020 culture season was 451.4 viss acre^{-1} year^{-1} (1,817.4 kg^{-1} ha^{-1} year^{-1}). The mean production rate in the 2019-2020 culture season was much higher (56.3%) than the 288.3 viss acre^{-1} year^{-1} (1,162.9 kg^{-1} ha^{-1} year^{-1}) in the 2018-19 culture season.

Of the 172 dbh that made a complete pond harvest, 145 (84.3%) of the 172 dbh made a net cash profit, while 27 dbh (15.7%) made a net cash loss in the 2019-20 culture season. The main reasons identified for low household production in Kengtung were the weak monsoon, ponds drying up and a shorter culture season, theft, and insufficient cash to fertilize ponds and feed fish.

2020-21 culture season (season 3 of MYSAP support)

In the third and final 2020-21 fish, vegetable and fruit culture season, Malteser International provided extension and training services on small-scale aquaculture, integrated vegetable and fruit production and improved human nutrition to a total of 391 dbh, being 237 first season dbh, 140 second season dbh and 14 new dbh. The dbh formed 27 small-scale aquaculture and improved human nutrition groups and selected 24 demonstration farmers. MYSAP supported all the pond input costs of the demonstration farmers in return for using the demonstration pond as a practical training venue.

In the 2020-21 culture season MYSAP Inland supported the stocking of a total of 215,391 fish seed of four different fish species into the small-scale grow out ponds of 257 direct beneficiary households and 2 community ponds in Kengtung Township. Stocking was completed by 25 September 2020, exactly 2 months earlier than the previous culture season. The seed was supplied from a local commercial hatchery and 8 MYSAP Inland supported nursery farmers.

All-male tilapia	Grass carp	SIS species	Common carp	Total #
199,284	7,976	4,800	3,331	215,391

On 14 September 2020 the first cross farmer visit was arranged to Wan Kan Village for 14 direct beneficiary famers (5 ♀). The key hands-on lesson learning activities were, i) Nursery pond preparation; ii) Feeding and nursing fish in hapas; and, iii) Grading and counting fish.

On 15 September 2020 a second cross visit of 17 farmers (9 ♀) was arranged to Wan Latt Village, Kengtung Township with a similar training and key message learning agenda.

Photo 32. Wan Kan Village cross visit to see hapa nursing of GIFT tilapia on 14 September 2020.

All farmers were provided with face masks, plastic visors and rain coats for COVID-19 protection. Farmers travelled to the cross visit on motorbikes.

Tables 22, **23** and **24**, below summarize the training on small-scale aquaculture, integrated vegetable and fruit production, and improved human nutrition delivered by Malteser International for old and new farmers in Kengtung Township in the third and final 2020-21 culture season of MYSAP support. Much of the training was done in a COVID-19 smart-manner, in small groups wearing appropriate PPE supplied by MYSAP. All planned training was completed by 22 March 2021.

Table 22. Training sessions for new farmers in the 2020-21 culture season.

Training course	Start date	Finish	Groups trained	Men trained	Women trained	Households trained
Module1_Session 1 to 6	17-Aug-20	17-Aug-20	4	11	3	14
Module1_Session 7 to 10	7-Oct-20	7-Oct-20	4	10	4	14
Module2_Session 11 to 13	7-Oct-20	7-Oct-20	4	10	4	14
Module2_Session 14 to 18	8-Oct-20	8-Oct-20	4	10	4	14
Module3_Session 19 to 21	11-Nov-20	11-Nov-20	4	11	3	14
Module3_Session 22 to 27	19-Nov-20	19-Nov-20	4	11	3	14
Training farmers on use of Green Way mobile phone application	17-Aug-20	17-Aug-20	4	11	3	14

Table 23. Training sessions for old farmers in the 2020-21 culture season.

Training course	Start date	Finish	Groups trained	Men trained	Women trained	Households trained
Module1_Session 1 to 10	18-Aug-20	17-Nov-20	28	160	217	377
Module2_Session 11 to 18	11-Nov-20	20-Nov-20	29	156	221	377
Module3_Session 19 to 27	11-Jan-21	25-Jan-21	29	168	209	377
Women Group In Target Village	20-Aug-20	26-Jan-21	7	-	78	78
Training farmers on use of Green Way mobile phone application	18-Aug-20	17-Nov-20	29	160	217	377

Table 24. Training for both old and new farmers in 2020-21.

Training course	Start date	Finish	Men trained	Women trained	Households trained
Common Carp Induced Breeding Training	18-Mar-21	22-Mar-21	12	6	18

The delivery of Module 3 (sessions 19-27) for old households was postponed to January 2021 after confirmed COVID-19 cases in Tachileik.

In Q4 of 2020, Malteser International staff distributed a total of 9,975.5 viss (16,260.1 kg) of sinking pelleted feed to 257 dbh with individual household ponds including 24 demonstration farmers and 2 community ponds with a further 180 households sharing benefits, for the 2020-21 fish culture season, valued at MMK 12,968,150 (€ 12,707.2).

In January 2021 a total of 1,704 viss (2,777.5 kg) of sinking pellets feed was distributed to 24 demonstration farmers and 2 community ponds. Malteser International staff completed the delivery of Module 3 (sessions 19-27) to a total of 377 (209 ♀; 55.4%) new and old farmers and all planned small-scale aquaculture training for dbh were complete.

Only 36 (14%) of the 257 direct beneficiary households that received fish for stocking in their small-scale grow-out pond had conducted complete fish harvests by 30 April 2021 when the sub-grant agreement with MYSAP Inland ended. The 36 dbh that conducted complete harvests included 4 dbh that continued growing fish from the 2019-20 culture season into the 2020-21 culture season and 32 ponds from the 2020-21 culture season. All 4 demonstration farmers that made conducted a final pond harvest made cash profits. Six (18.8%) farmers made a net cash loss had fish ponds sited in areas where ground water was pumped to irrigate rice which caused the pond water levels to drop very quickly, and which resulted in high bird predation and theft, forcing farmers to harvest early before the stocked fish had reached market size. This highlights the importance of getting good reliable local information on how many months per year a pond will hold water, particularly in areas where ground water is pumped to irrigate rice production, as this will lower the water table more quickly in the dry season.

The remaining 225 dbh still had sufficient water in their small-scale household ponds and have grown their fish on, and plan to conduct partial harvests for regular family meals and to sell some fish to generate extra income, until their pond water levels drop further and they are forced to conduct a complete final harvest.

Community ponds

2019-20 culture season

During a field trip by Jessica Scott, (WorldFish Myanmar, Gender and Value Chains) and Dr Mark Dubois (WorldFish Myanmar, Environment and Social) to Wan Nam Village, Kat Htaik Tract and Naung Kan Village, Mong Lat Tract, in Kengtung Township on 16 and 17 January 2019 respectively, a request was made for MYSAP to support community fish ponds. 29 households at Naung Kan Village had family members with leprosy or were widows. Dr Mark Dubois provided the inland component of MYSAP with recommendations on how to conduct this in a socially responsible manner and the recommendations were followed.

The Malteser International Shan State Coordinator, the Aquaculture Technical Officer and the MYSAP Inland Field Coordinator, Shan State attended a small group meeting at Naung Kan Village on 31 May 2019 to discuss MYSAP Inland support for a 3.5 acre (1.42 ha) community fish pond. 27 people (11 ♂ and 16 ♀) agreed that

[12] € 1 = MMK 1,660 on 18 December 2020

80% of any net profits would go to the village community fund and 20% of the net profits would be paid as an allowance for people doing extra work.

The second community pond meeting was held in Naung Kan Village, Kengtung Township on 14 July 2019. Fifty seven villagers (40 ♀) attended and agreed the community pond management plan. MYSAP supported deepening of the community pond and all pond preparation costs, with community members doing the physical labour.

123 households benefitted from the community fish pond that MYSAP supported in 2019-20, of which 22 households were direct beneficiary households, meaning that 101 households were new. Several of the new households had family members with disabilities. The Naung Kan community pond was stocked on 25 October 2019.

MYSAP also supported input costs for the 0.13 acre (0.05 ha) pond at the Naung Kan Basic Education School with 176 students (106 girls) up to 12 years of age school. GIFT seed funded by MYSAP were stocked into the school pond on 27 September 2019, while 537 rohu and common carp were stocked in the school pond on 13 November 2019.

A first community pond meeting was held in Naung Cho Village, Kengtung Township on 28 July 2019. Thirty seven villagers (18 ♀) attended and agreed to develop a community pond plan for the 0.74 acre community pond, the benefits from which were to be shared by 58 beneficiary households. MYSAP agreed to fund all the community pond inputs and it was agreed that Malteser International staff would provide training at appropriate times in the fish culture season.

The second community pond meeting was held in Naung Cho Village on 03 August 2019. Thirty (30) villagers attended (16 ♀) to discuss the rules, regulations and responsibilities for managing the community pond. A third community pond meeting was held in Naung Cho Village on 04 August 2019. A total of 15 villagers (3 ♀) and three MI staff approved the community pond rules and regulations. Two villagers (both ♂) from the Naung Cho Village community pond management committee attended SSA training delivered at Pang Waun Village on 04 August 2019. MYSAP Inland funded stocking of a total of 2,998 fish seed being GIFT seed rohu and common carp on 14 November 2019.

The MYSAP Inland Team Leader, Field Manager, Shan State Field Coordinator and the IEC Officer visited all 3 community ponds on 17 January 2020 to check on their status. The Naung Kan Basic Education School pond had begun drying up in December 2019, so after consulting with Malteser International MYSAP staff, the community decided to harvest the fish and to transfer them all to the Naung Kan Village 3.5 acre (1.42 ha) community pond that MYSAP was also supporting.

Unfortunately the Naung Cho Village community pond began drying up only 2 months after stocking in mid-January 2020 and a large proportion of the fish were probably eaten by predatory birds, while the GIFT tilapia probably died because of the cold water temperatures at the higher village elevation. A small number of the fish remaining were transferred by villagers on 14 January 2020 into another small pond.

Village	Pond area	h/h	Fish stocked	Comments
Naung Kan Village	3.5 acres (1.42 ha)	123 h/h	25 October 2019 14,121 total 11,540 rohu 1,581 common carp 1,000 GIFT	Partial harvest 25 February 2020 Final harvest 27-31 March 2020
Naung Kan Basic Education School	0.13 acres (0.05 ha)	176 students (106 girls)	13 November 2019 537 total 330 rohu 107 common carp 100 GIFT	Dried up in late December Fish transferred to main community pond
Naung Cho Village	0.74 acre (0.3 ha)	58	14 November 2019 2,998 total 2,102 rohu 600 common carp 296 tilapia	Dried up by mid-January Few fish moved to a very small pond Harvest planned in mid-April 2020

Naung Kan Village community pond was partially harvested on 25 February and finally harvested 27-31 March 2020. The total fish harvested from the pond was 417.6 viss (668.1 kg) which was equivalent to a production of 286.3 viss acre^{-1} year^{-1} (1,132 kg ha^{-1} year^{-1}) which was 57% of the average 2018-19 culture season fish productivity of MYSAP supported direct beneficiary households was 504 viss acre^{-1} year^{-1} (2,035 kg ha^{-1} year^{-1}). While this production rate was low, the 417.6 viss (668.1 kg) of fish produced from the Naung Kan community pond with MYSAP support was shared out amongst the 123 households, with each household receiving 3.4 viss (5.5 kg) of fresh fish each. 5 viss (8.1 kg) of fish was donated to the local church. 101 of the community pond households were non-MYSAP Inland dbh and several of the community pond households had family members with disabilities and 29 of the community pond households had at least one family member with leprosy and so they were therefore especially vulnerable. 129 viss (210.3 kg) of sinking pelleted fish feed supported by MYSAP was supplied to the community, giving a FCR of 0.3.

2019-20 culture season

A questionnaire survey format translated from English into Myanmar language was used 29 May to 01 June 2020 inclusive by Malteser International staff to interview 40 (25%) Naung Kan community pond members by mobile phone to get their feedback on the MYSAP supported community pond activities in 2019-20. The sample frame included 26 households with disabled family members, 2 widow households, 4 households with children under 5 years of age, 3 committee members and 5 MYSAP dbh's.

Following positive questionnaire feedback by the interviewed Naung Kan community pond members, MYSAP agreed to support the 3.5 acre (1.42 ha) Naung Kan community pond again in 2020-21.

Malteser International staff and the MYSAP Inland Field Coordinator, Shan State met 9 members (2 ♀) of the Naung Kan community pond for discussion on MYSAP support on the morning of 04 October 2020.

At a community pond committee meeting on 18 October 2020 community pond activities were agreed and responsibilities assigned.

In the afternoon of 04 October Malteser International staff and the MYSAP Inland Field Coordinator, Shan State met 10 members (2 ♀) of the Joe Phyu community pond and detailed how MYSAP would support the pond. The Joe Phyu community pond was drained over 3 days (06-08 October 2020) and prepared with urea and TSP prior to refilling with water on 10 October 2020.

After community pond refilling, MYSAP supported the stocking of 300 grass carp on 20 October 2020 and 5,720 all-male tilapia into the community pond on 21 October 2020. 103 households benefit from the Joe Phyu community pond of which 24 were already MYSAP dbh, while 79 were new beneficiary households, including 14 ♀ headed households, 90 ♀ of reproductive age, 27 children under the age of 5, and 15 disabled people.

In February 2021 MYSAP supported the provision of lime for the Naung Kan and the Joe Phyu community ponds to increase the pond pH, to flocculate out suspended clay particles, to increase sunlight penetration, improve photosynthesis and enhance natural food production.

Malteser International staff and the MYSAP Inland Coordinator, Shan State met committee members of Joe Phyu and the Naung Kan community ponds on 27 April 2021 and it was agreed that the fish in both ponds would be grown on longer, beyond the end of MYSAP support, while there is sufficient water depth in the ponds, before conducting a complete harvest at a later date.

The Joe Phyu and Naung Kan community pond continued to feed the EU supplied De Heus floating pelleted feed in May 2021, but will go back to using sinking pelleted feed made by MYSAP supported feed millers when the EU pelleted feed runs out.

On 31 May 2021 when the implementation period of the inland component of MYSAP ended, the fish in the Naung Kan and Joe Phyu community ponds and in 225 dbh small-scale dbh ponds in Kengtung Township were being grown on and were to be harvested later, when bigger or when declining pond water levels necessitate the fish being harvested.

3.6.7 Pinlaung Township

The Team Leader and the Field Manager met U Tin Tun Lin, DoF Director Shan State on 05 December 2018, to discuss how DoF staff could deliver extension and training activities in Pinlaung Township, Southern Shan State. On 15 January 2019 the DoF Shan State provided a budget estimate for MYSAP Inland to support the cost of:

- Constructing ten (10) demonstration ponds in Pinlaung Township of approximately 20 feet by 60 feet i.e. square feet in area (110 m^2) with a depth of about 5 feet.
- A DoF staff member to travel to Pinlaung Township (depart Monday and return Friday) and to stay in the location 4 nights a week for 2 weeks per month to liaise with the GAD and farmers and to provide extension and training support services for six months.

The Field Manager and Finance and Administration Officer travelled to Taunggyi and met Mr Tin Tun Lin (Director DoF Shan State), Ms Kyu Kyu Thin (DoF officer, Shan State) and Ms Khin Mar Aye (DoF Assistant Office, Shan State) on 29 March 2019 at the Shan State DoF office, to further discuss supporting demonstration ponds in Pinlaung Township. On 30 March 2019 the Field Manager and the Finance and Administration Officer plus Ms Kyu Kyu Thin and Ms Khin Mar Aye went to Pinlaung and met with U Phone Htat Naing Myint, GAD Township Administrator, where it was agreed that:

- It was the right time to start the activities including the beneficiary selection, pond digging and pond establishment.
- The DoF, Shan State, could provide staff to supervise the activity.
- Land ownership had to be confirmed.
- Criteria for the pond site and beneficiary selection would be explained at a meeting with village administrators which the GAD would arrange.
- The GAD would notify the DoF and MYSAP Inland after the Thingyan Festival.
- MYSAP Inland staff would visit Pinlaung again after receiving updates from the GAD Pinlaung.
- MYSAP would provide training for both the DoF and farmers before or during culturing the fish and should consider conducting field activities in Pekon Township where there were many fish farmers and favorable fish raising conditions.
- MYSAP would require confirmation from the Director General that the DoF was fully behind and would support this initiative before any financial commitments could be made.

The Field Manager and the DoF Shan State staff visited Pinlaung in 07-09 May 2019 with senior Shan State DoF staff, to interview farmers, collect baseline data and to confirm the households and locations where small-scale aquaculture ponds to be supported by MYSAP Inland.

On 07 June 2019, the DoF Shan State office provided MYSAP Inland with a list of six farmers (5 ♂ and 1 ♀) from Ko Kaung Ward, Lwe Phwe Village, Hoe Phae Village and Pin Sone Village. MYSAP Inland agreed it would support the construction of 1 new pond of 20 feet by 60 feet i.e. 1,200 square feet in area (110 m^2) with a depth of about 5 feet and renovate 5 existing new ponds to be used as demonstration ponds for the delivery of small-scale aquaculture and improved human nutrition training to farmer groups.

The Field Manager and the Finance and Administration Officer travelled to Taunggyi on 8-9 July 2019 for further discussions with the DoF Shan State. The Field Manager and the Field Coordinator, Shan State had another meeting with the Shan State DoF in Taunggyi on 04 August 2019 and meetings in Pinlaung on 05-08 August 2019 to finalize household selection and to obtain quotes for pond renovation and construction.

The Field Manager, and the Field Coordinators for both the Shan State and the Sagaing Region travelled with two DoF staff to Pinlaung on 30 August – 5 September 2019 to finalize direct beneficiary household selection, group formation, collection of household profile data and to collect pond GPS location data. Construction of a

new pond, using a mechanical back hoe commenced on 31 August 2019 and was completed by 04 September 2019. Delivery of the SSA module 01 training was conducted on 01 September 2019. The SSA module 01 training was attended by a 26 direct beneficiaries and 3 indirect beneficiaries. Only 3 of the trainees were women. On 2 September 2019, GPS locations were taken of direct beneficiary household ponds. The renovation work of the five other demonstration ponds was completed on 4 September 2019. MYSAP supported a total of 25 direct beneficiary households, including six demonstrations farmers, 18 other grow-out direct beneficiary households in Pinlaung Township.

	**Photo 33**. New small-scale pond construction in Pinlaung Township supported by MYSAP.
	**Photo 34**. Pond renovation in Pinlaung Township supported by the MYSAP.

On 30 September 2019, the current status of training in Pinlaung Township was as shown in **Table 25** below.

Table 25. Department of Fisheries direct beneficiary training status (Up to **31 October 2019**).

Summary table for Progress training report	
Partner organization	Department of Fisheries
Project area	Pinlaung Township
Type of farmer	New Farmers
Total direct beneficiary households	25
Reporting period	1 July 2019 to 31 October 2019

			# of DBH				**Households trained (DBH)**
Training Course	**Date**	**Finish Date**	**# of groups trained**	**# of men trained**	**# of women trained**	**Total # Trained**	
Module1_Session 1 to 3	1-Sep-19	1-Sep-19	6	22	3	25	24
Module1_Session 4 to 7	1-Sep-19	1-Sep-19	6	22	3	25	24
Module1_Session 8 to 10	1-Sep-19	1-Sep-19	6	22	3	25	24
Module 2 – Sessions 11 to 14	9 Oct 2019	9 Oct 2019	6	14	5	19	18
Module 2 – Sessions 15 to 18	9 Oct 2019	9 Oct 2019	6	14	5	19	18
Feed making	24-Jan-2020	25-Jan-2020	1	1	1	0	1

The Field Manager and the Field Coordinator, Shan State and the IEC Officer visited Taunggyi and Pinlaung townships on 07-11 October 2019 and in collaboration with staff from the Shan State Department of Fisheries oversaw stocking of 25 fish ponds (4 ♀ – 16%) including 06 demonstration ponds (1 ♀) on 09 October with a total of 8,560 rohu fingerling supported by MYSAP. A total of 19 beneficiaries (5 ♀) attended SSA training module 02 and gender training on 9 October 2019.

In Q1 of 2020, the 25 direct beneficiary households continued to grow their fish on in their small-scale ponds.

MYSAP Inland supported one male farmer from Pinlaung to attend feed miller training in Shwebo Township, on 24-25 January 2020.

The planned delivery in March 2020 of Module 3 training and training on the use of the Green Way mobile phone application for 25 dbh was first postponed and later cancelled because of COVID-19 travel restrictions. The MYSAP Inland Field Manager therefore followed the progress of the 6 demonstration farmers by mobile phone. One of 6 demonstration farmers had insufficient water flow and level for his pond to be stocked. Of the remaining 5 demonstration farmers, 1 harvested in April 2020 because of dropping water levels. At harvest, the pond yielded 19 viss (31 kg) of fish. Two viss (3.3 kg) was eaten by the household and 17 viss (27.7 kg) were sold at MMK 6,000 per viss in nearby villages for a cash income of MMK 102,000 (€ 67.6[13]). This high fish price reflected fish scarcity in that area at the time.

[13] MMK 1,508 = € 1.

Photo 35. Newly constructed pond Pinlaung Township supported by MYSAP.

U Tun Tin from Ho Pya Village, who received MYSAP supported feed miller training in Shwebo, produced a total of 249 viss (405.9 kg) of sinking pelleted feed using the raw materials supplied by MYSAP. U Tun Tin distributed 120 viss (195.6 kg) to 4 demonstration ponds in April 2020 i.e. 30 viss each. The remaining 129 viss (210.3 kg) of feed was distributed to the 4 demonstration farmer ponds in May 2020.

Four of the five MYSAP Inland supported demonstration farmers continued to grow their fish on into the 2020-21 culture season. However no production data was collected because Pinlaung Township was not covered by the costed one extension of the inland component of MYSAP.

3.6.8 MYSAP Inland supported rice-fish pilot activities

The Team Leader, Field Manager and Dr Girija Page, AVI attended the WorldFish *Southeast Asia Rice-Fish Systems (RFS) Symposium: Optimizing Land and Water Use* in Nay Pyi Taw, 6-8 August 2018. The Team Leader, Field Manager and Dr Girija Page also attended the planning meeting of the WorldFish/IRRI MYRice-Fish project on 8 August 2018 and recommended that the MYRice-Fish project should provide training for NGO and DoF staff on how to identify marginal rice fields with the potential for conversion to rice-fish culture.

MYSAP funded the MYSAP Inland Team Leader to attend an FAO arranged workshop entitled *Rice Landscapes and Climate Change: Options for mitigation in rice-based agroecosystems and the scaling-up of climate-smart rice cultivation technologies in Asia*, in Bangkok, Thailand 10-12 October 2018. Workshop recommendations were taken on board when planning MYSAP promotional rice-fish activities.

The Team Leader and the Field Manager met with Mr Toe Wai, Director for Agriculture, Mandalay Region, on 6 February 2019, and informed him about rice-fish production systems. Mr Toe Wai said that he would discuss further with Department of Agriculture and Department of Fisheries staff from the Mandalay Region to determine if there was any interest to establish some collaborative rice-fish demonstration pilots in the Mandalay Region funded by MYSAP.

Photo 36. Group photo - *Rice Landscapes and Climate Change: Options for mitigation in rice-based agroecosystems and the scaling-up of climate-smart rice cultivation technologies in Asia.*

The MYSAP Programme Steering Committee meeting in Nay Pyi Taw on 14 May 2019, approved MYSAP support to pilot rice-fish plots of up to 5 acres (2.02 ha) in area operated by individuals or farmer groups in Kengtung Township and Shwebo Townships.

The Team Leader attended the ACIAR funded Development of Rice Fish Systems (RFS) in the Ayeyarwady Delta, Myanmar (MYRice-Fish) Reference Committee Meeting, at Nay Pyi Taw on 28 May 2019.

MYSAP Inland finalized and printed 1,200 copies of a Myanmar language rice-fish leaflet (see below) which was disseminated to farmers to raise awareness about rice-fish culture systems. The leaflet was also uploaded onto both the Green Way mobile phone application and the DoF Fisheries Information Centre.

Table 26 below shows that in 2019 MYSAP Inland supported the modification of 5 rice fields with a total area of 4.13 acres (1.67 ha), being 2 pilot rice-fish plots in Shwebo, 1 pilot rice-fish plot in Kengtung and 2 pilot rice-fish plots in Kale Townships, by the construction of a deeper fish refuge ditch, with a total area of less than 10% of the rice field plot. MYSAP also supported fish seed stocking costs and fish feed input costs for 4 of those 5 pilot rice-fish farmers.

Table 26. Summary of MYSAP Inland supported pilot rice-fish pilot plots in 2019.

Township	Village	Field area (acres)	Refuge ditch dug	Rice planted	Fish stocked	Comment
Shwebo	Se Gyi	0.69	Yes	Yes	No	Refuge ditch, 10% of total field area Insufficient monsoon rain to stock fish
Shwebo	Thee Kone	0.57	Yes	Yes	12 July 2019 500 common carp 500 GIFT 1,000 total	Refuge ditch 5% of total field area
Kale	Kyaung Taik	0.96	Yes	Yes	300 common carp 200 silver barb 1,000 GIFT 1,500 total	Refuge ditch 10% of total field area

Township	Village	Field area (acres)	Refuge ditch dug	Rice planted	Fish stocked	Comment
Kale	Kyar Inn	0.41	Yes	Yes	500 rohu 100 common carp 100 silver barb 500 GIFT 1,200 total	Refuge ditch 10% of total field area
Kengtung	Mikesili Koon	1.5	Yes	Yes	2,290 GIFT 80 common carp 2,370 total	The existing old refuge ditch was 51% of total field area
	TOTAL	**4.13**				

Figure 10. Myanmar language version of a promotional leaflet on rice-fish production systems.

Two farmers selected in Shwebo Township with a total rice field area of 1.26 acres, both transplanted rice in early July 2019. The farmer from Thee Kone Village stocked GIFT tilapia and common carp on 12 July 2019 at a stocking density of 1,754 per acre, equivalent to 0.43 fish per m^2 of the total rice-fish plot area. The Thee Kone Village farmer was contracted by a broker who paid a higher price for rice grown pesticide-free. Unfortunately the Se Gyi Village farmer received insufficient monsoon rains and he could not stock fish.

Photo 37. Deeper refuge ditch along the edge of the rice-fish plot in Thee Kone Village, Shwebo Township.

Photo 38. Rice transplantation in Thee Kone Village, Shwebo Township.

In Kale Township, 2 individual farmers with a total rice field area of 1.37 acres were selected for MYSAP support. After rice transplantation they stocked fish seed at a stocking density of 1,971 fish per acre, equivalent to 0.49 fish per m^2 of the total rice-fish plot area.

On 8 January 2020 MYSAP Inland supported the rental costs of a mechanical back hoe to renovate a pilot 1.5 acre plot (0.6 ha) rice-fish field plot belonging to a household in Mikesili Koon Village, Kengtung Township. MYSAP funded the purchase of 2,200 all-male GIFT seed from the DoF Nad Yay Kan hatchery and their transport by air to Kengtung on 17 December 2019. After air transportation with 100% survival, the GIFT seed were nursed in hapas by a MYSAP trained nursery farmer, while the rice-fish plot renovation work was finished. The rice seedlings were trans-planted on 14 January 2020. Thereafter on 18 February 2020 MYSAP supported the stocking of 830 GIFT tilapia fingerlings (1.0 - 1.5 inch) and 80 common carp advanced fingerlings (4.0 – 5.5 inch) into the pilot rice-fish field plot. On 6 March an additional 1,460 GIFT tilapia fingerlings were stocked into the pilot rice-fish plot, making a total of 2,370 fish being 2,290 GIFT and 80 common carp stocked.

On 03 April 2020, two Ar Yone Oo Community Facilitators oversaw the partial harvest of the pilot 0.96 acre (0.39 ha) rice-fish plot belonging to U Sein Maung in Kyaung Taik Village, Kale Township, took photos and video of the event and collected fish harvest data. The farmer harvested a total of 155.5 viss (253.5 kg) of fish being 109 viss (177.7 kg) of GIFT tilapia, 25 viss (40.8 kg) of common carp, 13 viss (21.2 kg) of silver barb, 4 viss (6.5 kg) of SIS, 3 viss (4.9 kg) of snakehead and 1.5 viss (2.4 kg) of shrimp, which was sold for MMK 533,600 (€ 342.10). The fish prices ranged between MMK 3,000 - 6,000 $viss^{-1}$ (€ 1.18 - 2.36 kg^{-1}) for tilapia and snakehead respectively.

Photo 39. Release of GIFT fingerlings into the pilot 1.5 acre plot (0.6 ha) rice-fish field plot in Mikesili Koon Village, Kengtung Township on 18 February 2020 by the MYSAP Inland, Shan State Field Coordinator.

Table 27 below shows that in 2020 MYSAP Inland supported a total of 8 rice-fish pilot plots with a total area of 6.91 acres (2.8 ha), with 4 in Kale, 3 in Shwebo and 1 in Kengtung Townships.

Table 27. Summary of MYSAP Inland supported pilot rice-fish pilot plots in 2020.

Township	Village	Area (acres)	Area (ha)	Ditch (%)	Comment
Kale	Na Ga Pwat	0.62	0.25	9.6%	**New farmer**
Kale	Htoo Mar	0.92	0.37	9.7%	**New farmer**
Kale	Kyaung Taik	0.96	0.39	10.0%	Second year rice-fish
Kale	Kyar Inn	0.41	0.17	10.0%	Second year rice-fish
Shwebo	Min Kone	1.43	0.58	4.2%	**New farmer**
Shwebo	Kyaung Man Kan	0.5	0.20	8.5%	**New farmer**
Shwebo	Thee Kone	0.57	0.23	5.0%	Second year rice-fish
Kengtung	Mikesili Koon	1.50	0.61	51.3%	Continued first season grow-out
	TOTAL	**6.91**	**2.80**		

The MYSAP Inland IEC Officer travelled to Shwebo Township 18-20 August 2020 to record drone video footage at Thee Kone Village of rice transplantation and at Min Kone Village of refuge ditch deepening. Unfortunately completion of the final video of MYSAP supported pilot rice-fish culture systems was stopped by COVID-19 travel restrictions and the state of emergency.

The pilot rice-fish plot of U Myo Myint Maung in Min Kone Village, Shwebo Township was stocked with 1,200 GIFT and 300 silver barb on 17 November 2020.

With MYSAP support U Sai Sum Tip's 0.6 ha (1.5 acre) pilot rice-fish plot, Mikesili, Koon Village, Kengtung Township in one year yielded 4,400 kg (2,699.4 viss) of rice, being 2,320 kg (1,423.4 viss) of irrigated summer SR456 rice and 2,080 kg (1,276 viss) of monsoon RO428 rice without the use of any pesticides and a total of 689.5 kg (423 viss) of fish being 546 kg (335 viss) of tilapia and 86.5 kg (53 viss) of common carp and 57 kg (35 viss) of wild snakehead, catfish and SIS.

The total net cash profit from growing 2 crops of rice (irrigated summer rice and monsoon season rice) and one crop of GIFT tilapia and common carp was MMK. 2,309,447 (€ 1,372.38) over a one year production period. The 2 rice crops combined yielded 42.2% of the net profit (irrigated summer rice 22.9% and monsoon rice 19.3%), while the single crop of fish yielded 57.8% of the net profit.



Photo 40. Common carp and tilapia from the pilot rice-fish plot in Kengtung Township.

On 28 April 2021, MYSAP supplied both U Sein Maung, Kyaung Taik Village and U Ye Phay, Na Ga Pwat Village, Kale Township, with 15,000, 10,000 and 10,000 silver barb, common carp and rohu fry each, for stocking into their irrigated pilot rice-fish nursery plots. The common carp seed stocked was produced on the MYSAP funded common carp induced breeding training course. The MYSAP Inland Sagaing Field Coordinator visited the two rice-fish nursery farmers on 12-13 May 2021 to check on progress in Kale Township. The common carp and silver barb being nursed in the rice-fish nursery plot were sampled and were growing well.

This new technology for Myanmar, has effectively provided large sized (advanced) fingerlings from irrigated rice-fish nursery plots for stocking into grow-out ponds as soon as the grow-out ponds have water available, in Vietnam and Bangladesh. If successful in Myanmar, this nursing of fish in irrigated rice-fish nursery plots will help to offset the impacts of climate change and shorter growing seasons.

On 05 May 2021, the MYSAP Inland Team Leader attended a WorldFish webinar entitled, *Invitation to collaborate on an inventory of rice-fish innovations*.

The Myanmar version of the success story entitled, *Pilot rice-fish plot in Kengtung proves profitable*, was finalized on 05 May 2021. The English and Myanmar languages of the article were uploaded onto the WorldFish Monitoring Education and Information (MEL) system on 06 May 2021 and uploaded by Greenovator onto the Green Way mobile app on 13 May 2021:

WorldFish Dspace (English language) - https://dx.doi.org/20.500.12348/4817

WorldFish Dspace (Myanmar language) - https://dx.doi.org/20.500.12348/4818

Greenway app - https://greenwaymyanmar.com/posts/success_story_on_pilot_rice_fish_plot_very_profitable

3.6.9 Virtual Fish Culture Learning Group (VFCLG)

On 13 May 2020, the MYSAP Inland IEC Officer established a private Facebook page entitled Virtual Fish Culture Learning Group (VFCLG). The intention of the VFCLG site was to test proof of concept for the use of a virtual extension and training platform and if successful, to migrate the site across to the MYSAP Facebook website before the implementation period of the inland component ended.

The MYSAP Inland IEC Officer gave face-to-face training on the Virtual Fish Culture Learning Group (VFCLG) to BRAC Myanmar staff in Shwebo on 01-02 August 2020 and to both Ar Yone Oo and Malteser International staff virtually in 2 separate training sessions on Friday 07 August 2020.

The MYSAP Inland IEC officer edited training videos produced in the office by the NGO staff at times when field work was banned because of COVID-19 restrictions, and adding appropriate logos, before uploading the videos onto the VFCLG. Invited VFCLG dbh and NGO staff provided feedback on the training videos, so that both the video quality and staff capacity for the production of training videos was further enhanced.

On 8 October 2020 MYSAP Inland Field Manager and Team Leader facilitated a brainstorming meeting with 9 staff (4 ♀), its 2 Field Coordinators, M&E Coordinator, IEC Officer and the 3 Aquaculture Technical Officers of the 3 partner NGO's to agree a community extension approach to provide extension and training service support for MYSAP dbh, if face to face meetings were banned due to further COVID-19 lockdowns.

In a Teams meeting on 22 October 2020 the 3 NGO's agreed to identify 1 community resource person per village as part of a Participatory Community Outreach Modality, that MYSAP would fund training of and equip them to provide extension services, even during tighter COVID-19 movement restrictions and after the implementation period of the inland component of MYSAP. The partner NGO's identified 81 people (27 ♀) for training, being 21 (3 ♀) from Kale, 32 (14 ♀) from Shwebo, and 28 (10 ♀) from Kengtung Townships. 68 cast nets and weighing scales were ordered and given to the village resource people, so that they could continue to sample fish and adjust the feed ration. Unfortunately planned virtual training for the community resource people planned in February 2021 was suspended, when MYSAP instructed the MYSAP Inland component to suspend all external activities except time critical activities.

The table below shows that on 30 April 2021 the MYSAP Inland Virtual Fish Culture Learning Group (VFCLG) had 180 members (52 ♀) being 136 farmers (31 ♀) and 44 (21 ♀) IP and MYSAP Inland staff. A total of 25 training videos (10 in Myanmar and 11 in Arka and 2 in Lahu and 2 in Shan languages) had been edited and uploaded onto the VFCLG Facebook page.

	♂	♀	**TOTAL**	**% ♀**
Farmer	105	31	136	22.8
AYO	3	5	8	62.5
BRAC	6	6	12	50.0
MI	7	4	11	36.4
MYSAP	5	5	10	50.0
GIZ	2	1	3	33.3
TOTAL	**128**	**52**	**180**	**28.9**

3.7 Food security and nutrition

3.7.1 Barrier analysis study

The WorldFish Myanmar nutritionist and 3 Save the Children specialists, including a medical doctor, a nutritionist and a training coordinator provided 2 days of training for 17 participants (8 ♀), (DoF 2, BRAC 8, Ar Yone Oo 1, Malteser International 2 and MYSAP Inland 4), on 26-27 November 2018 on undertaking a nutrition barrier analysis using a methodology developed by Bonnie Kittle of Helen Keller International. Following the training, 3 teams each consisting of 5 people conducted a barrier analysis survey, collecting data from the field on 28-29 November. The collected data was then validated and coded over 2 more days on 30 November and 01 December 2018. The survey was designed to study the behaviours of women with children between the age of 6 months and 5 years of age (N = 90) and the fish consumption of their children.

The MYSAP Inland Barrier Analysis survey report, was modified in response to feedback from Silvia Kaufmann, MYSAP nutrition consultant and approved for dissemination by MYSAP on 31 July 2019. The report was uploaded onto the FIC and shared with Dr. Zar Ni Htet Hlaing, Nutrition Advocacy Advisor, Scaling-up Nutrition

Civil Society Alliance (SUN CSA) Myanmar. Quennie Rizaldo, WorldFish Myanmar Nutrition consultant presented the barrier analysis process at the SUN CSA general assembly on 14 November 2019.

Following the barrier analysis study MYSAP Inland modified its nutrition activities to cross the identified barriers, including fears of young children between 6 months and 5 years of age choking on bones, by piloting the production of a dried SIS powder (see section **3.7.8 Community testing of a low cost fish drier and powdered SIS** of this report) and producing IEC materials to promote the making and consumption of fish balls.

3.7.2 Food security and nutrition extension and training service delivery

The WorldFish Myanmar nutrition specialist and the MYSAP Inland Team Leader made fact finding field visits to both the Sagaing Region and the Shan state and met and had discussions with a variety of different agencies conducting food security and nutrition activities in the field in 2017 to learn and gain from the activities and experiences of others and to collect examples of relevant nutrition related training and extension materials. Field visits and meetings were conducted with the GIZ Food and Nutrition Security Project and staff of Welthungerhilfe, PACT, Partnership for Change, Myanmar Institute for Integrated Development, Malteser International, Winrock in Myanmar to learn from coffee brand promotion and marketing, and Lilypad, Nyaung Shwe in 2017 to discuss potential collaboration and arrangement of training courses on home garden plant species.

MYSAP funded the MYSAP Inland Team Leader to attend a global WorldFish and Fisheries Administration of Cambodia workshop in Siem Reap, Cambodia, 06-08 December 2017 on Nutrition-Sensitive Fish-Agriculture Production Systems. Workshop recommendations fed into the planning of MYSAP inland component activities thereafter.

In February 2018, Dr Thet Thet Win of the Department of Zoology, Kengtung University shared her field research data showing that small indigenous fish species, including flying barb or Burmese barb (*Esomus ahli*), and glass fish (*Parambassis ranga*) routinely entered fish ponds with water sourced from streams and that villagers frequently captured and ate SIS from streams and rice fields, so in her opinion there would be minimal resistance to promoting the culture and cooking of SIS for improved household nutrition.

MYSAP Inland arranged networking workshops in Kengtung, Kale and Shwebo Townships in the first half of 2018 to introduce inland component of MYSAP activities and to network with the government including GAD, the Ministry of Health and Sports (MoHS), universities, the DoF, etc., NGO's, and donor agencies and the private sector working with livelihoods, health, nutrition and food security in the 3 townships. During visits to the 3 townships, fish consumption data was collected from separate male and female groups and feedback was also obtained on a variety of nutrition extension and training materials, so that the materials could be improved and made more relevant for the 5 MYSAP Inland townships and in Kengtung for translation into Shan language.

WorldFish Myanmar nutrition specialists Quennie Rizaldo and Jessica Scott have both contributed actively to MYSAP Inland nutrition activities and the promotion of small indigenous fish species (SIS) that are nutrient-rich. Their participation in the nutrition dialogue group contributed to the important inclusion of fish as an essential component for human nutrition in Myanmar within the Multi-Sectoral National Plan of Action on Nutrition (MS-NPAN) 2018/19 – 2022/23.

Jessica Scott supervised a review of the nutrition content in the WorldFish MYCulture Training of Trainer (TOT) training manual materials on *Small-Scale Aquaculture and Improved Human Nutrition* with input from MYCulture, MYSAP Inland, and the Save the Children LEARN staff. Thereafter the TOT training manual materials were radically revised and improved. Jessica also developed an additional training session on '*nutrition sensitive food systems*' which was first tested at the MYSAP Inland TOT training course for DoF and BRAC Myanmar staff in Mandalay 04-08 June 2018. The '*nutrition sensitive food systems*' session was subsequently incorporated into the TOT manual. The revised MYSAP Inland *Small-Scale Aquaculture and Improved Human Nutrition* TOT materials were tested for a second time during the TOT training course for 16 (8 ♀) DoF, Ar Yone

Oo and Malteser International participants delivered at the DoF Regional Mandalay office, Mandalay, 30 July to 03 August 2018.

Following the revision, the first day of the five day TOT training course on *Small-Scale Aquaculture and Improved Human Nutrition* started with human nutrition and the importance of fish, before moving onto SSA and this reflects the central importance of nutrition within SSA. Other important additions to the TOT in the 2019 update were the development and inclusion of facilitating agricultural calendars for men and women, and seasonal vegetable and perennial vegetable production calendars.

In preparation for the second 2019-20 extension and training season MYSAP Inland delivered a TOT training course 18-25 June 2019 in Kale T/S for a total of 33 staff (16 ♀) covering small-scale aquaculture, integrated vegetable and fruit production, improved human nutrition and training of farmers on the use of the Green Way mobile phone app.

Plans to conduct a face to face TOT training course on nutrition at Bagan in September 2020 were cancelled because of COVID-19 restrictions. Thereafter, Save the Children medical and nutrition specialists delivered a virtual *MYSAP Inland Improved Human Nutrition Training of Trainers (TOT) Training Course* for 35 staff (19 ♀) from Ar Yone Oo, BRAC Myanmar, Malteser International and MYSAP Inland 14 - 18 September 2020.

Organization	**♂ trained**	**♀ trained**	**Total # trained**
Ar Yone Oo	2	4 (66.7%)	6
BRAC Myanmar	5	5 (50.0%)	10
Malteser International	7	4 (36.4%)	11
MYSAP Inland	2	6 (75.0%)	8
TOTAL	**16**	**19 (54.3%)**	**35**

The training covered the following key topics:

- The importance of eating fish and a diverse diet for improved dietary diversity and human nutrition;
- Hygiene and sanitation practices; and,
- COVID-19 risk avoidance and risk reduction.

MYSAP Inland delivered TOT training on *Small-scale aquaculture and integrated vegetable and fruit production* virtually via Zoom on 23-26 November 2020, for 36 (17 ♀) people, including 11 (4 ♀) Malteser International staff, 10 (5 ♀) BRAC Myanmar staff, 6 (4 ♀) Ar Yone Oo staff, 6 (3 ♀) MYSAP Inland and 3 (1 ♀) Fish 4 Livelihoods staff.

Improvement revisions were made to each of the 5 successive MYSAP Inland 5 TOT training courses and TOT training materials on *Scale-scale Aquaculture and Improved Human Nutrition* delivered in 2018 (x 2 courses), 2019 and 2020 (x 2 courses with separate SSA and improved human nutrition components).

Table 28 below summarizes the TOT training courses on *Small-Scale Aquaculture and Improved Human Nutrition*, during the implementation period of the inland component of MYSAP.

Table 28. MYSAP Inland delivered TOT training courses.

Start Date	End Date	Name of Training	DoF			NGOs			MYSAP			Total		
			♂	♀	Tot	♂	♀	Tot	♂	♀	Tot	♂	♀	Tot
4-Jun-18	8-Jun-18	TOT SSA and Human Nutrition	4	4	**8**	3	4	**7**	0	1	**1**	7	9	16
30-Jul-18	3-Aug-18	TOT SSA and Human Nutrition	2	4	**6**	6	4	**10**	2	1	**3**	10	9	19
18-Jun-19	22-Jun-19	TOT SSA and Human Nutrition	1	1	**2**	13	13	**26**	5	4	**9**	19	18	37
14-Sep-20	18-Sep-20	TOT Improved Human Nutrition	0	0	**0**	14	13	27	3	6	**9**	17	19	36
23-Nov-20	26-Nov-20	TOT SSA and vegetable production	0	0	**0**	14	13	27	6	4	**10**	20	17	37

The entry point for all MYSAP nutrition activities with direct beneficiary households was a small-scale freshwater pond of less than 2,023 m^2 (0.5 acres) which held water for at least six months per year. After TOT training provision by MYSAP for the NGO staff, extension services on small-scale aquaculture, integrated vegetable and fruit production and improved human nutrition were delivered in season-long training sessions at a demonstration farmer's small-scale pond and pond embankment or homestead garden by Ar Yone Oo, BRAC Myanmar and Malteser International staff, under sub-grant agreement contracts in Kale, Shwebo and Kengtung Townships respectively. The training delivered by the NGO staff to the MYSAP dbh's covered small-scale aquaculture, integrated vegetable and fruit production on pond banks and homestead gardens, dietary diversity and improved human nutrition and gender inclusivity.

In the second half of 2018, after the NGO staff had consulted with direct beneficiary households and Department of Agriculture staff, seasonal vegetable calendars were developed for Kale, Kengtung and Shwebo Townships. Thereafter MYSAP Inland procured and disseminated a mixture of annual and perennial vegetable and fruit seeds and cuttings requested by farmers to a total of 465 dbh that were grown on integrated pond embankments and homestead gardens. Malteser International for example distributed vegetable seeds and cuttings to dbh in January 2019 including pumpkin, red gourd, carrots, peas, okra, long beans, tomatoes, water cress, and mustard leaf.

In the 2018-19 culture season, there were 755 women of reproductive age (15-49 years old) and 229 children under 5 years of age in the 648 dbh benefitting from MYSAP supported extension and training services on SSA, integrated fish, vegetable, fruit and livestock production systems and improved human nutrition.

Supported by MYSAP, Jessica Scott, WorldFish Myanmar Gender and Nutrition Advisor visited Kengtung Township, 19-24 May 2019 and interviewed women of reproductive age and mothers of children under five to get feedback on MYSAP Inland improved human nutrition, integrated nutrition-sensitive production system promotion training. Following the visit, positive aspects were emphasized and changes were made to address negatives identified in nutrition training delivery in the 2019-20 culture season. One direct outcome was that MYSAP Inland increased the emphasis in its messaging to promote the earlier introduction of animal source foods, other than eggs, for infants from 6 months of age and later went on to pilot the production of dried powdered SIS as a complementary food for infants of 6 months of age and above (see section **3.7.8 Community testing of a low cost fish drier and powdered SIS**).

MYSAP Inland funded the WorldFish Myanmar Gender and Nutrition advisor to attend the Myanmar Nutrition Technical Working Group meeting in Nay Pyi Taw on 18 June 2019 organized by the World Food Programme in collaboration with the National Nutrition Council (NNC) under the MoHS, where Fill the Nutrient Gap (FNG) survey findings for Myanmar were presented.

A key nutritional activity promoted by MYSAP Inland from 2019 was the deliberate stocking of small indigenous fish species (SIS) into small-scale aquaculture pons systems in combination with the normally stocked larger carp species. There 4 main reasons for promoting SIS culture were:

1) Small indigenous fish species, when eaten, after gutting, but with the heads on, are highly nutritious and rich in minerals and vitamins;
2) Women and children can easily and regularly, selectively harvest SIS from a family pond using a floating surface gill net to generate income and provide animal protein food for the family;
3) The short life cycle of SIS allows harvesting to commence 6 weeks after stocking and to continue every week thereafter, providing a quick return on investment costs (money and time); and,
4) Culturing SIS in fish ponds should reduce fishing pressure on wild fish stocks and perhaps reduce the use of inappropriate non-sustainable fishing gear like electric fish shockers.

The inland component of MYSAP with input from the WorldFish Myanmar Nutrition Advisor produced IEC materials to promote the stocking of SIS into fish ponds and regular SIS harvesting to give a regular income source and fish protein for consumption by household members and in October 2019 supplied 120 floating gill nets (1 m deep and, 18 m long, with 2.5 cm mesh size) to demonstration farmers and others to train group members on partially harvesting SIS at regular intervals. Training courses on use of a floating gill net for partially harvesting SIS were delivered in Kale, Shwebo and Kengtung townships by the staff of the 3 collaborating NGO's in January 2020.

A promotional video on how to partially harvest was recorded in January 2020 in Kale and uploaded onto the CGIAR website in May 2020 (SIS video clip), onto the Green Way app and onto YouTube (https://youtu.be/RtB373pxq2A) on 11 May 2021.

Through the NGO's, Ar Yone Oo, BRAC Myanmar, and Malteser International, and the Shan State DoF, the inland component of MYSAP delivered extension and training messages on improved human nutrition, dietary diversity, the benefits of eating fish and integrated vegetable and fruit production on pond embankments and homestead gardens to 1,264 households in the 2019-20 fish, vegetable and fruit culture season. These 1,264 dbh had 1,496 women of reproductive age and adolescent girls and 341 children under 5 years of age.

The table below shows that in the 2019-20 culture season MYSAP Inland provided vegetable and fruit seeds and cuttings of various species to a total of 806 (134 women) dbh.

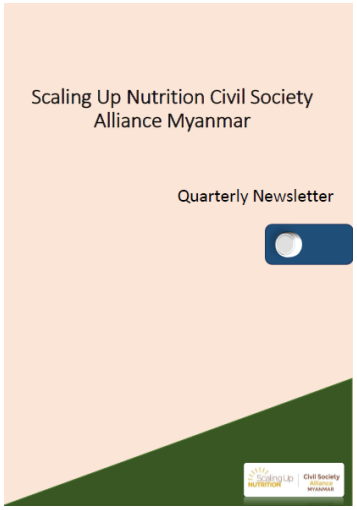
MYSAP funded the WorldFish Myanmar Nutrition Advisor to attend the World Food Programme (WFP) Fill the Nutrient Gap – Final Dissemination Workshop in Nay Pyi Taw on 04 October 2019.

Vegetable Seeds Distribution and Coverage according to township (2019-2020)_November											
Project Townships	# of ward/ Village	# of Beneficiaries			Start Date (From)	Finish Date (To)	# of Beneficiaries who received vegetable seeds			% of Beneficiaries who received Vegetable seeds	Total # & Type of Vegetable seeds
		Male	Female	Total			Male	Female	Total		
Kale	16	226	35	261	9-Oct-19	22-Oct-19	157	13	170	65.1%	7
Shwebo	49	374	54	428	3-Dec-19	3-Dec-19	210	35	245	57.2%	8
Kengtung	39	305	86	391	21-Oct-19	26-Nov-19	305	86	391	100.0%	16
Pin Laung											
Total	**104**	**905**	**175**	**1,080**			**672**	**134**	**806**	**74.6%**	22

With input from the WorldFish Myanmar Nutrition Advisor, the inland component of MYSAP submitted an application to the Scaling-Up Nutrition Civil Society Alliance (SUN CSA) to support the partial cost of an NGO exchange visit to Kale. Six male staff from the Cohesion Development Group, Thandwe Township, Rakhine State and 1 female SUN CSA member travelled to Kale, 04-06 November 2019, to learn about MYSAP Inland and Ar Yone Oo agriculture-aquaculture nutrition sensitive activities in the field, including fish culture, integrated vegetable and fruit production on pond embankments and homestead gardens and improved nutrition activities.

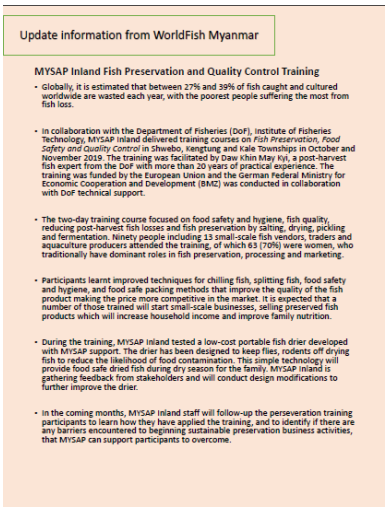
MYSAP funded the WorldFish Myanmar Nutrition Advisor and the MYSAP Inland IEC Officer to attend the Annual General Assembly Meeting of SUN CSA meeting in Yangon on 14-15 November 2019. The Nutrition Advisor presented on *The Methodology and the Findings of the MYSAP Inland Nutrition Barrier Analysis Survey on Fish Consumption by Children Under 5 Years Old in Shwebo Township*. The IEC Officer presented on *Nutrition Sensitive Fish Agri-Food Production Systems promoted by MYSAP Inland*.

MYSAP Inland and WorldFish Myanmar articles on *Fish Preservation and Quality Control Training* and cross visits by SUN CSA members were published on 09 January 2020, in the SUN CSA Q4 2019 newsletter.




The second visit was conducted on 5th November 2019 at Kale Township, Sagaing Region. The secretariat team couldn't able to join this exchange visit because of planning on SUN CSA Annual General Assembly. Daw Shwe Yadanar Naing, the secretariat of Delta SUN CSA from Kyal Sin May joined and participated this visit for the administrative and logistics support. The visitor team had a chance to learn Myanmar Sustainable Aquaculture Program (MYSAP) implemented by WorldFish in partnership with Ar Yone Oo.

Learning objective of the MYSAP project: increase affordable nutritious aquaculture products supplied by small scale farmers to provide food and income for the poor and vulnerable households, their activities on availability and access into inputs 1) seed (2) feed and (3) extension and training services; providing aquaculture value chain training, piloting activities on Green Way mobile phone app and their food security and nutrition activities were included in the orientation session and in the field visit as well.
And also, they had chance to see and learn cooking demonstration session, the whole supply chain process of fish powder and dried fish production and market formulation.


Update information from WorldFish Myanmar

MYSAP Inland Fish Preservation and Quality Control Training

- Globally, it is estimated that between 27% and 39% of fish caught and cultured worldwide are wasted each year, with the poorest people suffering the most from fish loss.
- In collaboration with the Department of Fisheries (DoF), Institute of Fisheries Technology, MYSAP Inland delivered training courses on *Fish Preservation, Food Safety and Quality Control* in Shwebo, Kengtung and Kale Townships in October and November 2019. The training was facilitated by Daw Khin May Kyi, a post-harvest fish expert from the DoF with more than 20 years of practical experience. The training was funded by the European Union and the German Federal Ministry for Economic Cooperation and Development (BMZ) was conducted in collaboration with DoF technical support.
- The two-day training course focused on food safety and hygiene, fish quality, reducing post-harvest fish losses and fish preservation by salting, drying, pickling and fermentation. Ninety people including 13 small-scale fish vendors, traders and aquaculture producers attended the training, of which 63 (70%) were women, who traditionally have dominant roles in fish preservation, processing and marketing.
- Participants learnt improved techniques for chilling fish, splitting fish, food safety and hygiene, and food safe packing methods that improve the quality of the fish product making the price more competitive in the market. It is expected that a number of those trained will start small-scale businesses, selling preserved fish products which will increase household income and improve family nutrition.
- During the training, MYSAP Inland tested a low-cost portable fish drier developed with MYSAP support. The drier has been designed to keep flies, rodents off drying fish to reduce the likelihood of food contamination. This simple technology will provide food safe dried fish during dry season for the family. MYSAP Inland is gathering feedback from stakeholders and will conduct design modifications to further improve the drier.
- In the coming months, MYSAP Inland staff will follow-up the perseveration training participants to learn how they have applied the training, and to identify if there are any barriers encountered to beginning sustainable preservation business activities, that MYSAP can support participants to overcome.

In the 2020-21 culture season the inland component of MYSAP delivered training and extension services on small-scale aquaculture and improved human nutrition to a total of 1,255 direct beneficiary households through the same 3 NGO's in Kale, Kengtung and Shwebo Townships. These dbh had a total of 1,287 women reproductive age (15-49), 170 adolescent girls (10-14) and 286 children under 5 years of age.

The WorldFish program brief entitled, *Nutrition approaches of MYSAP Inland* was disseminated on 23 July 2020 with MYSAP approval and uploaded onto the WorldFish Monitoring, Education and Learning website at the following link:

https://digitalarchive.worldfishcenter.org/handle/20.500.12348/4242

An English language article entitled, *Progress against MYSAP Inland target nutrition indicators*, was disseminated on 23 August 2020. A PowerPoint presentation of *MYSAP Inland progress against nutrition indicators* was also produced on 01 September 2020.

The table below shows that in the 2020-21 culture season the inland component of MYSAP took household specific orders and delivered vegetable and fruit seeds and cuttings of 16 different species to 827 (166 ♀ - 20.1%) direct beneficiary households in Kale, Shwebo and Kengtung Townships. The 16 species were long green bean, lady's finger, pumpkin, carrot, water cress, *Acacia pennata*, drumstick, papaya, roselle, mustard, egg plant, sweet potato, chili pepper, sponge gourd, calabash and *Luffa acutangula*.

Township	# of dbh			# of dbh receiving vegetable seeds			% of dbh receiving seeds
	♂	♀	Total	♂	♀	Total	
Kale	225	29	254	185	26	211	83.1%
Shwebo	376	54	430	193	32	225	52.3%
Kengtung	283	108	391	283	108	391	100.0%
Total	**884**	**191**	**1,075**	**661**	**166**	**827**	**74.0%**

Within the COVID-19 context, MYSAP supported small-scale fish ponds and integrated vegetable and fruit gardens on pond embankments and homestead gardens were vital for i) a healthy and diverse diet, ii) food and nutrition security, iii) household income, and iv) household resilience, and particularly when poorer people cannot travel for seasonal work.

The following English and Myanmar language statement was therefore used at the bottom of all emails from the inland component of MYSAP Team Leader to emphasize the importance of nutrition in Myanmar under the COVID-19 context:

"For optimal health and nutritional status of all people, especially the poor and vulnerable, access to diverse, nutritious and safe foods is paramount. A diverse, nutritious diet should include fish, fish-based products and other aquatic foods. Access and availability of fish for the people in Myanmar continues to be important, as over 50% of all animal-sourced foods consumed are fish."

လူသားအားလုံး အာဟာရချို့တည့်မှုကင်းဝေးပြီးကျန်းမာသန်စွမ်းမှုရှိစေရန်မှာ အာဟာရဓါတ်ပြည့်ဝသော၊ ဘေးဥပဒ်မဖြစ်စေနိုင်သော အစားအစာမျိုးစုံကိုစားသုံးရန် အဓိက ဖြစ်ပါသည်။ အထူးသဖြင့် ဆင်းရဲနွမ်းပါးသူများအတွက် ပိုမို လိုအပ်ပါမည်။

အစားအစာအမျိုးမျိုးတွင် ငါးမျိုးစုံ၊ ငါးဖြင့်ပြုလုပ်သောအစားအစာများနှင့် အခြားရေထွက်ပစ္စည်းများလည်း ပါဝင်ပါသည်။

မြန်မာနိုင်ငံတွင် အသားငါးစားသုံးမှု စုစုပေါင်းပမာဏ၏ ၅၀% ကျော်မှာ ငါးစားသုံးခြင်း ဖြစ်ပါသည်။ ထို့ကြောင့် ငါးထုတ်လုပ်မှုနှင့် ငါးရရှိနိုင်မှုမှာ မြန်မာပြည်သူများအတွက် အရေးကြီးသောအခန်းကဏ္ဍတွင် ဆက်လက်တည်ရှိနေမည်သာ ဖြစ်ပါသည်။

The WorldFish Myanmar Nutrition Advisor and the MYSAP Inland IEC Officer attended the Scaling-Up Nutrition Civil Society Alliance (SUN CSA) online event 08-11 December 2020 and presented key achievements

and challenges when implementing nutrition and WASH activities under COVID-19 movement restrictions. WorldFish Myanmar was elected as a SUN CSA committee member, which provided an opportunity for full involvement in nutrition discussions, sharing of nutrition experiences from WorldFish Myanmar field programmes, including the activities of the inland component of MYSAP, and the promotion of fish as an important animal food source for people in Myanmar.

English and Myanmar versions of a booklet entitled, *Better management practices for vegetable production systems* were finalized on 06 April 2021. This was a collaborative IEC production output by nutritionists, horticulturalists, livelihoods and communication specialist staff from the inland component of the Myanmar Sustainable Aquaculture Programme (MYSAP), sponsored by the European Union and the German Federal Ministry for Economic Cooperation and Development (BMZ), and the Fish for Livelihoods programme sponsored by USAID. The Myanmar language version was finalized in May 2021 and disseminated via the WorldFish website.

MYSAP Inland shared all food and nutrition security materials widely through the SUN SCA network, GIZ Food and Nutrition Security Project and with collaborating NGO's.

Table 29 below shows that during 3 full seasons of MYSAP support with 3 collaborative NGO's in Kale, Shwebo and Kengtung Townships and with 1 partial season of support through the Shan State DoF in Pinlaung Township, which was unfortunately cut short by COVID-19 travel restrictions, the inland component of MYSAP delivered improved nutrition messages to 1,504 different dbh, with over 7,500 family members.

Table 29. MYSAP Inland extension and training reach by township.

Agency	Township	Region or State	# of dbh 2018-19 (Season 1)	# of dbh 2019-20 (Season 2)	# of dbh 2020-21 (Season 3)	Total # of different dbh
Ar Yone Oo	Kale	Sagaing	151	261	254	**406**
BRAC Myanmar	Shwebo	Sagaing	256	428	430	**430**
DoF	Pinlaung	Southern Shan	0	25	0	**25**
Malteser International	Kengtung	Eastern Shan	241	391	391	**405**
Community pond 1			0	101	101	**101**
Community pond 2			0	58	0	**58**
Community pond 3			0	0	79	**79**
TOTAL			**648**	**1,264**	**1,255**	**1,504**

3.7.3 National Nutrition Promotion Month

The Ministry of Health and Sports (MoHS) conducts National Nutrition Promotion Month each year in August. The inland component of MYSAP contributed to both national level and township level MoHS National Nutrition Promotion Month activities in 2018, 2019 and 2020. This began by the inland component of MYSAP and the WorldFish Myanmar Nutrition and Gender Advisor supporting MYSAP activities at the Pone Sao Sub-Rural

Health Centre, in Nar Nwet Village, Mong Pat (Kengtung Township), at Kengtung High School and at Kengtung main market, 14-16 August 2018.

MYSAP Inland posters and the frequently asked questions pamphlets in Shan language distributed at the above events proved very popular. Following feedback, the materials were modified and larger print runs of posters and pamphlets were made in Big Shan language for Kengtung Township.

The MYSAP Inland IEC Officer attended a preparatory meeting for the MoHS National Nutrition Promotion Month in Nay Pyi Taw on 26 July 2019. The IEC Officer and the Field Coordinator, Shan State helped to set up and attended the MYSAP booth at the National Nutrition Promotion Month central launch event at the City Hall, Taunggyi Township on 04 August 2019. Over 200 people took part in a nutrition quiz with give-away prizes. MYSAP posters were displayed and extension leaflets on freshwater small-scale aquaculture and nutrition were disseminated. A rice-fish model generated a lot of interest and was visited by Dr. Myint Htwe, Union Minister of Ministry of Health and Sport.

Photos 41 and **42**. MYSAP booth at the National Nutrition Month launch in Taunggyi on 04 August 2019.

MYSAP Inland staff submitted an article on the MYSAP booth at the national launch of the National Nutrition Month in Taunggyi Township on 04 August 2019. The article was uploaded onto the MYSAP website at the web link below:

http://www.mysap-myanmar.com/mysap-booth-exhibition-at-the-national-central-launch-of-the-nutrition-promotion-month/?fbclid=IwAR3XE5n0yVNhwgIVfG7A4-WxlUb7yNA8LS0k4iJYK3Rbx4rU5IWYFO7d7kQ

MYSAP Inland supported National Nutrition Promotion Month activities in each township in August 2020. Following layout revision and updating, the 1000 day poster was reprinted in Myanmar and Shan languages and distributed during National Nutrition Promotion Month. Nutrition month banners were produced by the MYSAP Inland IEC Officer and sent to the 3 NGO's for printing and display in Kale, Shwebo, and Kengtung townships.

MYSAP funded 3,000 face masks, being 1,680 with the Ministry of Health and Sport National Nutrition Month theme for August 2020 and 1,320 masks with the MYSAP logo that were distributed to MYSAP Inland dbh members on other occasions.

In August 2020, the MYSAP Inland IEC Officer travelled to Shwebo Township and took photographs and recorded videos of 2 BRAC Myanmar staff delivering training sessions on the benefits of eating fish for pregnant

and lactating mothers and children under the age of five. Three 3 MoHS staff also gave vaccinations as part of National Nutrition Promotion Month activities at 3 health clinics on 01-02 August 2020. BRAC Myanmar delivered nutrition training to a total of 438 people (419 ♀ - 95.6%) in 13 villages of Shwebo Township in August 2020.

Photo 43. Nutrition training at a MOHS ante- and post-natal clinic in Shwebo by a BRAC Myanmar staff member.

Malteser International conducted 3 National Nutrition Promotion Month training sessions in August 2020. Two sessions were in villages with MYSAP dbh, while the third session was at a MoHS health clinic. Other sessions planned at health clinics were cancelled because of a diphtheria outbreak and the closure of some health clinics.

The Ministry of Health and Sports conducted a virtual "*Launching ceremony of Nutrition Promotion Month 2020*" on 26 August 2020. The MYSAP Inland partial harvesting of SIS video was shown at the virtual launch.

A Myanmar language version of the article, *Progress against MYSAP Inland target nutrition indicators*, was widely disseminated during National Nutrition Promotion Month in August 2020.

Table 30 below shows that in August 2020, MYSAP Inland provided nutrition training to 593 people (574 ♀ - 96.8%) in support of the MoHS National Nutrition Promotion Month. Most of this training was delivered at pre- and post-natal health clinics, where pregnant women and women with children under the age of five were attending for mother and child health check-ups and/or vaccinations. Of the women trained, 24 were MYSAP Inland direct beneficiary households meaning, 550 non-MYSAP Inland women were reached.

Table 30. Training on nutrition delivered in National Nutrition Promotion Month August 2020.

Township	Pregnant ♀	Parents of children < 5 years of age		# of ♀ DBH	Total trained		
	# of ♀	# of ♂	# of ♀	# of ♀	# of ♂	# of ♀	# of trained
Shwebo	195	19	224	0	19	419	438
Kengtung	9	0	22	24	0	55	55
Kale	82	0	18	0	0	100	100
Total	**286**	**19**	**264**	**24**	**19**	**574**	**593**

3.7.4 Support to the development of trade and marketing groups

The findings of the Mekong Economics Limited baseline survey and the value chain surveys of 1) rohu, 2) tilapia and 3) the main nutrient rich small indigenous fish species (SIS) for each of the five MYSAP Inland townships were factored into the operational planning process for the inland component of MYSAP in Nay Pyi Taw on 26 May 2018 and were considered when planning activities with the key NGO's to support the development of trade and marketing groups.

Information gathered from the field was used to facilitate the formation of groups, and to support existing trade and marketing groups to improve access to resources and to strengthen their bargaining power in the market. The baseline value chain studies showed that in Amarapura, Pinlaung and Shwebo townships women were engaged in fish processing activities including fish ball, pickled fish and dried fish production, while in Kale Township fish processing was limited to mainly barbequeing or smoking of fish, both of which were in high demand in the Chin State and the border area with India.

The value chain reports also highlighted that there was a lack of cold chain storage in Pinlaung and Shwebo Townships. Without cold storage options, traders and market vendors had to sell fresh fish at lower prices near the end of the day to avoid spoilage, which reduced their profit margins and decreased the likelihood of making a profit.

The WorldFish Myanmar Nutrition and Gender Advisor conducted key informant interviews (KII's) in Kengtung Township main market on 17 August 2018. The key findings were:

- There was a very strong preference for fresh aquatic products in Kengtung Township.
- There were a large variety of processed aquatic products sourced from both wild captured and culture systems available daily in the market.
- The main product traded in terms of quantity (weight) were a large variety of dried inland and marine (captured) fish species and a lesser amount of shrimp species. Most of the dried fish sold in Kengtung market was brought into the Shan State by road.
- There were smaller volumes of fish (and shrimp) pastes traded, which though popular in most Myanmar regions and states, was less popular in the Shan State. All fish and shrimp pastes were purchased from Bayint Naung wholesale market, Yangon.
- Most of the dried snakehead and fish sauce sold, was sourced from Thailand.
- Other value-added aquatic products were mainly locally made 'cooked whole fish' and 'fried dried fish with chilli mix' in the 'takeaway' food section/aisle of the market.
- Households from remote upland hill areas had very poor access to all aquatic products and often could not afford to purchase dried aquatic products from the market.

Photo 44. Crispy fried whole tilapia.

The following constraints and barriers, in order of importance, were identified by KII's that limited the local production of processed aquatic animal based products in the Kengtung area:

- Local labour costs in the Kengtung area were much higher than other rural areas of Myanmar. This reduced profit margins and made it difficult to compete with processed products brought in by road.
- The climate was not as well suited for drying fish as in the central dry zone, which meant that drying took longer, giving a less consistent product and increased food safety risks.
- Road transportation distances could be up to 1,000 km by road, but the costs could be offset by shared transport modes e.g. tour buses carrying passengers and goods in both directions.

The Field Coordinator, Shan State consulted fish vendors in Kengtung main fresh product market on 30 May 2019 to access interest in collaborating with MYSAP to test the use a cool box and ice to reduce product temperature, to keep flies and insects off the product and to increase aquatic product freshness and shelf-life. After scoping discussions with vendors, only one fish vendor was interested in collaborating with MYSAP to improve her storage and display practices. However the vendor, who sold fish at 2-3 markets daily, said she would be unable to store or move the ice box between markets and so the idea was shelved.

To determine what activities the inland component of MYSAP should prioritize and implement, partner NGO's were asked in May 2019 to consult women to determine which processing activities were in greatest demand. Feedback from over 1,000 direct beneficiary households collected by Ar Yone, BRAC Myanmar and Malteser International was that small-scale fish producers easily sold all their fish locally in their village or to fish wholesalers, except when fish harvests were usually large. For most MYSAP dbh there was no urgent need to learn about fish processing.

Despite this, the inland component of MYSAP requested and obtained DoF approval for Daw Khin May Kyi, Deputy Fisheries Officer, of the Institute of Fisheries Technology to deliver three training courses each of two days duration, with U Thein Kyi (ex-DoF) engaged as a national consultant. The training focused on hygiene, fish quality, food safety, reducing post-harvest fish losses and preservation of fish by salting, drying, pickling and fermentation and pasting. A target of at least 80% women was set for the preservation training courses which were targeted at small-scale fish vendors from local markets and the wives of small-scale fish producers.

The table below shows that 90 people (63 women – 70%) were trained in October and November 2019 on the three preservation courses of which 13 (all ♀) were fish vendors.

Location	Dates	Fish vendors	MYSAP Inland household member	NGO staff	MYSAP Inland staff	TOTAL
Shwebo	22-23 October 2019	03 (03 ♀) from Inland farmers	19 (15 ♀)	09 (05 ♀)	04 (02 ♀)	35 (25 ♀)
Naung Shan Village, Kengtung	29-30 October 2019	05 (05 ♀) 1 from Young Kham market and 4 from Kengtung market	17 (11 ♀)	08 (03 ♀)	04 (02 ♀)	34 (21 ♀)
Village, Kale	05-06 November 2019	05 (05♀) all Inland farmers	18 (12 ♀)	02 (02 ♀)	03 (02 ♀)	28 (21 ♀)
TOTAL		**13** (13 ♀)	**54** (38 ♀)	**19** (10 ♀)	**04** (02 ♀)	**90** (63 ♀)

Training materials for the preservation training course were provided in Myanmar language and in Khun Shan language for participants in Kengtung Township. In addition, Malteser International staff completed pre- and

post-test forms for non-literate participants and sat at tables to provide simultaneous local dialect translations including Shan, Akha and Lahu dialects to ensure that all course participants were fully engaged. Similarly in Kale, Ar Yone Oo staff completed pre- and post-test forms for non-literate participants in Kale and sat at tables to provide simultaneous local Chin dialect translation to ensure that all course participants were fully engaged.

Photo 45. Group photo of the Fish Preservation and Quality Control training course conducted at the Department of Fisheries Hatchery, in Shwebo Township, 22-23 October 2019.

Photo 46. Fish preservation course participants display salted, dried and pickle/fermented fish products produced during training at Naung Shan Village, Kengtung Township, 29-30 October 2019.

MYSAP Inland funded the travel costs of Ms Moet Moet, BRAC Myanmar Aquaculture Technical Officer and Ms Chu Saw, BRAC Myanmar Community Facilitator to attend an intensive training course funded by the DoF entitled, *Fish Processing and Quality Control for Fishery Products* conducted at the Sagaing Fishery Technical School, 17-21 August 2020. Sayama May Kyi, from the Department of Fisheries, Institute of Fisheries Technology, was the lead trainer.

3.7.5 Nutrition training at micro-credit locations and health clinics

When the MYSAP Inland sub-grant agreements for the 3 NGO's were approved for the 2020-21 season, they were modified to include the delivery of nutrition awareness training at health clinics for all 3 NGO's and to include the delivery of nutrition awareness training at micro-credit loan collection and interest repayment locations where women in particular congregated regularly for Ar Yone Oo and BRAC Myanmar. The target numbers agreed for nutrition awareness training delivery are given in the table below.

Agency	Township	Region or State	Health clinics	Micro-credit location	Total #
Ar Yone Oo	Kale	Sagaing	240	500	740

Agency	Township	Region or State	Health clinics	Micro-credit location	Total #
BRAC Myanmar	Shwebo	Sagaing	350	1,250	1,600
Malteser International	Kengtung	Shan State	120	0	120
		Total	**710**	**1,750**	**2,460**

After easing of movement restrictions in Shwebo, between 11-20 November 2020 BRAC Myanmar staff delivered nutrition awareness raising training to 244 people (223 ♀; 91.4%) attending micro-credit loan repayment locations.

Plans to provide nutrition training at health centres in Kengtung Township were postponed in Q4 of 2020 because the staff of the health centres were too busy dealing with COVID-19 prevention and quarantine, to work collaboratively with Malteser International staff to coordinate bringing groups of women together for nutrition training.

To reduce the likelihood of COVID-19 contagion and spread BRAC Myanmar stopped group attendance for the repayment of micro-credit loans in January 2021, where they had planned to deliver nutrition awareness training to a target of 1,250 women. BRAC Myanmar staff instead provided nutrition awareness training to groups of a maximum of five women at a time when loans were disbursed at the BRAC Myanmar Shwebo Township office.

In total BRAC Myanmar were able to train 808 people (763 ♀) on nutrition awareness at health clinics and at micro-credit receipt and repayment locations. This was short of the 1,600 target agreed in the SGA, but circumstances in the field including COVID-19 travel and meeting restrictions and safety concerns for staff and women during, the State of Emergency and the Civil Disobedience Movement protests, were beyond the control of BRAC Myanmar.

Malteser International under an agreement with mid-wives commenced nutrition awareness training in Kengtung Township on 07 January 2021 for pregnant women and women with children under the age of five years old. To 30 April 2021, a total of 194 people (193 ♀) women were trained at 5 different Ministry of Health and Sport health centres, which was more than the planned total number of 120 for Malteser International.

To 30 April 2021 Ar Yone Oo plans provided nutrition awareness raising training for a total of 818 people (all ♀), including 543 and 275 women trained at micro-credit repayment locations and at 8 health clinics in Kale Township.

Despite the constraints imposed by a) the state of emergency and civil disobedience movement protests and b) Covid-19, the 3 collaborating NGO's provided nutrition awareness training to a total of 1,820 people (1,774 ♀; 97.5%) at micro-credit locations and health centres, which was 26% short of the planned target of 2,460, though under the circumstances was an impressive achievement.

Township	Health clinics	Micro-credit	Total
Kale	275 (275 ♀)	543 (543 ♀)	818 (818 ♀)
Shwebo	444 (420 ♀)	364 (343 ♀)	808 (763 ♀)
Kengtung	194 (193 ♀)	0	194 (193 ♀)
TOTAL	**913 (888 ♀)**	**907 (886 ♀)**	**1,820 (1,774 ♀)**

Photo 47. Malteser International staff member delivering nutrition raising awareness training at a health clinic in Kengtung Township, Shan State.

3.7.6 Nutrition and MDDW survey

In May 2019 using the same questionnaire format used by Mekong Economics Limited for the baseline survey conducted April 2018, the Data Management Officer provided training and conducted a mid-term minimum dietary diversity of women (MDD-W) and household fish consumption survey in Kale, Shwebo and Kengtung townships between 06-10 May 2019, 13-17 May 2019, and, 20-24 May 2019 respectively. 250 women of reproductive age (15 to 49 years of age) from 250 dbh were interviewed on the food, fish and food groups eaten in the previous seven (07) days.

A total of 19 people (09 ♀) were trained in the three survey methodologies being 02 (01 ♀) Ar Yone Oo staff, 07 (04 ♀) BRAC Myanmar staff and 08 (04 ♀) Malteser International staff, plus, 2 MYSAP Inland Field Coordinators (both ♂).

MDD-W and fish consumption survey data was collected by the Aquaculture Technical Officers and the Community Facilitators of the NGO's, plus the Data Management Officer and the Field Coordinators for the Sagaing Region and Shan State using android phones.

The mid-line MYSAP Inland nutrition survey including MDD-W, fish consumption and the proportion of cultured aquatic products consumed by low-income consumers was finalized and approved for dissemination by MYSAP on 20 November 2019.

In May 2020 the MYSAP Inland Data Management Officer designed and oversaw a follow-up MDD-W survey, to that conducted in May 2019 at the request of MYSAP. The MDD-W questionnaire, which had to be conducted by mobile phone because of COVID-19 restrictions, was pre-tested on 26 May 2020. The Data Management Officer delivered virtual training on 27 May 2020 for a total of 26 (13 ♀) Ar Yone Oo, BRAC Myanmar and Malteser International staff on conducting the MDD-W questionnaire survey by mobile phone and entering the data directly into the digital platform KoBo Toolbox. Interviews of a sample of 290[14] of the 1,081 direct beneficiary households serviced by the 3 NGO's in the 2019-20 culture season commenced on 31 May 2020 and were completed by 05 June 2020.

[14] A sub-sample of 284 from a total of 1,081 provides 95% confidence limits in the results.

NGO	Date trained	♂ trained	♀ trained	TOTAL trained
BRAC Myanmar	26 May 2020	04	06	10
Ar Yone Oo	27 May 2020	03	03	06
Malteser International	27 May 2020	06	04	10
TOTAL		**13**	**13**	**26**

The key findings for MYSAP Inland direct beneficiary households were:

- The mean number of meals eaten per week that contained fish increased from 5.98 in 2019 to 7.36 in 2020.
- The mean number of meals eaten per week that contained small indigenous fish species (SIS) increased from 1.47 in 2019 to 3.24 in 2020.
- The mean overall MDD-W of women increased from 5.0 in 2019 to 6.1 in 2020.
- The proportion of fish eaten by poor and vulnerable direct beneficiary households sourced from culture increased from 69.9% in 2019 to 93.5% in 2020.
- The mean weekly number of household meals containing processed fish was 4.67.
- The main processed fish product types consumed were i) fish (and shrimp) pastes and ii) dried fish (and shrimp).

MDD-W and fish consumption surveys were again included in the MYSAP Inland end-line survey the results conducted in April 2021. The end-line survey questionnaire survey results are detailed in section **3.9 End-line survey**, of this report.

3.7.7 Post-harvest innovation consultancy

Following an open advertisement on the WorldFish website for consultant input on *Post-harvest innovations in the fish value chain*, a selection committee unanimously selected BoPInc from the 3 proposals submitted by the closing deadline on 23 March 2020.

Following a pre-test in April 2020, in May 2020 staff of the inland component of MYSAP contacted 41 people (32 ♀) previously trained by MYSAP on post-harvest value addition, that were fish vendors, fish wholesalers and fish processors from Pinlaung (11), Kale (5), Shwebo (14) and Kengtung (11) Townships, and conducted a computer assisted telephone interview (CATI) questionnaire survey to assess their interest in receiving post-harvest innovation training, and to gather information on their internet and digital platform use and mobile phone types. The Team Leader, wrote a blog based on the report produced on the mobile phone and digital access and capability that was uploaded on both the WorldFish and FISH CRP websites at the links below.

https://fish.cgiar.org/news-and-updates/news/mysap-inland-supports-small-scale-fish-farmers-and-fish-processors-during

http://blog.worldfishcenter.org/2020/06/mysap-inland-supports-small-scale-fish-farmers-and-fish-processors-during-covid-19/

On 09 June 2020, MYSAP approved cost sharing (50:50) of the post-harvest innovation consultancy input for 3 MYSAP townships (Kale, Shwebo, and Kengtung) and 3 Fish for Livelihoods (USAID funded) townships (Pekon, Madaya and Ngape).

Unfortunately despite many virtual meetings between the Team Leader, BoPInc, and the WorldFish Myanmar Gender and Value Chain Advisor, and the WorldFish Myanmar Nutrition Advisor from April to July 2020, on 22 July 2020 the inland component of MYSAP and Fish for Livelihoods both agreed to end discussions with BoPInc

for the consultancy, as their proposed final budget was far too expensive.

On 17 August 2020, the inland component of MYSAP signed an international consultancy contract with Asper Consulting Limited to provide consultancy input to conduct scoping, develop extension and training materials and roll-out training on post-harvest innovations for fish processors, processed fish retailers, processed fish wholesalers, fresh fish retailers, and fresh fish wholesalers and for selected staff of Ar Yone Oo, BRAC Myanmar and Malteser International in Kale, Shwebo and Kengtung Townships.

Asper Consulting Limited designed and shared with MYSAP Inland post-harvest and food safety scoping questionnaires (semi structured/Key Informant Interviews) and focus group discussion guidelines for the above mentioned actors along the fish value chain. Following feedback from the inland component of MYSAP, these were finalized, translated into Myanmar language and entered into KoBo Toolbox.

All 27 NGO staff attended virtual training on data collection conducted by Asper Consulting Limited on 07, 09 and 11 September 2020.

Organization	**♂ trained**	**♀ trained**	**Total # trained**
Ar Yone Oo	2	4 (66.7%)	6
BRAC Myanmar	5	5 (50.0%)	10
Malteser International	7	4 (36.4%)	11
MYSAP Inland	2	6 (75.0%)	8
TOTAL	**16**	**19 (54.3%)**	**35**

On 15 October Asper Consulting Limited facilitated a half day training session on Focus Group Discussion (FGD) meetings which all 17 interviewers joined. Seventeen (6 ♀) field staff of the 3 NGO partners of MYSAP Inland, being 5, 8 and 4 staff from Ar Yone Oo, BRAC Myanmar and Malteser International respectively, sampled 92 (80 ♀; 87%) fish value chain actors, (Kale 27, Shwebo 53 and Kengtung 12) as part of the Asper Consulting Limited post-harvest innovation consultancy during October 2020.

Township	**Fresh fish wholesaler**	**Fresh fish retailer**	**Fish processor**	**Processed fish wholesaler**	**Processed fish retailer**	**Total #**
Kale	5 (5 ♀)	14 (12 ♀)	4 (1 ♀)	0	4 (4 ♀)	**27 (22 ♀)**
Shwebo	13 (8 ♀)	24 (24 ♀)	12 (10 ♀)	0	4 (4 ♀)	**53 (46 ♀)**
Kengtung	2 (2 ♀)	9 (9 ♀)	0	0	1 (1 ♀)	**12 (12 ♀)**
Total #	**20 (15 ♀)**	**47 (45 ♀)**	**16 (11 ♀)**	**0**	**9 (9 ♀)**	**92 (80♀)**

A focus group discussion (FGD) meeting was held in Kale Township with 6 (all ♀) fresh fish retailers on 03 November and with 4 (1 ♀) processed fish retailers (smoked rohu) in Kale Township on 04 November 2020.

Separate focus group discussions (FGD) meetings for 12 (all ♀) fresh fish retailers, and 4 (2 ♀) Malteser International staff were held on 09 November 2020 in Kengtung Township.

Separate focus group discussions (FGD) meetings of 5 (3♀) fresh fish retailers and 7 (all ♀) fish processors were held in Shwebo Township on 13 and 14 November 2020.

The Asper Consulting Limited scoping mission report was finalized on 18 December 2020 after incorporation of feedback from the inland component of MYSAP. Thereafter Asper Consulting Limited, MYSAP Inland and Fish for Livelihoods staff co-designed and agreed an English version of a *Facilitator Guide for Good Post-Harvest Practices for Fresh Fish Trading*. MYSAP and Fish for Livelihoods share funded (50:50) the translation of the facilitator guide into Myanmar and Big Shan languages.

Following a Zoom meeting on 26 February 2021 conducted by Asper Consulting Limited to check the internet connectivity at the 3 NGO offices, an Asper Consulting Limited national post-harvest consultant delivered 1.5 hour virtual training sessions (15.00 – 16.30 hours) for 5 days on 01, 03-05 and 08 March 2021 to field test the facilitator guide for peer to peer training entitled, *Good post-harvest practices for fresh fish trading* with NGO staff in small COVID-19 safe groups. On 03 March 2021, it was too dangerous to leave the home in Kale, so no Ar Yone Oo staff attended that day.

Date	Ar Yone Oo	Kale vendors	BRAC MM	Shwebo vendors	Malteser International	Kengtung vendors	Total
01/03/2021	6 (4 ♀)	5 (5 ♀)	6 (5 ♀)	0	4 (3 ♀)	5 (5 ♀)	26 (22♀)
03/03/2021	0	0	6 (5 ♀)	0	4 (2 ♀)	5 (5 ♀)	15 (12 ♀)
04/03/2021	3 (1 ♀)	5 (5 ♀)	6 (5 ♀)	0	4 (1 ♀)	5 (5 ♀)	23 (17 ♀)
05/03/2021	2 (0 ♀)	5 (5 ♀)	6 (5 ♀)	0	4 (2 ♀)	5 (5 ♀)	22 (17 ♀)
08/03/2021	3 (1 ♀)	5 (5 ♀)	6 (5 ♀)	0	4 (3 ♀)	5 (5 ♀)	23 (19 ♀)

A range of 15-26 people (12-22 ♀) including 10 vendors (all ♀) from Kale and Kengtung Townships and NGO staff from Ar Yone Oo, BRAC Myanmar and Malteser International joined the training and gave feedback to improve the *Good post-harvest practices for fresh fish trading*.

Asper Consulting Limited delivered virtual post-harvest best practice training by Zoom for a total of 21 (10 ♀) NGO staff on 07 April 2021. On 08 April 2021 a total of 20 (12 ♀) NGO staff were given virtual training on how to facilitate training on post-harvest best practices for vendors.

Date	Ar Yone Oo	BRAC Myanmar	Malteser International	MYSAP Inland	Total
07/04/2021	0	7 (4 ♀)	11 (4 ♀)	3 (2 ♀)	21 (10 ♀)
08/04/2021	4 (2 ♀)	7 (4 ♀)	6 (4 ♀)	3 (2 ♀)	20 (12 ♀)

The NGO staff gave further feedback on the facilitator guide on *Good post-harvest practices for fresh fish trading* which was then updated and finalized in English, Myanmar and Big Shan languages.

With MYSAP approval the English language of the *Facilitator Guide for Good Post-Harvest Practices for Fresh Fish Trading* was uploaded on 30 April 2021 onto the WorldFish website for dissemination on 21 May 2021.

Myanmar and Big Shan language versions of the Asper Consulting Limited produced *Facilitator Guide for Good Post-Harvest Practices for Fresh Fish Trading* were also uploaded onto the WorldFish website on 18 May 2021 for dissemination.

(https://dx.doi.org/20.500.12348/4722 - English language version)

(https://hdl.handle.net/20.500.12348/4748 – Myanmar language version)

(https://hdl.handle.net/20.500.12348/4749 – Shan language version)

3.7.8 Community testing of a low cost fish drier and powdered SIS

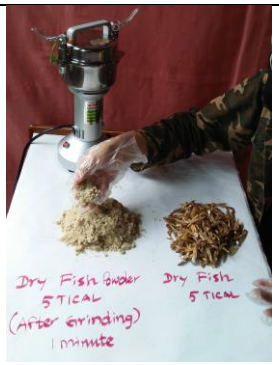
A prototype collapsible portable low technology blue nylon net mesh container for drying fish was made up in late August 2019 and tested in early September 2019. The design was primarily intended to keep flies, other insects and rodent pests off the fish during drying to reduce the likelihood of, or to prevent, contamination and to keep the drying fish food safe.

Unfortunately the heavy stainless steel frames stretched the blue nylon netting of the first prototype drier sufficiently for small flies to enter the container and to contaminate the drying fish. In late September 2019 a modified version of the collapsible blue nylon net mesh container was ordered with lighter stainless steel frames and stronger blue nylon net mesh material. The WorldFish Myanmar, Nutrition Advisor tested the second version of the portable drier in November and December 2019 and gave feedback in her report on 24 January 2020. Sixty of the third prototype low technology, portable fish driers were fabricated and distributed in May 2020 to 60 households (20 Kale, 20 Shwebo and 20 Kengtung Townships) each with a child under 5 years of age for community testing of the low-cost portable fish drier to reduce fly and insect infestation, and to produce a dried fried small indigenous fish species (SIS) powder as a complementary feed for infants above six months of age. However the SIS powder was not to be fed to infants before laboratory tests confirmed that the SIS was food safe.

Photo 48. Prototype collapsible net container for drying fish.

Photos 49 and **50**. Small flies were able to enter the first prototype collapsible net container.

Guidelines in English with input from Dr Shakuntala Thilsted, WorldFish nutrition advisor and 2021 World Food Prize Laureate, for the production of powdered SIS fish were translated into Myanmar language by MYSAP. On 13 July 2020, the inland component of MYSAP finalized the Myanmar language booklet *Pilot testing of a low-cost portable fish drier in the communities: Guide for preparing dried small fish powder at home*. Copies in Myanmar language were given to each of the 60 collaborating households. Groups of 5 households were also provided with a multi-function grinder by MYSAP to make a fine powder of the dried SIS

	
Photo 51. Portable low-cost fish driers supported by MYSAP are being tested by 60 direct beneficiary households in communities.	**Photo 52**. Multi-function electric grinder used to powder the dried SIS.

Two hundred copies of the booklet in Myanmar language were printed for National Nutrition Promotion Month. On 28-30 July 2020, the MYSAP Inland Data Management Officer provided training for 27 (12 ♀) NGO and MYSAP Inland staff on using KoBo to enter feedback data from the women that received the low-cost portable drier for testing in the communities.

Township	Organization	Training Date	Participant				Total		
			Partner		WF				
			♂	♀	♂	♀	♂	♀	Total
Kale	Ar Yone Oo	28 July 2020	3	3	1		**4**	**3**	**7**
Shwebo	BRAC Myanmar	29 July2020	5	5			**5**	**5**	**10**
Kengtung	Malteser International	30 July 2020	6	3		1	**6**	4	**10**
			14	**11**	**1**	**1**	**15**	**12**	**27**

Testing of the driers and the production of powdered dried SIS using a kitchen blender in the community was conducted during July to September 2020. Field staff from the 3 NGO's collected feedback from the 20 households in each township and entered the data into KoBo Toolbox by 23 October 2020.

The MYSAP Inland Team Leader and Quennie Rizaldo, jointly drafted an article highlighting the fish drier and powdered SIS production that was published in the SUN CSA Myanmar Quarterly Q3 of 2020 newsletter.

The MYSAP Inland M&E Coordinator and a WorldFish Myanmar national consultant on Social Science finalized the MYSAP report on *Piloting a Low-Cost Fish Drier* on 06 January 2021.




Photos 53, 54, 55 and **56**. Community testing activities of the fish drier.

A total of 16 kg of dried powdered SIS samples taken from the 60 collaborating households were collected and couriered via Mandalay to Yangon and were tested for 20 different food safety parameters and proximate analysis (measurement of moisture, crude protein, fat, ash and salt levels) was conducted at the DoF QCRS Analytical Laboratory.

The 20 food safety parameters tested were:

Total plate count; Coliforms; *Escherichia coli*; *Staphylococcus aureus*; *Salmonella*; *Vibrio cholerae*; *Listeria monocytogenes*; *Vibrio parahaemolyticus*; *Shigella*; *Enterobacteriaceae*; yeasts; moulds; Aflatoxin B1; histamine; DDT; heptachlor; dieldrin, cadmium, mercury and lead.

The proximate analysis of the dried SIS powder showed that the crude protein content was between 51.4-54.9%, the moisture content between 9.6 in Kale Township to 11.4% in Kengtung Township, while the salt content was relatively low ranging from 2.3% in Kale Township to 3.7% in Kengtung. All the food safety parameters results are available in the MYSAP Inland report entitled, *Piloting a Low-Cost Portable Fish Drier and Food Safety Test Results of Powdered Dried Fish*, which was uploaded onto the WorldFish website on 12 May 2021 and disseminated on 24 May 2021 (Report on Piloting a Low-Cost Portable Fish Drier and Food Safety Test Results of Powdered Dried Fish (worldfishcenter.org).

The food safety test results for all 20 food safety parameters tested were within food safe levels for the dried SIS product from Kale, Shwebo and Kengtung Townships and the dried powdered SIS was food safe for infants over 6 months of age, mixed with rice soup and mashed up vegetables.

Thelma Tun-Thein, MS, RDN, IBCLC, RLC, Registered Dietitian/Nutritionist and International Board Certified Lactation Consultant stated that feeding the dried SIS powder "would be helpful for increasing protein, with the analysis showing that all items tested fall within the acceptable ranges….. I think this powder will be a wonderful nutrient and flavour enhancer. The salt content is also low, so this complements our typically high sodium Myanmar diet."

Further promotion of the pilot fish drier and feeding the dried powdered SIS as a complementary food for infants from six months of age by MYSAP and other agencies in Myanmar will encourage household production of food safe dried fish, while extending the availability of dried hygienic food safe aquatic products for household consumption.

3.7.9 Tinned fish as possible complementary infant feed

Staff of the inland component of MYSAP and WorldFish Myanmar investigated the range of fish based options for complementary feeding of young children from six months onwards through market survey sampling to access seasonal availability of different fish species and the impact on fish supply volume and price.

Tinned sardines and mackerel were also available in many townships of Myanmar. Everything in the tin is edible, the bones are soft and can easily be mashed up with a spoon and fed to children between 6 months and five years of age. Tinned fish is sterile and so has a long shelf life and tinned fish can be eaten without further cooking, as it has been pressure-cooked.

In September 2019 staff of the inland component of MYSAP and the 3 NGO's checked on the availability of different tinned sardine and mackerel products in Kale, Kengtung and Shwebo townships. The nutritional details on the tin labels were used to assess the cost per g of fish protein in tinned fish products and to compare that against the cost per g of fish protein sourced from fresh rohu (*Labeo rohita*), which was the major fish species cultured in Myanmar, bought from local markets.

Using FAO data[15], and assuming that tinned mackerel contained 21% protein, tinned sardine contained 23% protein, and unspecified fish species were assumed to contain 20% protein, the price per g of fish protein for tinned fish available in the MYSAP townships was calculated to be between MMK 27 – 43.

In comparison fresh rohu purchased from the market at MMK 3,000 per viss, assuming an edible portion of 83% and an average protein content of 18%, meant that the price per g of fish protein sourced from fresh rohu in the market was MMK 12.5 per g, which was less than half.

On a weight by weight basis fresh fish (rohu) was a much cheaper source of fish protein than tinned fish. However with the added convenience of tinned fish, its long shelf life and no requirement for a fridge or further cooking, tinned fish can still be a back-up fish source, which can easily and perhaps more conveniently be fed to young children by busy multi-tasking mothers, than fresh fish.

3.7.10 Stacked value chain study of fish smoking and improved fish smoker testing

After openly advertising on the WorldFish website (Consultant Smoking Study) for consultant input to conduct a stacked value chain analysis of smoked fish from Kale Township, the inland component of MYSAP issued the Chinbridge Institute with a service contract on 02 March 2020.

The WorldFish Myanmar Gender and Value Chain Advisor and the WorldFish Myanmar Social Awareness Officer joined and provided input to the scoping mission in Kale 08-13 March 2020.

The Chinbridge Institute finalized the *Stacked value chain analysis study of smoked rohu from Kale Township, Sagaing Region, Myanmar* on 14 July 2020 and with MYSAP approval the report has been widely disseminated.

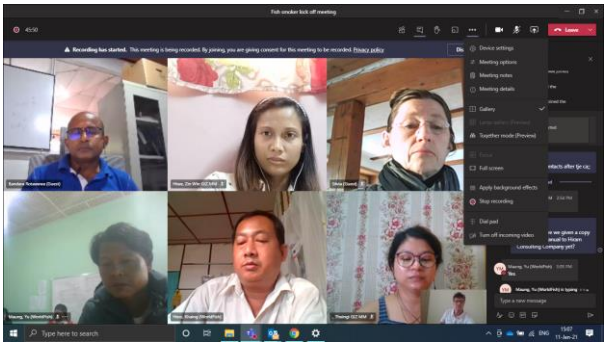
The inland component of MYSAP openly advertised inviting construction companies to quote against specifications for construction of 2 FAO FTT Thiaroye improved fish smokers in Kale Township, while MYSAP contracted an international consultant to provide design drawings, bills of quantities for the FTT Thiaroye smoker, a protocol for testing the smoker and virtual input to oversee construction and testing of the improved smokers.

The Team Leader drafted an article on the stacked value chain study of smoked rohu and MYSAP's plans to support piloting of 2 improved smokers, which was uploaded onto the MYSAP Facebook website on 23 November 2020 and also republished on the Voice national digital magazine at the links given below:

https://www.facebook.com/myanmaraquaculture/posts/2786809121590143?__cft__[0]=AZXI246QLSq2kBhHD3RnHU1vi9CXPR3EWUtYmH10yK8VvJWRKmOnQbPSihyj_1Dtv3oZqQG-d6euYuDHFaQOrh3XAMM3hDnQa9vYatGzd_D7E1CiZ3QMBxswdHZRZK4RfCsj5542tV_06lgQZMyHViGk&__tn__=%2CO%2CP-R

http://thevoicemyanmar.com/news/44645-kig

A virtual kick-off meeting was held on 11 January 2021 to discuss and agree how to take the construction of the improved smokers forward.



[15] FAO. http://www.fao.org/flw-in-fish-value-chains/value-chain/processing-storage/canning/en/

The inland component of MYSAP signed a service contract on 14 January 2021 for the Hiram Construction Company to construct 2 FAO FTT Thiaroye improved fish smokers by 14 February 2021. Work commenced with site clearance and lay out on 15 January 2021. The 2 photos below show the status of the smoker construction at the 2 village locations on 25 January 2021.

Photo 57. Daw Vuli, Pyin Khone Lay Village Kale Township.

Photo 58. U Lala, Nay Gyi Kong Village, Kale Township.

MYSAP Inland funded the translation into Myanmar language of *Construction guidelines for an improved FAO FTT Thiaroye smoker*, and a *Guide for operation and testing of an improved FAO FTT Thiaroye smoker*, both of which were drafted by the MYSAP contracted international smoking consultant and edited by the MYSAP Inland Team Leader.

The Hiram Construction Company completed the construction of the improved fish smokers as scheduled on 14 February 2021. See the photographs of the completed smokers below.

Photo 59.The completed improved fish smoker of Daw Vuli, Pyin Khone Lay Village, Kale Township.

Photo 60.The completed improved fish smoker of U Lala, Nay Gyi Kong Village, Kale Township.

The Hiram Construction Company service contract required the smokers be operated and any faults rectified before the final construction invoice could be paid. Therefore testing of the smokers, was conducted in Pyin Khone Lay Village with Daw Vuli on 04-05, 08-11 March 2021 and in Nay Gyi Kong Village, with U Lala, on 08-09 and 16 March 2021. MYSAP funded the rohu used in the testing of the smokers, because there was no guarantee that the product could be sold. The international smoking consultant provided data collection formats on 09 March 2021 for use during smoker testing to track the weight loss due to gutting, hot smoking and oven cooking, and for assessing the smoking duration, and the quantity of fuel wood and sawdust used for smoking.

Bandara Rotawewa, international consultant submitted his final consultancy report on improved rohu smoking in Kale Township to MYSAP on 09 May 2021. Key findings from the MYSAP funded consultancy input and the pilot activity were that the improved FAO FTT Thiaroye smoker:

- Had a processing capacity of 49.0-61.3 viss (80-100 kg) of fresh fish per batch.
- The smoking time was reduced from 12 – 14 hours for the traditional smoking method, to 7 hours.
- Used only one-third the amount of fuelwood and sawdust per weight of smoked fish produced and therefore produced less greenhouse gas emissions.
- Operators and family members were less exposed to smoke, which may reduce the likelihood of respiratory infections.
- Required less handling and turning of the smoking fish and was more ergonomic and easier to operate.
- The moisture content variation for all 3 size grades of smoked was less and the product had more consistent quality.
- Had a mean taste panel score of 25.5 across the six sensory parameters compared to 20.6 for traditionally smoked rohu, indicating that the smoked product from the improved FTT smoker was preferable.
- Buyers preferred the FTT smoked product because it had an attractive golden colour and looked better than the darker traditionally smoked fish.
- Daw Vuli, on her own initiative, has diversified her smoking product output and now uses the MYSAP supported FTT improved smoker to produce and profitably sell smoked pork at the weekends.

Outputs from this MYSAP funded consultancy input and pilot activity, in addition to the construction of the 2 FTT improved smokers were Myanmar and English language guide documents entitled:

- *Guide for the operation and testing of an FTT improved smoker*; and
- *Guide for the construction an FTT improved smoker in Myanmar*.

The English and Myanmar language versions of guide documents were uploaded onto the WorldFish MEL system and were disseminated via the WorldFish website from 24 May 2021 at the share links below:

Guide for the construction of an FTT smoker in Myanmar (worldfishcenter.org)
Guide for the construction of an FTT smoker in Myanmar (Burmese version) (worldfishcenter.org)
FTT smoker operation and testing protocol guidelines (worldfishcenter.org)
FTT smoker operation and testing protocol guidelines (Burmese version) (worldfishcenter.org)

An English language success story entitled, *Improved fish smoker delivers a superior product*, was finalized on 18 May 2021 and was sent for translation into Myanmar language. The English and Myanmar language versions of the smoker success story were submitted to MYSAP on 26 May 2021 and approved for uploading onto the Greenovator, Green Way mobile phone application, and MIMU website. The success story was uploaded onto the MIMU website and is available at the following link (http://themimu.info/node/109418) and to Greenovator for uploading onto the Green Way app.

The English and Myanmar language versions of the *Success story: Improved smoker delivers a superior product*, was uploaded onto the WorldFish MEL system on 09 June 2021 and disseminated via the WorldFish website at the following links:

English version: https://mel.cgiar.org/reporting/download/report_file_id/27431

Myanmar version: https://mel.cgiar.org/reporting/download/report_file_id/27433

Additionally the MYSAP supported FTT improved smoker activity proved that when face-to-face visits were impossible, that virtual mentoring and guidance could be provided, even when internet connectivity was weak with low bandwidth, via freely available international call platforms like Viber.

Asper Consulting Limited have used the English version of the MYSAP supported *Guide for the operation and testing of an FTT improved smoker* as a reference for post-harvest innovation consultancy training that is being developed and which will be delivered for the USAID funded Fish for Livelihoods project in their townships.

On 29 June 2021, WorldFish HQ communications produced a draft blog on the pilot improved smoker activity entitled, *Improved fish smoker delivers superior products in Myanmar*. The blog will be finalized and uploaded onto the WorldFish website in August 2021.

The international consultant Bandara Rotawewa finalized the draft on 10 July 2021 of a paper entitled, *FAO-Thiaroye processing technique (FTT) in Asia and the Pacific: revisions and lessons learned*, which was submitted to the African Network of Fish Technology and Safety – 2021 webinar, for publication. The MYSAP Inland Team Leader and Silvia Kaufmann were co-authors. The international consultant submitted the finalized version of the papter to the ANFTS for publication on 22 July 2021.

3.7.11 Parasite screening study

The inland component of MYSAP engaged Fish Vet Group Asia Limited in August 2019 to test fish and shrimp paste samples collected from Myanmar to determine if there were any cysts of parasites of human health concern.

Quennie Rizaldo, WorldFish Myanmar Nutrition Advisor and Ziziwah from the Department of Fisheries, collected a total of 41 samples from Bayint Naung and Thiri Mingalar markets in Yangon on 21-23 August 2019. On 15 September 2019, the MYSAP Inland Team Leader hand delivered the samples to Chonburi, Thailand, for analysis by Fish Vet Group Asia Limited.

The Fish Vet Group Asia Limited report on *Screening of fish and shrimp-based pastes for the presence of parasites: An analysis of pastes from Myanmar* was finalized on 04 March. The MYSAP funded parasite screening study of the fish and shrimp paste samples from Myanmar found potential parasite species in 10 of 41 (24%) of the analyzed paste samples.

This important study, highlighted that much of the fish parasite fauna of Myanmar is unknown and requires further study. Prior to the study, only one parasite, the zoonotic nematode *Gnathostoma spinigerum*, had previously been recorded in Myanmar. This is a species that infects several freshwater fish species, and humans can be infected, if they eat raw or insufficiently cooked fish hosting this nematode. The study therefore emphasized the importance of sufficiently cooking fish and shrimp pastes before consumption, to kill the parasite life-cycle stages, and also the need for additional study to identify to parasite species in aquatic products that are of concern for human health.

As a follow-on activity to the parasite screening study, Dr Andy Shinn recommended that screening for parasites be conducted for a selection of commonly cultured fish species in Myanmar. The inland component of MYSAP contacted the Zoology Departments of Yangon University and Mandalay University to discuss how to involve selected staff and students from both universities in a study to collect, preserve and examine culture species for parasites, overseen by Dr Andy Shinn with a remote webinar training element included. However plans to take this screening study forward, were stalled by the COVID-19 pandemic.

3.7.12 Fish market survey reports

With design recommendations from Dr Jimmy Young, ex-Humberside International Fisheries Institute and Stirling University marketing specialist, the inland component of MYSAP commenced monthly collection of data on the quantities and price of captured and cultured fish species in Kengtung market in January 2018. The survey was designed to regularly sample all 4 wholesalers and a representative sample of the fish vendors selling at least 50% of the fish being traded through the market on any sampling day. A proportion of the fish vendors

interviewed each day were considered innovative or leading vendors by their peers. The market survey report for Kengtung main market sampled January-July 2018 by the MYSAP inland component was widely disseminated.

In May 2019, the inland component of MYSAP repeated the market survey of Kale, Shwebo and Kengtung markets, using the sampling protocol used by Mekong Economics Limited for the baseline survey conducted in May 2018, to determine if there had been any change in the amount of captured and cultured fish species sold in these three township markets.

An estimated total amount of 20,075 kg of fish was traded in the Kale, Shwebo and Kengtung markets when sampled in May 2019. The percentage increase in the daily volume of fish traded in the 2019 over the baseline survey data was 101.1%, 14.3% and 345.3% for Kale, Shwebo and Kengtung Townships respectively.

Monthly fish market sampling by the Field Coordinator was restarted in Kengtung Township in January 2019 and ran until November 2019, while monthly fish market sampling was conducted in Kale and Shwebo Townships from April 2019 to March 2020 inclusive.

Dr Kay Khine Nyein, Associate Professor, Meiktila University of Economics was contracted by the MYSAP inland component in October 2020 to clean, analyse and write up reports on the fish market sampling data collected from Kale, Shwebo and Kengtung Township markets. The cleaned data was submitted on 30 November 2020 with the first draft of the Kengtung Township market report on 22 December 2020. Feedback was provided on the report on 25 December 2020. The draft market survey report for Kale Township was provided on 01 June 2021 and feedback given on 03 June 2021. The revised Kale Township report was supplied on 22 June and finalized and approved on 23 June 2021. The draft market report for Shwebo was submitted on 17 June 2021, feedback was provided on 18 June and the report was finalized and approved on 21 June 2021.

All 3 finalized market reports were uploaded onto MEL on 24 June 2021 for dissemination through the WorldFish website (Kale market report - link; Shwebo market report - link; and Kengtung market report - link).

3.7.13 MYSAP Inland IEC materials uploaded to the Green Way mobile phone app

In support of farmer training in the field by NGO staff, the MYSAP Inland IEC Officer developed, tested and refined a whole series of MYSAP Inland leaflets, posters, booklets, fliers, etc., on nutrition topics in Myanmar language, some of which have been translated into Big Shan, and Pa'O. **Annex 3** of this report provides a complete list of MYSAP Inland IEC materials. A few illustrated examples are given below.

MYSAP funded the printing of 50 posters (3 feet x 2 feet) entitled "The first 1,000 days" translated into Khun Shan language and modification of the photographs to include Shan people see **Figure 11** below.

Error! Reference source not found.. MYSAP Inland funded the printing of 50 posters (3 feet x 2 feet) entitled "The f irst 1,000 days" translated into Khun Shan language and modification of the photographs to include Shan people.

MYSAP Inland also funded the printing and lamination of 200 A4 sized brochures on "Culture of Small-Indigenous Fish Species". See Error! Reference source not found. below.

Error! Reference source not found.. Culture of Small-Indigenous Fish Species.

The inland component of MYSAP and the WorldFish Myanmar Nutrition Advisor produced a leaflet in English on the financial and nutrition benefits of stocking SIS in ponds and partial harvesting. The leaflet was designed to promote partial harvesting of SIS every two weeks, commencing six weeks after stocking SIS. Partial harvesting of SIS provides a regular source of income and fish protein for consumption by household members. MYSAP funded translation of the leaflet into Myanmar and printed and disseminated 1,200 copies to dbh and others. The leaflet was also uploaded onto the Greenovator Green Way mobile phone app on 28 September 2019 and onto the Fisheries Information Centre website to further promote SIS culture and partial harvesting.

(https://greenwaymyanmar.com/posts/partial_harvesting_guide)

Myanmar, Khun Shan, and Pa'O language versions of the SIS mola comic poster were uploaded onto the Green Way mobile phone app on 26 February 2020.

https://greenwaymyanmar.com/posts/let_eat_traditional_small_fish_for_health

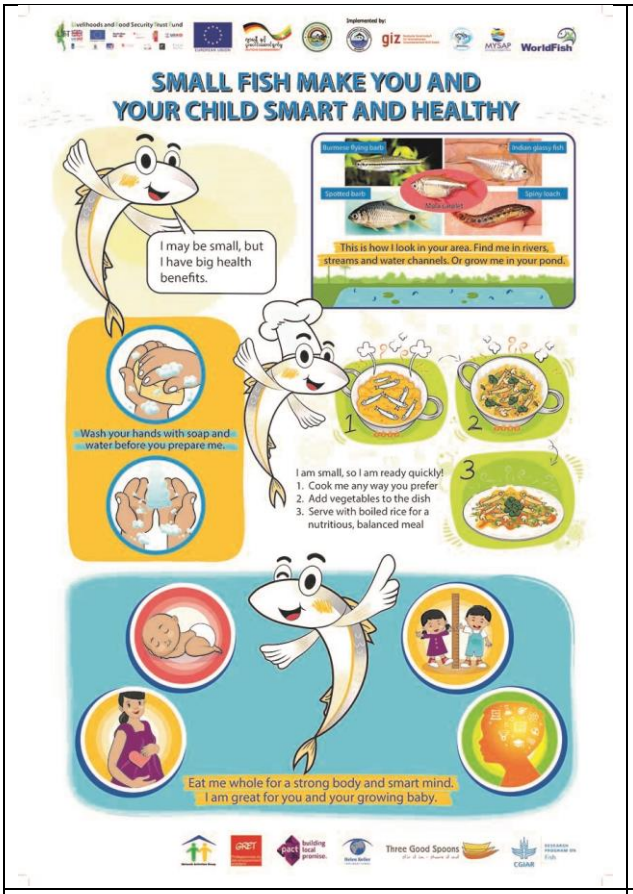


Figure 13. English language poster on the benefits of eating small nutrient-rich fish species.

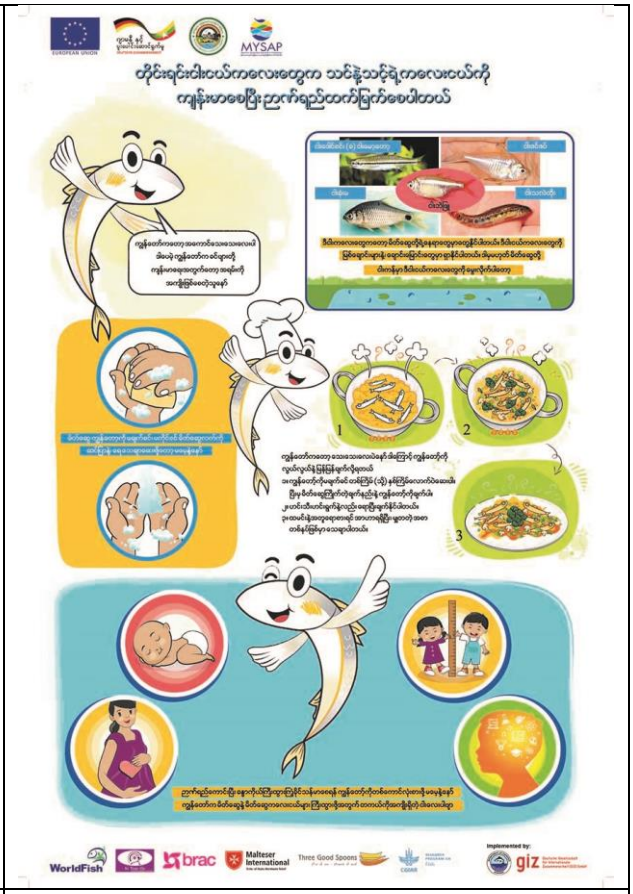


Figure 14. Myanmar language poster on the benefits of eating small nutrient-rich fish species.

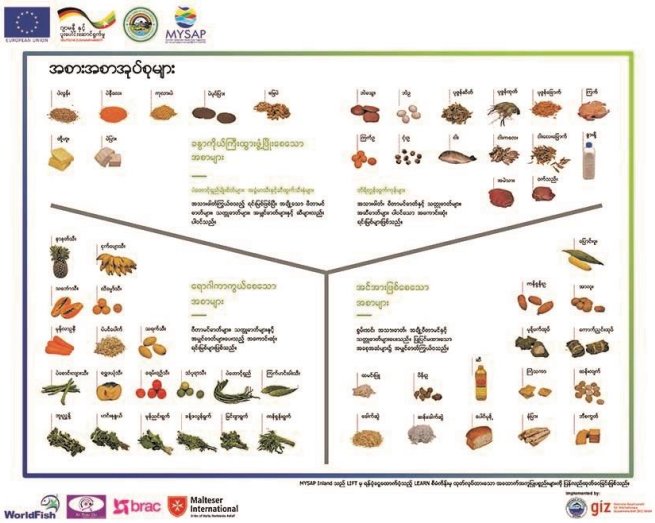


Figure 15. Myanmar language poster of the main food groups.

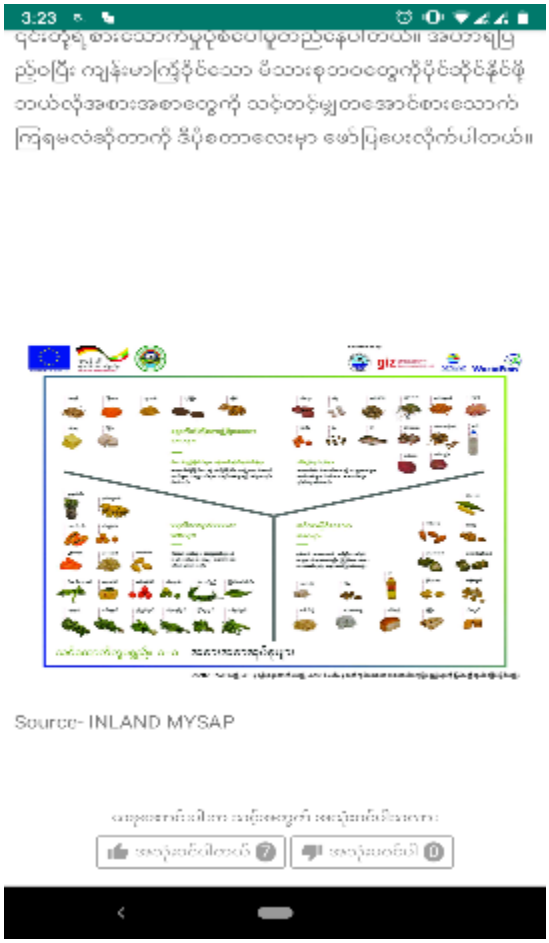


Figure 16. Shows a screenshot of the *Three food groups* poster uploaded onto the 'Nutrition and Health' section of the Green Way app on 22 February 2019.

Nutrition, horticulturalists, livelihoods and communication specialist staff from the inland component of MYSAP, and the Fish for Livelihoods programme collaborated on the joint production of a booklet entitled, *Best management practices (BMP) for vegetable production systems* covering 15 key vegetable species that were important for human nutrition. English and Myanmar language versions of the *Best management practices (BMP) for vegetable production systems* were disseminated via the Green Way mobile phone app', and the MIMU (http://themimu.info/node/109419) and WorldFish (https://dx.doi.org/20.500.12348/4738; https://dx.doi.org/20.500.12348/4739) websites.

Staff of the inland component of MYSAP, Ar Yone Oo, BRAC Myanmar and Malteser International produced a total of 77 small-scale aquaculture and human nutrition training videos (17 Myanmar, 25 Big Shan, 20 Lahu and 15 Arkar languages), during the COVID-19 pandemic period funded by MYSAP. Greenovator, have committed to upload all 77 training videos onto the Green Way mobile phone app by 31 July 2021.

To 14 May 2021 a total of 8,070 people had viewed the 4 nutrition articles, leaflets, and posters uploaded onto the Green Way mobile phone app by the inland component of MYSAP and a total of 26,837 people had viewed the 20 different aquaculture and nutrition articles, leaflets, posters and success stories uploaded onto the Green Way mobile phone app by the inland component of MYSAP.

3.8 Networking

The inland component of MYSAP made arrangements for BRAC Myanmar to host Mr Georgi Chertkov, MSc student supervised by Professor Manfred Zeller, Hohenheim University, to conduct field work for his MSc research thesis study in Shwebo Township from 03-31 May 2019 entitled, *Quantifying Pond and Labour Productivity for Small-Scale Tilapia Farmers in the Central Dry-Zone of Myanmar*.

The inland component of MYSAP made similar arrangements for BRAC Myanmar to host Ms Lizeth Casagua Diaz, Hohenheim University MSc student to conduct field work for her MSc research thesis study, from 12 May – 13 June 2019, entitled, *Analysis of Aquaculture farmers´ organizations in Hta Naung Win Village and Shwe Paw Tune Village in Shwebo Township, Myanmar*.

On 13 October 2019, Lizeth Tatiana Casagua Diaz's MSc thesis study was posted on the Hohenheim University website at the link below:

https://nbn-resolving.de/urn:nbn:de:bsz:100-opus-17990

An English language version of Lizeth's blog on her experience was uploaded onto the CGIAR and WorldFish websites on 19 October 2020.

https://fish.cgiar.org/news-and-updates/news/field-notes-boosting-small-scale-aquaculture-productivity-inland-myanmar
http://blog.worldfishcenter.org/2020/10/field-notes-boosting-small-scale-aquaculture-productivity-in-inland-myanmar/

The MYSAP Inland Team Leader joined a webinar entitled, *Building Forward Better with Aquatic Foods*, a High-Level Partner Event on the role of sustainable, resilient, and inclusive aquatic food systems in driving COVID-19 recovery and global food systems transformation, organized by FAO and the Committee on World Food Security (CFS) on 13 October 2020.

Field staff interviewed people from 10 (1 ♀) different MYSAP direct beneficiary households being 3, 3 and 4 dbh from Kale, Shwebo and Kengtung Townships in the first week of October to seek feedback on the production, sale and consumption of MYSAP supported integrated fish, vegetable and fruit. Quotes from the households were included in a WorldFish blog entitled *Nutrition-sensitive approaches from pond to plate in Myanmar*, which was posted online in January 2021, at the link below.

http://blog.worldfishcenter.org/2021/01/nutrition-sensitive-approaches-from-pond-to-plate-in-myanmar/

Funded by MYSAP, Khaing Kyaw Htoo, attended the virtual Justice Based Approach: Foundation Course delivered in 12 sessions between 03 November and 10 December 2020.

The MYSAP Inland Team Leader delivered a guest speaker presentation to a total of 45 biology and environmental systems students at the NIST International School, Bangkok, Thailand on 25 November 2020 entitled, *Pond culture, pond ecosystems and human nutrition*.

A total of 33 (16 ♀) staff attended MYSAP delivered training by the IEC Officer, the M&E Coordinator and the Field Manager on the use of the i) Miro, ii) Mentimeter and iii) Virtual parking lots, software to make virtual meetings more interactive and stimulating on 17 November 2020.

The MYSAP Inland Team Leader, joined the FAO arranged virtual workshop on 25 November 2020, entitled, *Urgent call for agri-food systems transformation to achieve healthy diets for all* - Special FAO Seminar on Food and Nutrition.

The MYSAP Inland Team Leader and other senior MYSAP Inland staff joined the virtual MYSAP Programme Steering Committee meeting on 02 December 2020.

The Team Leader joined the *MYSAP - Yangon University – Asian Institute of Technology Stakeholder Workshop for the Master's Curriculum in Fisheries & Aquaculture at Yangon University* by Zoom, on 19 January 2021.

The Team Leader joined a MYSAP Aquatic Animal Health virtual workshop on *Presentation of Small Research Projects* on 22 January 2021 and shared MYSAP Inland protocols in Myanmar language for taking fish and shrimp samples for histopathology and PCR testing with the participants, which included Department of Fisheries and university staff.

The MYSAP Inland Team Leader attended the Big Fish Series, *Impacts on COVID-19 on Seafood Value Chains* virtual seminar on 11 February 2021 co-hosted by the University of Stirling's Institute of Aquaculture and the Johns Hopkins Center for a Liveable Future.

As part of the celebrations for the International Day of Women and Girls in Science, the biography of the MYSAP Inland IEC officer was included in the package of promotional material released by WorldFish on 11 February 2021.

The MYSAP Inland Team Leader attended an FAO organized webinar entitled, *Small low-cost fish: from bait to plate*, on 15-16 February 2021.

On 16 February 2021, the MYSAP Inland Team Leader attended a virtual webinar arranged by Australian National University (ANU) Myanmar Research Survey, entitled, *Military coup in Myanmar: what just happened?*

The MYSAP Inland Team Leader attended the WHO, OIE and FAO organized webinar entitled *Antimicrobial resistance is simple to understand, yet it is often misunderstood* on 24 February 2021.

The MYSAP Inland Team Leader and Prof Andy Shinn co-authored an article entitled, *Trichodina a common fish parasite in freshwater ponds*. MYSAP Inland funded translation of the article from English into Myanmar language which was disseminated via the WorldFish web site.

On 08 March 2021, the MYSAP Inland Team Leader provided feedback to an International Water Management Institute Research Assistant on the MYSAP inland component activities to mitigate climate change impacts.

The MYSAP Inland Team Leader attended the Global Aquaculture Alliance webinar entitled, *Best Aquaculture Practices Farm Standard (Issue 3) Overview*, on 11 March 2021.

The MYSAP Inland Team Leaded attended the FAO organized webinar entitled, *Experiences in Implementing Gender Transformative Approaches in the Fisheries and Aquaculture Sector for Food Security and Nutrition*, on 16 March 2021.

3.9 End-line survey

Under a WorldFish arrangement, and at no cost to MYSAP, Dr Alexandros Gasparatos, Associate Professor of Sustainability Science, and Eric Dompreh, Institute for Future Initiatives, Tokyo University provided consultancy input to design and to set the sample frame for the inland component of MYSAP end-line survey. The end-line survey sample frame given below, included a total of 480 interviews, with 150 dbh with only one year of MYSAP support, 150 dbh with two years of MYSAP support and 180 control households from Tachileik and Wetlet with which MYSAP had not worked and which had no support from any fish development project.

Region	Township	# Season 1 dbh to sample	# Season 2 dbh to sample	Total # dbh to sample	# control hh's to sample
Sagaing	Kale	34	40	74	
	Shwebo	60	60	120	
	Wetlet	0	0	0	121
Shan	Kengtung	56	50	106	
	Tachileik,	0	0	0	59
		150	**150**	**300**	**180**

Tokyo University submitted the finalized English questionnaire format for translation and field testing in January 2021. Following translation finalization of the end-line survey questionnaire on 19 February 2021, Myanmar Survey Research checked the questionnaire logic, coded and digitized the end-line questionnaire into the KoBo Toolbox platform under a service contract.

MSR provided training on 25 February 2021 of the MYSAP Inland M&E Coordinator on using the end-line survey questionnaire on the KoBo Toolbox digital platform and how to check and clean data.

On 08 March 2021 the MYSAP Head of Programme instructed MYSAP Inland to conduct its end-line survey by mobile phone only, following the suspension of all field activities.

The finalized digitized MYSAP Inland questionnaire was supplied by MSR on 09 March 2021 and uploaded into KoBo Toolbox by the MYSAP Inland Monitoring and Evaluation Coordinator.

The MYSAP Inland M&E Coordinator provided training on 12 March 2021 for a total of 38 (21 ♀) people including 31 (17 ♀) NGO staff, 6 (3 ♀) staff of the inland component of MYSAP and the WorldFish Myanmar Nutrition Advisor (1 ♀) on using the end-line questionnaire survey and how to enter the data into the KoBo digital platform on a mobile phone. On 12 March 2021 the NGO staff tested the end-line questionnaire both face to face (with colleagues in the office) and by mobile phone.

The end-line survey commenced on 15 March 2021 in Kengtung and Shwebo where there was Wi-Fi internet, but was delayed in Kale, Tachileik and Wetlet because internet services were suspended. Data collection from the field was completed on 02 April 2021 and after data checking and cleaning was sent to Tokyo University on 16 April 2021.

On 21 May 2021, Tokyo University requested follow-up of the control farmers that did not supply information on pond area and pond production, so staff of the inland component of MYSAP phoned all control households with missing data. The first draft of the MYSAP Inland end-line questionnaire survey report was presented virtually to MYSAP Inland by the Institute for Future Initiatives, Tokyo University on 25 June 2021.

Key findings of the inland component of MYSAP end-line questionnaire survey were that:

i) Transfer of knowledge on aquaculture production and auxiliary support

The results showed an increased transfer of valuable technical knowledge on aquaculture production as well as key auxiliary support such as nutrition knowledge, financial literacy and access to productive resources through extension support, demonstration ponds and other interventions. These interventions provided an important support base for efficient production and livelihoods enhancement.

ii) Increased yield of farmers

Increased yields emanated from complementarity interventions. This included extension of BAPs, effective extension support, access to inputs and credit. The delivery of well-coordinated interventions, was reflected in increased yields among direct beneficiary households compared to non-beneficiary (control) farmers.

iii) Increased income

Increased yields coupled with better access to markets and financial literacy obtained by direct beneficiary households helped dbh to increase both their revenue per unit area of land and also the total household income. This enhanced the livelihoods of direct beneficiary households compared to the control (non-beneficiary households).

iv) Increased food security

Food security of farmers was enhanced as a result of benefitting from MYSAP supported interventions. This resulted from increased incomes which enabled farmers to buy food, access to harvested fish from the small-scale household ponds and increased vegetable production as a result of integrated cultivation on pond dikes and homestead gardens. Even though the MDD-W data for 2021 showed an inconsistent trend, the propensity score matching indicates positive impact on food security through dbh involvement with the inland component of MYSAP compared to control households.

v) Enhanced impact was observed for direct beneficiary households that had longer duration of MYSAP support.

The Institute for Future Initiatives, Tokyo University will finalize and submit the MYSAP inland component end-line questionnaire survey report to WorldFish by the end of August 2021.

4 Assessment of MYSAP Inland progress towards planned results

Specific Objective 1 Mean food intake diversity in target areas measured by the Minimum Dietary Diversity Score for Women (MDD-W) by EOP.

Baseline value: 3.34 MDD-W

Target Value: 3.51 MDD-W

Current Value:

A midline nutrition survey including MDD-W and household fish consumption was conducted in Kale, Kengtung and Shwebo Townships in May 2019. The survey was not conducted in Amarapura or Pinlaung as no MYSAP Inland field activities had been conducted in those townships to that time.

The mean MDD-W of 250 sampled women of reproductive age from 250 direct beneficiary households (dbh) in the 3 sampled townships in 2019 was 5.0. However, the women in sampled in Kale had not achieved minimum diet diversity.

Survey	Minimum dietary diversity score for women (MDD-W)					Overall
	Amarapura	Kale	Kengtung	Pinlaung	Shwebo	
2018 survey	2.17	4.91	3.38	3.43	3.47	3.34
2019 survey	Not sampled	4.69	5.22	Not sampled	4.98	5.0[16]
2020 survey	Not sampled	6.3	6.2	Not sampled	5.8	6.1
2021 survey	Not sample	3.86	5.05	Not sampled	5.46	4.87

A repeat MDD-W survey of 290 sampled women of reproductive age from 290 dbh was conducted in May and early June 2020. 238 of the people sampled in the 2019 MDD-W survey, were sampled again in 2020. The MDD-W in all 3 townships improved between 2019 and 2020 and the overall mean MDD-W increased from 5.0 in 2019 to 6.1 in 2020 and this was despite the 2020 survey being conducted after 2 months of COVID-19 restrictions. In 2020 the minimum dietary diversity score for women was above the minimum in Kale, Shwebo and Kengtung Townships. MDD-W was conducted again in April 2021 as part of the MYSAP Inland end-line survey and the overall MDD-W score was 4.87. The decline in the 2021 MDD-W was probably due to a full year of COVID-19 impact. Despite the lower MDD-W score in 2021, the target SO1 indicator was achieved and surpassed.

Current Status

☒ Done ☐On Track ☐ Minor deviation ☐ Major deviation ☐ Off track ☐No assessment

Specific Objective 8 Cumulated quantity of aquaculture products harvested annually in selected demonstration farms of fish-deficient areas measured in kg per year by EOP.

Baseline value: 2,052 kg per ha per year (including Kale, Shwebo, Kengtung, Amarapura and Pinlaung)

Target Value: 2,257.2 kg per ha per year (including Kale, Shwebo, Kengtung, Amarapura and Pinlaung). 10% increase.

Current Value:

In the 2018-19 culture season, 379 MYSAP Inland farmers harvested a total of 33,769 kg of fish from 39.6 ha of small-scale ponds. The overall mean productivity in the 2018-19 culture season was 2,035.2 kg ha^{-1} $year^{-1}$.

[16] The overall mean value was calculated by dividing the numerator, the combined food group data, by the denominator 250 (sample size for 3 townships), being 58 sampled direct beneficiary households (dbh) from 151 dbh in Kale, 99 from 256 dbh in Shwebo and 93 from 241 dbh in Kengtung.

Township	Mean Production (viss/acre/season)	Mean Production (viss/acre/year)	Mean Production (kg/ha/year)
Kale	266.1	509.6	2,055.5
Kengtung	139.8	288.3	1,162.9
Shwebo	359.1	606.2	2,444.9
Overall	**286.9**	**504.6**	**2,035.2**[17]

In the 2018-19 culture season the mean productivity of MYSAP supported demonstration farmers was 31% higher than the overall mean at 2,675 kg ha^{-1} $year^{-1}$.

663 MYSAP supported farmers harvested a total of 70,996 kg of fish in the 2019-20 culture season, from 63.5 ha of small-scale freshwater ponds.

Township	Mean Production (viss/acre/season)	Mean Production (viss/acre/year)	Mean Production (kg/ha/year)
Kale	372.9	567.7	2,285.5
Kengtung	250.5	451.4	1,817.4
Shwebo	290.7	514.3	2,070.8
Overall	**302.3**	**512.4**	**2,063.0**[18]

The mean production per unit area per year in the 2019-20 culture season improved in Kale and Kengtung townships, but was lower in Shwebo Township. Despite this, the overall mean production per unit of pond area increased 1.4% across the 3 townships, rising from 2,035.2 kg ha^{-1} $year^{-1}$ in the 2018-19 culture season to 2,063.0 in kg ha^{-1} $year^{-1}$ in the 2019-20 culture season.

In the 2019-20 culture season the productivity of MYSAP supported freshwater demonstration farmers was 33.4% higher than the mean at 2,752.3 kg ha^{-1} $year^{-1}$.

Township	Mean Production (viss/acre/season)	Mean Production (viss/acre/year)	Mean Production (kg/ha/year)
Kale	459.5	672.3	2,706.7
Kengtung	614.7	792.1	3,189.1
Shwebo	550.6	592.7	2,386.1
Overall	**547.0**	**683.6**	**2,752.3**[19]

388 MYSAP supported dbh harvested a total of 70,629 kg of fish in the 2020-21 culture season, from 44.2 ha of small-scale freshwater ponds. 381 (98.2%) of the 388 households that harvested made a net cash profit.

The overall mean production per unit of pond area per year increased 45.4% across the 3 townships, rising from 2,063.0 in kg ha^{-1} $year^{-1}$ in the 2019-20 culture season to 2,999.5 kg ha^{-1} $year^{-1}$ in the 2020-21 culture season.

Township	Mean Production (viss/acre/season)	Mean Production (viss/acre/year)	Mean Production (kg/ha/year)
Kale	506.6	816.8	3,288.3
Kengtung	305.8	624.8	2,515.4
Shwebo	413.8	742.5	2,989.2
Overall	**420.2**	**745.0**	**2,999.5**[20]

[17] The overall mean reflects the different number of direct beneficiary households in each of the 3 townships.
[18] The overall mean reflects the different number of direct beneficiary households in each of the 3 townships.
[19] The overall mean reflects the different number of direct beneficiary households in each of the 3 townships.
[20] The overall mean reflects the different number of direct beneficiary households in each of the 3 townships.

In the 2020-21 culture season the productivity of MYSAP supported demonstration farmers was 43.6% higher than the mean at 4,305.7 kg ha^{-1} $year^{-1}$.

Township	Mean Production (viss/acre/season)	Mean Production (viss/acre/year)	Mean Production (kg/ha/year)
Kale	623.6	1,012.9	4,078.1
Kengtung	712.3	1,274.3	5,130.5
Shwebo	644.3	1,030.2	4,147.6
Overall	**651.3**	**1,069.5**	**4,305.7**[21]

Current Status

☒ Done ☐On Track ☐ Minor deviation ☐ Major deviation ☐ Off track ☐No assessment

Indicator 4.1 Number of hatcheries and nurseries distributing improved seed (fry and fingerlings) supplied from hatcheries renovated by the project with improved biosecurity by EOP (management of hatcheries disaggregated by sex)

Baseline value: Hatcheries 0; nurseries 0

Target Value: Hatcheries 4; nurseries 25, (20% women nursery managers)

Current Value:

The inland component of MYSAP supported a total of 4 hatcheries being 3 DoF (Hlawgar, Daedaye, and Nad Yay Kan), and 1 private sector, Aung Zay Ya hatchery, Shwebo. Support for the 2 GIFT satellite hatcheries, being the DoF Nad Yay Kan hatchery and the private sector Aung Zay Ya hatchery, Shwebo continued until the inland component of MYSAP implementation ended on 31 May 2021.

26 nursery farmers (02 ♀) received pond nursery training in 2019, of which 23 (02 ♀) were supported by MYSAP to nurse fish seed. In 2019 all 23 nursery farmers supported by MYSAP made a net cash profit from nursing fish.

In 2020 MYSAP supported a total of 28 (2 ♀) nursery farmers being 10, 10 and 8 in Kale, Shwebo and Kengtung townships respectively.

Eight MYSAP supported nursery farmers in Kengtung Township nursed 250,200 all-male tilapia from August to September 2020. After nursing, 205,004 all-male tilapia were stocked into 258 small-scale household grow-out ponds and two community ponds. The hapa nursing survival of tilapia of the 8 nursery farmers ranged from 75.6 to 92.0%, with the mean being 81.9% survival. All 8 nursery farmers in Kengtung Township made a cash profit in 2020.

Current Status

☒ Done ☐On Track ☐ Minor deviation ☐ Major deviation ☐ Off track ☐No assessment

Indicator 4.2 Cumulative number of improved seed (fry and fingerlings) produced annually in Myanmar by EOP

Baseline value: 0

Target value: 1,600,000 fish seed per year

breakdown
- Tilapia GIFT 500,000 annually from 2 hatcheries
- Carp species 1,000,000 annually from 17 hatcheries

[21] The overall mean reflects the different number of direct beneficiary households in each of the 3 townships.

- Small Indigenous Species (SIS): 100,000 annually

Current value:

The cumulative total to 31 May 2021 was 536,180 all-male GIFT seed stocked into the grow-out ponds of 374 farmers. Of the 536,180 all-male GIFT seed produced and sold 98,890 (18.4%) was from the DoF Nad Yay Kan hatchery and 437,290 (81.6) from the Aung Zay Ya, Shwebo hatchery. All the GIFT all-male seed produced was of an improved faster growing strain.

Carp species:

Nad Yay Kan produced 500,000 rohu fingerlings in 2019.

Kume (Myitthar) DoF hatchery reported selling 2,300,000 carp species (and 20,000 improved tilapia) to the end of the first week in September 2020.

To the end of April 2021, the DoF Nad Yay Kan hatchery had delivered 335,000 fish seed of rohu, common carp and silver barb species to the government.

In 2019, MYSAP supported the stocking of 9,850 SIS into 70 ponds, including 67 demonstration ponds. 4,700 of the SIS stocked, were from MYSAP Inland supported nursery farmers and the balance were supplied by MYSAP contracted fishers.

In 2020, a total of 9,500 SIS fry were stocked into 69 demonstration ponds in Kale, Shwebo and Kengtung Townships. The SIS species stocked were sourced from contracted fishers, MYSAP supported nursery farmers and 2,600 SIS from the SIS breeding trial conducted at the Aung Zay Ya Hatchery, Shwebo.

A SIS breeding trial successfully bred four different SIS species, but only produced 892 SIS fry.

In total MYSAP funded the stocking of a total of 19,350 SIS.

The cumulative reported total of improved fish seed from MYSAP supported hatcheries was in excess of 3.67 million fish seed, being 3,135,00 carps, 536,180 GIFT tilapia and 19,350 SIS seed.

MYSAP supported the stocking of 339,885 fish seed into 454 direct beneficiary ponds in the 2018-19 fish culture season, the stocking of 601,943 dbh ponds in the 2019-20 culture season and the stocking of 708,291 fish seed into 711 dbh ponds in the 2020-21 culture season, i.e. MYSAP funded the stocking of 1,650,119 fish seed into small-scale freshwater ponds during 3 years of fish culture season support.

MYSAP Inland is supporting the stocking of Indian major carp species rohu, mrigal and catla and Chinese carp species including common carp, big head carp and grass carp. The only other species that MYSAP supported stocking of into small-scale freshwater ponds were silver barb, SIS and GIFT tilapia, which were stocked because they reach market size in 3-4 months, even in climate change foreshortened pond grow-out seasons.

Current Status

☒ Done ☐On Track ☐ Minor deviation ☐ Major deviation ☐ Off track ☐No assessment

Indicator 4.3 Number of small-scale feed mills set up with the support of the project by EOP (management of feed mills disaggregated by sex).

Baseline value: 0

Target value: 67

Current value:

60 people (4 ♀) trained and equipped to make pelleted feed and all 60 (6 ♀[22]) produced and sold pelleted feed.

To 31 May 2021, the 60 MYSAP supported feed millers have produced a cumulative 33,042 viss (53,858.5 kg) of pelleted feed which was sold for MMK 36.68 million (€ 22,925) to 765 different farmers, including 697 MYSAP direct beneficiary households.

Current Status

☐ Done ☐On Track ☒ Minor deviation ☐ Major deviation ☐ Off track ☐No assessment

The inland component of MYSAP learned from experience in the first year of support that when feed millers have too few local customers buying their feed, the feed milling operations were not economically viable. Recognizing this, a reduced number of feed millers were selected for MYSAP support in the second season. The target indicator value was not increased in the costed extension year because the demand for pelleted feed sales in the supported villages would have been insufficient for additional feed millers to operate profitably and sustainably. Sales of fish feed to none-MYSAP Inland farmers increased in 2021. In addition some feed millers used their equipment and experience gained to produce and sell pelleted feed for pigs and chickens.

Indicator 4.4 Number of farmers taking up financial literacy training with the support of MYSAP by EOP (sex disaggregated)

Baseline value: 0

Target value: 400, (120♀ - 30%)

Current value:

Ar Yone Oo and BRAC delivered financial literacy training to a total of 564 (179 ♀) people in the 2019-21 culture season and to a total of 684 dbh in the 2020-21 culture season.

In 2020, Ar Yone Oo established a credit fund of US$ 32,000 for individual and group loans to be used for fish culture with 28% interest per year.

Current Status

☒ Done ☐On Track ☐ Minor deviation ☐ Major deviation ☐ Off track ☐No assessment

Indicator 4.5 Number of pilot paddy cum fish systems set up by EOP

Baseline value: 0

Target value: 2 rice-fish pilots

Current value:

The inland component of MYSAP supported the modification of 9 rice fields into pilot rice-fish plots. One of the nine, was not stocked with fish, because of insufficient rainfall in 2019. Eight pilot plots were stocked with fish seed and produced fish.

Two pilot rice-fish plots in Kale Township were continuing to nurse fish in irrigated rice at the end of the inland component of MYSAP implementation period, with the intention of producing and selling an advanced larger fingerling for sale early in the next grow-out season, immediately ponds have sufficient water depth for stocking.

Current Status

[22] One trained male farmer died and his wife has taken over. Another woman has learned the feed milling from her husband and taken over the activity.

☒ Done ☐On Track ☐ Minor deviation ☐ Major deviation ☐ Off track ☐No assessment

Indicator 4.6 Number of smallholders reached with EU supported interventions aimed to increase their sustainable production, access to markets and/or security of land by EOP (EURF Indicator 2.3) (sex disaggregated)

Baseline value: 0

Target value: 1,264

Current value:

In 2018-19, MYSAP Inland delivered extension and training services on, *Improved small-scale aquaculture and human nutrition* to a total of 648 direct beneficiary households.

In 2019-20, MYSAP Inland delivered extension and training services on, *Improved small-scale aquaculture and human nutrition* to a total of 1,264 direct beneficiary households.

In the third and final season 2020-21 culture season, the 3 NGO's supported a total of 1,255 direct beneficiary farmers including, 1,075 dbh of which 154 were new dbh and 180 households sharing the benefits of 2 community ponds.

To the end of May 2021, MYSAP Inland supported a total of 1,504 different direct beneficiary households with small-scale aquaculture, integrated vegetable and fruit production and improved human nutrition.

Current Status

☒ Done ☐On Track ☐ Minor deviation ☐ Major deviation ☐ Off track ☐No assessment

Indicator 4.7 Number of beneficiaries, who have INDIRECTLY benefitted from the project through direct and indirect support (e.g. trainings and digital apps) reached with EU supported interventions aimed to increase their sustainable production, access to markets and/or security of land by EOP.

Baseline value: 0

Target value: 500

Current value:

On 30 April 2021, there were a total of 695 (146 ♀ – 21%) direct beneficiary household members registered as users of the Greenovator Green Way mobile phone app, being 328 (83 ♀), 192 (23 ♀), and 175 (40 ♀) in Kale, Shwebo and Kengtung Townships respectively.

The 149 farmers introduced to the Green Way application by MYSAP Inland in Kale Township reported that a further 123 other farmers (60 ♀) or indirect beneficiaries had since registered and downloaded the Green Way mobile phone application.

To 14 May 2021, a total of 26,837 people had viewed the 20 different aquaculture and nutrition articles, leaflets, posters and success stories uploaded onto the Green Way mobile phone app by MYSAP Inland.

Current Status

☒ Done ☐On Track ☐ Minor deviation ☐ Major deviation ☐ Off track ☐No assessment

Indicator 4.8 Number of hectares of ponds where sustainable aquaculture management practices have been introduced with project support by EOP.

Baseline value: 0

Target value: 104 ha

Current value:

In the 2018-19 culture season MYSAP provided extension and training services to 648 direct beneficiary households with a mean pond area of 972 m^2 i.e. with MYSAP support, sustainable aquaculture management practices have been introduced to 63 hectares of freshwater aquaculture ponds.

In the 2019-20 culture season MYSAP provided extension and training services to 1,105 direct beneficiary households with an average pond area of 945 m^2 i.e. with MYSAP support, sustainable aquaculture management practices have been introduced to 104.4 hectares of freshwater aquaculture ponds.

Township	# of ponds	Area of ponds (ha)
Kale	261	29.1
Shwebo	428	52.7
Kengtung	391	22.3
Pinlaung	25	0.3
TOTAL	**1,105**	**104.4**

In 2020-21 the area of new ponds following sustainable management practices was 17.5 hectares.

The cumulative total area of freshwater ponds supported by MYSAP to practice sustainable aquaculture management practices was 184.9 hectares across the 3 culture seasons.

Current Status

☒ Done ☐On Track ☐ Minor deviation ☐ Major deviation ☐ Off track ☐No assessment

Indicator 4.9 Cumulative quantity of aquaculture products sold on selected local markets in target areas at risk of food security, measured in kg per day by EOP.

Baseline value: 3,603 kg/day (May 2018)

breakdown:

Amarapura: 1,533; Kale: 605; Kengtung: 480; Pinlaung: 765; Shwebo: 14,630

Target value: In 2021, 5% increase over the baseline survey (in kg/day), i.e. 3,783 kg/day

Current value:

Survey	Traded fish volume (kg) by township per day					
	Amarapura	**Kale**	**Kengtung**	**Pinlaung**	**Shwebo**	**Average**
Baseline survey 2018	1,532.8	604.8	480.0	764.8	14,630.4	3,602.6
Mid-line survey 2019	Not sampled	1,215.7	2,137.6	Not sampled	16,721.6	6,691.6
2019-20 market survey	Not sampled	1,267.0	794.6	Not sampled	6,112.5	2,724.7

The Mekong Economics Ltd market survey to assess the amount of captured and cultured fish species sold in representative local markets was repeated after one year in May 2019 in Kale, Kengtung and Shwebo townships to provide midline data. No market surveys were conducted in Amarapura or Pinlaung as there were no on-going MYSAP Inland activities to promote fish culture and improved human nutrition at the time.

An estimated total of **20,075 kg** of fish was traded in the Kale, Kengtung and Shwebo markets on the day the markets were sampled. The target indicator value of a 5% increase in the volume of traded cultured fish was surpassed in the three sampled townships in 2019.

Staff of the inland component of MYSAP sampled the main market in Kengtung from January to November 2019 and Kale and Shwebo markets from April 2019 to March 2020. The average quantity of fish traded per day across the 3 sampled markets declined to an estimated 2,724.7 kg with that of Shwebo Township having declined an

estimated 10,000 kg per day. The national consultant suggested that this was because a greater proportion of fish produced in Shwebo Township was being exported to other regions, states and possibly China.

Current Status

☐ Done ☐On Track ☐ Minor deviation ☒ Major deviation ☐ Off track ☐No assessment

Indicator 4.10 Number of hectares of ponds brought into fish production by the project by EOP

Baseline value: 0

Target value: 15 ha

Current value:

In the 2018-19 culture season MYSAP supported 106 households that had not previously cultured fish, meaning that a total area of 10.2 hectares (25.2 acres) of ponds were brought into production.

In the 2019-20 culture season with MYSAP support 145 households with 18.4 hectares (45.4 acres) of ponds were brought into production.

In the 2020-21 culture season with MYSAP support a further 6.4 hectares (15.8 acres) of ponds were brought into production.

With MYSAP support a cumulative total of 35.0 hectares (86.4 acres) of ponds were brought into production.

Current Status

☐ Done ☐On Track ☐ Minor deviation ☐ Major deviation ☐ Off track ☐No assessment

Indicator 4.11 Proportion of aquaculture products consumed by-low-income households[23] in intervention areas by EOP, measured as percentage of number of meals consumed over seven days.

Baseline value: 40%

Target value: 50%

Current value:

In May 2019 the inland component of MYSAP conducted a midline nutrition survey MDD-W and, assessed fish consumption and the proportion of cultured aquatic products consumed by low-income consumers by sampling a total of 250 direct beneficiary households in Kale, Kengtung and Shwebo townships. No survey was conducted in Amarapura or Pinlaung as no MYSAP freshwater fish culture field activities were on-going in these townships when the survey was conducted. In 2019, 69.9% of the fish eaten by low-income households was from culture.

The nutrition survey was repeated in 2020, when 290 women of reproductive age from 290 dbh were sampled in Kale, Kengtung and Shwebo townships in 2020. A total of 238 of the people sampled in the 2019 MDD-W survey sampled again in 2020 and were directly comparable. In 2020, 93.5% of the fish consumed by the low-income households was from culture, up from 66.9% in 2019.

In addition the proportion of people eating fish, the proportion of people eating SIS and the mean number of meals eaten containing fish in the last 7 days had all increased between 2019 and 2020.

[23] Mekong Economics Limited (MKE) used the definition of poverty and poverty line defined by the Millennium Development Goals, of US$ 1.25 per day per person, but assumed that the monthly mean income was from 2 working adults per household. This gave a low-income household threshold of < MMK 3,717 per day[23] or < MMK 111,510 per month. For the MYSAP Inland mid-line survey, low-income households were identified as households with a mean income of less than US$ 1.25 per day every household member, which factors in the number of children per household.

Survey	Proportion of cultured fish eaten by low-income MYSAP Inland households by township					Overall
	Amarapura	Kale	Kengtung	Pinlaung	Shwebo	
2019 survey	Not sampled	63.2%	67.9%	Not sampled	77.8%	69.9%
2020 survey	Not sampled	95.2%	87.9%	Not sampled	98.1%	93.5%
2021 survey	Not sampled	75.7%	69.0%	Not sampled	75.8%	73.7%

The household fish consumption survey was repeated as part of the end-line survey of the inland component of MYSAP conducted in April 2021, following the Mekong Economics Ltd methodology. While in 2021, the overall proportion of fish eaten by low-income households that was from culture had declined to an overall figure of 73.7% the end-line figure was still above the target indicator and was achieved despite operating through a full year of the COVID-19 pandemic.

Current Status

☒ Done ☐On Track ☐ Minor deviation ☐ Major deviation ☐ Off track ☐No assessment

Indicator 4.12 Number of women trained on fish processing and reduction of post-harvest losses in fish-deficient areas until EOP.

Baseline value: 0

Target value: 67

Current value:

Excluding the 13 women fish vendors counted under indicator 4.13 below, 77 (50 ♀) attended three training courses each of two days duration on fish preservation by i) drying, ii) salting, iii) pickling/fermentation delivered in October and November 2019 in Shwebo, Kengtung and Kale townships.

The inland component of MYSAP conducted community testing a fish drier and the production of a dried fried SIS powder as a feed supplement for infants above 6 months of age, with 60 dbh, being 20 each in Kale, Shwebo, and Kengtung townships.

The inland component of MYSAP funded the travel costs of Ms Moet Moet, BRAC Myanmar Aquaculture Technical Officer and Ms Chu Saw, BRAC Myanmar Community Facilitator to attend an intensive training course funded by the DoF entitled, Fish Processing and Quality Control for Fishery Products conducted at the Sagaing Fishery Technical School, 17-21 August 2020. Sayama May Kyi, from the Department of Fisheries, Institute of Fisheries Technology, was the lead trainer.

To 31 May 2021, a total of 109 different women have attended either the fish preservation training or the fish drying and dried fried SIS powder production training. 13 women attended two training courses.

Current Status

☒ Done ☐On Track ☐ Minor deviation ☐ Major deviation ☐ Off track ☐No assessment

Indicator 4.13 Number of female fish market vendors, whose capacity on fish handling in fish-deficient areas is strengthened by EOP (sex-disaggregated if necessary).

Baseline value: 0

Target value: 60 (sex-disaggregated if necessary)

Current value: 23

The inland component of MYSAP provided training (see **I 4.13 above**) for all 13 women from MYSAP direct beneficiary households that were fish vendors.

The MYSAP funded international consultancy on post-harvest innovation by Asper Consulting Limited that targeted fish processors (smoked fish, dried fish, fish paste, fish sauce, etc.), processed fish retailers, processed fish wholesalers, fresh fish retailers, and fresh fish wholesalers in Kale, Shwebo and Kengtung townships trained 10 vendors and 20 NGO staff on best post-harvest practices using a Facilitator guide produced and translated into Myanmar and Big Shan languages, which was revised following trainee feedback. Unfortunately all on-going external activities including fish vendor training were suspended from 8 February 2021 on MYSAP instruction

Current Status

☐ Done ☐On Track ☐ Minor deviation ☒ Major deviation ☐ Off track ☐No assessment

Indicator 4.14 Cumulative number of women of reproductive age and adolescent girls directly reached by nutrition related interventions supported by the project by EOP (disaggregated by age).

Baseline value: 0

Target value: MYSAP Inland: 1,668 women of reproductive age and adolescent girls (10-49)

2018: 992

2019: 676

2020: 676 2021: 676

Current Value:

The cumulative number of women reproductive age (15-49) and adolescent girls (10-14) in MYSAP direct beneficiary households was 2,110, being 1,913 women of reproductive age (15-49) and 197 adolescent girls (10-14)[24]. There were 389 children under 5 years of age in the MYSAP Inland dbh.

In addition, the inland component of MYSAP delivered improved human nutrition messages covering the benefits of eating fish for pregnant and lactating women and for children in the first 1000 days via the 3 collaborating NGO's which provided nutrition awareness training to a total of 1,820 people (1,774 ♀; 97.5%) at micro-credit locations and health centres, reached through its 3 NGO's, in the 2020-21 season.

Current Status

☒ Done ☐On Track ☐ Minor deviation ☐ Major deviation ☐ Off track ☐No assessment

5 Safeguards and gender

Throughout the implementation period of the inland component of MYSAP, WorldFish Myanmar has ensured that i) a 'no harm approach' was followed, ii) that human rights, health and the environment were protected and iii) that activities and processes followed were free from corruption.

Conflict sensitivity – Do-No-Harm approach:

Conflict sensitivity was covered under the inland component of MYSAP primarily by having contracted local NGO's that employed local staff, who spoke local languages and who were sensitive to and provided appropriate

[24] This data is based on 1,105 direct beneficiary households, being 428 from Shwebo, 261 from Kale, 391 from Kengtung and 25 from Pinlaung townships for which the inland component of MYSAP has complete household profile data. Data on adolescent girl numbers were not collected for the 159 households associated with the Naung Cho (58 households) and Naung Kan (101 households).

guidance on designing and implementing the field activities of the inland component of MYSAP. The NGO staff also closely liaised with their local level General Administration Departments and followed their instructions to offset the likelihood of conflict sensitivity being an issue until 01 February 2021, when activities with government departments were suspended on instructions from MYSAP.

Environment:

All production technologies promoted by MYSAP with direct beneficiary households in the field were low risk, low investment and promoted the stocking of 'low in the feed chain' feeding fish species which had minimal environmental impact. The improved extensive pond systems used by the majority of MYSAP supported households with small-scale freshwater ponds biologically recycled nutrients within villages, while the MYSAP supported pilot rice-fish plots promoted integrated pest management and the production of rice and fish together without the use of herbicides and pesticides in rice fields with beneficial environmental impacts.

Dr Girija Page, Australia Volunteer International, drafted a project proposal entitled *Life Cycle Inventories for measuring environmental footprints: Mapping key freshwater fish production and supply chains to the Mandalay market* which was submitted to FRDN for funding and which was approved by the FRDN steering committee on 19 October 2018.

The research project mapped freshwater fish production and supply chains to the wholesale fish market in Mandalay. Specifically, the study:

1. Identified the key production and supply systems of farmed fish;
2. Modelled key fish production systems around the Yangon hub and the Mandalay region;
3. Compared and contrasted the key production and supply chain systems in terms of intensity of inputs and yield; and,
4. Raised awareness and built capacity of local institutions for environmental assessments.

Dr Page field tested the survey questionnaire in Kyaukse Township and Patheingyi Township on 19 September 2018 and travelled to Yangon on 07 October 2018 and field tested the questionnaire again at Twantay Township at three intensive grow-out farms on 08 October 2018. On 16 October 2018, three MSc Zoology students visited the MYSAP Inland office to discuss field work on the proposed study with Dr Girija Page. MYSAP Inland funded the field work travel costs.

Data collection from a total of 44 farms was conducted in Patheingyi Township on 19-20 November and in Kyaukse Township on 26-27 November 2018. Dr Page submitted the first report draft on 05 January 2019 and a blog on the project on 27 January 2019.

The blog of Dr Girija Page[25] Australia Volunteer International, entitled *Life Cycle Inventories for measuring environmental footprints: Mapping key freshwater fish production and supply chains to the Mandalay market* went live on the WorldFish website on 14 May 2019, at the web link below:

http://blog.worldfishcenter.org/2019/05/characterizing-fish-supply-aquaculture-systems-myanmar/

Culturing SIS in fish ponds, was a move away from aquaculture practices which eradicate wild 'weed' fish like small indigenous fish species from aquaculture ponds by poisoning with chemicals like phostoxin and was therefore better for the environment. Moreover culturing SIS in fish ponds should reduce fishing pressure on wild fish stocks and perhaps reduce the use of inappropriate non-sustainable fishing gear like electric fishing gear, which is widely used in Myanmar.

[25] Girija was assigned to WorldFish Myanmar and based at the office of the inland component of MYSAP between February to December 2018

The MYSAP Inland Team Leader, as a trained ISO 9001: 2008 Lead auditor, ASC tilapia hatchery and farm auditor, Best Aquaculture Practices (BAP) qualified aquaculture hatchery and farm auditor (5 disciplines) and GlobalGAP qualified aquaculture auditor mentored staff working on the inland component of MYSAP to consider the environmental aspects of all work activities. For example, BAP recommendations were followed for storing outflow effluent from tilapia hatcheries and nursery ponds using 17α-methyltestosterone treatment to produce all-male tilapia.

Gender:

Gender support to inland component of MYSAP was provided by Jessica Scott, Dr Cynthia McDougall, Quennie Rizaldo and the Team Leader. The Team Leader attended virtual training and was certified on 28 November 2020 for successfully completing the CGIAR training module, *An introduction to Gender, Diversity and Inclusion in CGIAR's Workplaces*.

The inland component of MYSAP considered gender in all aspects of work design and planning and covered gender in its Training of Trainers (TOT) training manual and TOT training given to the staff of all the sub-contracted NGOs. All 3 NGO's were contracted under their sub-grant agreements to facilitate the development of separate sex seasonal agriculture calendars for the 2019-20 and the 2020-21 culture seasons for each village group to highlight the availability of both women and men, so that MYSAP funded training was scheduled to best accommodate the peak workloads of both women and men. In the 2020-21 culture season, the inland component of MYSAP provided shorter and more frequent training sessions to facilitate greater attendance of women, but without either unintentionally overburdening women or causing within household conflict. Specific feedback was collected on whether MYSAP supported activities overburdened women, or had unintended consequences and MYSAP then modified its activities to mitigate.

All data collected and reported by the inland component of MYSAP was sex disaggregated and the component closely monitored its reach and impact with women and made concerted efforts to increase both its reach and impact with women of all training and extension activities funded by MYSAP.

The end-line survey for the inland component of MYSAP was designed to highlight how the design and implementation of MYSAP funded field activities, impacted on the ability of women to attend training and to conduct MYSAP supported activities.

Until 30 April 2021 there were a total of 35 staff working under NGO sub-grant agreements. 18 (51.4%) of the staff funded by MYSAP to work on the inland component were women. The capacity of all these staff was significantly developed through their MYSAP funded work and training.

	Men	**Women**	**TOTAL**
MYSAP Inland staff	3	5 (62.5%)	8
NGO staff	14	13 (48.1%)	27
TOTAL	**17**	**18 (51.4%)**	**35**

In 2020 and 2021, the inland component of MYSAP set attendance targets for women's involvement in different training sessions, activities and workshops and assessed its performance against the set targets.

On 08 March 2021, the MYSAP Inland Team Leader attended a WorldFish webinar entitled *International Women's Day Celebration*, and pledged the MYSAP inland component to "*Challenge gender stereotypes and bias*".

6 Main risks and challenges

The inland component of MYSAP operated through 15 months of the COVID-19 pandemic from March 2020 to 31 May 2021, which at different times resulted in bans on travel between townships and/or the need to quarantine, bans on face-to-face meetings and/or restricted the size of group meetings.

The inland component of MYSAP also operated for 4 months under a state of emergency, following the military coup on 01 February 2020. This impacted on both staff and beneficiary safety and well-being, resulted in martial law imposition in some areas, the Civil Disobedience Movement and protests, interrupted and weak internet and mobile phone coverage and connectivity, and poor and irregular availability of banking and cash point services. All the above posed risks and challenges to the successful implementation of MYSAP freshwater aquaculture and improved human nutrition activities in the field.

To offset both the above, the management and implementation of the inland component of MYSAP was flexible, creative, and opportunistic and made far greater use of digital platforms and virtual media applications to disseminate key learning messages. However, while aquaculture was designated as an essential service, COVID-19 restrictions, the state of emergency and the order from MYSAP to suspend all external activities of the inland component of MYSAP[26], prevented the MYSAP inland component from achieving its planned target for indicator 4.13 *Number of female fish market vendors, whose capacity on fish handling in fish-deficient areas is strengthened* under an on-going international consultancy by Asper Consulting Limited.

The order to suspend all external field activities from 08 February 2021, meant WorldFish was deprived of 26 NGO staff, for 8% of the time contracted under the 3 sub-grant agreements with the NGO's.

[26] Common carp spawning training was the only inland component activity exempted from suspension by the EU and BMZ, as being time critical.

7 Implementation of the visibility and communication plan

7.1 Information dissemination

The inland component of MYSAP shared its IEC materials, after MYSAP approval and in line with the GIZ communication strategy, as widely as possible to maximise the impacts of extension and training materials and lessons learned both positive and negative by the dissemination of hard copies of extension and training materials like leaflets, posters, reports, training manuals, etc., and the dissemination soft copies of materials through:

1) The Green Way mobile phone application;
2) The Myanmar Information Management Unit;
3) The Fisheries Information Centre;
4) YouTube;
5) Facebook; and,
6) The Monitoring, Evaluation and Learning (MEL) website of WorldFish.

Annex 3 of this report lists all of the IEC materials and documentation produced (and links to each) by the inland component of MYSAP to 31 July 2021. These include 20 leaflets and posters, 19 different training materials, 25 technical reports (excluding progress reports), and 77 training videos, being 17 in Myanmar, 25 in Big Shan, 20 in Lahu and 15 in Arkar languages.

On 19 May 2021, MYSAP approved for dissemination a report co-authored by four MYSAP Inland staff entitled, *MYSAP Communication Approaches for Sustainable Aquaculture Development and Improved Nutrition in the Sagaing Region and the Shan State of Myanmar*. The report was uploaded onto the WorldFish Monitoring, Education and Learning (MEL) system the same day and was disseminated on 24 May 2021, via the WorldFish website at the share link below:

MYSAP Communication Approaches for Sustainable Aquaculture Development and Improved Human Nutrition in the Sagaing Region and the Shan State of Myanmar (worldfishcenter.org).

Annex 1 – Logical framework

MYSAP Inland indicators are those specified in MYSAP's EU logical framework.

Annex 2 – MYSAP Inland technical progress and financial reports

Technical progress reports:

MYSAP Inland – First progress report, 05 April – 15 December 2017
MYSAP Inland – Second progress report, 16 December 2017 – 31 March 2018
MYSAP Inland – Third progress report, 01 April – 30 September 2018
MYSAP Inland – Fourth progress report, 01 October 2018 – 31 March 2019
MYSAP Inland – Fifth progress report, 01 April – 30 September 2019
MYSAP Inland – Sixth progress report, 01 October 2019 – 31 March 2020.

MYSAP Inland – Monthly progress report for DoF, May 2018
MYSAP Inland – Quarterly progress report for DoF, 01 April – 30 June 2018
MYSAP Inland – Monthly progress report for DoF, July 2018
MYSAP Inland – Monthly progress report for DoF, August 2018
MYSAP Inland – Quarterly progress report for DoF, 01 July – 30 September 2018
MYSAP Inland – Monthly progress report for DoF, October 2018
MYSAP Inland – Monthly progress report for DoF, November 2018
MYSAP Inland – Quarterly progress report for DoF, 01 October – 31 December 2018
MYSAP Inland – Monthly progress report for DoF, January 2019
MYSAP Inland – Monthly progress report for DoF, February 2019
MYSAP Inland – Quarterly progress report for DoF, 01 January – 31 March 2019
MYSAP Inland – Monthly progress report for DoF, April 2019
MYSAP Inland – Monthly progress report for DoF, May 2019
MYSAP Inland – Quarterly progress report for DoF, 01 April – 30 June 2019
MYSAP Inland – Monthly progress report for DoF, July 2019
MYSAP Inland – Monthly progress report for DoF, August 2019
MYSAP Inland – Quarterly progress report for DoF, 01 July – 30 September 2019
MYSAP Inland – Quarterly progress report for DoF, 01 October – 31 December 2019
MYSAP Inland – Monthly progress report for DoF, January 2020
MYSAP Inland – Monthly progress report for DoF, February 2020
MYSAP Inland – Quarterly progress report for DoF, 01 January – 31 March 2020

MYSAP Inland – Quarterly Result 3 Inputs progress report – 01 January – 31 March 2018
MYSAP Inland – Quarterly Result 3 Inputs progress report – 01 April – 30 June 2018
MYSAP Inland – Quarterly Result 3 Inputs progress report – 01 July – 30 September 2018
MYSAP Inland – Quarterly Result 3 Inputs progress report – 01 Oct – 31 December 2018
MYSAP Inland – Quarterly Result 3 Inputs progress report – 01 January – 31 March 2019
MYSAP Inland – Quarterly Result 3 Inputs progress report – 01 April – 30 June 2019

MYSAP Inland – Quarterly Result 4 Value Chain progress report – 01 January – 31 March 2018
MYSAP Inland – Quarterly Result 4 Value Chain progress report – 01 April – 30 June 2018
MYSAP Inland – Quarterly Result 4 Value Chain progress report – 01 July – 30 September 2018
MYSAP Inland – Quarterly Result 4 Value Chain progress report – 01 Oct – 31 Dec 2018
MYSAP Inland – Quarterly Result 4 Value Chain progress report – 01 January – 31 March 2019
MYSAP Inland – Quarterly Result 4 Value Chain progress report – 01 April – 30 June 2019

MYSAP Inland – Quarterly Result 5 Nutrition progress report – 01 January – 31 March 2018
MYSAP Inland – Quarterly Result 5 Nutrition progress report – 01 April – 30 June 2018
MYSAP Inland – Quarterly Result 5 Nutrition progress report – 01 July – 30 September 2018
MYSAP Inland – Quarterly Result 5 Nutrition progress report – 01 Oct – 31 December 2018
MYSAP Inland – Quarterly Result 5 Nutrition progress report – 01 January – 31 March 2019
MYSAP Inland – Quarterly Result 5 Nutrition progress report – 01 April – 30 June 2019

Result 4 – MYSAP Inland – Quarterly progress report – 01 July – 30 September 2019.
Result 4 – MYSAP Inland – Quarterly progress report – 01 October – 31 December 2019.
Result 4 – MYSAP Inland – Quarterly progress report – 01 January – 31 March 2020.

MYSAP Inland – Monthly progress report for DoF, April 2020
MYSAP Inland – Monthly progress report for DoF, May 2020
MYSAP Inland – Quarterly progress report for DoF, 01 April – 30 June 2020
MYSAP Inland – Monthly progress report for DoF, July 2020
MYSAP Inland – Monthly progress report for DoF, August 2020
MYSAP Inland – Quarterly progress report for DoF, 01 July – 30 September 2020

Specific Objectives and Result 4 – MYSAP Inland – Quarterly monitoring questionnaire – 01 April – 30 June 2020
Specific Objectives and Result 4 – MYSAP Inland – Quarterly monitoring questionnaire – 01 July – 30 September 2020.

MYSAP Inland – Seventh progress report, 01 April – 30 September 2020.
MYSAP Inland – Eighth progress report, 01 October 2020 – 31 March 2021.

MYSAP Inland – Monthly progress report for DoF, October 2020.
MYSAP Inland – Monthly progress report for DoF, November 2020.
MYSAP Inland – Quarterly progress report for DoF, 01 October – 31 December 2020.
MYSAP Inland – Monthly progress report for DoF, January 2021.
MYSAP Inland – Monthly progress report for DoF, February 2021.
MYSAP Inland – Quarterly progress report for DoF, 01 January – 31 March 2021.
MYSAP Inland – Monthly progress report for the DoF, April 2021.
MYSAP Inland – Monthly progress report for the DoF, May 2021.

Specific Objectives and Result 4 – MYSAP Inland – Quarterly monitoring questionnaire – 01 October – 31 December 2021
Specific Objectives and Result 4 – MYSAP Inland – Quarterly monitoring questionnaire – 01 January – 31 March 2021.

Financial reports:

MYSAP Inland Financial Statement 01 January – 31 March 2018. Total amount € 128,634. Report submitted 31 May 2018.

MYSAP Inland Financial Statement 01 April – 30 June 2018. Total amount € 133,201. Report submitted 31 August 2018.

MYSAP Inland Financial Statement 01 July – 30 September 2018. Total amount € 151,021.55. Report submitted 29 November 2018.

MYSAP Inland Financial Statement 01 October – 31 December 2018. Total amount € 253,266.22. Report submitted 28 May 2019.

MYSAP Inland Financial Statement 01 January – 31 March 2019. Total amount € 130,269.03. Report submitted 16 August 2019.

MYSAP Inland Financial Statement 01 April – 30 June 2019. Total amount € 264,399.14. Report submitted 25 Oct 2019.

MYSAP Inland Financial Statement 01 July 2019 – 30 September 2019. Total amount € 243,376. Report submitted 26 May 2020.

MYSAP Inland Financial Statement 01 October 2019 – 31 December 2019. Total amount € 236,823. Report submitted 26 May 2020.

MYSAP Inland Financial Statement 01 January 2020 – 31 March 2020. Total amount € 167,981. Report submitted 01 September 2020.

MYSAP Inland Financial Statement 01 April – 30 June 2020. Total amount € 217,293.47. Report submitted 1st Sept 2020.

MYSAP Inland Financial Statement 01 July 2020 – 30 September 2020. Total amount € 165,110.20. Report submitted on 30th November 2020.

MYSAP Inland Financial Statement 01 October 2020 – 31 December 2020. Total amount €304,582.19. Report submitted on 10th March 2021.

MYSAP Inland Financial Statement 01 January 2021 – 31 March 2021. Total amount € 116,787.64. Report submitted 17 June 2021.

Annex 3 – MYSAP Inland IEC materials list

- Leaflets and posters
- Articles
- Success stories
- Training materials
- Reports
- Blogs
- Training of trainer (TOT) module and session video clip

Leaflets and posters: (MYSAP Inland leaflet and poster link)			
#	**Title**	**Language version**	**Link**
01	Tilapia Major Clinical Signs	English, Myanmar, Big Shan	Tilapia major clinical signs
02	Rice-fish culture	English, Myanmar	Rice-Fish culture
03	Nursing fish in hapas	English, Myanmar	Nursing fish in hapas
04	Partial harvest of small-indigenous fish species (SIS)	English, Myanmar	Partial harvest of SIS
05	Pond nursing of carp species	Myanmar	Nursing of Carp species
06	Climbing perch induced breeding	Myanmar	Climbing perch induced breeding
07	SIS Mola comic poster	Myanmar, Khun Shan, Pa'O	SIS Mola comic
08	Fish pumpkin ball recipe leaflet	English, Myanmar	Fish pumpkin ball recipe
09	First 1,000 days post	Myanmar, Khun Shan	First 1000 Day
10	Food group poster	Myanmar	Food group poster
11	SIS question and answer sheet	Myanmar, Khun Shan	SIS Q&A
12	MYSAP Inland factsheet	English, Myanmar	MYSAP Inland factsheet
13	Tilapia: the plain truth infographic	Myanmar	Tilapia: The Plain Truth
14	COVID-19 mitigation for township	Myanmar	COVID-19 mitigation
15	COVID-19 Hatchery	Myanmar	COVID-19 Hatchery
16	Options for shortened fish culture seasons	English, Myanmar	Options for shortened fish culture seasons
17	*Pangasianodon hypophthalmus* breeding, nursing and grow-out leaflet	Myanmar	Pangasianodon hypophthalmus breeding, nursing and grow-out leaflet
18	*Pangasianodon hypophthalmus* fact sheet	Myanmar	Pangasianodon hypophthalmus fact sheet
19	*Trichodina* a common fish parasite in freshwater ponds	English, Myanmar	link
20	BMP for vegetable production systems	English, Myanmar	link

Articles: (MYSAP Inland article link)			
#	**Title**	**Language Version**	**Link**
01	Fish feed production in 2018-19 season	English	Fish feed production training in 2018-19
02	INLAND MYSAP conducts a Training of Trainers (ToT) training course in Kale	English	MYSAP Inland ToT training in kale in 2019-20 culture season
03	MYSAP booth exhibition at the national central launch of the Nutrition Promotion Month	English	Nutrition event TG in 2019-20 season
04	Fish preservation and quality control	English	Fish preservation and quality control training
05	Fish feed production in 2019-20 season	Myanmar	Fish feed production on 19-20 culture season
06	Common carp induced breeding in KET	Myanmar	Common carp induced breeding in KET
07	MYSAP Inland supports SSA farmers and fish processing during COVID-19	English	MYSAP Inland supports SSA farmers and fish processors during COVID-19
08	Cross-visit to MYSAP Inland farmer villages in Kengtung	English, Myanmar	link
09	A stacked value chain analysis of smoked rohu from Kale	English, Myanmar	link

Success Stories: (MYSAP Inland success stories link)			
#	**Title**	**Language Version**	**Link**
01	Success story MFF Shwebo hatchery	English, Myanmar, Video clip	MFF hatchery success story
02	Success story Shwe Baw Kyun Shwebo	English, Myanmar, Video clip	SB Shwe Baw Kyun success story
03	Success story Nat Gyi Kone Kale	English, Myanmar, Video clip	Kale Nat Gyi Kone success story
04	Demonstration farmers combine video in 2018-19 culture season	Video clip	Demo combine in 2018-19 culture season
05	SIS partial harvesting guide	Video clip	SIS video clip
06	Success story demonstration farmers Shwebo Township	English, Myanmar, Video clip	Success story demonstration farmers SBO 2019-20
07	Nutritional Parameters	English, Myanmar	link
08	Success story on pilot rice-fish plot very profitable	English, Myanmar	link
09	MYSAP supports improved fish smoker construction and testing in Kale	English, Myanmar	link

Training material: (MYSAP Inland training materials link)			
#	**Title**	**Language Version**	**Link**
01	Farmer record book	Myanmar	Farmer record
02	Small-scale aquaculture (SSA) farmer guide	Myanmar	SSA farmer guide
03	GIFT breeding and All-male Seed Production	English, Myanmar	GIFT breeding and all-male seed production
04	Hatchery Biosecurity	English, Myanmar	Hatchery Biosecurity
05	Management of Inbreeding in Carp Hatcheries in Myanmar, April 2019	English, Myanmar	Management of Inbreeding in Carp
06	Taking and preserving fish samples for histopathology analysis	English, Myanmar	Fish histopathology analysis
07	Taking and preserving fish samples for PCR analysis	English, Myanmar	Fish PCR analysis
08	Taking and preserving shrimp samples for PCR analysis	English, Myanmar	Shrimp PCR analysis
09	Taking and preserving shrimp samples for histopathology analysis	English, Myanmar	Shrimp histopathology analysis
10	Feed Production Technology	Myanmar	Feed production technology
11	Fish Nutrition and Feeding	Myanmar	Fish nutrition and feeding
12	Fish drier & powder guideline	English, Myanmar	Fish drier & powder guideline
13	MYSAP Inland SSA integrated vegetable production and improved human nutrition	Myanmar	link
14	Fish feed milling business model guide	English	link
15	Grow out farm business model guide	English	link
16	Nursery fish farm business model guide	English	link
17	Myanmar FAO FTT Thiaroye smoker operation guide	English, Myanmar	link
18	Fresh fish trading facilitator guide	English, Myanmar, Big Shan	link
19	FTT Myanmar smoker construction guide	English, Myanmar	link

Reports: (MYSAP Inland report link)			
#	Title	Language Version	Link
01	Baseline survey report - MYSAP Inland	English	Baseline survey report
02	Value chain report - Amarapura	English	Value chain report - Amarapura
03	Value chain report – Kale	English	Value chain report – Kale
04	Value chain report – Kengtung	English	Value chain report – Kengtung
05	Value chain report – Pinlaung	English	Value chain report – Pinlaung
06	Value chain report - Shwebo	English	Value chain report - Shwebo
07	Nutrition Barrier Analysis Report – Shwebo	English	Nutrition Barrier Analysis Report – Shwebo
08	Management of inbreeding in carp hatcheries in Myanmar	English	Management of inbreeding in carp hatcheries in Myanmar
09	BRAC Evaluation Report - 2018-19 season	English	BRAC Evaluation Report - 2018-19 season
10	Lessons learned workshop report - Shwebo	English	Lessons learned workshop report – Shwebo
11	Lessons learned workshop report – Kengtung	English	Lessons learned workshop report – Kengtung
12	Lessons learned workshop report – Kale	English	Lessons learned workshop report – Kale
13	Midline nutrition report	English	Midline nutrition report
14	Kengtung Township Market - Fish sales report	English	Kengtung Township Market - Fish sales report
15	Options for supplying all-male tilapia for Kengtung Township, Eastern Shan State, Myanmar	English	Options for supplying all-male tilapia for Kengtung Township, Eastern Shan State, Myanmar
16	Screening of fish and shrimp-based pastes for the presence of parasites: An analysis of pastes from Myanmar	English	Fish paste diagnostic report
17	Data analysis of questionnaire digital abilities	English	Data analysis of questionnaire digital abilities
18	Nutrition approaches of MYSAP Inland	English	Nutrition approaches of MYSAP Inland
19	A stacked value chain analysis study of smoked rohu from Kale	English	A stacked value chain analysis study of smoked rohu from Kale
20	Small Indigenous Fish Species (SIS) Project	English	SIS project
21	MYSAP Report on Piloting a Low-Cost Portable Fish Drier	English	link
22	MYSAP Communication Approaches for Sustainable Aquaculture Development and Improved Nutrition in the Sagaing Region and the Shan State of Myanmar	English	MYSAP Communication Approaches for Sustainable Aquaculture Development and Improved Human Nutrition in the Sagaing Region and the Shan State of Myanmar (worldfishcenter.org)
23	Kale Township Fish Sales Report, April 2019 to March 2020	English	link

Reports: (MYSAP Inland report link)			
#	Title	Language Version	Link
24	Shwebo Township Fish Sales Report, April 2019 to March 2020	English	link
25	Kengtung Township Fish Sales Report, April 2019 to March 2020	English	link

Open access at websites of MYSAP Inland are:
(Please just type the name of MYSAP Inland in search box, then all documents will be appeared.)

https://digitalarchive.worldfishcenter.org/
http://www.dof-myanmar-fic.org

Blogs				
#	Title	Language	Site	Link
01	MYSAP Inland supports small-scale fish farmers and fish processors during COVID-19	English	WorldFish	http://blog.worldfishcenter.org/?s=MYSAP+Inland
02	MYSAP Inland supports small-scale fish farmers and fish processors during COVID-19	English	CGIAR	https://fish.cgiar.org/news-and-updates/news/mysap-inland-supports-small-scale-fish-farmers-and-fish-processors-during
03	COVID-19 impact and the opportunities for working digitally with small scale fish entrepreneurs in rural Myanmar	English	LinkedIn (BoPInc)	https://www.linkedin.com/pulse/covid-19-impact-opportunities-working-digitally-small-britt-de-lange
04	A Stacked value chain analysis study of smoked Rohu from Kale Township, Sagaing Region, Myanmar	English	WorldFish	link

Training of trainer (TOT) module and session video clip (All ToT video clip link)

The following lists of the video clip are also available and have been uploaded onto the virtual fish culture learning group (VFCLG), private group in Facebook.

#	TOT		Topic	Languages and Access Link			
	Module	Session		MM	Big Shan	Ahkar	Lahu
1	01	02	Nutrition and food groups	Link	Link	Link	Link
2		03	Fish and types of fish culture, site selection criteria of new pond, its construction and dimension	Link	Link	Link	Link
3		04	Repairing dike and bottom of pond, eradicating of aquatic weed, removing carnivores and non-cultured fish	Link	link	Link	link
4		05	Water filling, application of lime and fertilizer during pond preparation	Link	Link	Link	link
5		06	Natural food observation, water suitability test, determine different fish species, habitat and its stocking density	Link	Link	Link	link
6		07	Identification of strong and weak fry, disinfection of fry, transportation, acclimatization, stocking and survival rate fry	link	Link	Link	Link
7		08	Gender, role of women in fish culture, food & nutrition, components of food & classification of feed according to function	Link	Link	Link	link
8		09	Disaster management in fish culture	Link	Link	Link	link
9		10	Micronutrients – Vitamin A and Iron	Link	Link	Link	link
10	02	11	Identification of local small fishes and nutrition value, and maintaining nutrition value	Link	Link	Link	Link
11		12	Intergenerational Cycle of Malnutrition Script	Link	-	Link	
12		13	Cooking small indigenous fish species and keep the nutrient	Link	link	Link	Link
13		14	Increasing pond productivity after stocking, water exchange and water quality test	Link	link	Link	Link
14		15	Supplementary feeding	Link	link	Link	
15		16	Sampling	-	link	Link	Link
16		17	FCR and calculation of food	Link	Link	Link	
17		18	Disease prevention management of fish	Link	Link	Link	

#	TOT		Topic	Languages and Access Link			
	Module	Session		MM	Big Shan	Ahkar	Lahu
18	03	19	Partial harvesting & re-stocking and complete harvesting	Link	link	-	link
19		20	Marketing of fish, income and expenditure account and yearly calendar of fish culture activities	Link	link	-	link
20		21	Dike cropping, production season, seed bed preparation, fertilizer management in seed bed and compost preparation method	-	link	Link	Link
21		22	Culture method of sweet orange potato and nutritional value	-	link	Link	Link
22		23	Crop management, disease protection and crop marketing, preservation for household consumption, cropping calendar	-	link	-	Link
23		24	Supplement food for children, Part (1)	Link	link	Link	Link
24		25	Supplement food for children, Part (2)	Link		Link	
25		26	Practical training for nutrient diet system	Link	link	-	Link
26		27	Importance of hand wash, steps and use of tippy tap	Link	link	Link	Link