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## Feed the Future Burma Fish for Livelihoods Project

Better management practices:  
Small-scale aquaculture farmers - survey  
Year 2 and 3 farmers (2021 and 2022)



In partnership with



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# Feed the Future Burma Fish for Livelihoods

## Better management practices: Small-scale aquaculture farmers survey- Year 2 and 3 farmers (2021 and 2022)

### **Authors**

Naw Christine Pan Wai  
Monitoring and Evaluation Coordinator  
WorldFish Myanmar

Syed Aman Ali  
Monitoring, Evaluation and Communications Specialist  
WorldFish Myanmar

### **Editor**

Michael Akester  
Regional Director (Southeast Asia and Pacific)  
WorldFish

Magway, Sagaing, Kachin, Southern and Eastern Shan

Published: February, 2024

Data collection from the field: 2nd week of June to 1st week of July'2023

This publication was produced for review by the United States Agency for International Development (USAID) under the Fish for Livelihoods project led by WorldFish.

## Citation

This publication should be cited as: WorldFish. 2024. Better management practices: Small-scale fisheries farmers survey. Penang, Malaysia: WorldFish. Program Report.

## Fish for Livelihoods

Capture fisheries are declining in Myanmar, yet 60% of the population's animal-sourced food comes from fish. To meet the growing demand for fish, aquaculture production is increasing. Myanmar must develop a sustainable aquaculture industry that minimizes potential environmental impacts while ensuring that aquaculture practices are socially acceptable and economically sound. The United States Agency for International Development (USAID) funded the Feed the Future Burma Fish for Livelihoods *Activity*, *hereinafter referred to as F4L*. F4L aims to increase fish production, labor productivity, food availability, and fish consumption, especially for women and children from vulnerable households. It will provide opportunities for entrepreneurial activities in small-scale aquaculture systems, and promote social behavioral change messages that direct home production and market purchases towards nutritious-conscious household decisions.

## Acknowledgments

The **Feed the Future Burma Fish for Livelihoods *Activity*** (F4L) is funded by the United States Agency for International Development (USAID). This work was also undertaken as part of the CGIAR Research Initiative on Aquatic Food and funded by CGIAR Trust Fund donors. Funding support for this work was provided by CGIAR Trust Fund donors.

We wish to express our sincere thanks to our implementing partners: Shwebo team, Nansang team from BRAC Myanmar, the Salin, Seikphyu, Myothit and Ngaphe teams from PACT, the Karuna Mission Social Solidarity (KMSS) Keng Tung team, the Myanmar Fisheries Federation (MFF) Kachin team, and the Myanmar Fisheries Federation (MFF) Southern Shan team for their support in surveying despite all the difficult circumstances. The data collection for this survey would not have been possible without the active participation and support of the field teams from our implementing partners.

## Contact

WorldFish Communications and Marketing Department, Jalan Batu Maung, Batu Maung, 11960 Bayan Lepas, Penang, Malaysia. Email: [worldfishcenter@cgiar.org](mailto:worldfishcenter@cgiar.org)

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# Table of contents

1. Introduction.....	4
1.1. Project introduction and implementing areas .....	4
1.2. Objectives of the survey .....	5
1.3. Respondents .....	5
2. Methodology .....	7
2.1. Systematic random sampling .....	7
2.2. Selecting enumerators .....	7
2.3. Survey method .....	7
2.4. Training sessions and collecting data .....	7
2.5. Limitations .....	9
3. Analysis .....	10
3.1. Participation of farmers who harvested ponds .....	10
3.2. Location of aquaculture ponds .....	10
3.3. Liming .....	11
3.4. Fertilizer application .....	12
3.5. Testing the amount of natural food in ponds .....	13
3.6. Use of quality fish seed .....	133
3.7. Maintaining stocking density .....	<b>Error! Bookmark not defined.</b> 4
3.8. Species selection .....	<b>Error! Bookmark not defined.</b> 5
3.9. Responsible use of Probiotics free supplementary feed .....	16
3.10. Proper post-harvest handling .....	177
3.11. Drugs and chemicals.....	188
3.12. Practicing better management practices .....	199
Findings .....	21
Recommendations .....	22

# 1. Introduction

## 1.1. F4L introduction and implementing areas

Capture fisheries are declining in Myanmar, however the inland fisheries provide around 850,000 mt of fish to the Myanmar people, their preferred source of fish. This production is insufficient to meet demand, hence the growing importance of aquaculture. Sixty percent of the animal-source protein in the country still comes from fish. To meet the growing demand for fish, aquaculture production has been increasing. In doing so, Myanmar must develop a sustainable aquaculture industry that minimizes potential environmental impacts and ensures aquaculture practices are socially acceptable and economically sound.

To this end, in October 2019, the United States Agency for International Development (USAID) awarded funding to WorldFish for the period 2019–2024, subsequently extended to 2027. The purpose of F4L is to improve the nutrition status in central and northern Myanmar by promoting inclusive and sustainable aquaculture growth that focuses on small-scale farmers. It provides opportunities for entrepreneurial activities in small-scale aquaculture systems and promotes social behavioral change messages that direct home production and market purchases toward nutrition-conscious household decisions. More specifically, it aims to increase fish production, labor productivity, food availability, and fish consumption in Myanmar, especially for women and children from vulnerable households.

Part of WorldFish's mission in Myanmar focuses on small-scale aquaculture (SSA) to promote the resilience of small-scale farmers and the sustainability of the agriculture sector. WorldFish provides technical backstopping to our main field-based implementers: the Myanmar Fisheries Federation, Karuna Social Services Association, PACT (subsequently replaced by Ar Yon Oo (AYO)) and BRAC.

F4L focuses on five inland states and regions in central and northern Myanmar: The Central Dry Zone regions of (1) Mandalay, (2) Magway and (3) Sagaing, (4) the southern and eastern parts in Shan State, and (5) all of Kachin State. From these five areas, the Baseline study focuses on 36 townships: Bamaw, Mogaung, Moemauk, Myitkyina, Waingmaw, Mansi, Salin, Ngaphe, Myo Thit, Seik Phyu, Sinbaungwe, Taungdwingyi, Pwintphyu, Shwe Bo, Khin-U, Wetlet, Tigyaing, Kale, Madaya, Sintgaing, Patheingyi, Myittha, Sintgu, Tachileik (Tar Lay), Mongyawng, Monghpyak, Kengtung, Taunggyi, Pekon, Pinlaung, Nansang, Loilen, Nyaungshwe, Pindaya, Hopong, and Hsihseng. In the baseline study, which was conducted in late 2021 and early 2022, the number of townships was 36.

These areas present challenges concerning aquaculture development and livelihood opportunities. Aquaculture growth can play an important role in changing this scenario by increasing production and income opportunities.

Figure 1 shows the townships selected for the survey.



**Figure 1.** Townships where the BMP survey was conducted

## 1.2. Objectives of the survey

Objectives of the survey

The survey has two main objectives:

1. To verify whether SSA farmers from the project areas are using better management practices (BMPs) in their aquaculture systems.
2. To promote BMPs among SSA farmers and check for any difficulties in applying them.

## 1.3. Respondents

The respondents were selected among the year 2 (FY 2021) and 3 (FY 2022) farmers who received fish fingerlings.

To ensure that farmers in each study area were represented proportionally, approximately 30 percent of the overall number of farmers in each region or state were interviewed for the BMP survey questionnaires, as shown in Table 1. This proportional representation was also attempted for most of the study townships.

Region/Township	Farmers/HH	30%	# of Enumerator	Remark 1
Kachin	103	31	2	
Bamaw	21	6		
Myitkyina	12	4	1	
Moe Kaung	9	3		
Waing Maw	52	16		
Moe Mauk	9	3	1	
Sagaing	150	45	3	
Shwebo	150	45	3	
Magway	251	75	5	
Ngaphe	44	13	1	
Seikphyu	21	6	1	
Myothit	63	19	1	
Salin	123	37	2	
Eastern Shan	144	43	2	
Kengtung	144	43	2	
Southern Shan	285	86	5	
Pindaya	36	11	1	
Nyaung Shwe	68	20	1	
Pinlaung	59	18	1	Y2 farmers which were not collected during Y2
Pinlaung	22	7		Y3 farmers
Nansang	100	30	2	
Grand Total	933	281	17	

**Table 1.** Number of respondents who participated in the BMP survey

### Geographical focus

The BMP survey focuses on Years 2 and 3 for all the farmers and townships covered in the implementation areas of the project. F4L initiated activities in 15 townships in Year 3. Together 15 townships were considered for the survey: Myitkyina, Mogaung, Waingmaw, Bahmo, Moemauk, Shwebo, Salin, Myothit, Ngaphe, Seikphyu, Kengtung, Pinlaung, Pindaya, Nyaungshwe and Nansang.

## 2. Methodology

### 2.1. Systematic random sampling

A systematic random sampling technique was used to select 30 percent of the F4L farmers as respondents for the survey. Respondents were selected from the project's list of participating farmers who received fingerlings, the confidence rate is 95% and the interval was set at every third respondent.

### 2.2. Selecting enumerators

The enumerators were selected following due process. Positions were advertised and standard criteria were set. In selecting enumerators, a top priority was to choose local people who know the local context and possess a basic knowledge of aquaculture and/or fisheries management. Enumerators were selected upon the recommendation of implementing partners, and nearly all of them were familiar with the aquaculture sector. Data for the BMP survey was collected using the KoBo toolbox and the enumerators met and interviewed the farmers in person.

### 2.3. Survey method

The respondents were interviewed face to face and enumerators were asked to take photos of the ponds for evidence unless the ponds were far from the farmer's house. Enumerators interviewed farmers and observed their ponds to determine if they were using BMPs. While interviewing the farmers, they inputted the data using the KoBo toolbox software program.

### 2.4. Training sessions and collecting data

Initially, one-day training sessions were held with the enumerators on how to administer the BMP survey, collect data, and enter the data into the Kobo toolbox. Collecting data took 1 to 5 days, depending on the sample size for each township. An M&E Coordinator and Data Specialist and three Field Coordinators from Magway, Sagaing and Kachin trained a total of 14 enumerators on the technical aspects of how to collect data and the BMP criteria used for the survey. The remaining 3 enumerators were trained by implementing partners' staff who participated in a one-day training.



Townships	Enumerators		WorldFish staff		Implementing Partners		Traning Days	Training Methods	Data Collection Days	Data Collection Methods
	M	F	M	F	M	F				
Myitkyina			1				6-Jun-23	Virtual	2nd week of June to 1st week of July	Visit to Pond Site
Waingmaw	1							Virtual	2nd week of June to 1st week of July	Visit to Pond Site
Mogaung								Virtual	2nd week of June to 1st week of July	Telecommunication
Bhamo					1		6-Jun-23	Virtual	2nd week of June to 1st week of July	Visit to Pond Site
Momaik	1							Virtual	2nd week of June to 1st week of July	Visit to Pond Site
Mandalay			1							
Shwebo	2	1				1	8-Jun-23	Training by IP staff	2nd week of June to 1st week of July	Visit to Pond Site
Myothit	1				1		6-Jun-23	Virtual	2nd week of June to 1st week of July	Visit to Pond Site
Ngaphe	1						6-Jun-23	Virtual	2nd week of June to 1st week of July	Visit to Pond Site
Seikphyu		1					6-Jun-23	Virtual	2nd week of June to 1st week of July	Visit to Pond Site
Salin	2		1		1		6-Jun-23	Virtual	2nd week of June to 1st week of July	Visit to Pond Site
Kengtung	2					1	6-Jun-23	Virtual	2nd week of June to 1st week of July	Visit to Pond Site
Pindaya		1					6-Jun-23	Virtual	2nd week of June to 1st week of July	Visit to Pond Site
Nyaungshwe	1			1			6-Jun-23	Virtual	2nd week of June to 1st week of July	Visit to Pond Site
Pinlaung	1						6-Jun-23	Virtual	2nd week of June to 1st week of July	Visit to Pond Site
Nansang		2				1	6-Jun-23	Virtual	2nd week of June to 1st week of July	Visit to Pond Site
Yangon				2						
	12	5	3	3	3	3				

**Table 2.** Training sessions and data collection.

## 2.5. Limitations

The survey was administered in difficult times of political tension and adversities in different scenarios. The enumerators from Shwebo township were not trained directly by the M & E Coordinator because of the political tension and security concerns. Weakness in terms of enumerator digital illiteracy in Shwebo Township, resulted in the M & E Coordinator hiring another encoder to fill the data in KoBo since the enumerators had collected the data in hard copies. By chance, the enumerators are familiar with aquaculture activities, they can collect the data within the needed time frame. For data validity and accuracy, implementing partners assisted with the work. Because of the fighting in the nearby villages of Mogaung and Waingmaw Townships, the enumerator could not go and collect BMP data in person in Mogaung Township so it was collected via mobile phone.

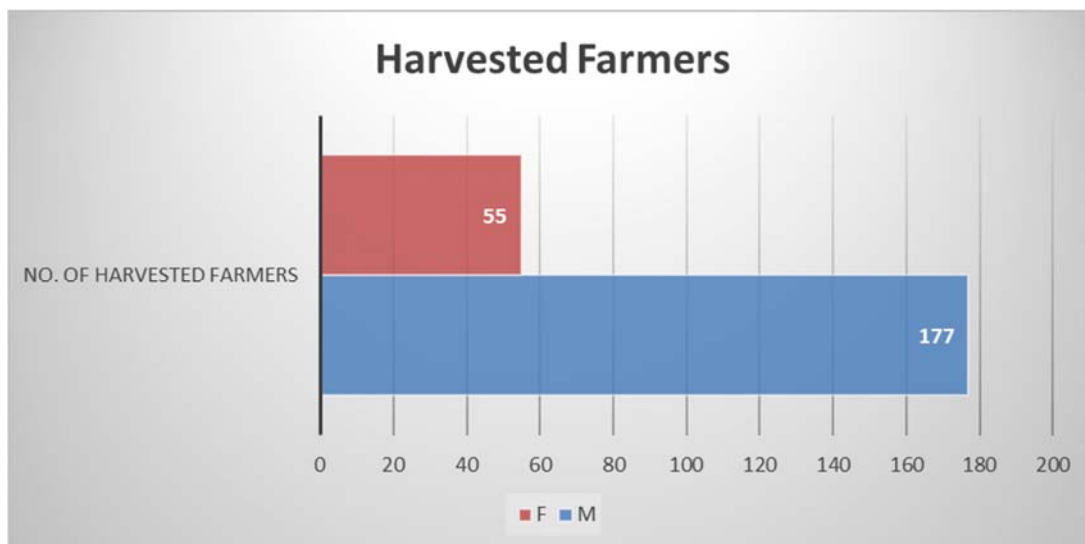


Photo credit: Zin Lin Tun/ Enumerator

**Figure 2.** A small pond in Nyaungshwe Township, Southern Shan State

### 3. Analysis

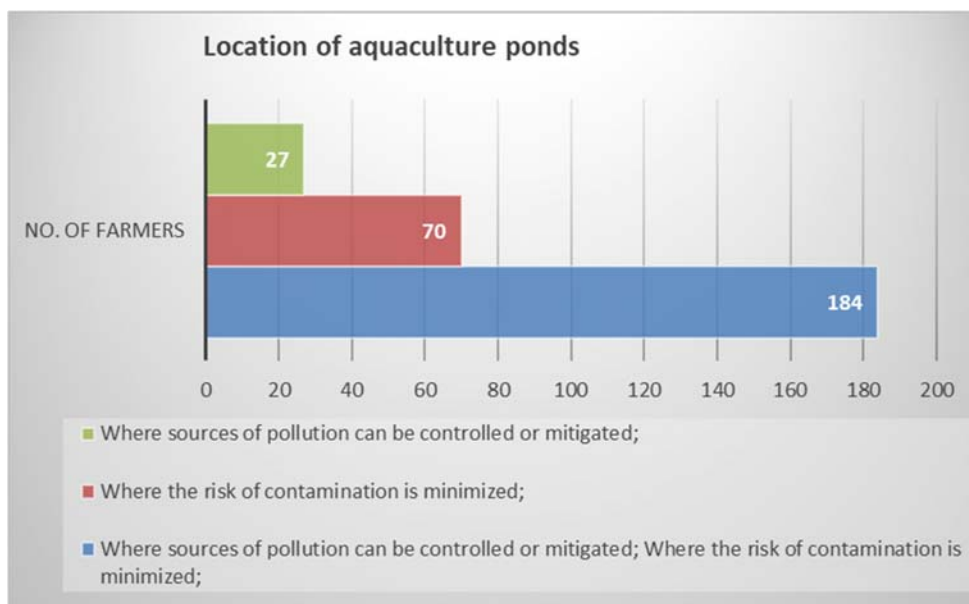
#### 3.1. Participation of farmers who harvested ponds



**Figure 3.** Participation of farmers who harvested ponds.

Among the 281 respondents, nearly 83 percent had already harvested their ponds, as shown in Figure 3.

#### 3.2. Location of aquaculture ponds

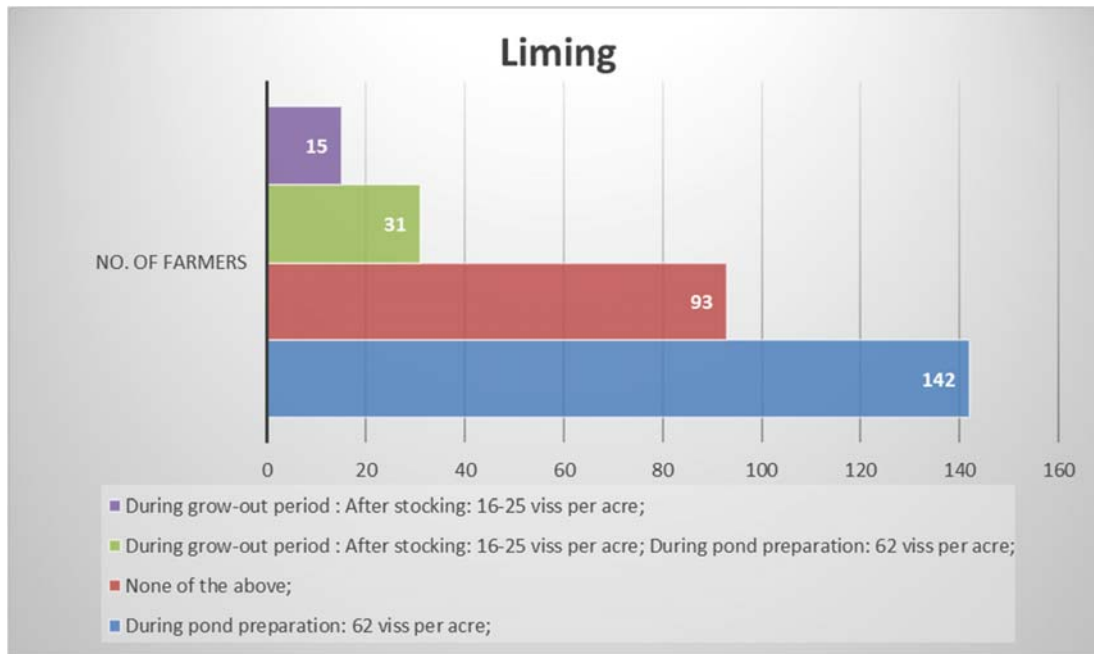


**Figure 4.** Number of farmers whose ponds are in a proper location.

As shown in Figure 4, 184 farmers (65 percent) were aware that their ponds were in good condition and not polluted. The remaining 25 percent (70 farmers) did not meet this criterion because they are farming fish together with pigs and the pigs take baths in the

ponds which can increase the risk of contamination. The remaining 10 percent (27 farmers) had shaded ponds although there is no pollution in nearby areas.

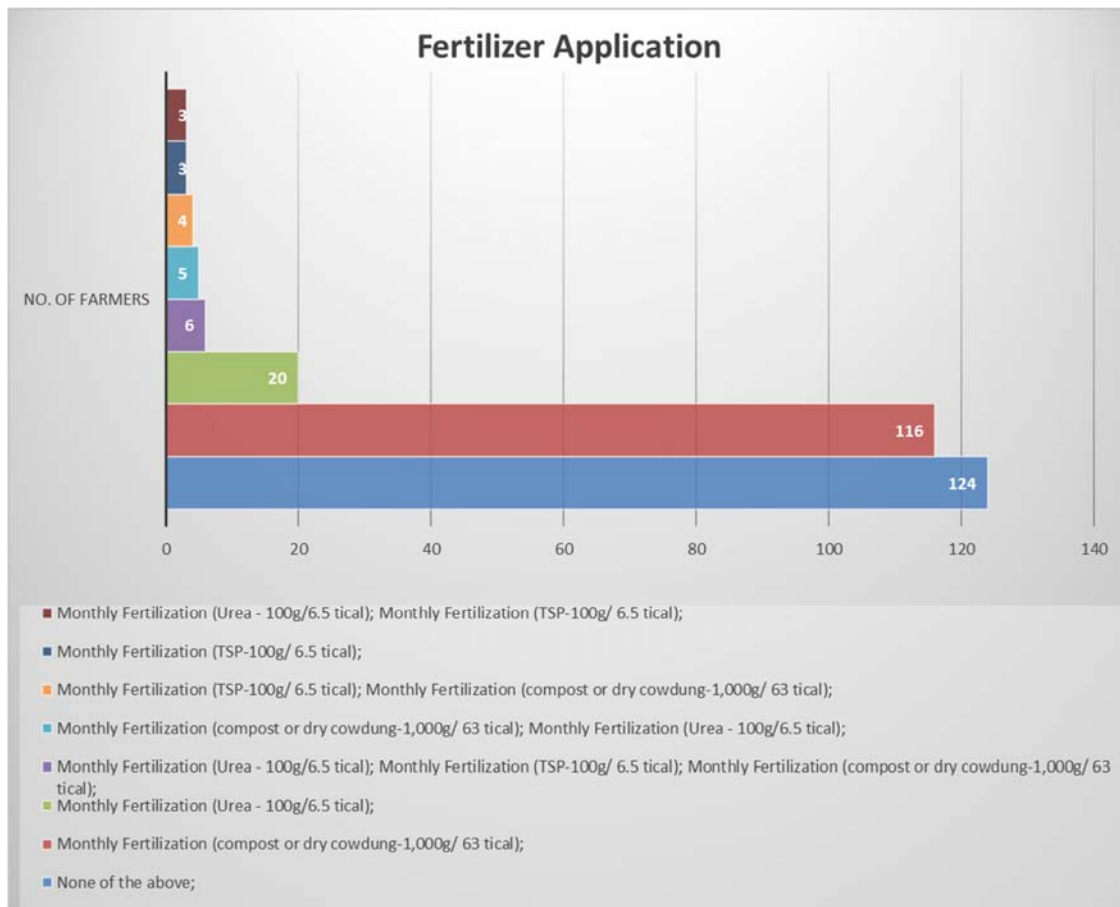
### 3.3 Liming



**Figure 5.** Number of farmers that lime their ponds before and after stocking

As shown in Figure 5, only 11 percent (31 farmers) apply lime before pond preparation and during grow-out as per the instructions. Farmers usually apply lime before pond preparation significantly 51 percent (142 farmers) but they seldom use lime during the grow-out period which is only 5 percent (15 farmers). Still, some farmers do not use lime at all before stocking and during the grow-out period and the number of farmers is 33 percent (93 farmers).

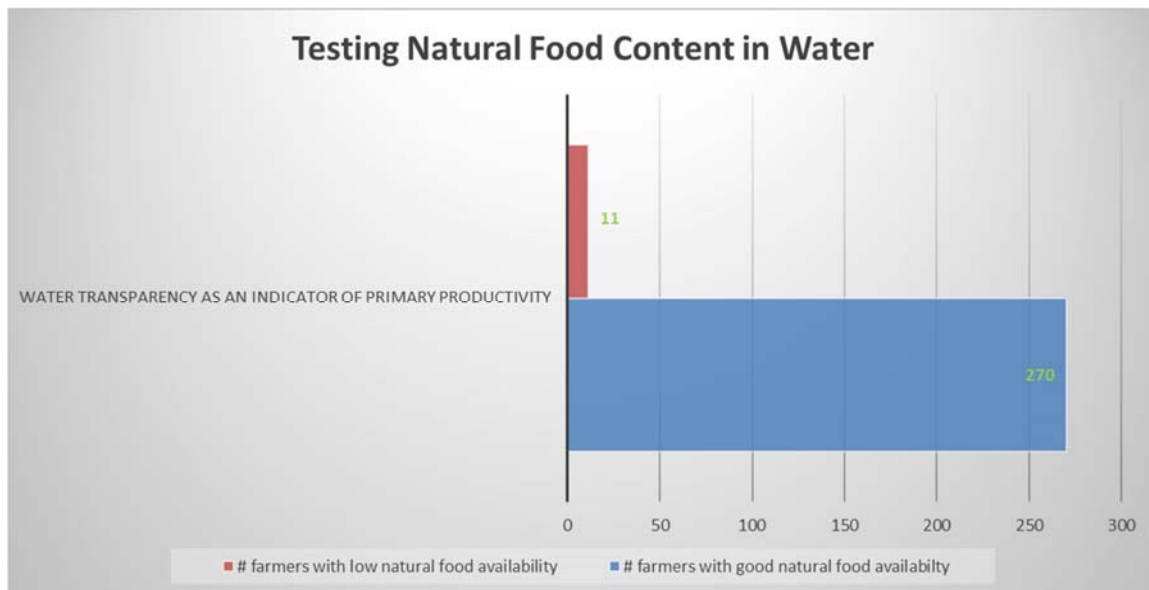
### 3.4. Fertilizer application



**Figure 6.** Number of farmers that apply fertilizers.

As shown in Figure 6, only 2 percent of the respondents (6 farmers) add all fertilizers (Urea, Triple Super Phosphate, compost, or cattle dung) to their ponds monthly, while the rest do not. According to the respondents, they apply fertilizers only at the preparation stage and only when the pond is in need. Most of the respondents did not know how to apply fertilizer monthly. We assume applying two or more fertilizers as applied fertilizer in the ponds and 18 farmers apply fertilizers in their ponds which will be urea with cow-dung or Triple Super Phosphate with cow-dung or Urea with Triple Super Phosphate or applying all three fertilizers.

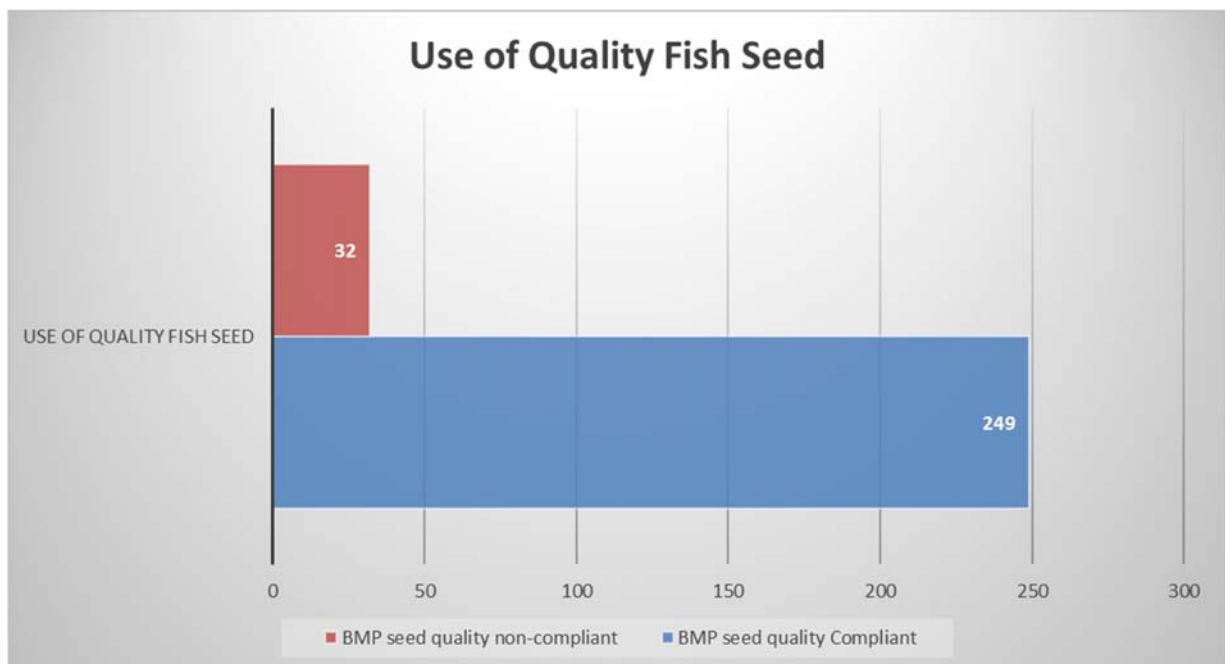
### 3.5. Testing the amount of natural food in ponds



**Figure 7.** Number of farmers test for the amount of natural food in their ponds.

For the survey, ponds were tested to determine the amount of natural food in them. Testing was done using a Secchi disk, with visibility between 10 and 25 inches indicating a proper level of natural food. Among the townships in the survey, as shown in Figure 7, 96 percent of the farmers (270) had an adequate amount of natural food in their ponds. The remaining 4 percent did not test their ponds for natural food. Some of the ponds have turbid water from sediment deposits.

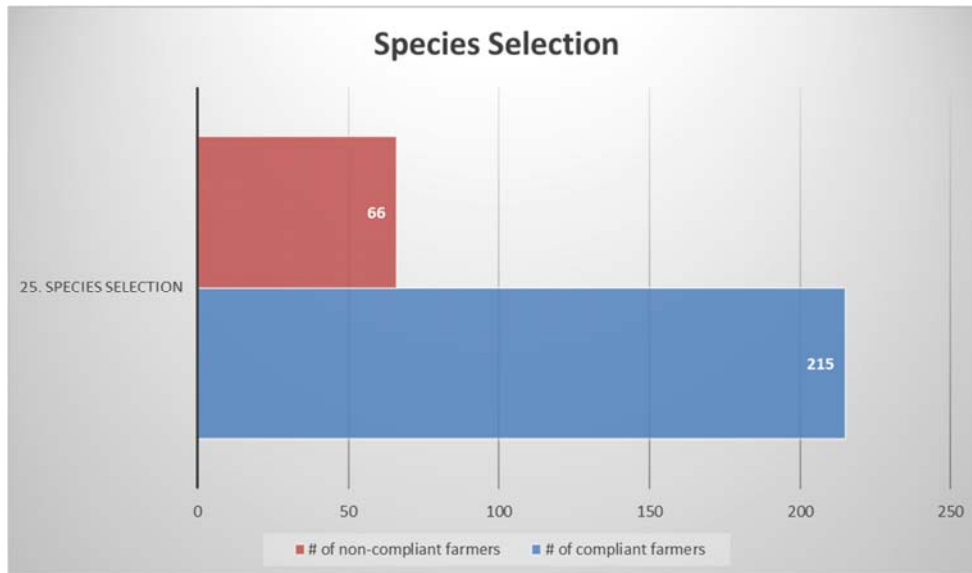
### 3.6. Use of quality fish seed



**Figure 8.** Farmers stock good quality fish seeds.

As per Figure 8, 89 percent (249 farmers) use quality fish seed and they are satisfied with the fingerling quality supported by WorldFish. All the fish seed was distributed from the F4L supported hatcheries and nurseries so that the farmers have responded they have quality seed. The remaining 11 percent (32 farmers) bought the fingerlings from outside and these fingerlings were from the river i.e. wild-caught and not of fish hatchery origin.

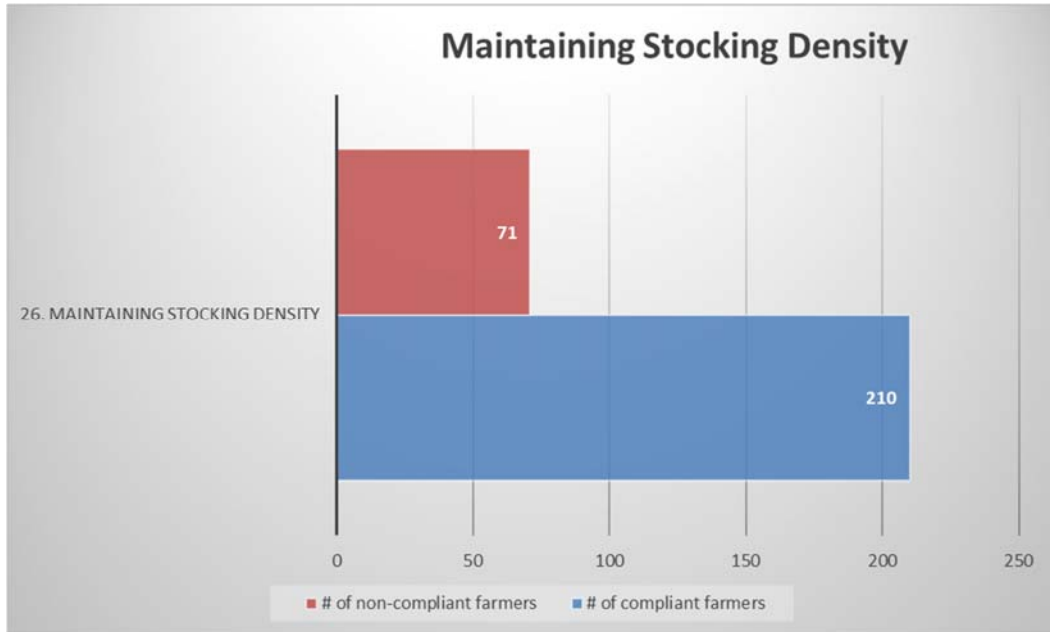
### 3.7. Species selection



**Figure 9.** Number of farmers maintaining the recommended stocking density.

Figure 9 shows that over three-quarters (215) of respondents, have maintained polyculture fish farming according to the WorldFish guidelines. The remaining 25 percent said they have used monoculture fish farming practices because there are no other species available in their townships.

### 3.8. Maintaining Stocking Density



**Figure 10.** Number of farmers who selected the correct fish species for stocking

Exactly three-quarters (210) followed the recommended stocking density and the remaining 25 percent added other species by buying from outside as they thought the stocking was less than they expected (Figure 10).



### 3.9. Responsible use of Probiotics Antibiotic free supplementary feed

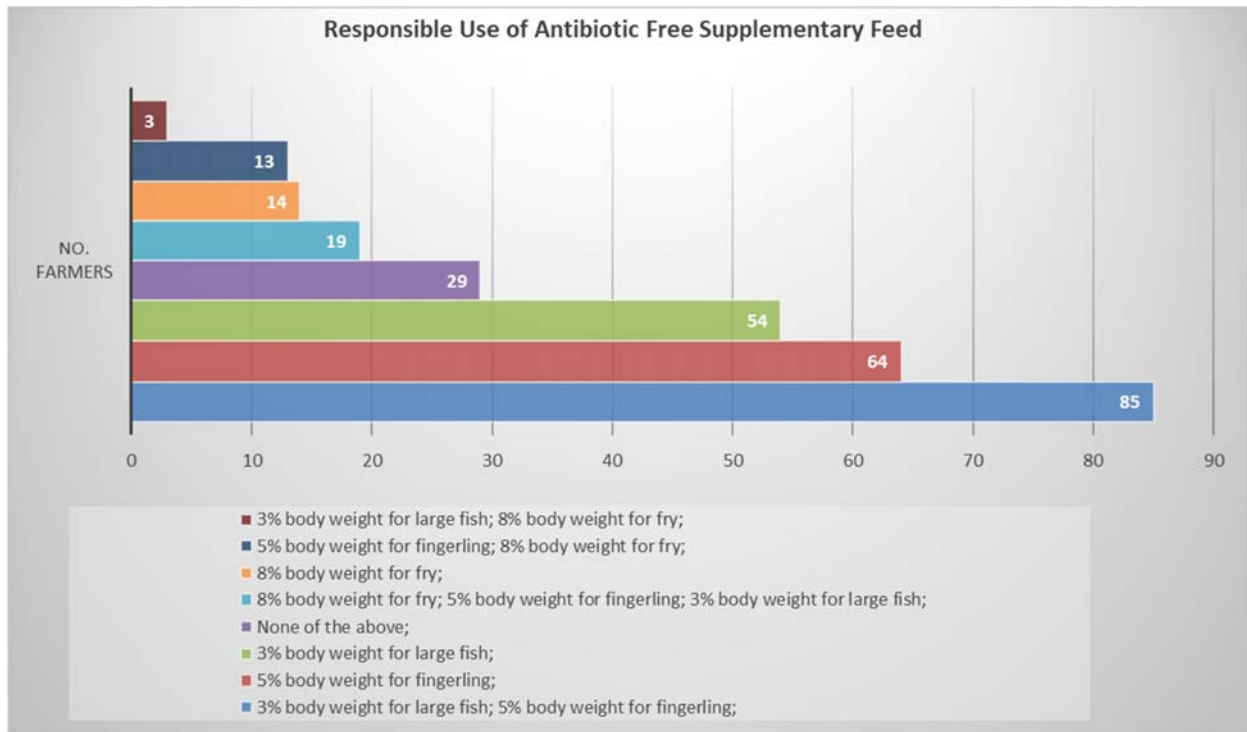


Figure 11. Number of farmers feed given to fish daily in terms of percentage body weight

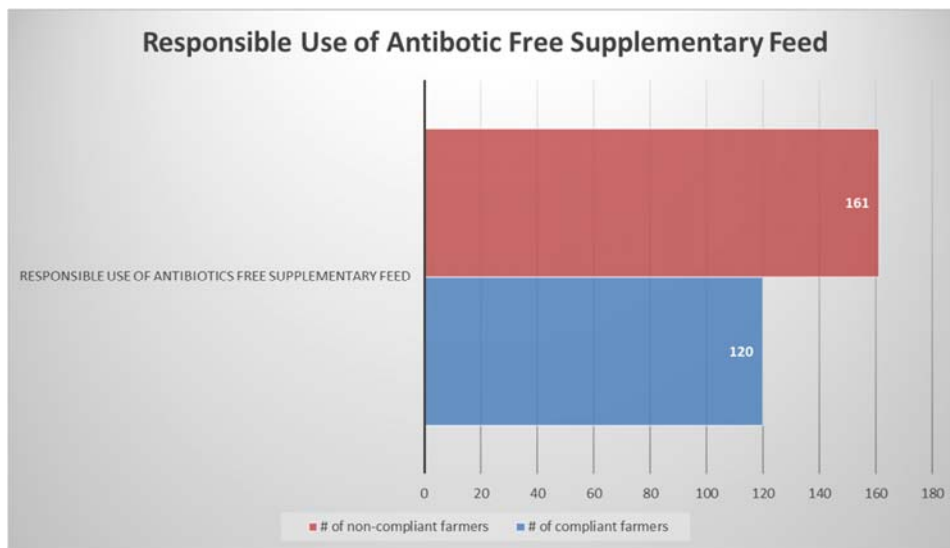
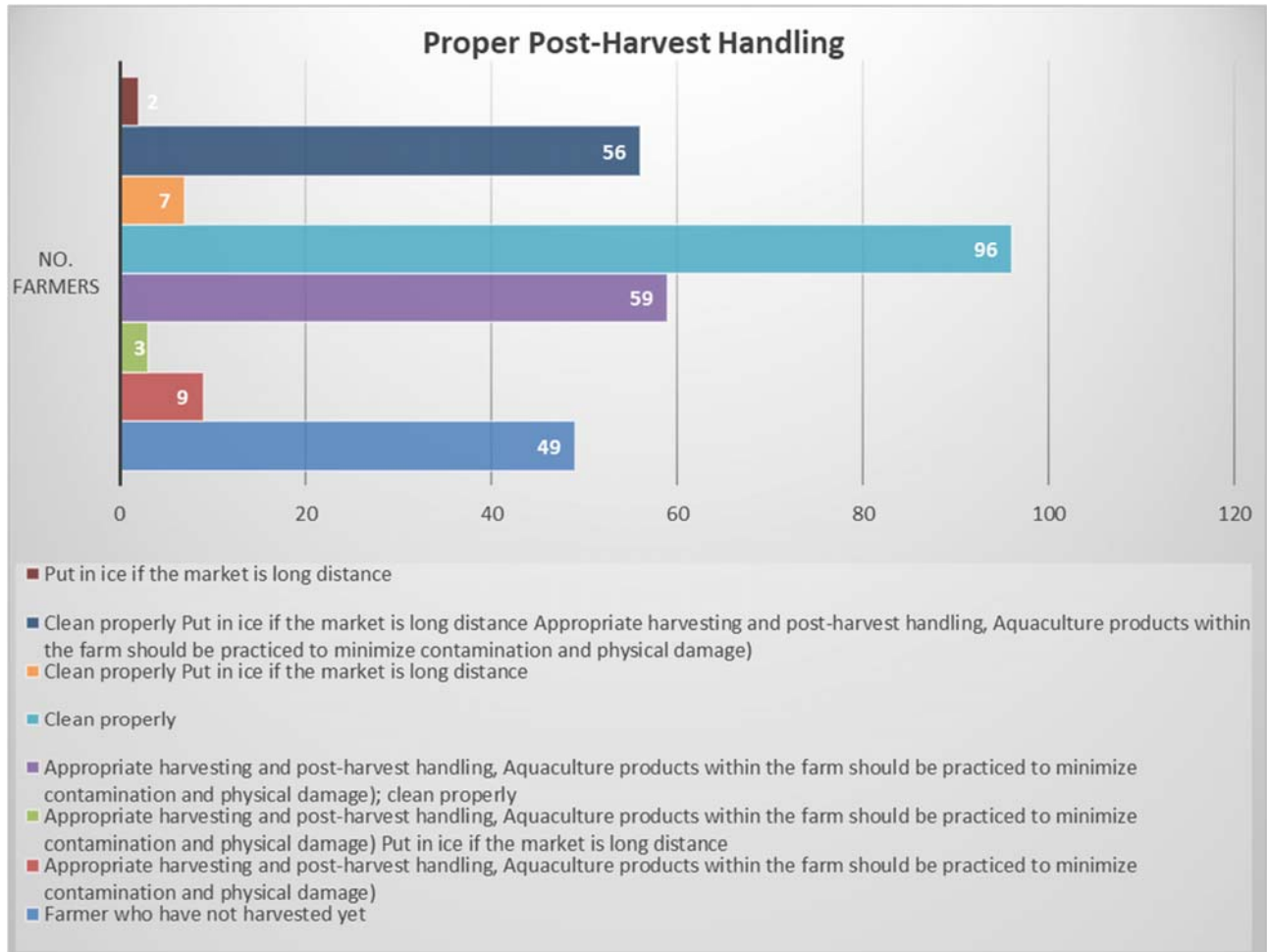


Figure 12. Farmers feeding their fish antibiotic free supplementary feed.

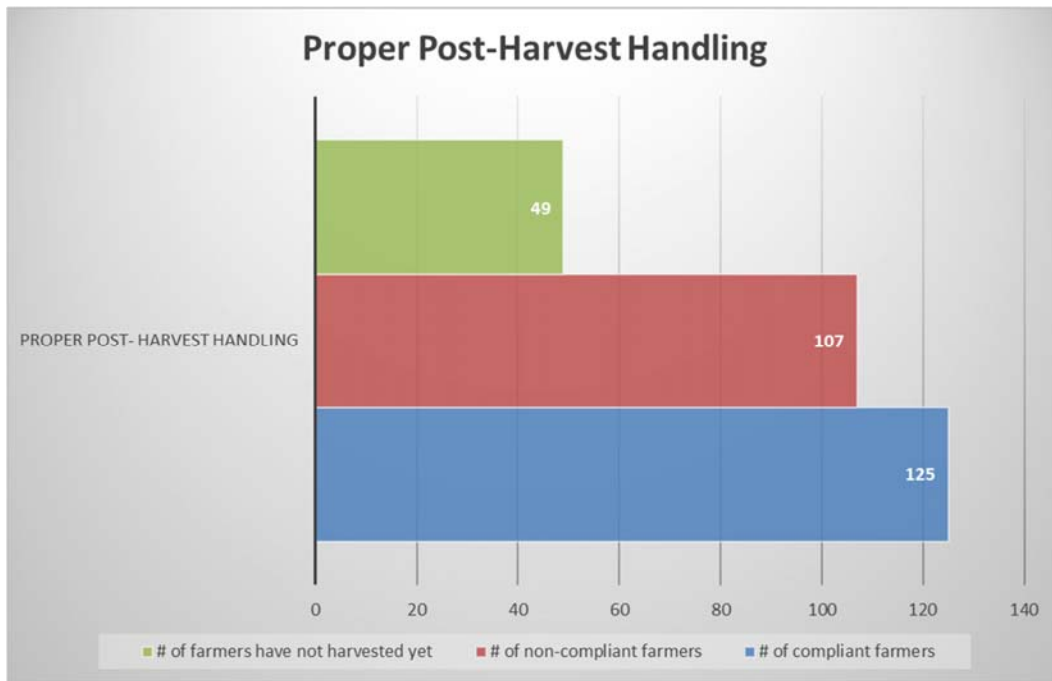
Figure 11 shows all farmers feed antibiotic-free feed while the percentage body weight farmers feed their fish varies from farmer to farmer. Figure 12 shows that 43 percent of farmers use antibiotic-free supplementary feed. The remaining 57 percent (161 farmers) also do not apply antibiotics but cannot feed in accordance with the size of the fingerlings. The farmers feed the fingerlings just the same amount of feed as usual like rice bran,

peanut cake, and sesame cake. Among 57 percent of farmers who cannot feed in proportion to the size of fingerlings, 10 percent (29 farmers) did not feed anything and depended on natural food only.

### 3.10. Proper post-harvest handling



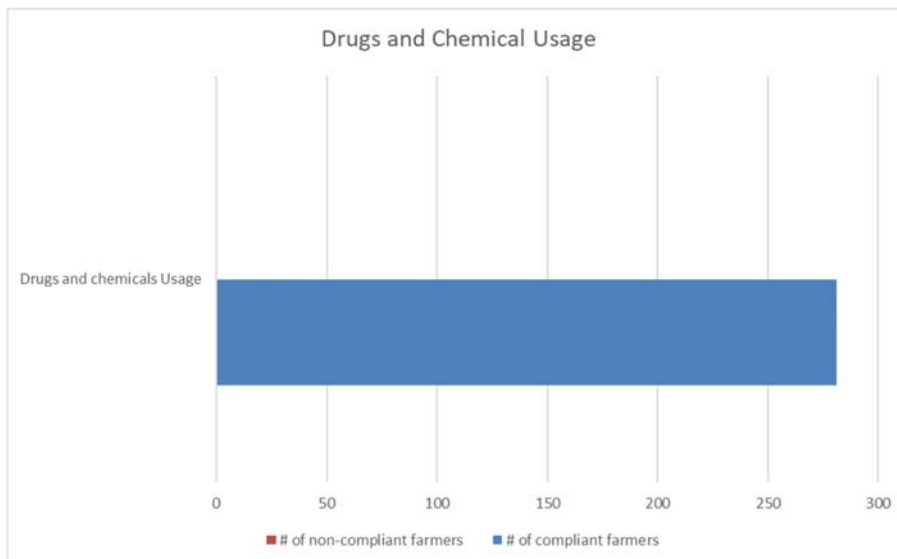
**Figure 13.** Number of farmers using correct post-harvest handling practices.



**Figure 14.** Percentage of farmers using correct post-harvest handling practices.

Among the 232 farmers who had already harvested their ponds before the survey, 54 percent (125 farmers) had adopted proper post-harvest measures and followed the instructions they received from the F4L team members as shown in Figure 14. The remaining 46 percent did not clean the harvested fish and used ice since the farmers sold the fish in the villages.

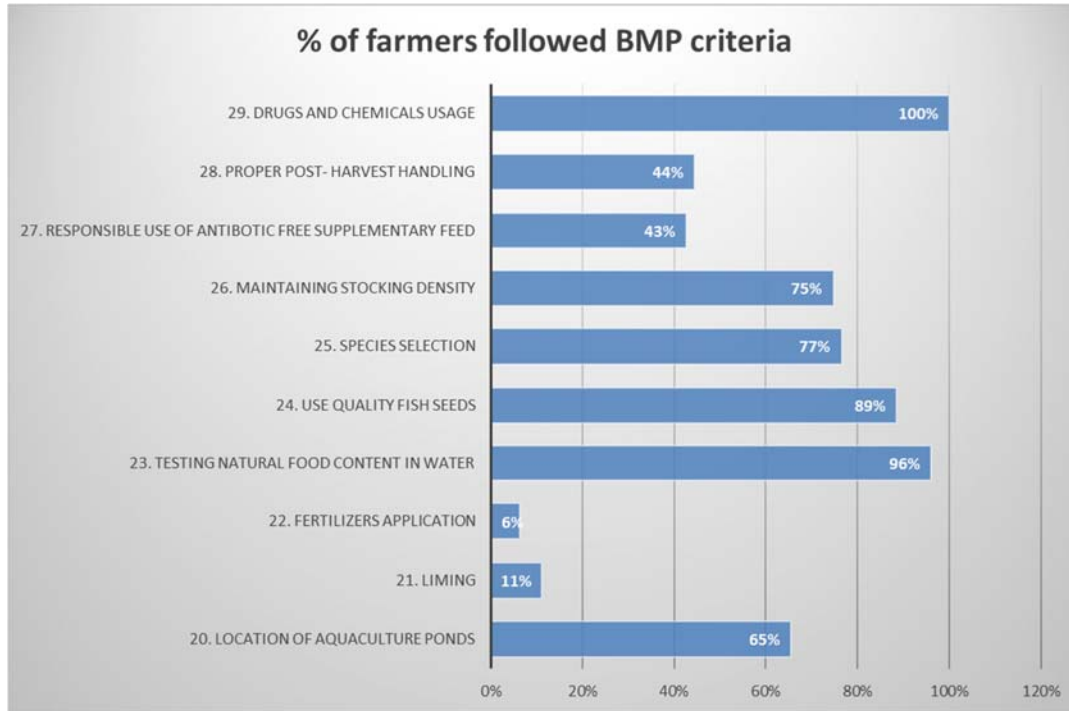
### 3.11. Drugs and chemicals Usage



**Figure 15.** Farmers using therapeutic chemicals

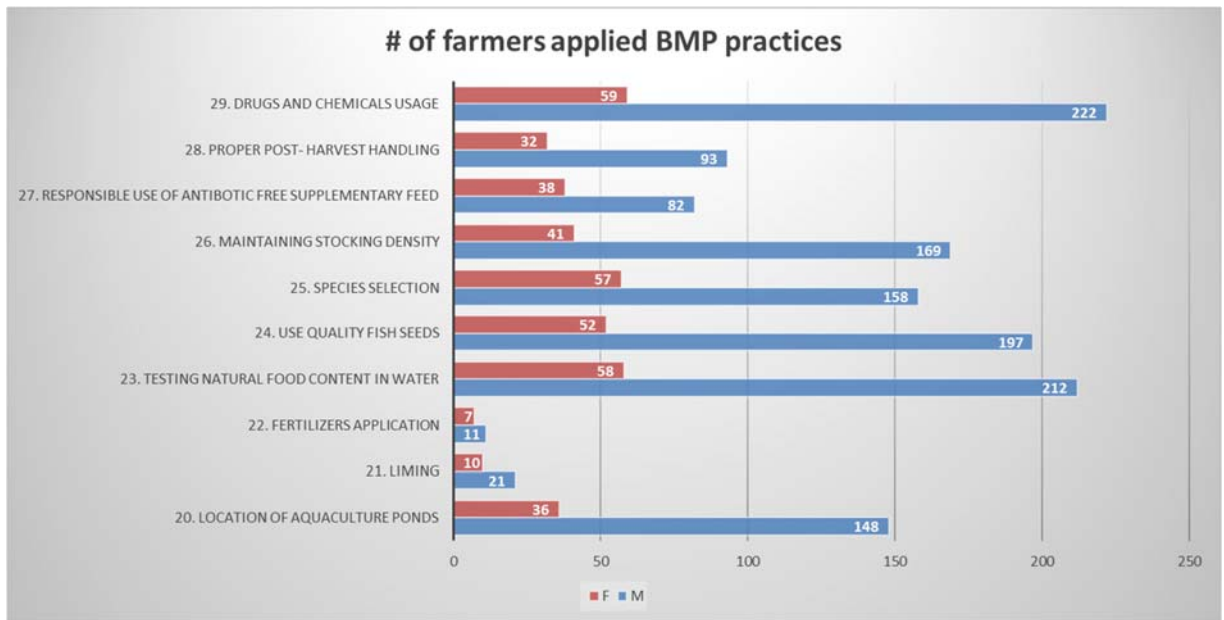
As shown in Figure 15, according to the data, 100 percent of all the farmers do not use therapeutic chemicals.

### 3.12. Practicing better management practices



**Figure 16.** BMPs that farmers used

Among the 10 BMP parameters, liming and fertilizer application are the parameters farmers comply with least. This is the same result as last year's report. Farmers do not use any chemical drugs or medicine at all and most of them are satisfied with WorldFish's supported fingerlings' quality.



**Figure 17.** BMP Criteria that farmers followed. Numbers of farmers disaggregated by sex.

The BMP criteria consist of 10 parameters. All of the respondents adopted BMPs and reported at least following three out of ten criteria. The farmers mostly applied about five parameters among 10 parameters.

## Findings

- Fish seed produced from the Feed the Future F4L supported hatcheries was considered to be of high quality by all farmers. Farmers who are near the river buy freshwater fish seed and add them to their ponds for stocking.
- SSA farmers do not use drugs and chemicals for fish diseases as was reported in the survey, hence this criterion of BMP is also fully adopted. However it is important to explain that certain therapeutic drugs/chemicals as approved by ASEAN member states can be used if necessary.
- About 50% of farmers use fertilizer on a monthly basis during the production cycle, however they may not apply the recommended amounts. Farmers typically only apply lime before pond preparation and only apply it irregularly during grow-out time. Farmers still consider that applying lime during the grow-out period is not necessary.
- Most of the farmers still have the practice of cleaning the fish and use ice when fish are to be given as a gift. Traditionally they do not like to use ice for harvested fish and according to them, ice was not needed since they sold the fish nearby in the villages.
- According to the data, ten farmers have practiced the selling of fish collectively as a group adhering to BMP. This is a good sign and should be encouraged as this is the first step towards a kind of certification whereby buyers prefer a product that is likely to be more food safe.
- Among 281 farmers, four farmers are demonstration farmers and they have adopted and applied up to nine of the BMP criteria in comparison with other grow-out farmers who adopt on average only 6 of the BMP.
- Among 232 farmers who had harvested, 91 percent (210 farmers) have sold fish while also consuming some fish and given fish as gifts.

## Recommendations

- Farmers from Magway need to be encouraged to apply BMP because 60% of those in non-compliance are from this area. Adoption of BMP is very important. There is evidence from demonstration farmers that adoption of BMP is linked to higher production in the farming system in Myanmar, for example 2,626.42 kg/ha from demo farmers versus 1,539.58 from the others. There is still a need for a detailed cost benefit analysis to see in the additional costs associated with BMP adoption produce not only higher yields but also higher profits.
- The WorldFish field teams and the staff from sub-grantees should discuss the use of lime and fertilizer with farmers according to the specific location of the pond according to the training of trainers (ToT) liming procedures delivered by the Farmer to Farmer program. Depending on the soil type and quality in some townships, there is a lesser need to lime a pond but in some they will have to lime before stocking. This is an important step and should be followed-up by field team and partners on the basis of their respective township needs.
- Different fish species are in demand in the range of townships. In one township there is a high demand for carp whereas in another there might be a low demand. Hence there is a need to match demand with supply and encourage fish hatcheries to meet this demand.
- We need to encourage clustered selling and buying and engage farmers with market actors (purchasers). There is an increasing need to connect farmers with market actors and build their capacity to sell their products at mutually beneficial prices.

