

Report

**Global program for Sustainable Fisheries and  
Aquaculture  
Endline Report Madagascar**

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## LIST OF ABBREVIATIONS

95% CI	95% Confidence Interval
FAO	Food and Agriculture Organization
FIES	Food insecurity experience scale
N	Number
SD	Standard Deviation

# 1 BACKGROUND

The global program Sustainable Fisheries and Aquaculture (GV Fish) contributes towards achieving the goals of the German Federal Ministry for Economic Cooperation and Development (BMZ) special initiative Special Initiative “Transformation of Agricultural and Food Systems” for eliminating extreme poverty and hunger. Fish products from sustainable and resource-friendly wild fishing and aquaculture from artisanal enterprises contribute to combating undernourishment and malnutrition. The GV Fish is active in Malawi, Madagascar, Cambodia, Zambia, Uganda, Mauritania, Ghana and India. In Malawi and Madagascar, the focus is on Aquaculture; in Uganda and Mauritania the focus is on fisheries while in Cambodia and Zambia the focus is mainly on aquaculture but also includes fishing activities. India has started with its baseline in November 2021.

This report is about the endline survey in Madagascar.

In Madagascar, the Sustainable Aquaculture Project focuses on the promotion of rice-fish and pond culture in the Highlands and the East-Coast and the improvement of inland aquaculture framework conditions.

The project focuses on three main objectives:

1. Increase the accessible supply of fisheries products from aquaculture for the food insecure population
2. Increase the average income in the value chain of aquaculture
3. Implementing measures for sustainable use and maintenance of natural resources within inland and coastal waters in alignment with FAO Guidelines on aquaculture

The first two components of the project are implemented by implementing partners. In the highlands, the promotion of rice-fish culture is supported by APDRA Pisciculture Paysanne and the pond culture by COFAD. In the East-Coast, Norges-Vel/Tilapia de l’Est is responsible for pond culture promotion. The third component is implemented by the GIZ team in Madagascar.

A baseline survey was conducted in 2018 at the beginning of the project. The data collected contributed to the establishment of baseline and target values across each project indicators. In addition, a midterm has been conducted in September/October 2021. Both surveys enable a comparison of outcomes over time. However, it should be considered that the regional coverage significantly differs. The endline is limited to the project area of ADRA Pisciculture Paysanne, which are the regions Amoron’i Mania and Haute Matsiatra.

Overall, the report (coverage, style etc.) and analysis (data quality management, Stata do-files etc.) strongly builds on the midterm, which has been implemented by the GFA Consulting Group GmbH.

## 2 METHODS

### 2.1 RESEARCH APPROACH

The study was carried-out in a participatory manner, actively involving all stakeholders. Discussions were held throughout the study, involving the ISA Agribusiness intervention team, the PADM/GIZ project team, project beneficiaries and other stakeholders, namely APDRA and

resource persons at DRPEB<sup>1</sup> level. The study was carried-out in four main stages, with field data collection at the center.

The initial phase of the intervention comprised several elements including various face-to-face and videoconference meetings organised between ISA and the PADM Project team, the preparation of internal working tools, review of documents, and the organisation of the data collection teams. The details of these preparatory stages are summarised in Table 1 below:

**Table 1: Main points held during the meetings**

STAGE	ACTORS INVOLVED	KEY POINTS
Kick-off meeting	PADM- ISA	<p>Technical meeting:</p> <ul style="list-style-type: none"> <li>▪ Official presentation of the project</li> <li>▪ Provision of all the documents needed to implement the study: reports, questionnaires, etc.</li> <li>▪ Clarification of study expectations</li> <li>▪ Definition of the process for translating the questionnaires into the local language</li> </ul> <p>Administrative meeting:</p> <ul style="list-style-type: none"> <li>▪ Various clarifications on administrative points</li> <li>▪ Preparation for the field test</li> <li>▪ Clarification of expected results and plan of the analysis</li> </ul>
	International Consultant – ISA	<ul style="list-style-type: none"> <li>▪ Discussion on the training of interviewers</li> <li>▪ Common understanding of questionnaires</li> <li>▪ Preparation of tools for training interviewers</li> <li>▪ Discussion of the role of each team during training</li> </ul>
	APDRA – ISA	<ul style="list-style-type: none"> <li>▪ Finalisation of sampling method and data collection schedule</li> </ul>
Document review	PADM- ISA	<ul style="list-style-type: none"> <li>▪ Analysis of information crucial to the study</li> </ul>
Recruitment and training of data collection teams	ISA - Interviewers	<ul style="list-style-type: none"> <li>▪ Selection and recruitment of interviewers</li> <li>▪ Supervision and training of interviewers and supervisors</li> </ul>
Organisation of data collection	ISA	<ul style="list-style-type: none"> <li>▪ Establishment of various internal ISA working tools: monitoring sheets and manuals for the leading consultant and supervisors</li> <li>▪ Configuration of the Kobo Toolbox App on each tablet provided by the project</li> </ul>

After the data collection phase in the field, the third phase began with the ISA team cleaning and standardising the data obtained. More specifically, this involved observing and identifying anomalies or outliers in the data collected using a summary file provided by the international data analysis consultant. The file was then carefully consulted by the ISA team to provide the international consultant with explanations and/or corrections to be considered to improve the database. The various exchanges carried-out enabled the ISA team and the international consultant to have an improved final database.

Once the final database had been compiled, the ISA team's data analyst carried out statistical analyses to extract the results in line with the project's expectations. A descriptive analysis of the survey data was then carried-out to determine the parameters of central tendency (median, mean), as well as relative and absolute frequencies. The descriptive analysis also involved

<sup>1</sup> Regional Directorate for Fishing and the Blue Economy (Direction Régionale de la Pêche et de l'Economie Bleue).

producing graphical representations to highlight general trends in the data. The main sections of the analysis dealt with:

- The socio-demographic characteristics of the respondents
- Levels of food insecurity (FIES)
- Availability and consumption of fish
- Income of producers and actors in the value chain
- Production and sales

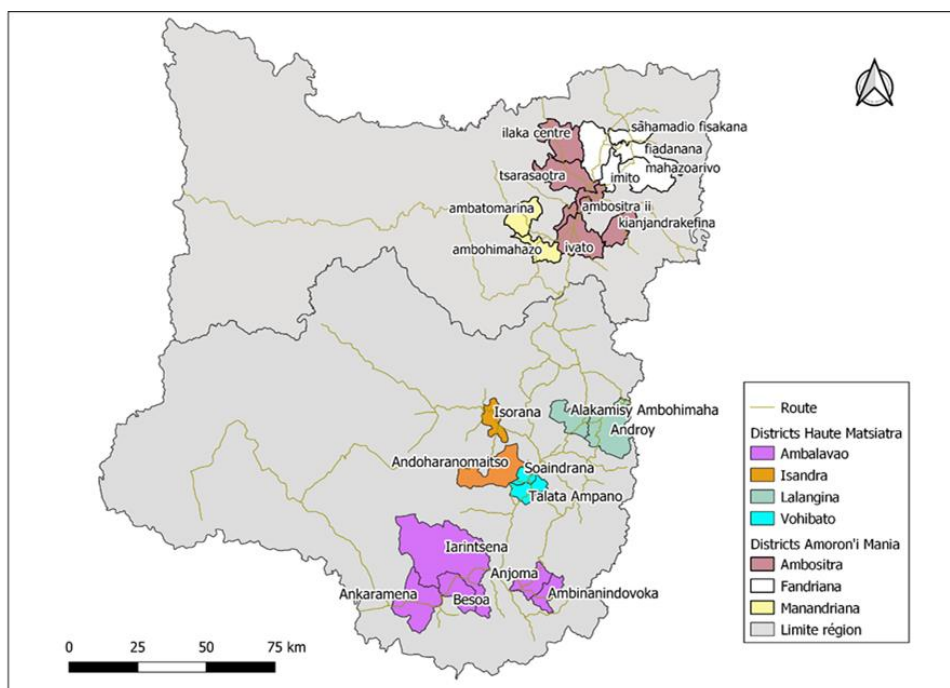
The analysis of socio-demographic characteristics and food insecurity considered the entire population, including consumers, producers, and value chain actors. On the other hand, for the analysis of income, production and sales, only crops that had been harvested were taken into account. Finally, the analysis was also disaggregated according to certain factors such as the type of survey target, the type of producers, the region of intervention, etc.

## 2.2 STUDY AREA

The data collection was carried-out in two regions where the PADM project is still active, namely Amoron'i Mania and Haute Matsiatra. Both covered regions are characterized by rice-fish culture as shown in Table 2. The project also supports pond culture in the region of Analamanga and Atsinanana. However, the project's activities in these regions have already been closed by 09/2021 for COFAD (Analamanga) and by 04/2022 for TDE (Atsinanana) and are not part of this report. Overall, the endline survey was carried out within 9 districts over the target regions as displayed in Map 1 below.

**Table 2: Regions, districts and fish farming type of the Endline 2023**

REGIONS	DISTRICTS	FISH FARMING TYPE
Haute Matsiatra	Ambalavao	Rice-fish culture
	Ambohimahaso	
	Fianarantsoa I	
	Isandra	
	Lalangina	
	Vohibato	
Amoron'i Mania	Ambositra	
	Fandriana	
	Manandriana	



**Map 1: Collection areas in Haute Matsiatra and Amoron'i Mania**

The communes and villages surveyed were selected based on information provided by APDRA, which has in-depth knowledge of the intervention areas.

Data collection in the Amoron'i Mania region was carried-out according to the initial schedule. In Haute Matsiatra, data collection was carried-out in the various communes and villages in accordance with the established schedule, except for the village of Tatadratsy, which was not visited for security reasons.

## 2.3 SURVEY INSTRUMENTS

During the interventions, three types of questionnaires were used by the data collection team: a producer questionnaire, a consumer questionnaire and a value-chain actor questionnaire. To ensure efficient data collection, the questionnaires were digitised in Kobo Toolbox and the surveys were conducted using a tablet. In addition, other survey tools were made available to the investigators, such as digital files of the list of producers targeted by the surveys, the printed version of the training manual, forms for recording the contacts of producers who had not yet finished their harvests, the catalogue of fish consumed in the highlands of Madagascar, the Malagasy version of the introduction letter, and badges.

## 2.4 SAMPLING DESIGN

To be representative, stratified sampling was adopted based on the PADM databases (list of project beneficiaries). A total of 657 producers were sampled from the 3653 producers who had received support from the project.

**Table 3: Strata considered during sampling**

STRATA	TYPES
Category of survey targets	Producers, consumers, value chain actors (VCA: traders, restaurateurs, fish traders, cooperatives, etc.)
Type of producers	Fish farmers, fingerling producer, fish farmer and fingerling producer
Producer category	Beginner, intermediate, advanced

The overall sample of farmers was made up of 300 rice-fish farmers per region. The selection included +10% in the event that some people could not be found, meaning that a total of 659 producers were planned to be surveyed for the 2 regions (Table 4). The sample for value chain actors (VCAs) was made up of 25 VCAs per region; and for consumers, the sample was made up of 200 consumers per region.

**Table 4: Producer sample size at the beginning of the intervention**

REGION	FISH FARMER			FINGERLING FARMER				FISH AND FINGERLING FARMER			TOTAL
	Déb	Inter	Av	Déb	Inter	Av	Au	Déb	Inter	Av	
AMM	160	120	30	30	40	25	4	25	35	7	476
HM	50	50	25	3	2	0	0	3	25	25	183
<b>Total</b>	<b>210</b>	<b>170</b>	<b>55</b>	<b>33</b>	<b>42</b>	<b>25</b>	<b>4</b>	<b>28</b>	<b>60</b>	<b>32</b>	<b>659</b>

## 2.5 HOUSEHOLD SELECTION PROCEDURE

Producers were selected from a sample list of beneficiaries provided by the PADM project. In the case of Amoron'i Mania, the beneficiaries on the list were contacted and brought together by a support person at a meeting point. The interviewers carried-out the data collection at these meeting points. In Haute Matsiatra, no meeting points were set-up. The surveys were carried out directly at the location of each producer selected from the list.

To overcome the difficulties associated with selecting producers from the list, the following steps and measures were taken:

**Table 5: Producer selection stages during the survey at the end of the 2023 project**

First stage	Use the entire sample list (659 beneficiaries sampled for the study).
Second stage	Make full use of the database waiting list (3653 beneficiaries from the X and Y databases). To comply with the sampling plan, the interviewers selected producers at the same level as the absent producers.
Third stage	Search for rice-farmers who were not on the list but who had received support from APDRA. Intermediaries (association presidents or members, etc.) helped the interviewers to identify these rice growers. As these rice farmers were not on the two lists, the interviewers were obliged to assess their level. In some cases, the replacement of rice farmers of the same level was not respected.

Consumers and VCAs were selected randomly at market or village level.

## 2.6 DATA QUALITY ASSURANCE

After each data collection and before transfers to the server, the interviewers checked and finalised the data collected. The finalised data was then transferred to the server. Once the raw data was available on the server, it was imported on a daily basis by the international data analysis consultant. The consultant then sent three files to the ISA team (lead consultant, data analyst, supervisor):

- A PDF file containing graphs giving an overview of the data relevant to the indicators;
- An Excel file showing the basis of the calculations made and the abnormal values identified;
- An Excel file containing all the data. All of these files enabled the ISA team to check the internal consistency of the data, for instance by cross-referencing certain variables with abnormal or outlying values.

## 2.7 DATA COLLECTION

A total of 1259 interviews were carried-out, representing a completion rate of 114,45% out of the 1050 targets. Details of completion are summarized in the table 6 below:

**Table 6: Table summarizing the results of the 2023 end-of-project survey**

TYPE	AMORON'I MANIA	HAUTE MATSIATRA	TOTAL	OBJECTIVES
Consumer	253	273	526	400
Producer	461	183	644	600
VCA	31	58	89	50
Total	745	514	1259	1050

It should be noted that it was difficult for the collection team to respect the distribution of targets according to their level (especially in Amoron'i Mania). The list of target beneficiaries was not up to date. Some producers previously categorised as fish farmers or fingerling farmers in the list and later became both fish farmers and fingerling farmers. Some producers had moved to other regions or had even died, and others were absent during the data collection process. The team tried to replace these producers with producers of the same level. However, defining the level of producers not on the list proved to be a difficult task.

## 2.8 DATA ANALYSIS

The data analysis in the following sections of this report was conducted using the statistical software STATA, version 17. The corresponding script is attached to this report (see Appendix).

### 2.8.1 DATA PREPARATION

The data made available for this analysis consists of three data files in excel (.xlsx) format, containing questionnaire responses and calculated variables from the three respondent groups: consumers, fish farmers and value chain actors (VCA). The data sets were also comprised of multiple roster variables.

The excel files containing the survey responses were imported into STATA. Due to the large quantity of variables in the data sets, data cleaning was conducted based on the input of the local team, which used the information provided as daily data quality checks. Briefings on the data cleaning, anomalies and missing data are provided in the applicable sections. Details can be found in the analysis script in the Appendix.

**2.8.2 OUTLIER TREATMENT**

Outliers were treated with the following approach: The local team critically checked all outliers revealed by the daily updates. The latest graphical outputs of the daily updates are also part of the Appendix. Based on the graphical outputs and the raw data, the local team made suggestions for data cleaning. To ensure transparency along the process, a excel template was created. Once the local team spotted an error that required cleaning, they filled in the excel sheet illustrated in Figure 1.

Sheet_No	ID	Enumerateur	Date of the interview <i>Date de l'entretien</i>	Actor <i>Acteur</i>	Variable name <i>Nom de la variable</i>	wrong value <i>valeur erronée</i>	correct value <i>valeur correcte</i>	Explanation/reasons <i>Explanation/raisons</i>
								1. why correct figure(s) <i>Pourquoi les corriger;</i> 2. methods to correct figure(s) <i>Comment les corriger;</i> 3. why we keep figure(s) <i>Pourquoi garder les valeurs</i>

**Figure 1: Data cleaning excel sheet filled in by the local team and shared with the international expert**

The excel correction sheet covers information about the interview ID, the enumerator who collected the data, the date of the interview, the actor, the variable to consider, the wrong value and the new corrected value. Furthermore, some insights on the source of error should be shared to ensure that there is no arbitrary cleaning. Next, the international expert implemented the corrections using the STATA Do-File Corrections.do attached in the Appendix.

In addition, to improve the data quality, the international expert and the GIZ team had regular briefings on data quality and anomalies. The GIZ team directly communicated with the local team to ensure that the insights have been considered during the data collection.

### 3 RESULTS

#### 3.1 GENERAL INFORMATION

For the Endline survey in Madagascar consumers, fish farmer and value chain actors (VCA) were interviewed. Table 7 and Figure 2 depict the frequency and share of the interview respondents. From all interviewees consent was obtained before the interview.

Table 7: Frequency of respondents by type (complete sample, N=1,259)

RESPONDENT TYPE	N
Consumer	526
Fish farmer	644
VCA	89
<b>Total</b>	<b>1,259</b>

Frequency of respondents by function

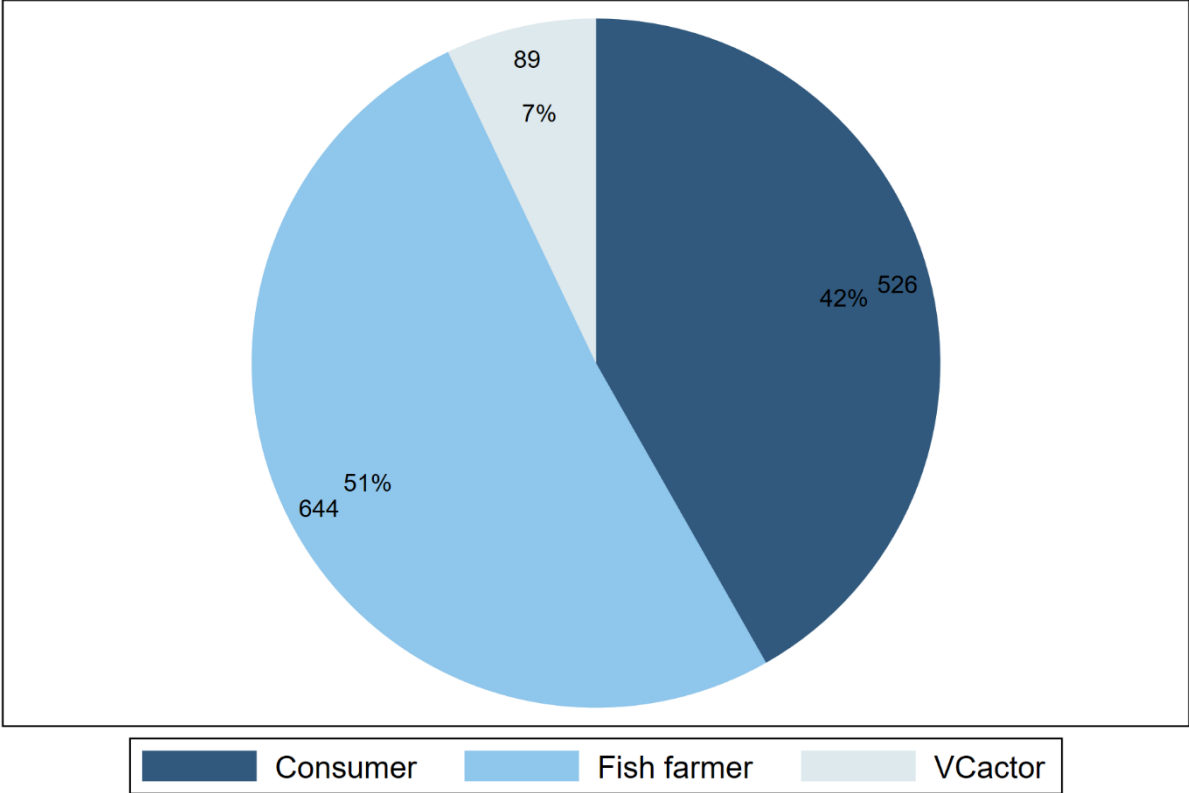


Figure 2: Frequency of respondents by type of respondent (complete sample, N=1,259)

In total, 1,259 interviews have been conducted. The majority are fish farmers with 644 interviews, followed by consumers with 526 interviews and value chain actors with 89 interviews. Table 8 reports the frequency of respondents by gender.

Table 8: Respondents by gender (complete sample, N=1,259)

GENDER	N
Female	819
Male	440
Total	1,259

In total, the survey featured more male respondents than females. The proportions however, vary when considering the different respondent types, as shown in Figure 3.

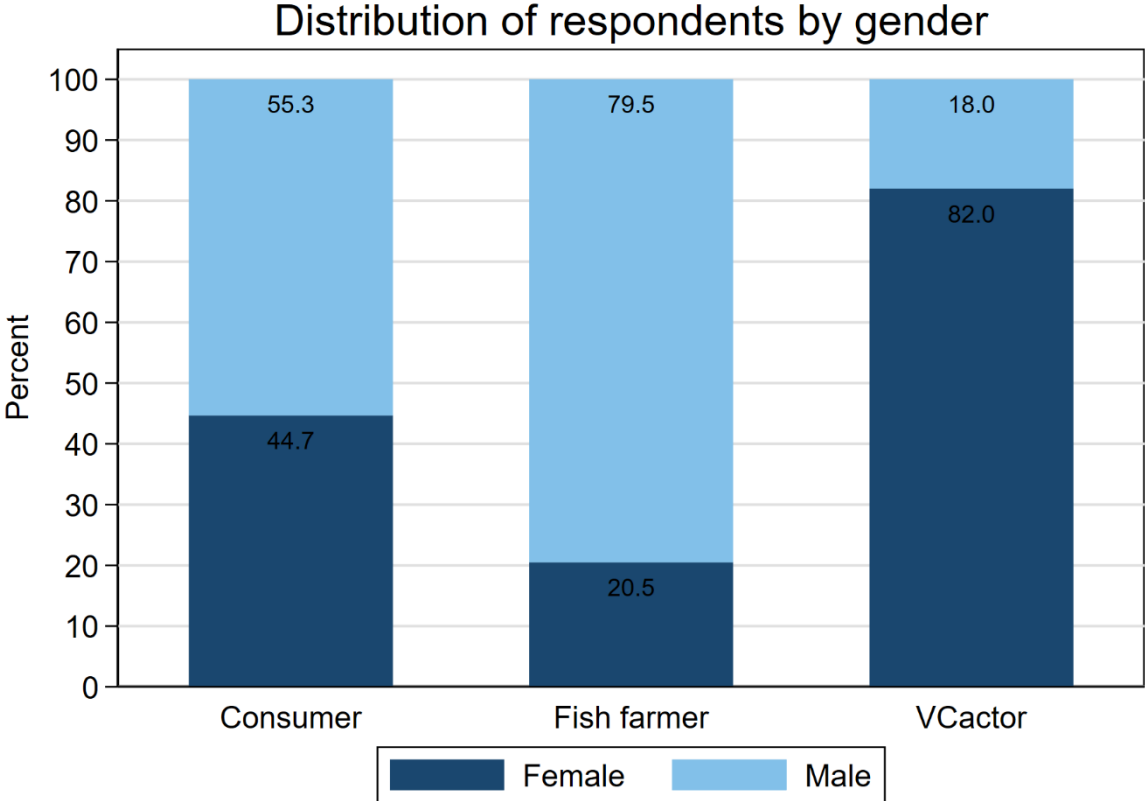


Figure 3: Distribution of respondents by gender in percent (complete sample, N=1,259)

The figure reveals that interviewed value chain actors have the by far highest proportion of female respondents (82%), while 44% of all interviewed consumers are female. The sample of fish farmers is dominated by males with only 21% female fish farmers. Table 9 disaggregates the sample geospatially by district of residence and respondent type.

**Table 9: Frequency of respondents by district of residence and type (complete sample, N=1,259)**

DISTRICT	CONSUMER	FISH FARMERS	VCA	TOTAL
Ambalavao	52	74	4	130
Ambohimahasoa	0	0	1	1
Ambositra	101	169	19	289
Fandriana	84	181	11	276
Fianarantsoa I	51	1	10	62
Isandra	59	11	8	78
Lalangina	73	26	24	123
Manandriana	68	111	1	180
Vohibato	38	71	11	120
Total	526	644	89	1,259

With 289, most interviews have been conducted in Ambositra, followed by Fandriana with 276 interviews. In total, interviews have been conducted in nine districts.<sup>2</sup>

### 3.2 FIES

FIES (Food Insecurity Experience Scale) is an experience-based indicator of the respondent's food security during the last 12 months. The index is constructed based on eight consecutive questions regarding the personal evaluation of access to adequate food. The questions focus on self-reported food-related behaviors and experiences associated with increasing difficulties in accessing food due to resource constraints. They cover both hunger (lack of access), as well as quality of food ("healthy and nutritious"). It is a standardized indicator that has been developed and promoted by the Food and Agriculture Organization (FAO). The eight questions can be found in the questionnaires attached to this report.

FIES was grouped into categories according to the number of standard FAO questions answered with "yes" (see Table 10). If an interviewee did not answer a question with "yes" or "no", the interview was completely excluded from the respective FIES statistics. Table 11 and Figure 4 show the FIES levels of the sampled consumers, fish farmers and value chain actors.

**Table 10: FIES score, level and status overview**

FIES SCORE	FIES LEVEL	FOOD SECURITY STATUS
0	food secure	Food secure
1-3	mildly food insecure	
4-6	moderately food insecure	Food insecure
7-8	severely food insecure	

<sup>2</sup> Main language by the respondents was not asked for, as – in comparison with other countries in which this program is active – language diversity is not a relevant factor in Madagascar.

Table 11: Frequency of respondent by FIES level, complete sample (N=1,259)

FIES LEVEL	N
Food secure	198
Mildly food insecure	611
Moderately food insecure	382
Severely food insecure	66
Missing	2
Total	1,259

Respondents by FIES level

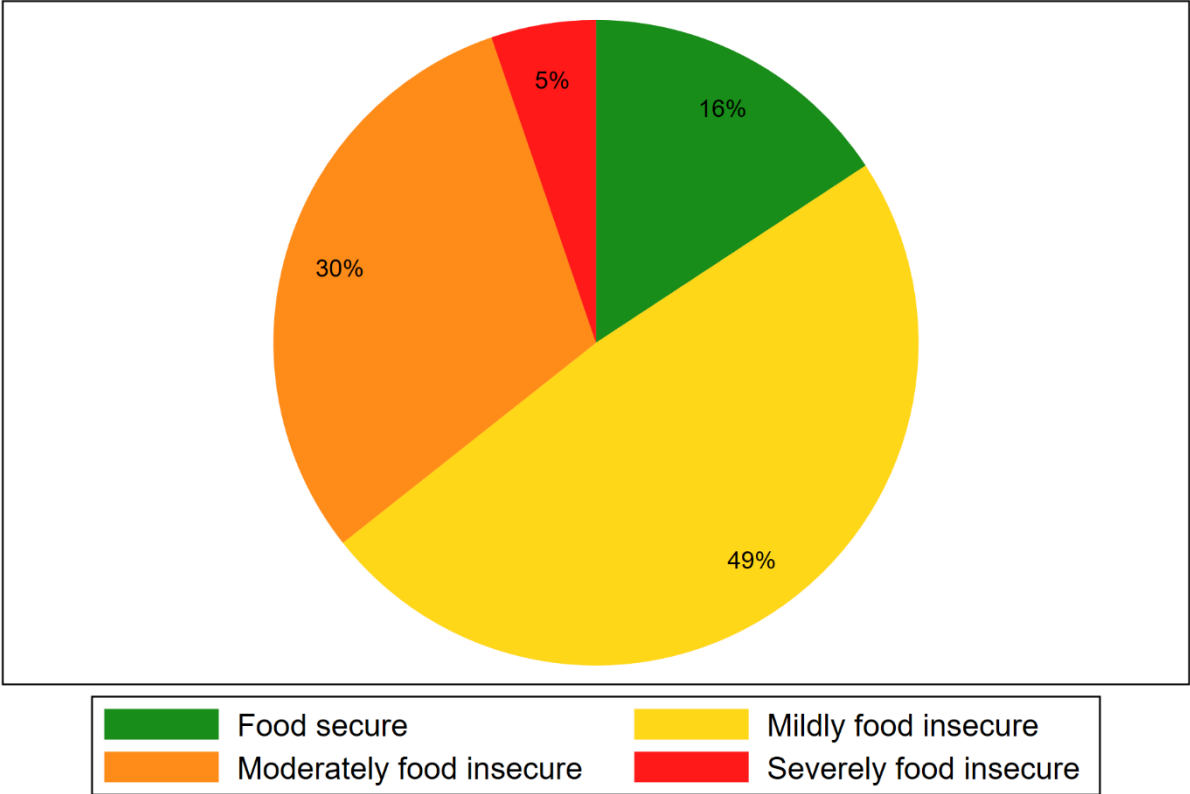
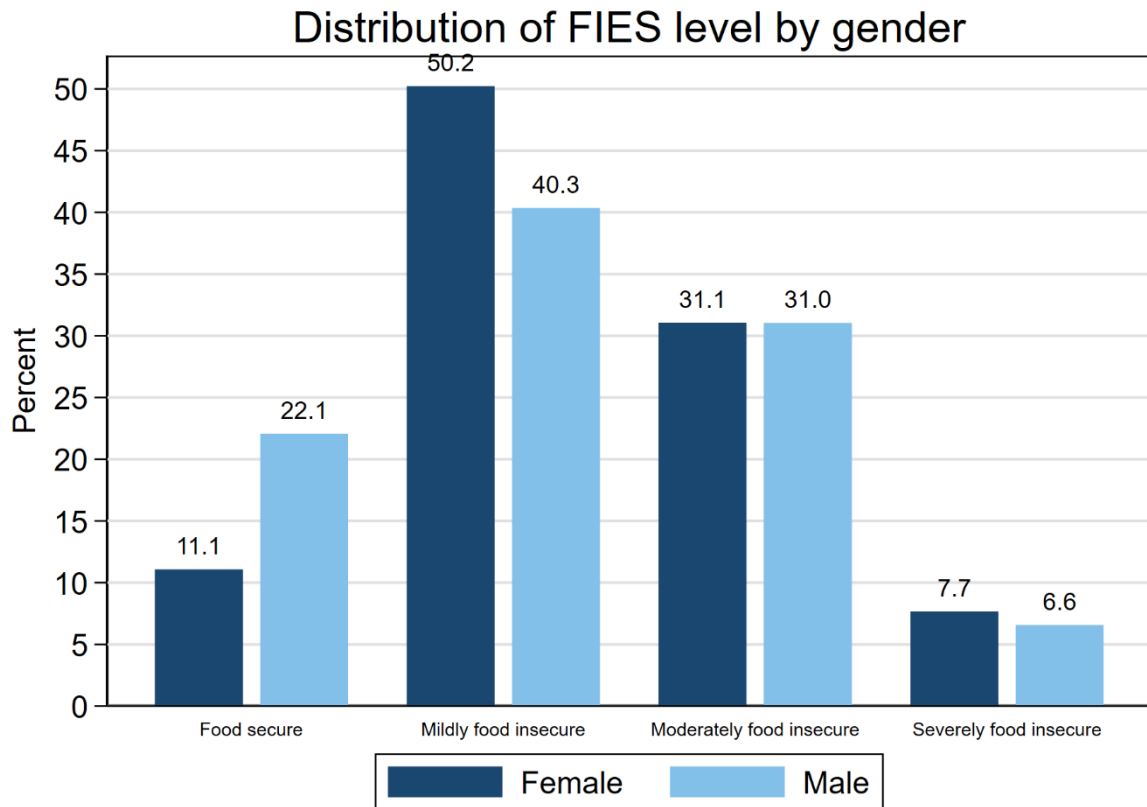


Figure 4: Distribution of FIES levels (complete sample, 2 missing, N=1,257)

For two observations (one fish farmer and one consumer), the calculation of the FIES level was not possible due to incomplete answers and thus the sample size is reduced from 1,259 to 1,257 for all tables and graphs related to the FIES level. Nearly half of all respondents suffer under mildly food insecurity (49%), followed by 30% with moderately food insecurity. While 16% are living under food security and 5% suffer under severe food insecurity. Table 12 and Figure 5 depict both the distribution of FIES levels separated by gender.

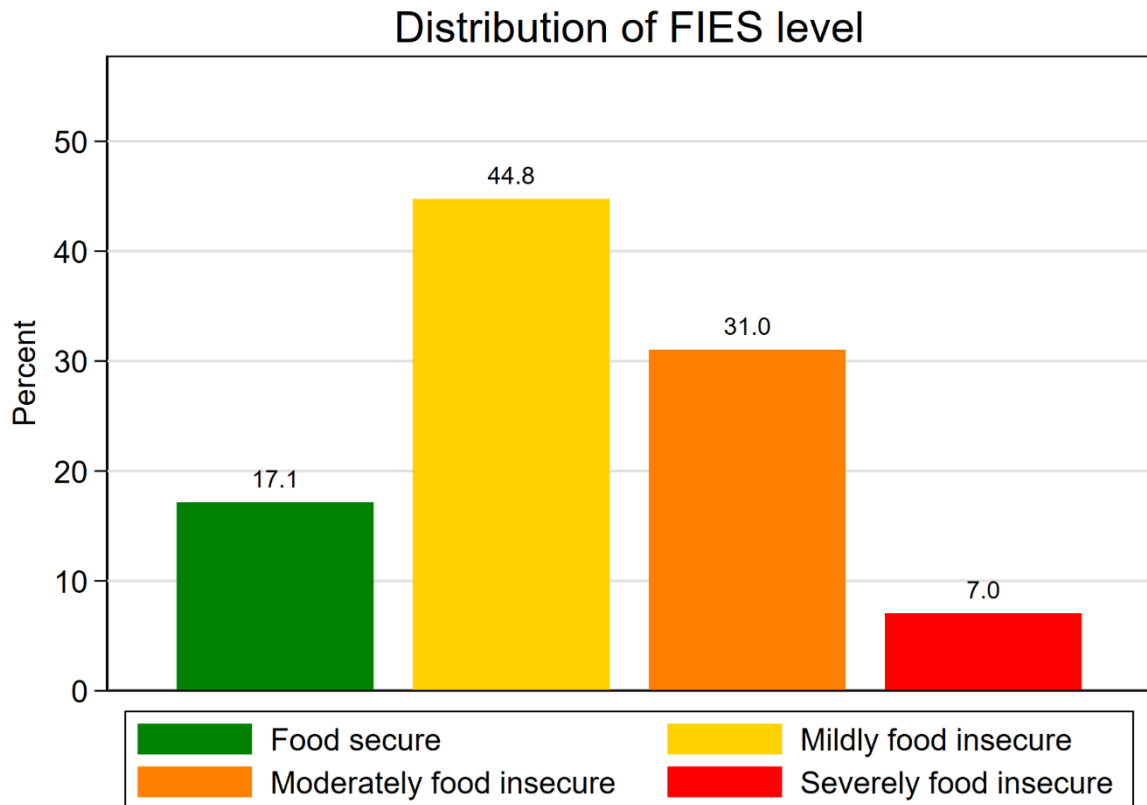
Table 12: Distribution of FIES level by gender in percent (consumers only, 1 missing, N=525)

FIES LEVEL	MALE %	FEMALE %	TOTAL %
Food secure (N=90)	22.1	11.1	17.1
Mildly food insecure (N=235)	40.3	50.2	44.8
Moderately food insecure (N=163)	31	31.1	31
Severely food insecure (N=37)	6.6	7.7	7
Total (N=525)	100	100	100



**Figure 5: Percentage distribution of both genders disaggregated by FIES levels (consumers only, 1 missing, N=525)**

For one consumer, the calculation of the FIES level was not possible due to incomplete answers, consequently the number of observations is reduced from 526 to 525. Male consumers are more likely food secure than female consumers (22.1% vs. 11.1%). Focusing on the most vulnerable group reveals that more female consumers suffer under severely food insecurity (7.7% vs. 6.6%). The majority of females are mildly food insecure (50.2%). Figure 6 shows the distribution of consumers (both genders) across FIES levels.



**Figure 6: Distribution of FIES level in percent (consumers only, 1 missing, N=525)**

Most consumers are living under mildly food insecurity (44.8%), followed by moderately food insecurity (31%). While 17.1% are food secure, 7% suffer under severely food insecurity. Table 13 and Figure 7 show disaggregated FIES level distributions according to actor types.

**Table 13: Distribution of respondents by FIES level and type (complete sample, 2 missings, N=1,257)**

FIES LEVEL	CONSUMER % (N=525)	FISH FARMERS % (N=643)	VCA % (N=89)
Food secure	17.1	13.2	25.8
Mildly food insecure	44.8	52.7	41.6
Moderately food insecure	31	30.2	28.1
Severely food insecure	7	3.9	4.5
<b>Total</b>	100	100	100

## Distribution of FIES level by respondent type

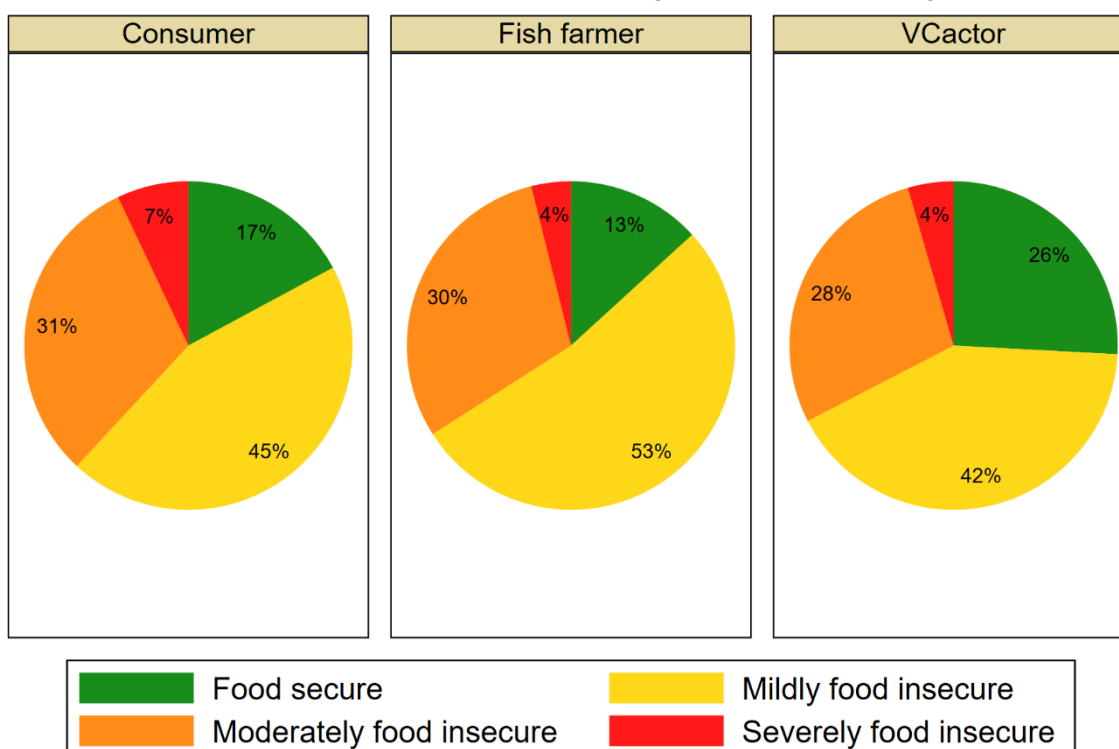


Figure 7: Distribution of FIES level by respondent type (complete sample, 2 missings, N=1,257)

Consumers report a higher share of severe food insecurity (7%) than fish farmers and value chain actors (both 4%). Furthermore, value chain actors have the highest proportion of food secure individuals (26%) and consumers the lowest (7%). Overall, most interviewees across all respondent types are within the two groups of mild or moderate food insecurity. Table 14 and Figure 8 show the disaggregated FIES level distributions according to actor types in Amoron'i Mania.

Table 14: Distribution of respondents by FIES level and type in Amoron'i Mania (complete sample, 1 missing, N=744)

FIES LEVEL	CONSUMER % (N=253)	FISH FARMERS % (N=460)	VCA % (N=31)
Food secure	12.6	13.5	29
Mildly food insecure	50.2	55.4	58.1
Moderately food insecure	32.8	28	9.7
Severely food insecure	4.3	3	3.2
<b>Total</b>	100	100	100

## Distribution of FIES level by respondent type in Amoron'i Mania

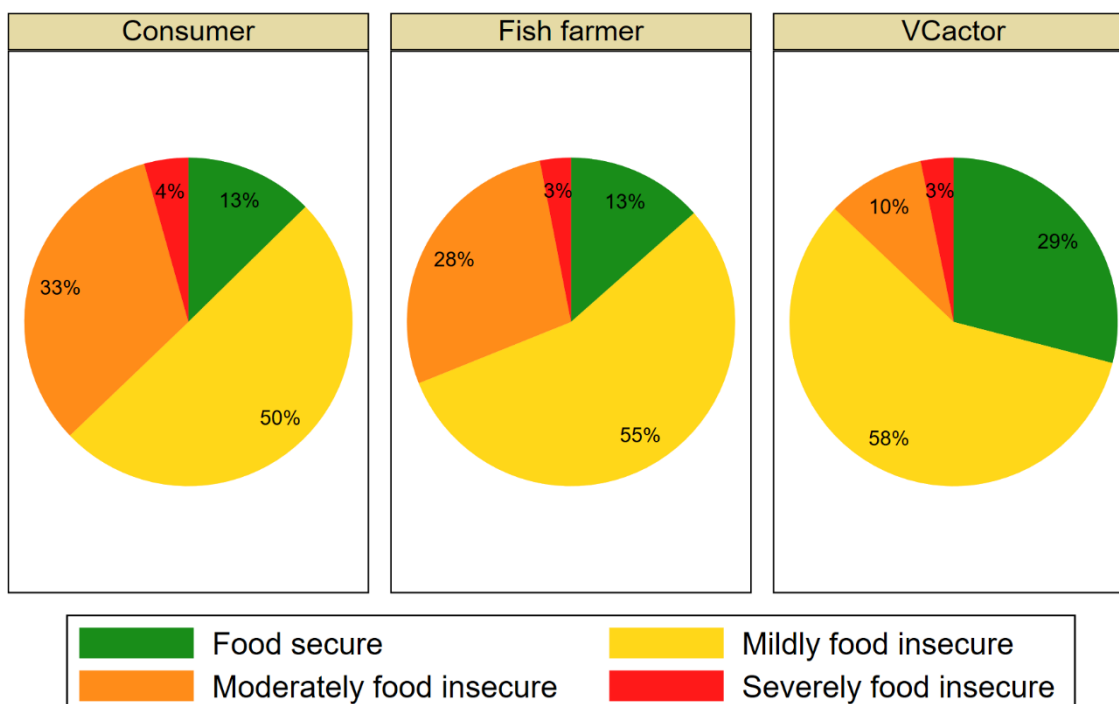


Figure 8: Distribution of FIES level (1 missing) by respondent type in Amoron'i Mania (complete sample, 1 missing, N=744)

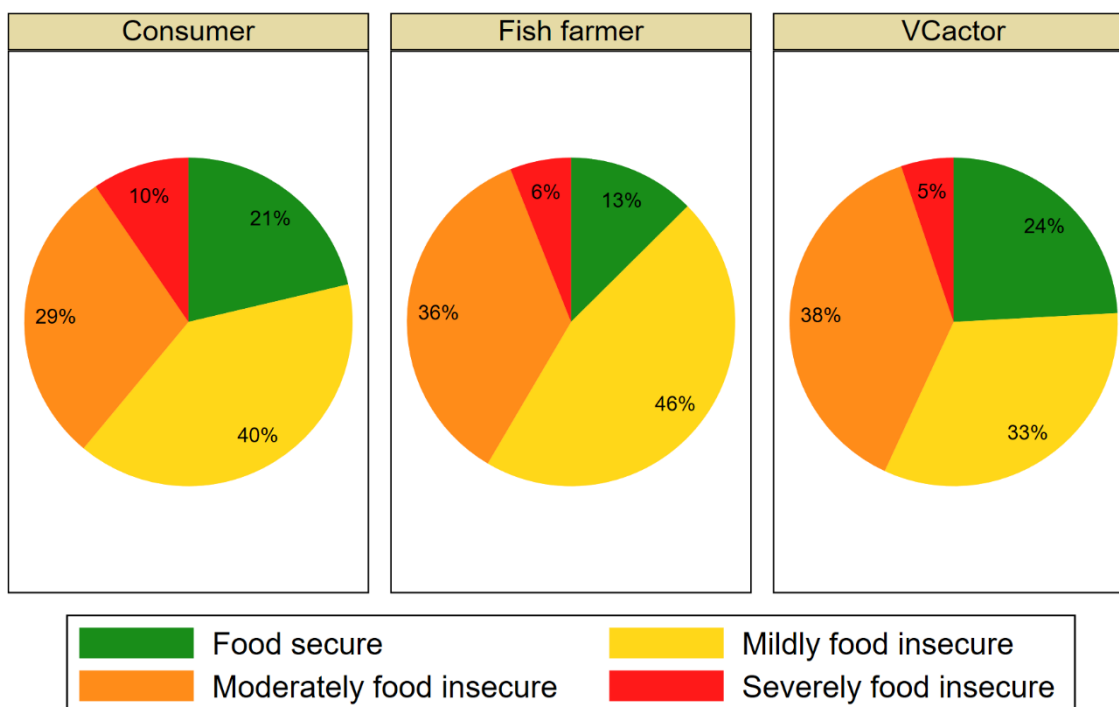
One observation is missing for fish farmers due to incomplete information on the FIES. For all respondent types, the majority lives under mildly food insecurity. Among the consumers and fish farmers, the next frequent category is moderately food security with 33% and 28%, respectively. Among the value chain actors, the next frequent category is food security with 29%.

Table 15 and Figure 9 show the disaggregated FIES level distributions according to actor types in Haute Matsiatra.

Table 15: Distribution of respondents by FIES level and type in Haute Matsiatra (complete sample, 1 missing, N=513)

FIES LEVEL	CONSUMER % (N=272)	FISH FARMERS % (N=183)	VCA % (N=58)
Food secure	21.3	12.6	24.1
Mildly food insecure	39.7	45.9	32.8
Moderately food insecure	29.4	35.5	37.9
Severely food insecure	9.6	6	5.2
<b>Total</b>	100	100	100

## Distribution of FIES level by respondent type in Haute Matsiatra



**Figure 9: Distribution of FIES level (1 missing) by respondent type in Haute Matsiatra (complete sample, 1 missing, N=513)**

One observation is missing for consumers due to incomplete information on the FIES. Most respondents live under moderately or mildly food insecurity. Among the consumers, 40% are mildly food insecure and 29% are moderately food insecure. Among the fish farmers, 46% are mildly food insecure and 36% are moderately food insecure. And among the value chain actors, 33% are mildly food insecure and 38% are moderately food insecure. Notably, consumers show the highest share of severely food insecure respondents with 10%, followed by fish farmers with 6% and value chain actors with 5%. Next, median household sizes disaggregated by FIES level and actor type are reported in Table 16.

**Table 16: Median household size by respondent and FIES level (complete sample, 2 missings, N=1,257)**

RESPONDENT TYPE	FOOD SECURE	MILDLY FOOD INSECURE	MODERATELY FOOD INSECURE	SEVERELY FOOD INSECURE	N
Consumer	5	5	5	4	525
Fish farmer	6	5	6	4	643
VCA	5	5	6	10	89

Overall, the median households vary mainly between 4 and 6 members. However, among the severely food insecure value chain actors, the median is even 10. Notably, there are four observations in this category with 10, 10, 10 and 5 household members, respectively. The next chapter focuses on the program indicators.

### 3.3 PROGRAM INDICATORS

#### 3.3.1 ACCESSIBLE SUPPLY OF FISH PRODUCTS FROM SUSTAINABLE AQUACULTURE

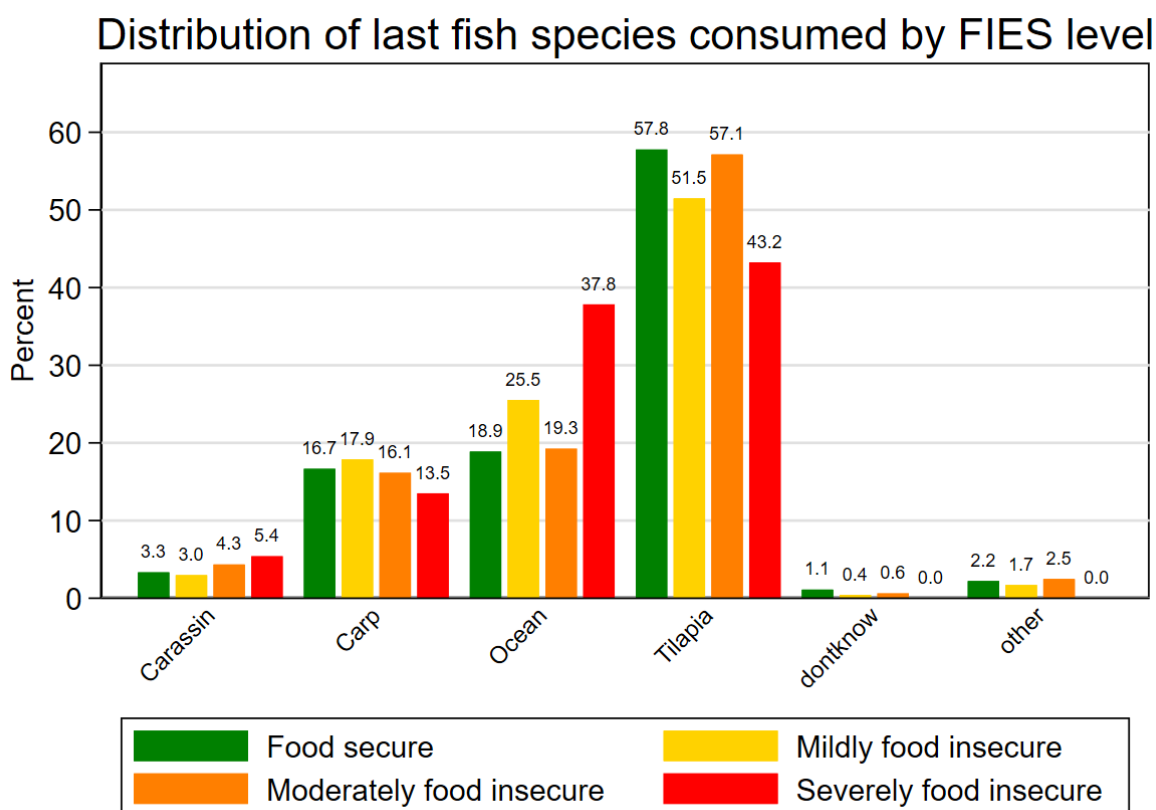
To address this indicator, fish farmers have been asked about their production and sales prices and all interviewees about their level of food security and their fish consumption behavior with regards to quantity, price of purchased fish and type of fish consumed. The following sections report on these aspects.

##### 3.3.1.1 CONSUMPTION BEHAVIOR

Two consumers answered that their households ‘never’ consume fish and as stated above for one consumer it was not possible to calculate the FIES level due to incomplete answers. Accordingly, the new total consumer sample size for questions related to fish consumption and the FIES level is 523 instead of the total 526 interviews with consumers. Table 17 and Figure 10 show the last consumed fish species of the household of the respondent by FIES level.

**Table 17: Distribution of consumed fish species by FIES level (consumers only, 3 missings, N=523)**

SPECIES	FOOD SECURE % (N= 90)	MILDLY FOOD INSECURE % (N=235)	MODERATELY FOOD INSECURE % (N=161)	SEVERELY FOOD INSECURE % (N=37)	TOTAL % N=523)
Carassin	3.3	3	4.3	5.4	3.6
Carp	16.7	17.9	16.1	13.5	16.8
Seafish	18.9	25.5	19.3	37.8	23.3
Tilapia	57.8	51.5	57.1	43.2	53.7
Don't know	1.1	0.4	0.6	0	0.6
Other	2.2	1.7	2.5	0	1.9
Total	100	100	100	100	100



**Figure 10: Distribution of last fish species consumed by FIES level (consumers only, 3 missing, N=523)**

Across all FIES levels, Tilapia was the last fish species consumed by around 50% of all consumers while the second largest share belongs to Seafish with around 23%. The overview shows that food insecure households consume the smallest share of Carp (14%), and Tilapia (43%) while they have the largest share of Seafish consumers (38%).

As previously mentioned, for one of the sampled fish farmers it was not possible to calculate the FIES level due to incomplete answers. In addition, one fish farmer stated to never consume fish, therefore the sample size reduces from 644 to 642 observations for all statistics related to fish consumption and the FIES level. Table 18 and Figure 11 show the distribution of last fish species consumed split by FIES level for fish farmers.

**Table 18: Distribution of consumed fish species by FIES level (fish farmers only, 2 missings, N=642)**

SPECIES	FOOD SECURE % (N= 85)	MILDLY FOOD INSECURE % (N=339)	MODERATELY FOOD INSECURE % (N=194)	SEVERELY FOOD INSECURE % (N=24)	TOTAL % (N=642)
Carassin	3.5	0.3	1	0	0.9
Carp	37.6	28.6	30.4	29.2	30.4
Seafish	8.2	10.6	6.2	0	8.6
Tilapia	48.2	58.4	60.3	70.8	58.1
Don't know	0	0.3	0	0	0.2
Other	2.4	1.8	2.1	0	1.9
Total	100	100	100	100	100

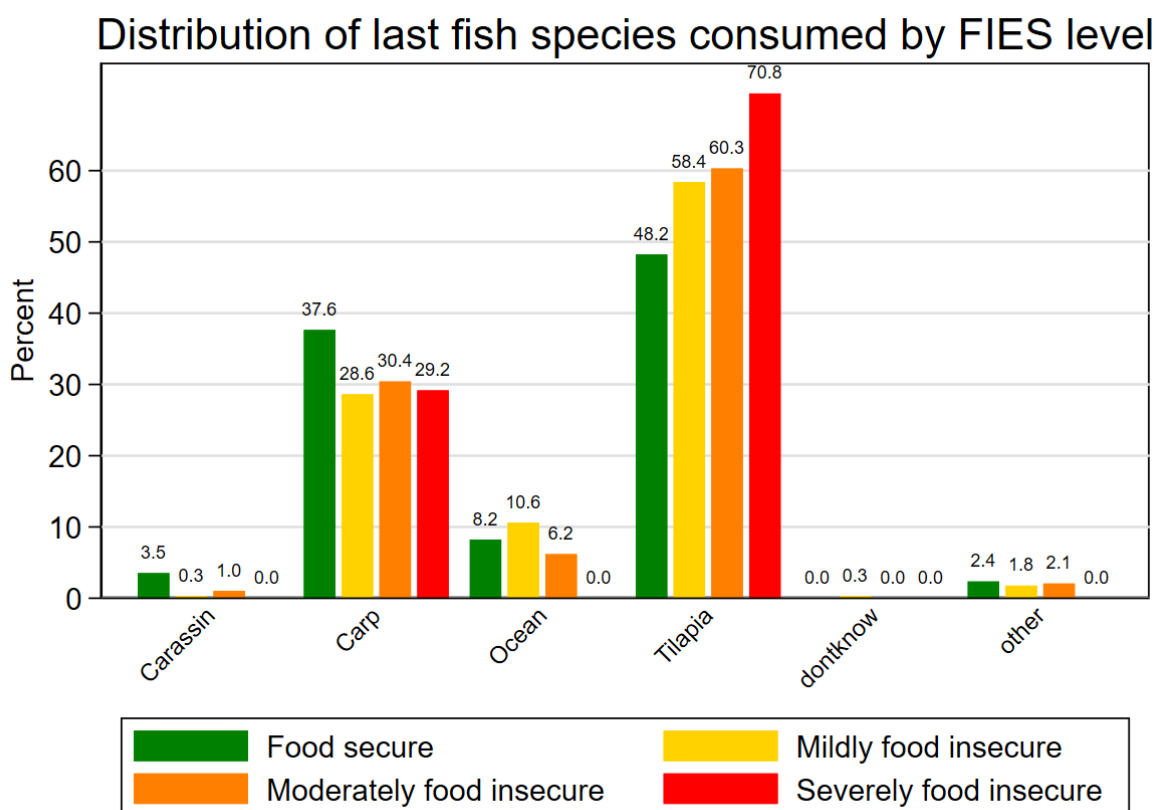
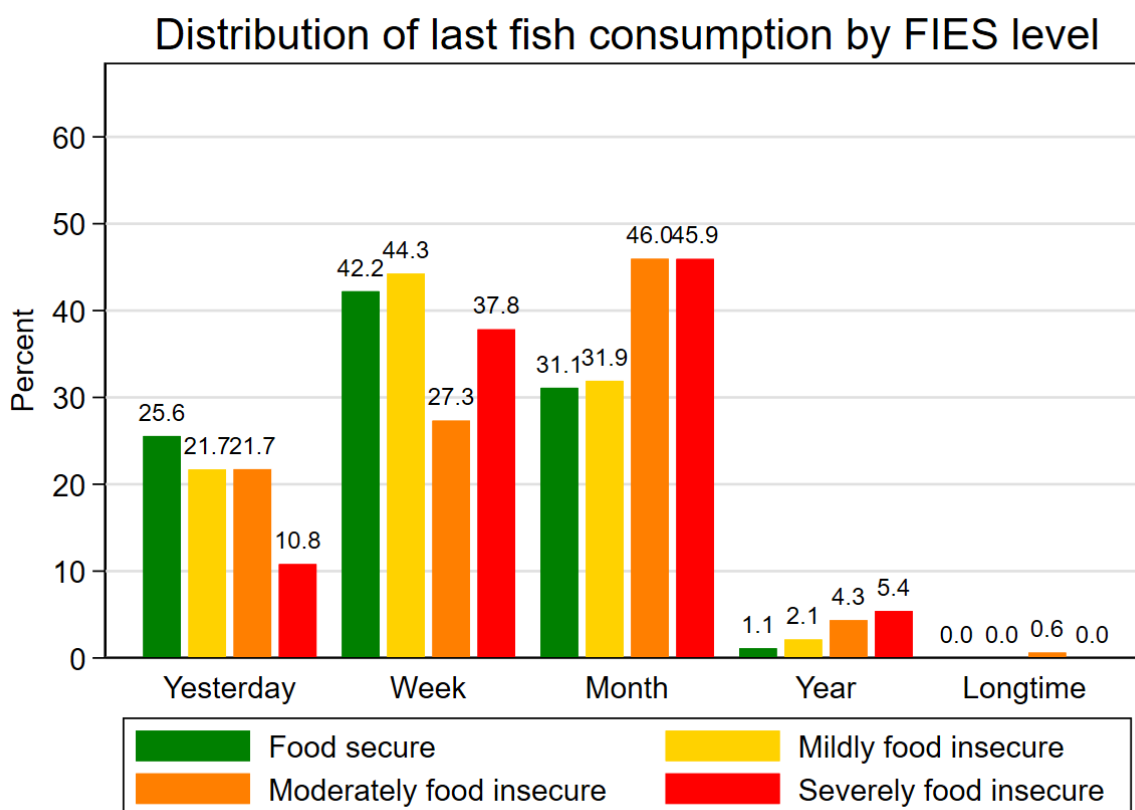


Figure 11: Distribution of last fish species consumed by FIES level (fish farmers only, 3 missings, N=642)

Tilapia is the most popular species across all FIES levels. Among severely food insecure fish farmers, even 71% stated to have consumed Tilapia the last time. The next most popular fish species is for all FIES levels Carp. Among food secure fish farmers, 38% have stated Carp as the last fish species consumed. Table 19 and Figure 12 report the time passed since the last meal which included fish products for consumers.

Table 19: Distribution of most recent consumption of fish by FIES level in percent (consumers only, 3 missings, N=523)

LAST CONSUMPTION OF FISH	FOOD SECURE % (N=90)	MILDLY FOOD INSECURE % (N=235)	MODERATELY FOOD INSECURE % (N=161)	SEVERELY FOOD INSECURE % (N=37)	TOTAL % (N=523)
Yesterday	25.6	21.7	21.7	10.8	21.6
Week	42.2	44.3	27.3	37.8	38.2
Month	31.1	31.9	46	45.9	37.1
Year	1.1	2.1	4.3	5.4	2.9
Longtime	0	0	0.6	0	0.2
Total	100	100	100	100	100



**Figure 12: Distribution of last fish consumption by FIES level (consumers only, 3 missings, N=523)**

Consumers which ate fish the last week or months before the interview took place make up the highest share across all FIES levels 38% and 37%, respectively. Within the group of consumers that indicated “yesterday” as their last fish consumption, food secure show the highest share with 26% and severely food insecure the lowest share with 11%. Overall, there is a trend towards less frequent fish consumption for less food secure households, e.g., they also show the highest share of stating that the last fish consumption is around one year ago (5%). An explanatory factor for this observation could be that food insecure households are presumably more income constraint and might therefore consume a higher number of staples instead of fish and meat. Next, the same analysis for fish farmers is presented. Table 20 and Figure 13 illustrate the distribution of the last fish consumption by FIES level for fish farmers.

**Table 20: Distribution of most recent consumption of fish by FIES level in percent (fish farmers only, 2 missings, N=642)**

LAST CONSUMPTION OF FISH	FOOD SECURE % (N=85)	MILDLY FOOD INSECURE % (N=339)	MODERATELY FOOD INSECURE % (N=194)	SEVERELY FOOD INSECURE % (N=24)	TOTAL % (N=642)
Yesterday	35.3	31.6	18	8.3	27.1
Week	50.6	38.6	47.9	33.3	42.8
Month	14.1	28.9	34	54.2	29.4
Year	0	0.9	0	4.2	0.6
Longtime	0	0	0	0	0
Total	100	100	100	100	100

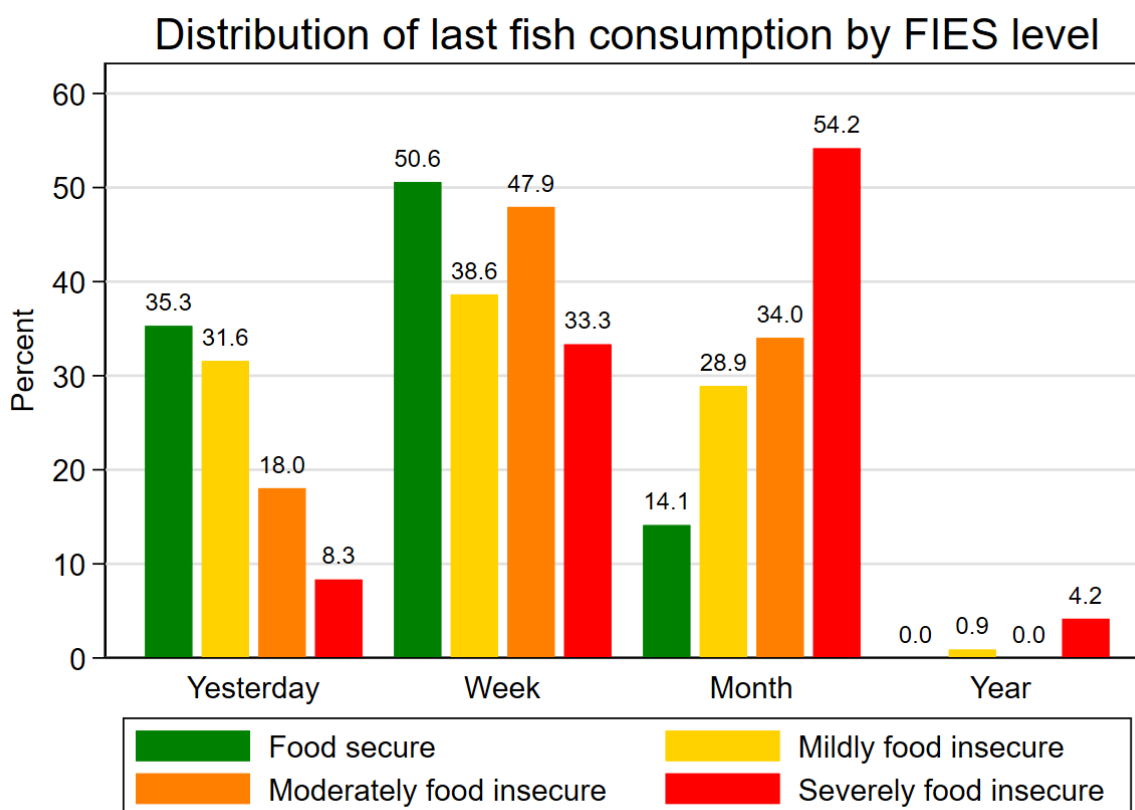
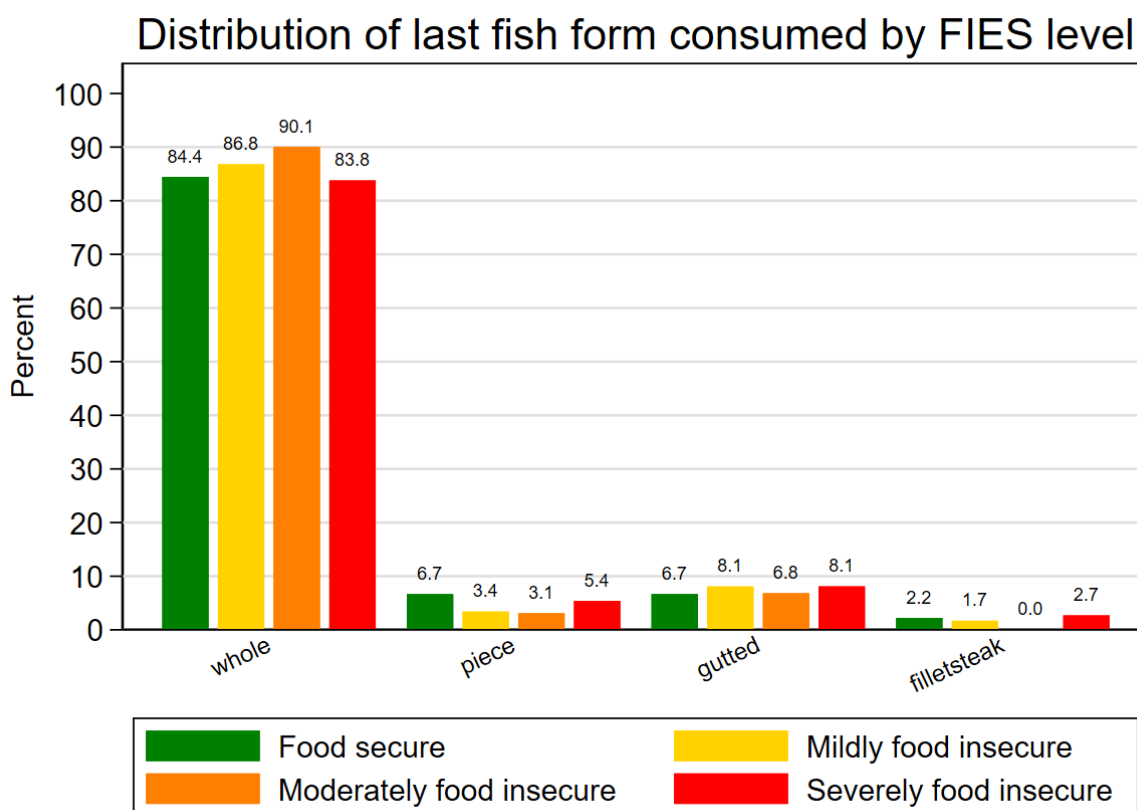


Figure 13: Distribution of last fish consumption by FIES level (fish farmers only, 2 missings, N=642)

Among fish farmers, last fish consumption is most frequently around one week ago (43%), followed by one month (29%) and yesterday (27%). Focusing on fish farmers who suffer under severely food insecurity reveals less frequent fish consumption, with 54% stating one month and only 8% stating yesterday. Overall, there is a tendency that more food secure fish farmers eat fish more frequently. 35% of the fish farmers stated yesterday and 51% last week. In addition, more generally, the results of the last fish consumption among fish farmers point towards a relatively high level of self-supply, with very little fish farmers eating fish less than once a month. Comparing the consumption patterns of fish farmers and consumers reveals that fish farmers eat more frequently fish than consumers. While 21.6% of all consumers ate fish the last time the day before, the share is 27.1% for fish farmers. Table 21 and Figure 14 are presenting the types of consumed fish formats differentiated by FIES level.

Table 21: Distribution of last consumed fish form by FIES level (consumers only, 3 missings, N=523)

FORM	FOOD SECURE % (N=90)	MILDLY FOOD INSECURE % (N=235)	MODERATELY FOOD INSECURE % (N=161)	SEVERELY FOOD INSECURE % (N=37)	TOTAL % (N=523)
Fillet steak	2.2	1.7	0	2.7	1.3
Gutted	6.7	8.1	6.8	8.1	7.5
Piece	6.7	3.4	3.1	5.4	4
Whole	84.4	86.8	90.1	83.8	87.2
Total	100	100	100	100	100

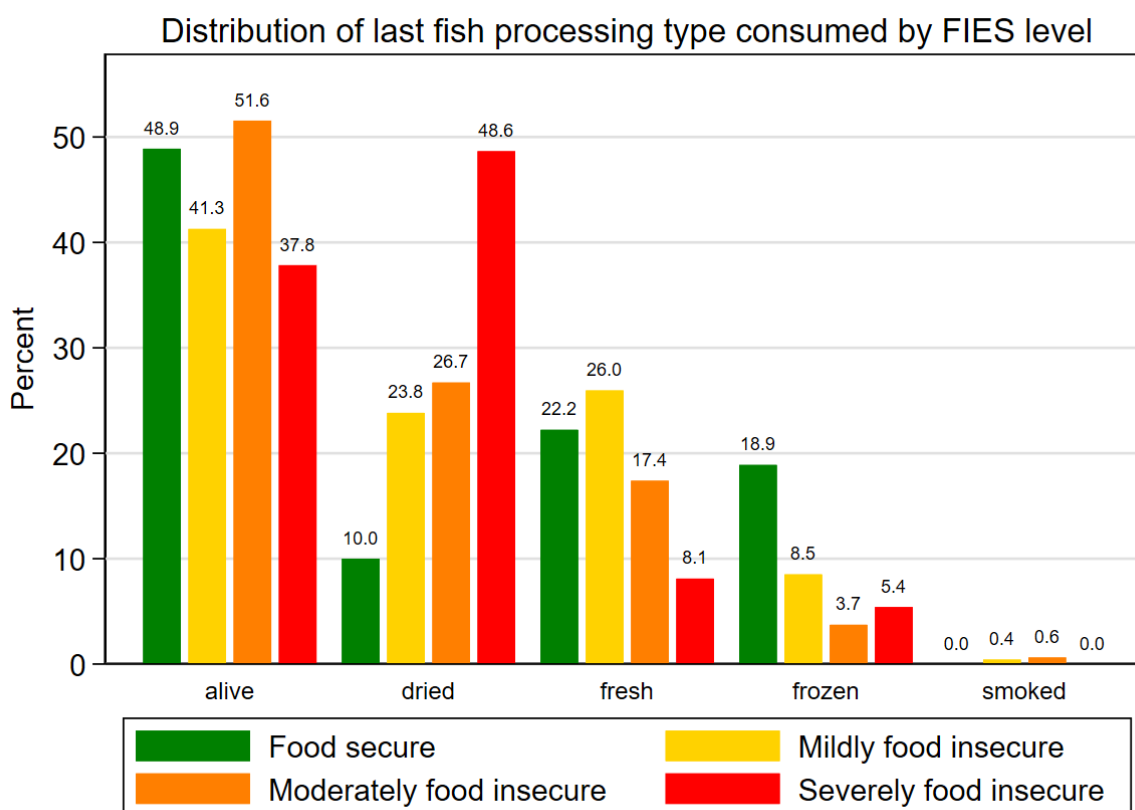


**Figure 14: Distribution of last fish form consumed by FIES level (consumers only, 3 missings, N=523)**

As expected, most consumers buy their fish as a whole, most likely either due to dominant supply or due to a lower market price since no further processing from producers or vendors is required. This applies to all levels of the FIES, showing a clear consumption pattern of whole fish: a total of 87.2% of all interviewed consumers had whole fish as their last consumed fish form. In contrast, only 7.5% of interviewees consumed gutted fish. Moreover, only 1.3% of consumers reported fillet steak, which involves the highest processing effort, as their last consumed fish form. Interestingly, severely food insecure consumer households reported the lowest share of whole fish while having the highest share of gutted fish (83.8% and 8.1%, respectively). Table 22 and Figure 15 report the processing type of fish eaten during the last meal.

**Table 22: Distribution of purchased fish by processing type and FIES level (consumers only, 3 missing, N=523)**

PREPARATION	FOOD SECURE % (N=90)	MILDLY FOOD INSECURE % (N=235)	MODERATELY FOOD INSECURE % (N=161)	SEVERELY FOOD INSECURE % (N=37)	TOTAL % (N=523)
Alive	48.9	41.3	51.6	37.8	45.5
Dried	10	23.8	26.7	48.6	24.1
Fresh	22.2	26	17.4	8.1	21.4
Fried	0	0	0	0	0
Frozen	18.9	8.5	3.7	5.4	8.6
Smoked	0	0.4	0.6	0	0.4
Total	100	100	100	100	100

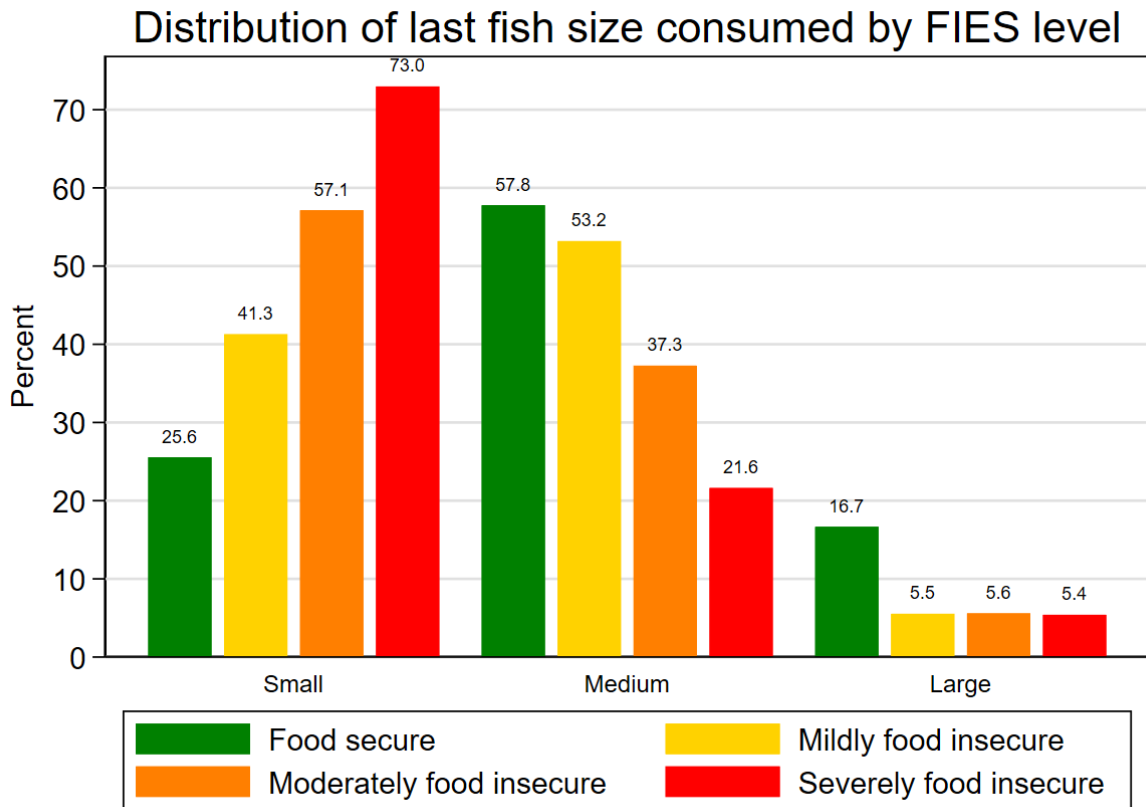


**Figure 15: Distribution of last fish processing type consumed by FIES level (consumers only, 3 missing, N=523)**

For consumers, alive fish makes up the majority of consumed processing types (45.5%), followed by dried fish (24.1%) and fresh fish (21.4%). Frozen fish is represented with an overall share of 8.6%, while the percentage of fried and smoked fish is 0 or close to 0, respectively. Among, severely food insecure consumers, dried fish is the most popular form (48.6%), followed by alive fish (37.8%). Among food secure consumers, only 10% consumed dried fish, compared to 48.9% who consumed alive fish. Table 23 and Figure 16 report the fish size consumed during the last fish meal by the household of the respondent, differentiated by FIES level.

**Table 23: Distribution of last consumed fish by size and FIES level in percent (consumers only, 3 missings, N=523)**

SIZE	FOOD SECURE % (N=90)	MILDLY FOOD INSECURE % (N=235)	MODERATELY FOOD INSECURE % (N=161)	SEVERELY FOOD INSECURE % (N=37)	TOTAL % (N=523)
Small	25.6	41.3	57.1	73	45.7
Medium	57.8	53.2	37.3	21.6	46.8
Large	16.7	5.5	5.6	5.4	7.5
Very large	0	0	0	0	0
Total	100	100	100	100	100

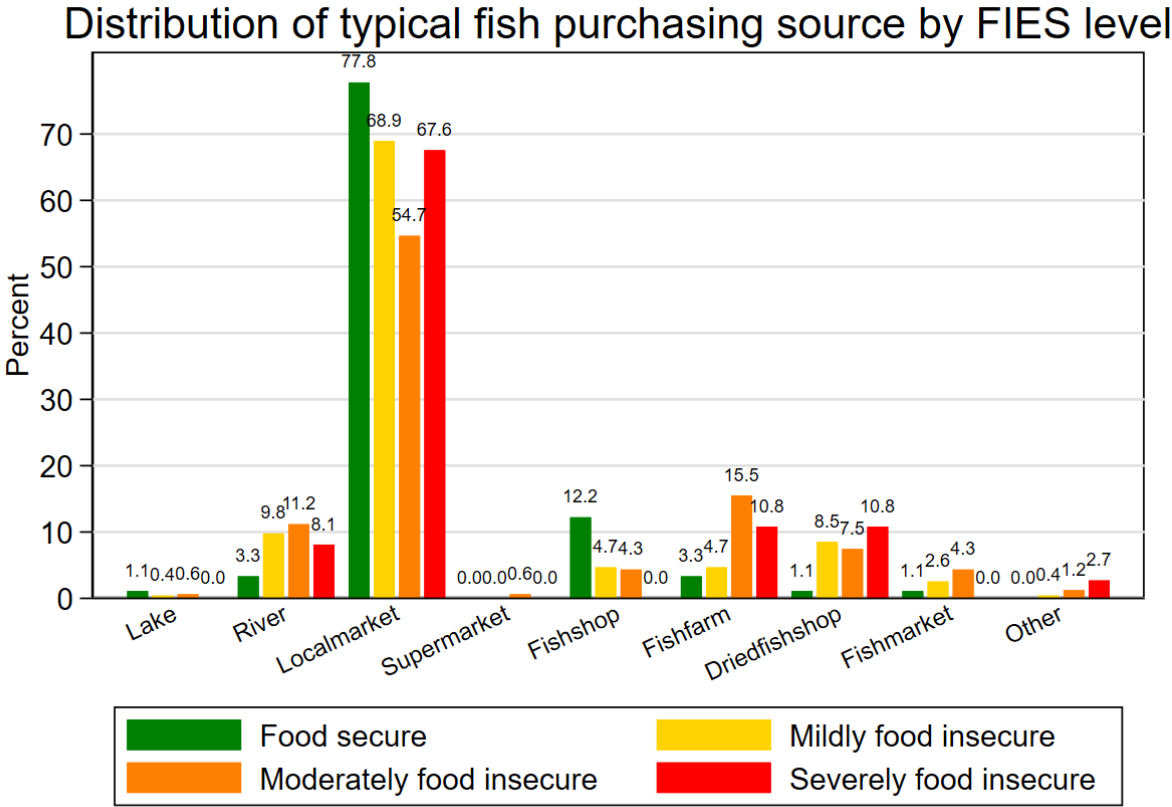


**Figure 16: Distribution of last consumed fish size by FIES level (consumers only, 3 missings, N=523)**

Medium fish account for the highest percentage share (46.8%), with medium being defined as approximately the size of a hand. Medium is closely followed by small with 45.7% – defined as approximately the size of a finger, while the share of large (size of two hands) is only 7.5%. Very large fish is mentioned by no consumer. Furthermore, a correlation between the size of the fish consumed and the FIES level can be observed: 73% of all severely food insecure consumer households consume small fish, while this is only the case for 25.6% of all food secure consumer households. Food secure households consume more medium- and large-sized fish than all other FIES levels (57.8% and 16.7%, respectively). Table 24 and Figure 17 depict the typical purchasing sources for fish by FIES level as percentage shares.

**Table 24: Distribution of typical fish purchasing sources by FIES level in percent (consumers only, 3 missings, N=523)**

SIZE	FOOD SECURE % (N=90)	MILDLY FOOD INSECURE % (N=235)	MODERATELY FOOD INSECURE % (N=161)	SEVERELY FOOD INSECURE % (N=37)	TOTAL % (N=523)
Lake	1.1	0.4	0.6	0	0.6
River	3.3	9.8	11.2	8.1	9
Local market	77.8	68.9	54.7	67.6	66
Supermarket	0	0	0.6	0	0.2
Fish shop	12.2	4.7	4.3	0	5.5
Fish farm	3.3	4.7	15.5	10.8	8.2
Dried fish shop	1.1	8.5	7.5	10.8	7.1
Fish market	1.1	2.6	4.3	0	2.7
Other	0	0.4	1.2	2.7	0.8
Total	100	100	100	100	100



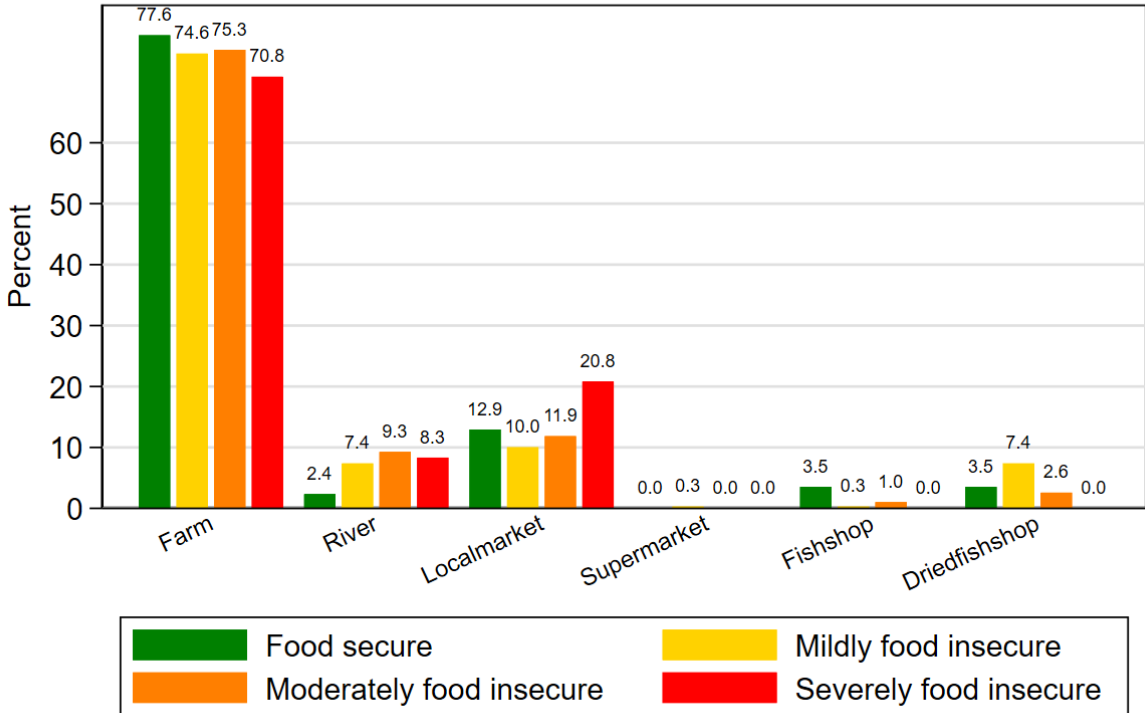
**Figure 17: Distribution of typical fish purchasing source by FIES level (consumers only, 3 missings, N=523)**

Local markets are building the most prominent fish purchasing source (66%) across all FIES Levels. Furthermore, rivers, fish farms and dried fish shops are a popular source with a percentage share of 9%, 8.2% and 7.1% in total, respectively. Next, Table 25 and Figure 18 summarize the typical fish purchasing sources of fish farmers split by FIES level.

**Table 25: Distribution of typical fish purchasing sources by FIES level in percent (fish farmers only, 2 missings, N=642)**

SIZE	FOOD SECURE % (N=85)	MILDLY FOOD INSECURE % (N=339)	MODERATELY FOOD INSECURE % (N=194)	SEVERELY FOOD INSECURE % (N=24)	TOTAL % (N=642)
Lake	0	0	0	0	0
Farm	77.6	74.6	75.3	70.8	75.1
River	2.4	7.4	9.3	8.3	7.3
Local market	12.9	10	11.9	20.8	11.4
Fish shop	0	0.3	0	0	0.2
Dried fish shop	3.5	0.3	1	0	0.9
Fish market	0	0	0	0	0
Other	0	0	0	0	0
Total	100	100	100	100	100

**Distribution of typical fish purchasing source by FIES level**

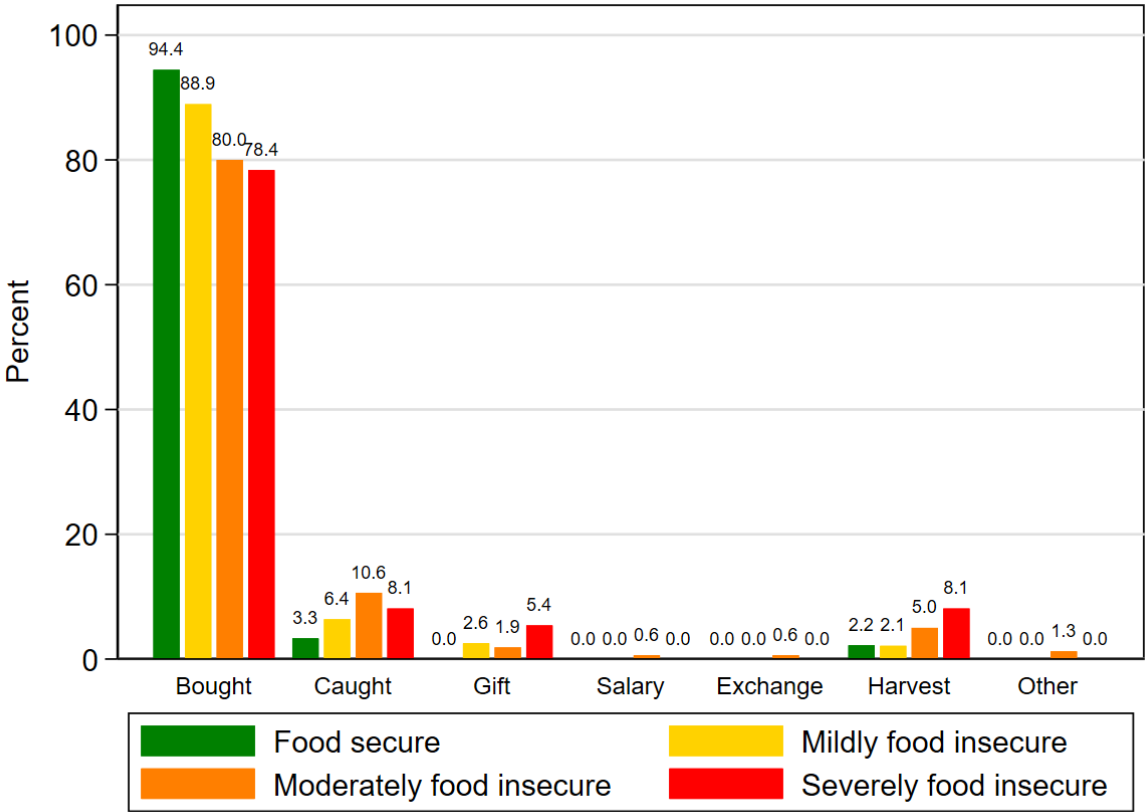


**Figure 18: Distribution of typical purchasing source by FIES level (fish farmers only, 2 missings, N=642)**

In contrast to consumers, fish farmer purchase fish mostly on fish farms (75.1%), followed by local markets (11.4%) and river (7.3%). Dried fish shops have a lower share of around 5.1%. Other fish purchasing sources (rivers, fish shops, fish markets) have a share of less than 1% and seem rather irrelevant for fish farmers. Furthermore, food insecure fish farmers tend to rely more on fish farms as well as rivers than food secure fish farmers. Table 26 and Figure 19 report the distribution of fish sourcing methods by FIES level for consumers. Notably, there is one additional missing observation on the variable getfish, reducing the sample size to 522.

**Table 26: Distribution of fish sourcing methods by FIES level in percent (consumers only, 4 missing, N=522)**

SOURCING METHOD	FOOD SECURE % (N=90)	MILDLY FOOD INSECURE % (N=235)	MODERATELY FOOD INSECURE % (N=160)	SEVERELY FOOD INSECURE % (N=37)	TOTAL % (N=522)
Bought	94.4	88.9	80	78.4	86.4
Caught	3.3	6.4	10.6	8.1	7.3
Gift	0	2.6	1.9	5.4	2.1
Salary	0	0	0.6	0	0.2
Exchange	0	0	0.6	0	0.2
Harvest	2.2	2.1	5	8.1	3.4
Other	0	0	1.3	0	0.4
Total	100	100	100	100	100

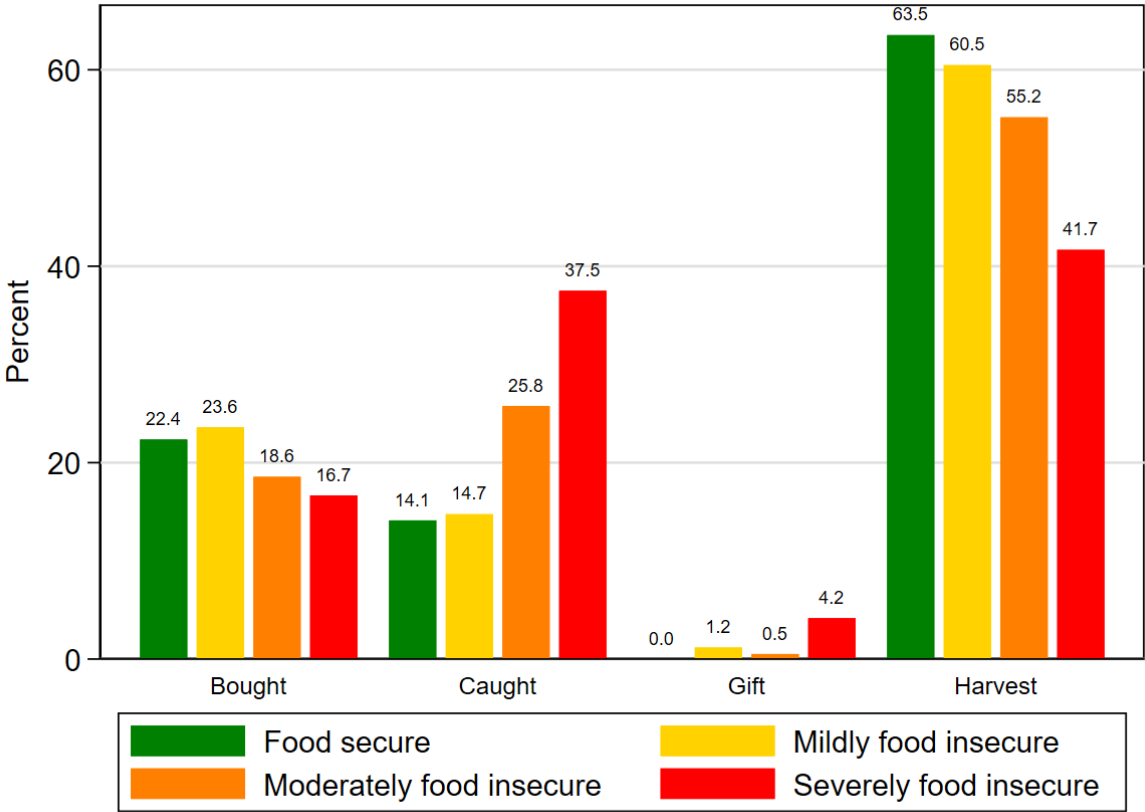


**Figure 19: Distribution of fish sourcing methods by FIES level (consumers only, 4 missings, N=522)**

86.4% of consumers across all FIES levels are purchasing their fish while 7.3% are catching fish themselves. However, the latter seems to be significantly higher for severely food insecure individuals. Furthermore, fish does not seem to play a significant role as part of the salary and or as a good for exchange. Table 27 and Figure 20 focus on the sample of fish farmers and state the respective distribution of fish sourcing split by FIES level.

**Table 27: Distribution of fish sourcing methods by FIES level in percent (fish farmers only, 2 missings, N=642)**

SOURCING METHOD	FOOD SECURE % (N=85)	MILDLY FOOD INSECURE % (N=339)	MODERATELY FOOD INSECURE % (N=194)	SEVERELY FOOD INSECURE % (N=24)	TOTAL % (N=642)
Bought	22.4	23.6	18.6	16.7	21.7
Caught	14.1	14.7	25.8	37.5	18.8
Gift	0	1.2	0.5	4.2	0.9
Salary	0	0	0	0	0
Exchange	0	0	0	0	0
Harvest	63.5	60.5	55.2	41.7	58.6
Other	0	0	0	0	0
Total	100	100	100	100	100



**Figure 20: Distribution of fish sourcing methods by FIES level (fish farmers only, 2 missings, N=642)**

Most fish farmers state to harvest their fish (58.6%), followed by buying (21.7%) and catching (18.8%). Among severely food insecure fish farmers, catching is significantly more widespread than for food secure fish farmers (37.5% vs. 14.1%, respectively). The distribution of walking time in minutes to the closest source of fish procurement is illustrated in Figure 21. The sample of consumers is complete and also includes consumers with a missing FIES level and never consuming fish.

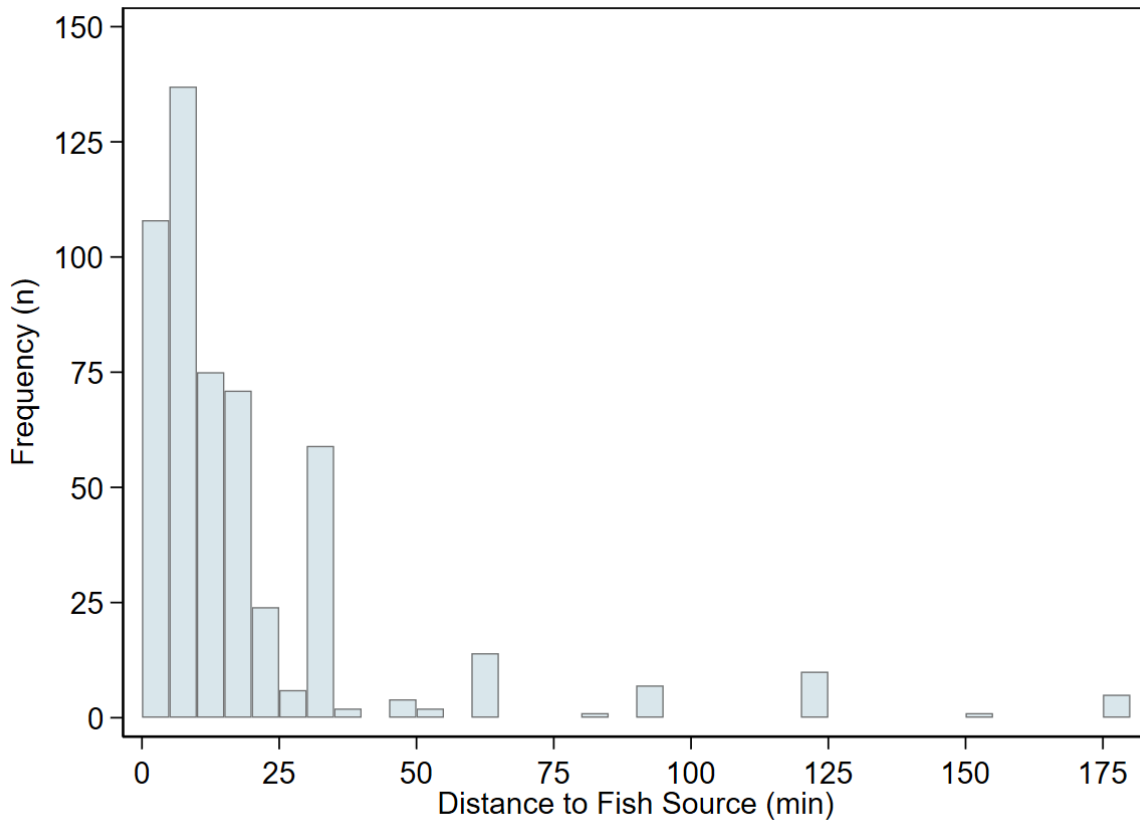


Figure 21: Frequency histogram for the confirmed walking distance to fish sources (consumers only, N=526)

The source in this case refers to the closest market or place where fish can be purchased. The y-axis shows the frequency or number of persons within the group confirmed to need e.g. 0 to 5 minutes. The x-axis shows the minutes. Bins were created in 5 min steps. On average, consumers take 18 minutes walking distance to their nearest fish source. The median is with 10 minutes lower. While 75% of consumers need less than 20 minutes, some consumers need even around 3 hours to reach the markets.

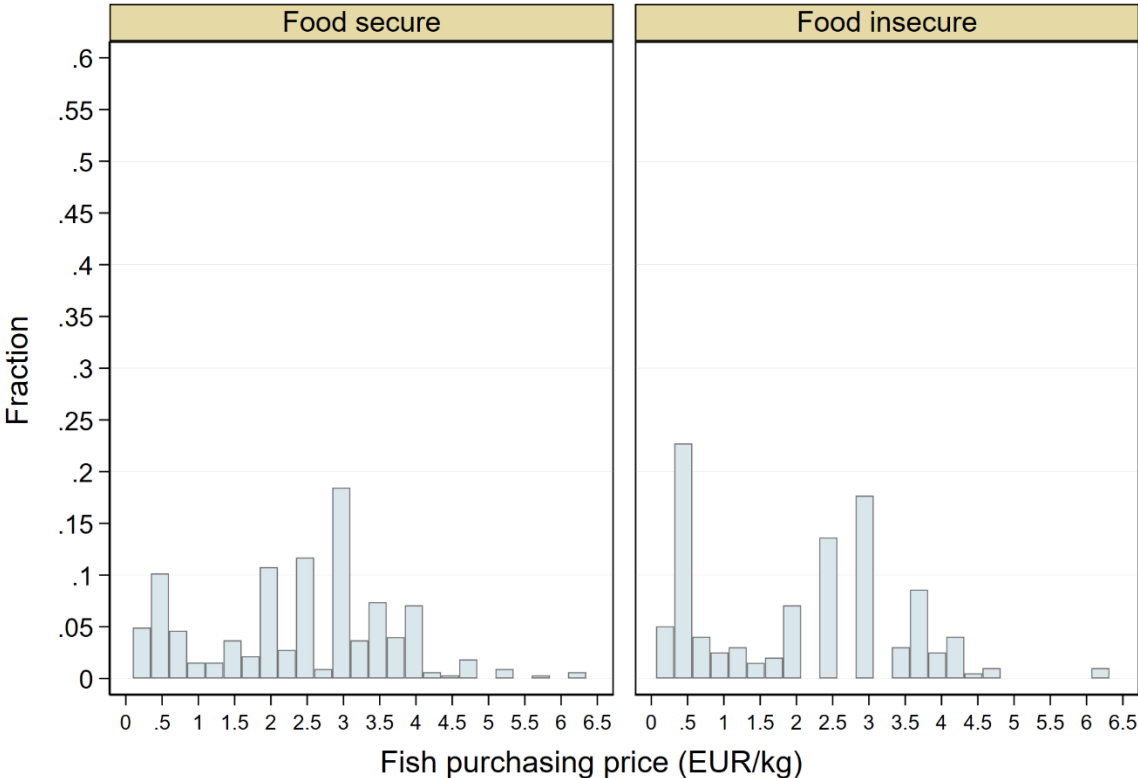
### 3.3.1.2 FISH PURCHASING PRICES (EUR/KG) BY FIES LEVEL

To enable comparison of fish quantities consumed for varying formats and processing, conversion factors were used to compute an equivalent price (EUR/Kg) as well as equivalent weight in fresh, round fish. Table 28 provides an overview of the conversion factors used that were provided by the GIZ team. For price conversion the price was multiplied by the remaining weight (e.g., 0.8 in the case of gutted), for kg conversion the inverse of the remaining weight was taken (e.g.,  $1/0.8=1.25$  in the case of gutted).

**Table 28: Conversion factors used to calculate fresh round fish equivalent price (EUR/kg)**

FORMAT /PROCESSING	REMAINING WEIGHT (%)	WEIGHT LOSS (%)
Whole/ Piece	100	0
Gutted	80	20
Fillet steak	30	70
Fresh	100	0
Frozen	100	0
Fried	30	70
Dried	25	75
Smoked	25	75
Cooked	100	0
Chilled on ice	100	0

Figure 22 provides a comparison of the distributions of price paid by food secure and food insecure consumers based on the information on last fish consumption, where the left-hand side plot (food secure) is comprised of food secure and mildly food insecure respondents; and the plot on the right side (food insecure) is comprised of moderately food insecure and severely food insecure respondents. The y-axis of the figure shows the fraction of persons within the group confirmed to have paid the respective price.

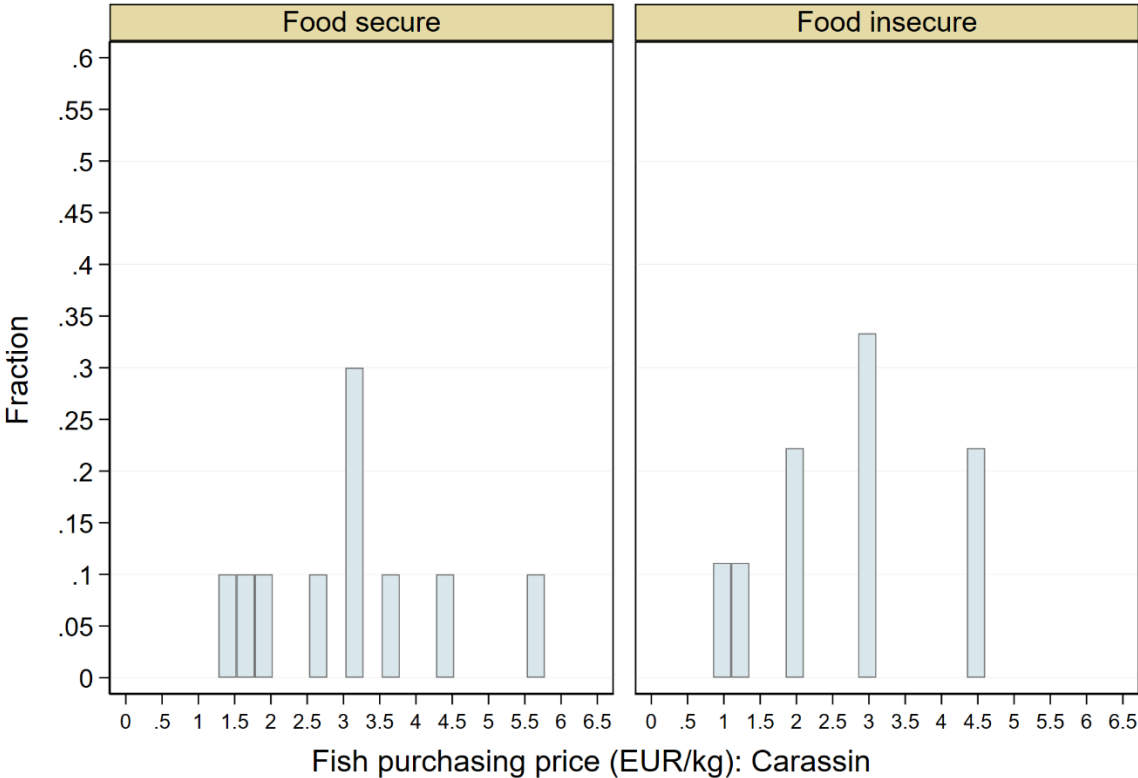


Graphs by Food security status

**Figure 22: Distribution of fish purchasing price (EUR/kg fresh round) disaggregated by FIES status (consumers only, 3 missings, food secure: N=325; food insecure: N=198)**

Among the food secure consumers, the average purchasing price is 2.44 EUR/kg of fresh round fish. The median is with 2.55 EUR per kg slightly higher. While the median for food insecure consumers is identically (corresponding to 10,000 MGA/kg fresh round), the average

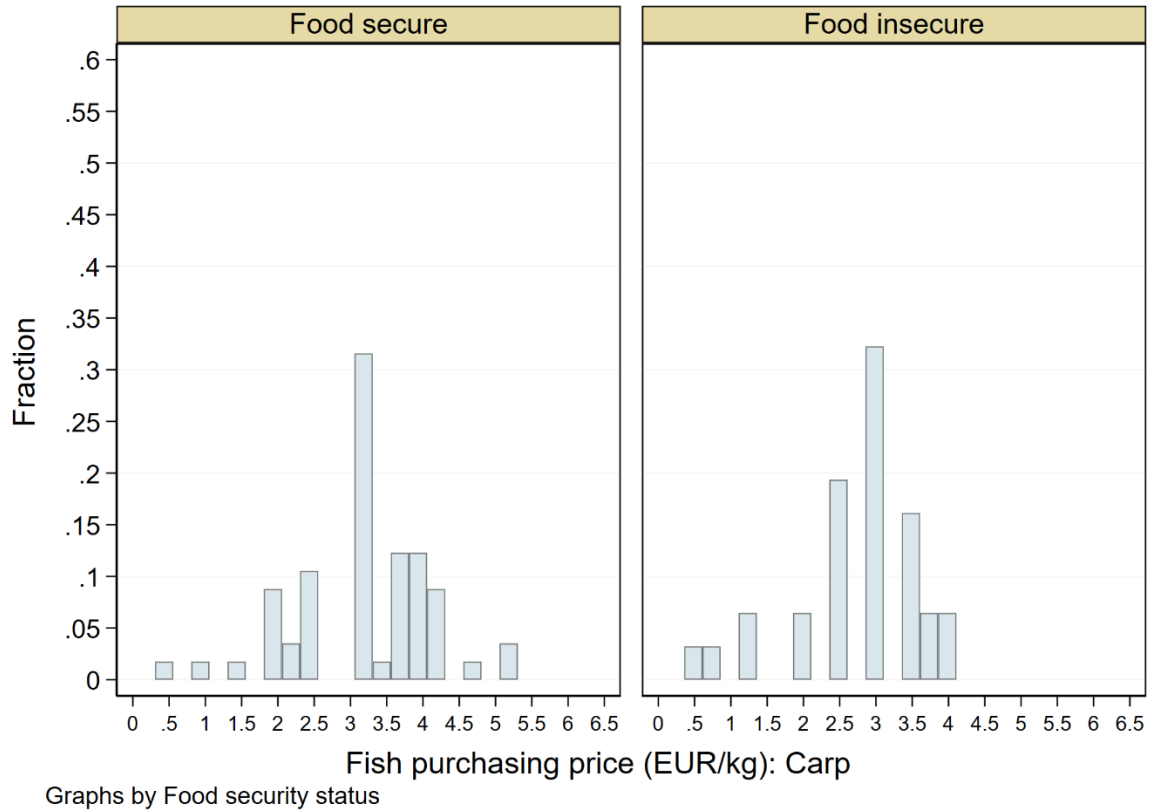
is with 2.10 EUR/kg fresh round considerably lower. The respective figure reveals that a high share of consumers pays around 0.50 EUR/kg fresh round, explaining the lower average. To get more insight on the price pattern, Figure 24 to Figure 26 depict the prices paid by consumers for the most popular fish species: Carassin, Carp, Seafish and Tilapia.



Graphs by Food security status

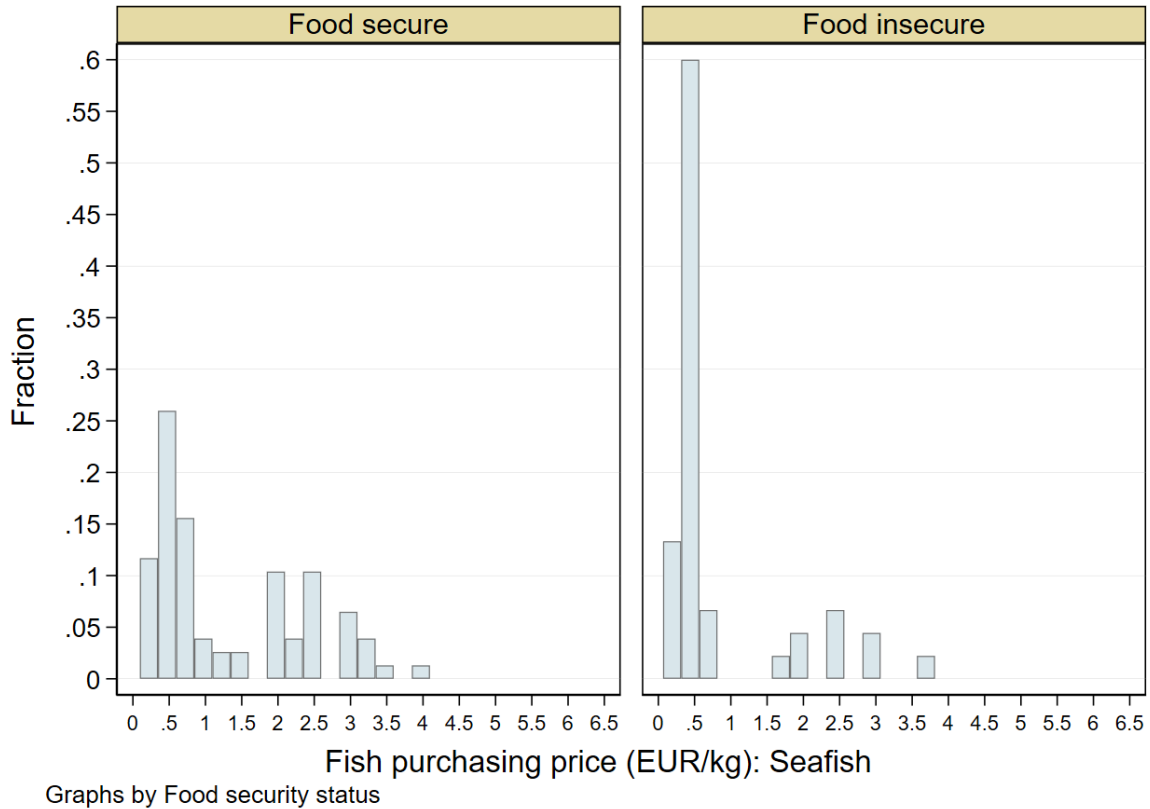
**Figure 23: Distribution of fish purchasing price (EUR/kg fresh round) disaggregated by FIES status (consumers only - only Carassin; food secure N=10; food insecure N=9)**

Since Carassin consumption is relatively less frequent, the sample reduces to 10 and 9 consumers for the respective FIES status. The average price paid for Carassin is 3.03 EUR/kg fresh round for food secure and 2.70 EUR/kg fresh round for food insecure consumers. The median is with 3.06 EUR per kg fresh round identically for both groups.



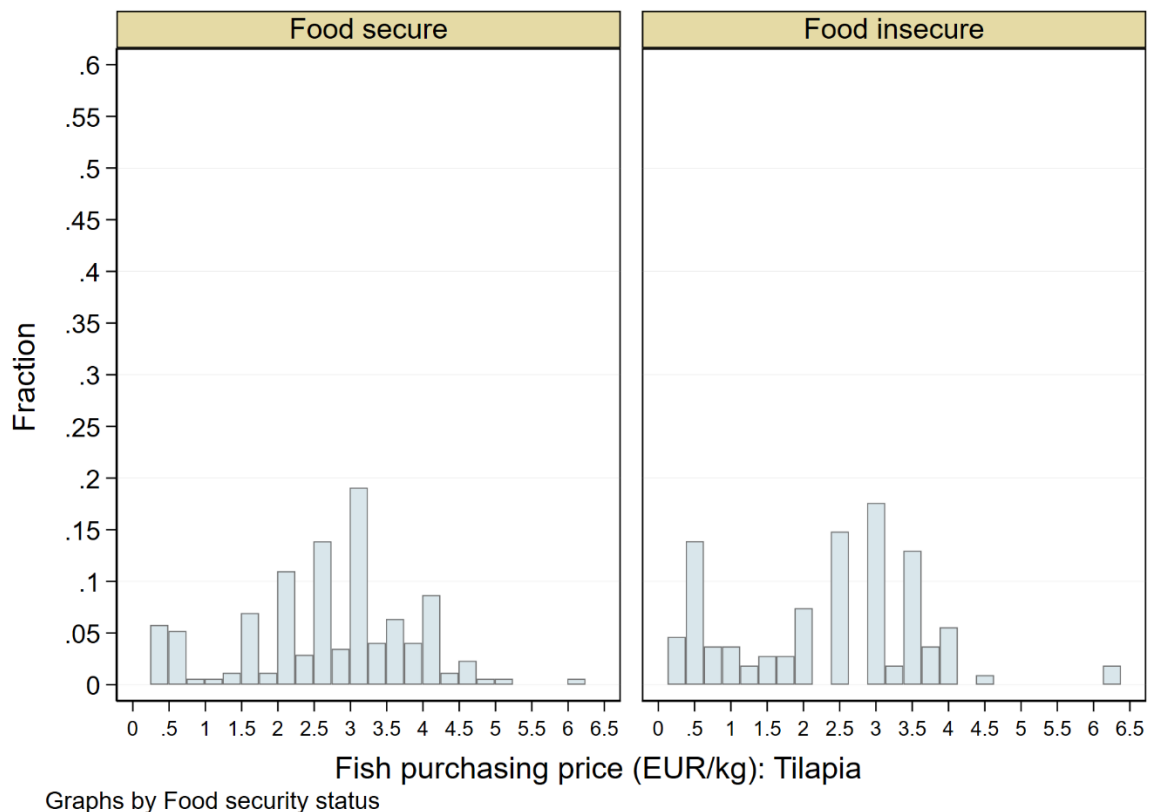
**Figure 24: Distribution of fish purchasing price (EUR/kg fresh round) disaggregated by FIES status (consumers only – only Carp; food secure N=57; food insecure N=31)**

Carp consumption is more frequent, providing also more statistical power for the illustrated patterns. The average price paid for Carp is 3.14 EUR/kg fresh round for food secure and 2.80 EUR/kg fresh round for food insecure consumers. The median is again identical for both groups, with 3.06 EUR/kg fresh round.



**Figure 25: Distribution of fish purchasing price (EUR/kg fresh round) disaggregated by FIES status (consumers only- only Seafish; food secure N=77; food insecure N=45)**

Similarly, Seafish consumption is popular among consumers. The average price paid for Seafish is 1.35 EUR/kg fresh round for food secure and 0.87 EUR/kg fresh round for food insecure consumers. The median price paid for Seafish is 0.77 EUR/kg fresh round for food secure and 0.51 EUR/kg fresh round for food insecure consumers. This illustrates that Seafish is significantly cheaper than other fish species. In addition, and also explaining the aggregated pattern of lower average prices per kg fresh round for food insecure consumers, food insecure consumers pay significantly less, likely be explained by the processing type the fish is bought as presented in Table 22.



**Figure 26: Distribution of fish purchasing price (EUR/kg fresh round) disaggregated by FIES status (consumers only, food secure N=173; food insecure N=108) – Only Tilapia**

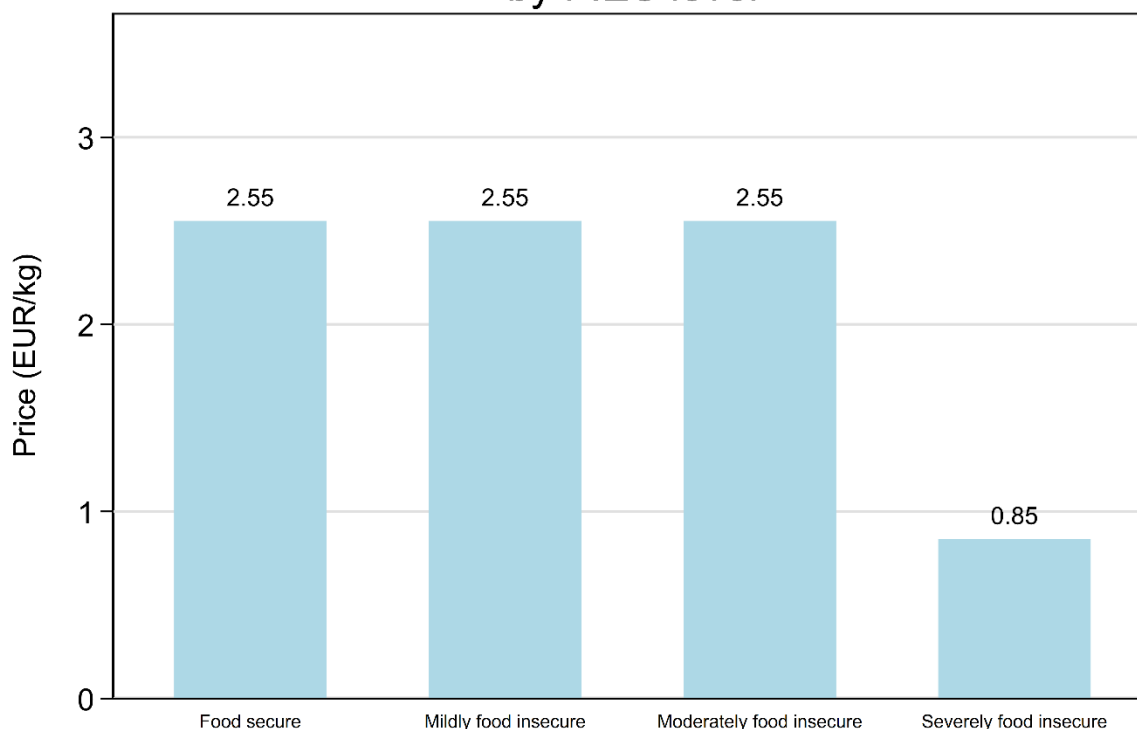
Tilapia is the most popular species consumed and hence having the highest number of observations. The average price paid for Tilapia is 2.66 EUR/kg fresh round for food secure and 2.37 EUR/kg fresh round for food insecure consumers. The median price paid for Tilapia is 2.87 EUR/kg fresh round for food secure and 2.55 EUR/kg fresh round for food insecure consumers. Table 29 and Figure 27 show different statistical indicators for the fish purchasing price of all levels of food security of consumers.

**Table 29: Distribution of fish purchasing price in fresh round (EUR/Kg) by FIES level (consumers only, 3 missings, N=523)<sup>3</sup>**

FIES LEVEL	N	MIN.	10%	MEDIAN	MEAN	90%	MAX.
Food secure	90	0.11	0.83	2.55	2.69	4.03	6.13
Mildly food insecure	235	0.10	0.45	2.55	2.34	4.09	6.13
Moderately food insecure	161	0.11	0.41	2.55	2.19	3.68	6.13
Severely food insecure	37	0.07	0.41	0.85	1.68	3.57	4.38
<b>Total</b>	<b>523</b>	<b>0.07</b>	<b>0.45</b>	<b>2.55</b>	<b>2.31</b>	<b>3.83</b>	<b>6.13</b>

<sup>3</sup> Prices are converted from MGA to € with the average exchange rate used in the Baseline and Midterm 2021 (1€ = 3916.47 MGA).

## Distribution of median fish purchasing price (EUR/kg) by FIES level



**Figure 27: Distribution of median fish purchasing price for fresh round (EUR/kg) by FIES level (consumers only, 3 missings)**

As above, three consumers do never eat fish or have incomplete information to calculate the FIES. The median is similar across most levels of FIES (2.55 EUR/kg fresh round), with severely food insecure consumers as an exception (0.85 EUR/kg fresh round). The mean reveals the tendency of more food secure consumers to pay higher prices, e.g., due to the form they buy the fish. While food secure consumers pay on average 2.69 EUR/kg fresh round, severely food insecure consumers pay 1.68 EUR/kg. A similar pattern is also observable for all other percentiles (e.g., 10%-percentile: 0.83 EUR/kg fresh round vs. 0.41 EUR/kg fresh round).

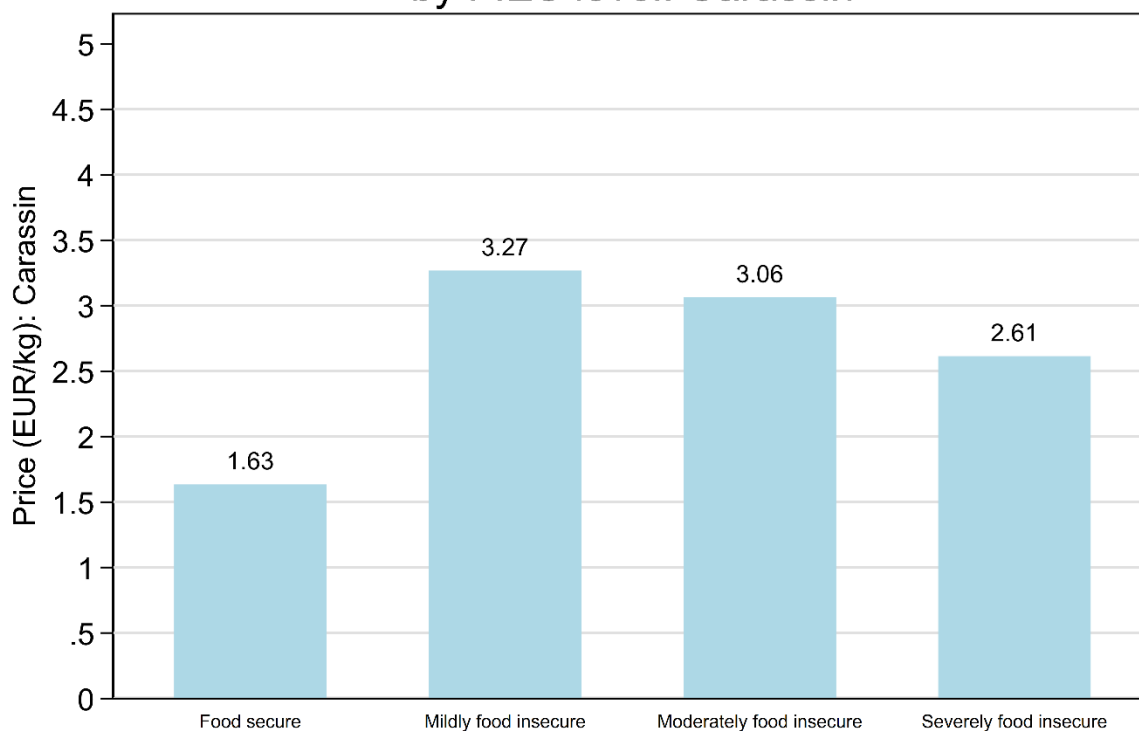
In addition, nonparametric test was conducted to analyze whether there is significance difference in the price with respect to the FIES level. In more detail, the (nonparametric) Kruskal-Wallis<sup>4</sup> test has been implemented in STATA to analyze the null hypothesis that the median is equal between all FIES level. The test reveals statistically significant differences between FIES categories with respect to median fish purchasing prices of consumers (p-value = 0.0026). However, considering that there is only a different level between severely food insecure consumers compared to all other FIES levels, the statistical difference is driven by this pattern.

As discussed above, the prices vary considerably between fish species. Figure 28 to Figure 31 depict the median prices paid by consumers depending on the FIES level and fish species.

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<sup>4</sup> The price distributions are not gaussian and therefore do not meet the assumptions necessary for a standard ANOVA test. However, the number of samples (n) for each distribution was sufficient to provide a roughly normal sampling distribution, confirmed by test diagnostics. As a precaution, the observed difference in price means was tested for significance using the (non-parametric) Kruskal-Wallis method suited for non-normal distributions.

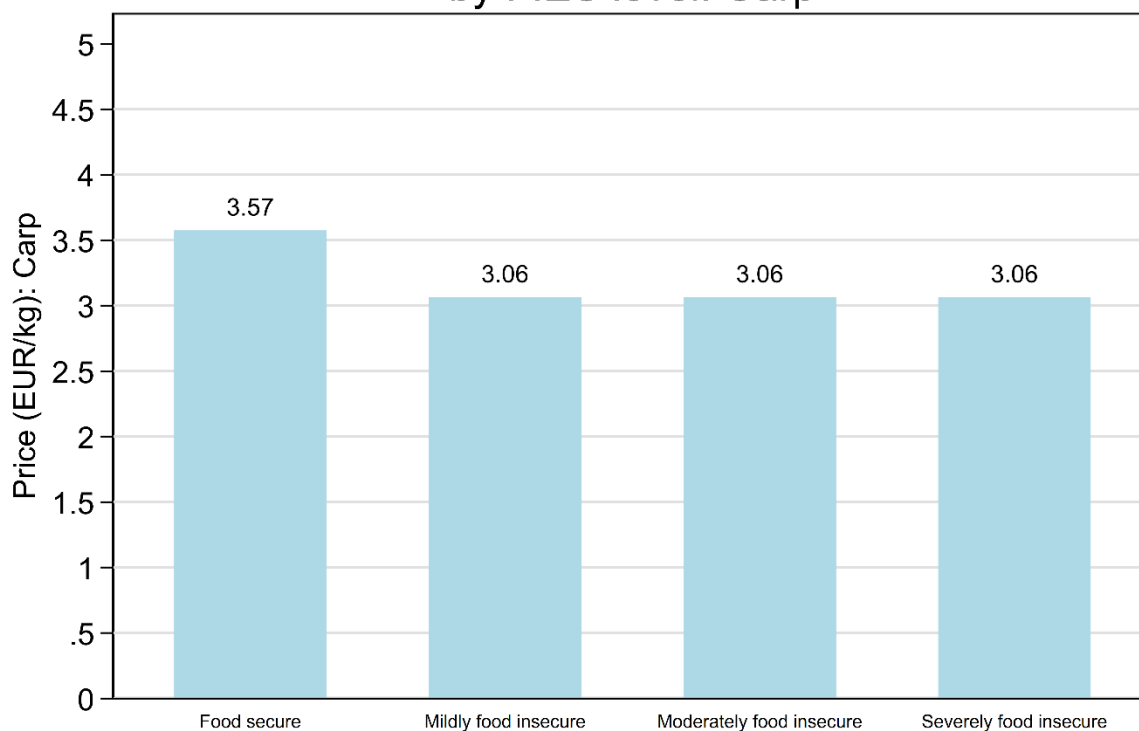
### Distribution of median fish purchasing price (EUR/kg) by FIES level: Carassin



**Figure 28: Distribution of median fish purchasing price for fresh round (EUR/kg fresh round) by FIES level (consumers only - only Carassin, N=19)**

Since the sample size of Carassin consumers is with 19 very small and even smaller for each FIES group, the results should be only interpreted as tentative information. Basically, the median per kg fresh round varies between 1.63 EUR/kg and 3.27 EUR/kg.

### Distribution of median fish purchasing price (EUR/kg) by FIES level: Carp



**Figure 29: Distribution of median fish purchasing price for fresh round (EUR/kg) by FIES level (consumers only - only Carp, N=88)**

The sample of Carp consumers has more statistically power, with 88 observations. Food secure consumers have the highest median with 3.57 EUR/kg fresh round. All other groups of FIES levels have with 3.06 EUR/kg fresh round a similar median price.

### Distribution of median fish purchasing price (EUR/kg) by FIES level: Ocean

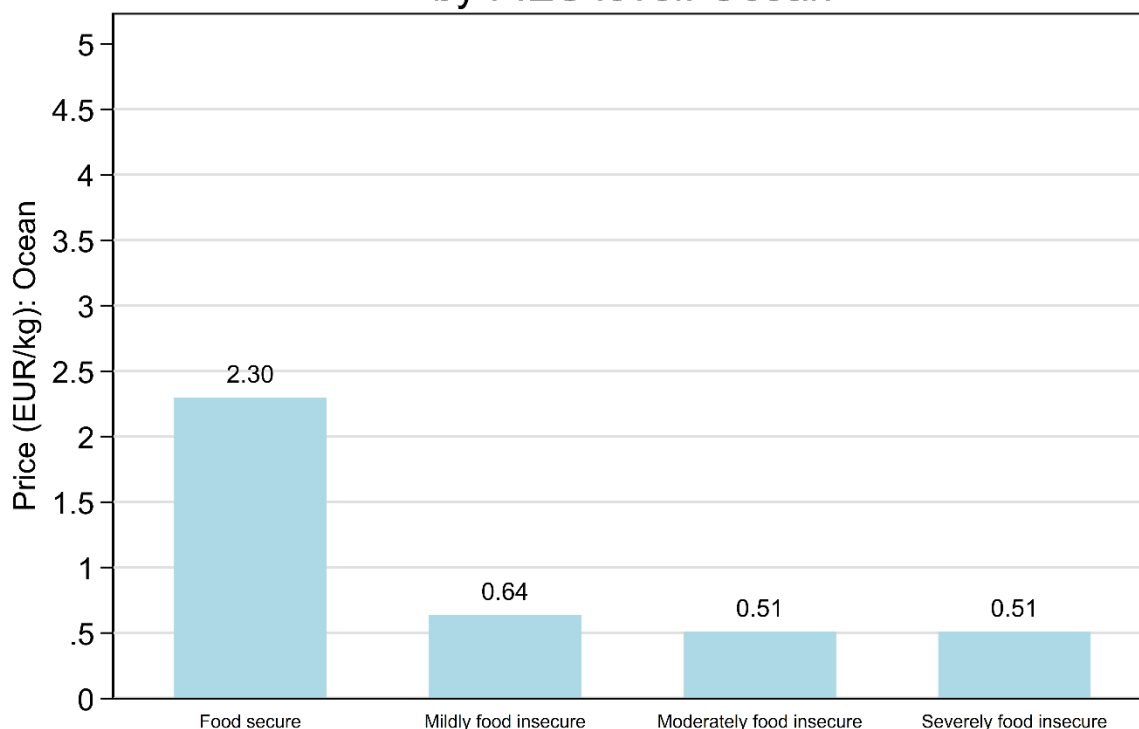


Figure 30: Distribution of median fish purchasing price for fresh round (EUR/kg) by FIES level (consumers only - only Seafish, N=122)

The sample of Seafish is also statistically meaningful with 122 observations. Again, food secure consumers have the highest median with 2.30 EUR/kg fresh round. All other FIES levels show significantly lower median values varying between 0.64 EUR/kg fresh round for mildly food insecure consumers and 0.51 EUR/kg fresh round for moderately and severely food insecure consumers.

### Distribution of median fish purchasing price (EUR/kg) by FIES level: Tilapia

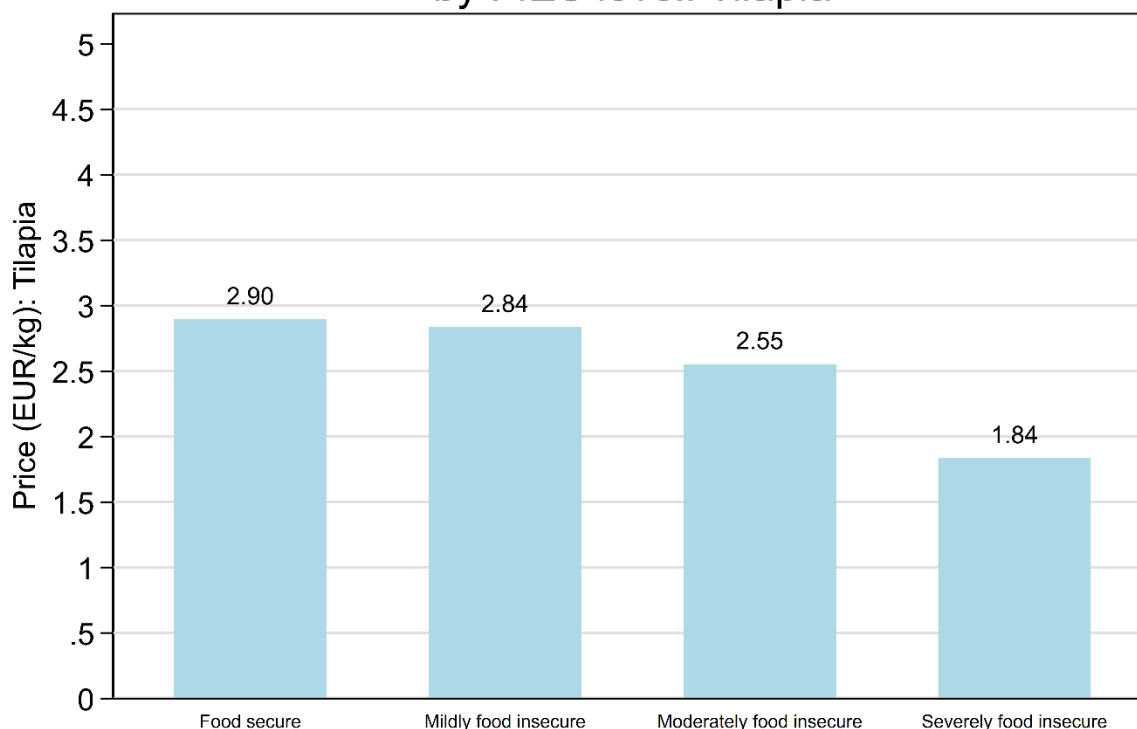


Figure 31: Distribution of median fish purchasing price for fresh round (EUR/kg) by FIES level (consumers only - only Tilapia, N=281)

The sample of Tilapia is with 281 the biggest. Similar as above, food secure consumers have the highest median with 2.90 EUR/kg fresh round. However, mildly and moderately food insecure consumers pay only a slightly lower price with 2.84 EUR/kg fresh round and 2.55 EUR/kg fresh round, respectively. Only, severely food insecure consumers pay a significant lower price with 1.84 EUR/kg fresh round, again pointing to likely differences in the processing type fish is bought discussed in Table 22. Figure 32 demonstrates the distribution of fish purchasing price (EUR/kg fresh round) disaggregated by fish size for consumers.

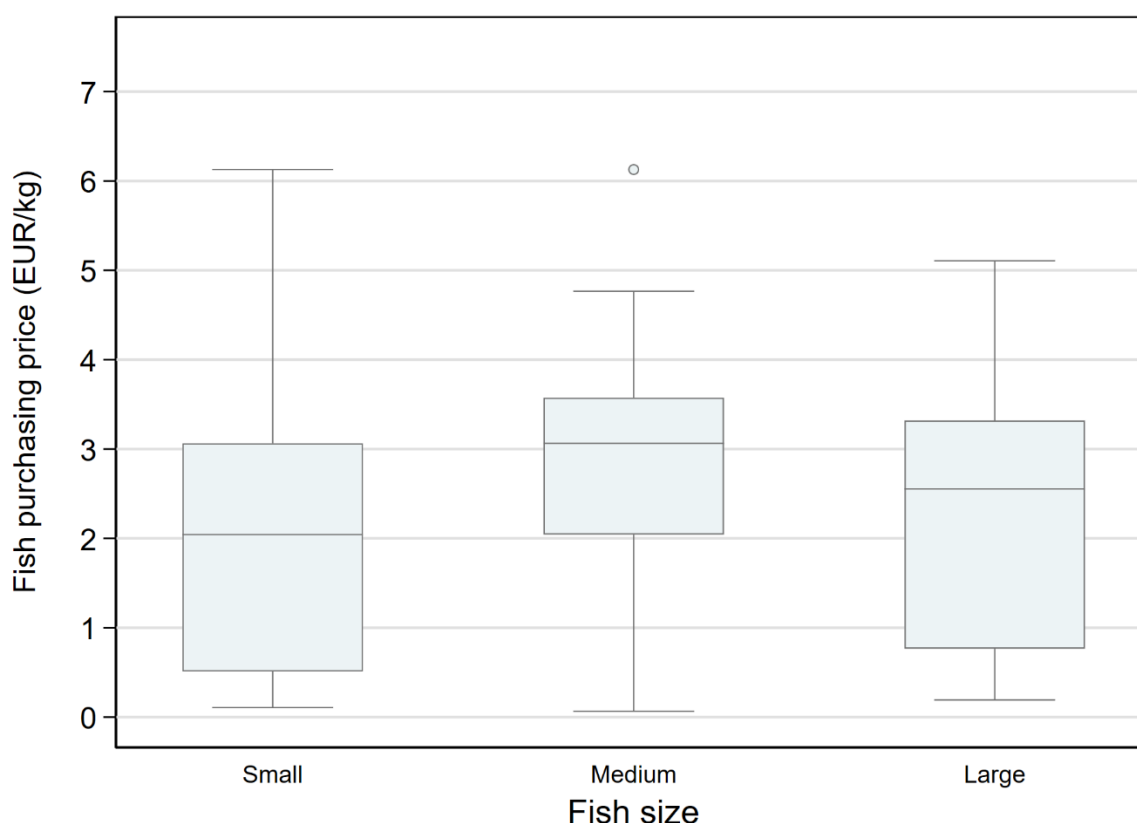


Figure 32: Distribution of fish purchasing price (EUR/kg fresh round) disaggregated by size (consumers only, 3 missings)

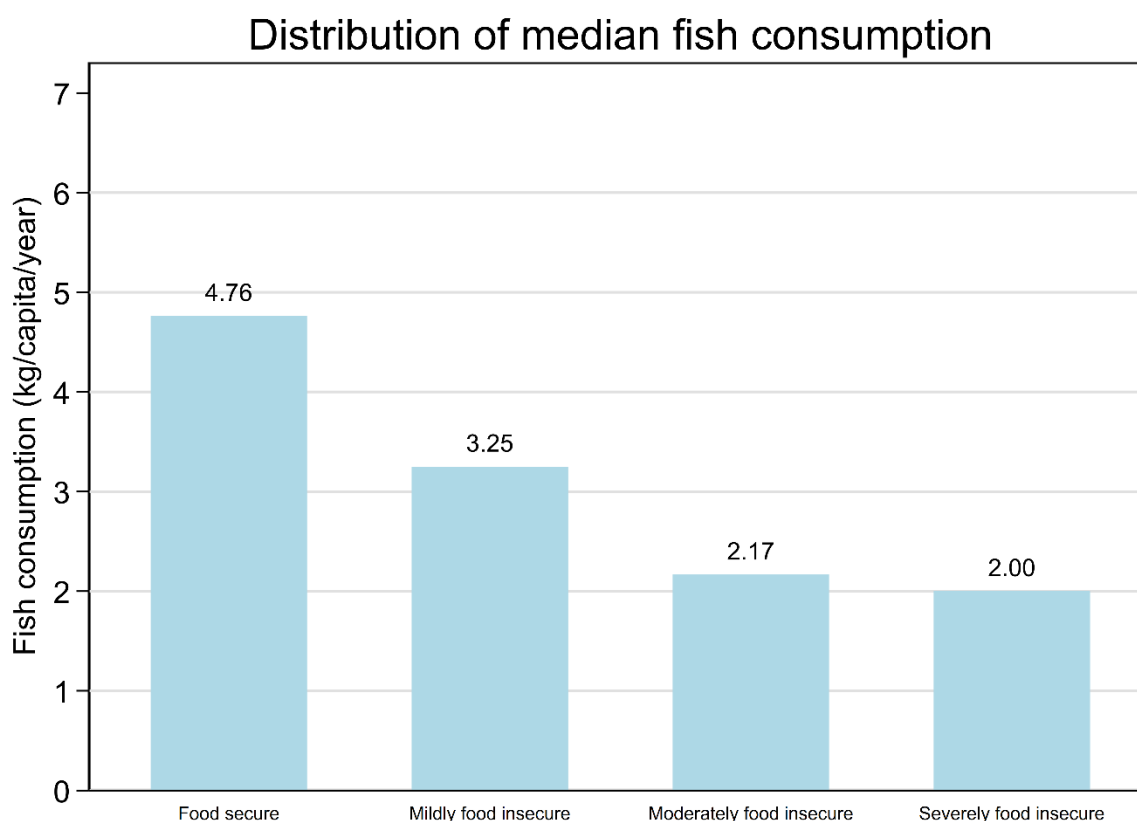
The sample is again limited to consumers with fish consumption and a stated FIES level. There is no clear pattern between fish sizes and prices. The median and average is the highest for medium sized fish, with a median of 3.06 EUR/kg fresh round and an average of 2.58 EUR/kg fresh round. Small fish is the cheapest with a median of 2.04 EUR/kg fresh round and a very similar an average of 2.03 EUR/kg fresh round.

### 3.3.1.3 FISH CONSUMPTION (CAPITA/YEAR) BY FIES LEVEL

To analyze, whether the amount of consumed fish correlates with a person’s food insecurity, we used the confirmed information from the last fish meal and the stated average frequency of fish consumption in the household, divided by the number of household members to calculate approximated adjusted fish consumption in kg per person per year. Table 30 and Figure 33 provide insights into consumption patterns of interviewed consumers, differentiated by FIES level.

Table 30: Fish consumption (kg fresh round/capita/year) by FIES level (consumers only, 1 missing, N=525)

FIES LEVEL	N	MIN.	10%	MEDIAN	MEAN	90%	MAX.
Food secure	90	0.13	1.20	4.76	6.29	13.00	26.00
Mildly food insecure	235	0.03	0.70	3.25	6.12	13.00	73.00
Moderately food insecure	163	0.00	0.17	2.17	4.91	12.00	60.83
Severely food insecure	37	0.01	0.20	2.00	3.77	12.00	26.00
<b>Total</b>	<b>525</b>	<b>0.00</b>	<b>0.50</b>	<b>3.00</b>	<b>5.61</b>	<b>13.00</b>	<b>73.00</b>



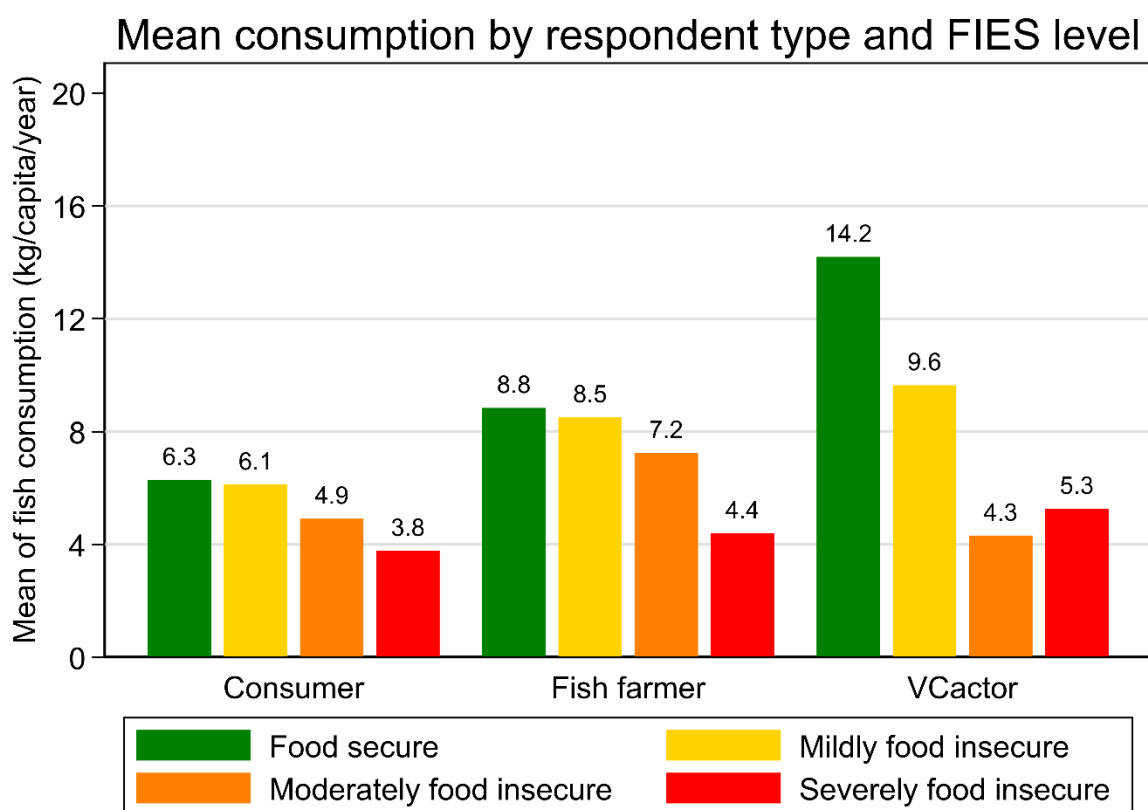
**Figure 33: Median fish consumption in kg/capita/year (consumers only, 1 missing, N=525)**

The sample size excludes one consumer with no information about the FIES. The two consumers who never eat fish enter the sample with zero consumption. Accordingly, the sample size is 525. The median yearly consumption per capita is 3 kg fresh round, compared to a higher mean of 5.6 kg fresh round. In general, the food consumption decreases with food insecurity. Food secure consumers consume on average 6.29 kg fresh round, while severely food insecure consumers consume 3.8 kg fresh round. The median is 4.8 kg fresh round for food secure consumers and 2 kg for severely food insecure consumers, respectively.

As already discussed above, an analysis of variance (ANOVA) was again conducted in STATA to confirm or reject the significance of the differences of fish consumption quantities with respect to FIES level. The test revealed statistically significant differences between all FIES categories with respect to fish consumption of consumers ( $p$ -value= 0.0002). Table 31 and Figure 34 show the mean fish consumption by respondent type and FIES level and help investigate the question whether fish consumption is different among the actor types along the fish value chain.

**Table 31: Mean consumption (kg/capita/year) by respondent function and FIES level (complete sample, 2 missings, N=1,257)**

RESPONDENT TYPE	FOOD SECURE (kg/capita/year)	MILDLY FOOD INSECURE (kg/capita/year)	MODERATELY FOOD INSECURE (kg/capita/year)	SEVERELY FOOD INSECURE (kg/capita/year)
Fish Farmer (N=643)	8.8	8.5	7.2	4.4
VC actor (N=89)	14.2	9.6	4.3	5.3
Consumer (N=525)	6.3	6.1	4.9	3.8



**Figure 34: Mean consumption (kg/capita/year) by respondent type and FIES level, (complete sample, 2 missings, N= 1,257)**

In general, among all actor types, the fish consumption diminishes with food insecurity. Only among value chain actors, moderately food insecure respondents have a slightly lower fish consumption compared to severely food insecure respondents. The highest average fish consumption is with 14.2 kg fresh round observable for food secure value chain actors. The lowest is observable for consumers suffering under severely food insecurity. Table 32 and Figure 52 show the median fish consumption by respondent type and FIES level. The sample remains similar to the statistics on the average fish consumption.

**Table 32: Median consumption (kg fresh round/capita/year) by respondent function and FIES level (complete sample, 2 missings, N=1,257)**

RESPONDENT TYPE	FOOD SECURE (kg/capita/year)	MILDLY FOOD INSECURE (kg/capita/year)	MODERATE LY FOOD INSECURE (kg/capita/year)	SEVERELY FOOD INSECURE (kg/capita/year)	Kruskal–Wallis test
Fish Farmer (N=643)	6.5	5.2	4.0	2.4	0.0001***
VC actor (N=89)	6.0	3.5	2.0	5.2	0.0804*
Consumer (N=525)	4.8	3.3	2.2	2.0	0.0002***

Note: A (non-parametric) Kruskal-Wallis equality-of-populations rank test was conducted to analyze whether there is significant different consumption for the respective respondent types depending on the FIES level. \*\*\* = 1% significance; \*\* = 5% significance; \* = 10% significance

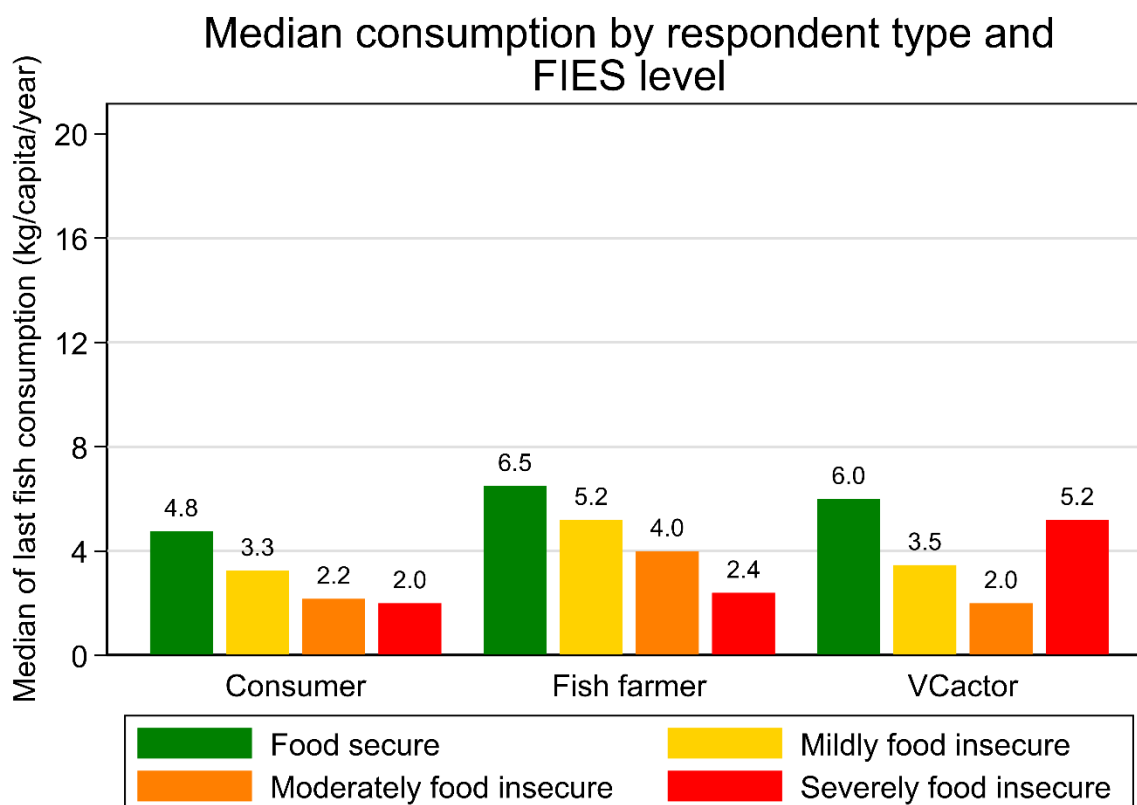
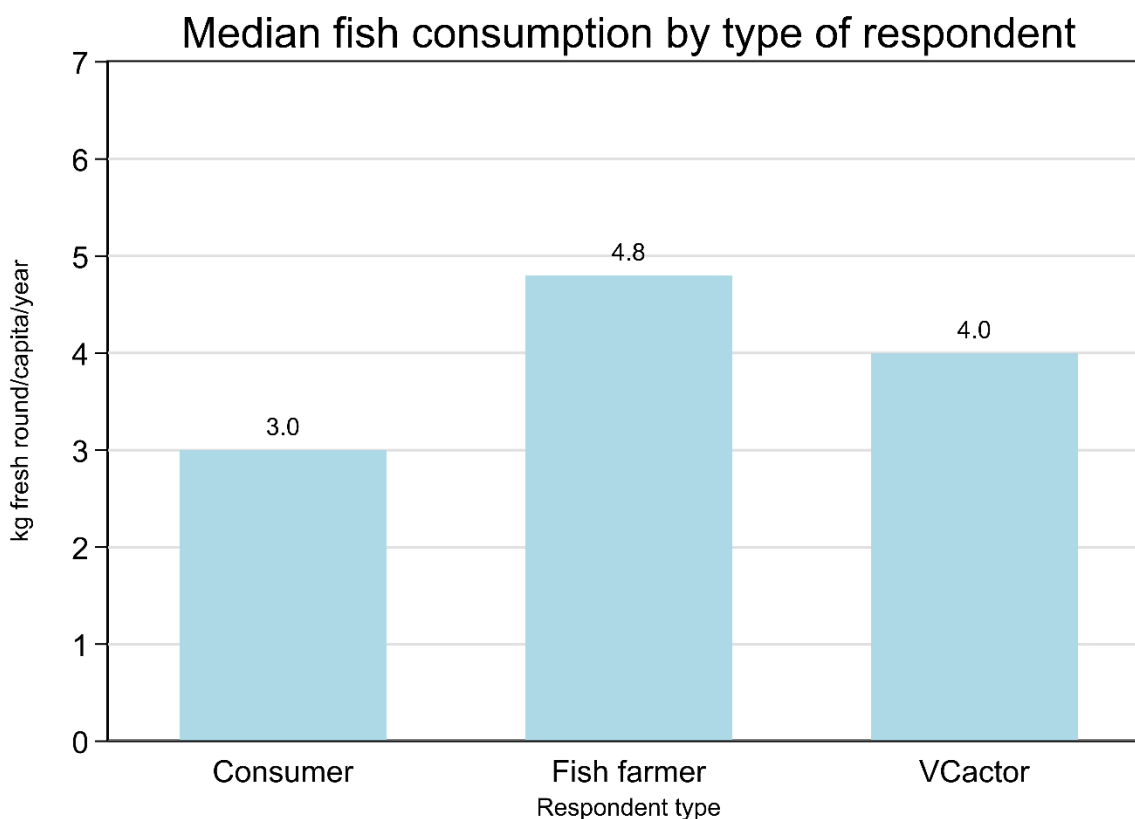


Figure 35: Median consumption (kg fresh round/capita/year) by respondent type and FIES level (complete sample, 2 missings, N=1,257)

Similar to the average fish consumption, there is a strong tendency of increasing fish consumption with better food security. The only exclusion from this pattern is visible for value chain actors. Among value chain actors, severely food insecure respondents consume 5.2 kg fresh round, which is the second highest value behind food secure value chain actors with 6 kg fresh round. The highest consumption is visible for fish farmers, varying between 6.5 kg fresh round for food secure fish farmers and 2.4 kg fresh round for severely food insecure fish farmers. Next, Table 33 and Figure 36 present the fish consumption independently of the FIES level and provide a closer look into the quantities of fish consumed (kg fish in fresh round/capita/year) by type or function of respondent (consumer, fish farmer, VCA). Consumption is calculated based on the variables “getfish3” and “getfish1” covered in all questionnaires.

Table 33: Fish consumption (kg fresh round/person/year) by function of respondent (complete sample, 2 missings, N = 1,257)

RESP. TYPE	N	MIN.	10%	MEDIAN	MEAN	90%	MAX.
Consumer	525	0.0	0.5	3.0	5.6	13.0	73.0
Fish farmers	643	0.0	1.1	4.8	8.0	17.3	91.3
VCA	89	0.1	0.4	4.0	9.1	20.8	91.3
<b>Total</b>	1257	0.0	0.8	4.0	7.1	15.6	91.3



**Figure 36: Median fish consumption (kg fresh round/capita/year) by type of respondent (complete sample, 2 missings, N = 1,257)**

Fish farmers show with 5.8 kg per capita and year the highest median fish consumption, followed by value chain actors with 4 kg and consumers with 3 kg. The means for consumers, fish farmers and value chain actors are 5.6 kg, 8.0 kg and 9.1 kg, respectively.

The next section of the focus on production-related statistics. To this end, the sample was trimmed to ensure a comparable sample size in the reporting. The methodology is described in the following section.

### 3.3.1.1 SAMPLE FOR PRODUCTION-RELATED STATISTICS

The following part of the report focuses on production-related statistics, such as kg produced by fish farmers or value chain actors over the last year. Targeting to enable the GIZ team to do calculations beyond the reported statistics, it is crucial to keep the sample constant in the regarding statistics. To this end, production and sales statistic have to be complete, e.g., there should be no missing because the respondent does not know a specific weight or price received. In addition, the timing of the Endline data collection within a year differs in comparison to the baseline in September 2018 and midterm in September/October 2021. The project team has been aware of resulting challenges in the monitoring and evaluation activities related to fish farmers. Unfortunately, a similar timing was not possible. Since the project team has been aware of these challenges, some additional questions on the harvest timing of fish farmers have been added. A key piece of information is whether the fish farmers have already finished their harvest or not. The project team decided to exclude fish farmers who have not finished their harvest from the reporting to facilitate a comparison with baseline and midterm data.

### ***Fish farmers: profit calculation***

In this section, some key statistics are presented to allow for an understanding of the assumptions made as well as to explain how the production-related sample for the reporting of fish farmers is derived. The section starts by presenting the sample of fish farmers exploited in the production-related statistics. Table 34 provides an overview for how many fish farmers a profit was calculated and which aspects resulted in a missing profit calculation. It is possible that one interview is excluded from profit calculation for multiple reasons. However, the table is structured in a cascading way, meaning that after each row the new sample size is stated and the next aspect only focuses on interviews of the new sample size.

**Table 34: Fish farmer: sample overview for profit calculation**

<b>Aspect</b>	<b>Applicable</b>	<b>New sample size</b>
Fish farmer interviews	0	644
No willingness to share income information	7	637
Production weight information is incomplete (grow out or fingerlings)	12	625
Sale price information is incomplete (grow out or fingerlings)	2	623
Investment information is incomplete	0	623
Cost information incomplete	6	617
<b>Number of observations for which profit can be calculated</b>	<b>27</b>	<b>617</b>

The total sample size is 644 fish farmer interviews. Of these interviews for 617 fish farmers a profit can be calculated. 7 observations are excluded because of a missing willingness to share income information. This reduces the sample size from 644 to 637. For 12 out of these 637 interviews production weight information is incomplete, either for grow out or fingerlings, reducing the sample size to 625. Out of these 625 interviews, 2 interviews have not complete information on sale prices, either for grow out or fingerlings, reducing the sample size to 623. Focusing on the cost-related aspects of profits, such as investments, the sample size is not reduced by missing investment information. Notably, the reason is artificial because it was based on information from the field decided to replace missing information with an investment amount of zero. Missing information on other cost domain than investment result in an exclusion of the sample. 6 fish farmers are excluded because of incomplete cost information, resulting to the sample of 617 fish farmers with a calculated profit.

### ***Fish farmers: Level of sophistication***

Depending on the training status, fish farmers are categorized in different levels of sophistication. Both for grow-out and fingerling activities.

**Table 35: Levels of sophistication of grow-out fish farmers (Variable: APDRAcatGR)**

<b>Category</b>	<b>Criteria</b>
Level 1: Beginner	<ul style="list-style-type: none"> <li>• Implements rice-field adaptations but not all of them</li> <li>• Stocks carps fingerlings (bought, given or harvested in the natural environment)</li> <li>• Might have other fish species than carps in the same rice-field</li> <li>• Is strongly dependent from the fish-farming trainer advices</li> <li>• Doesn't harvest enough to sell fish (most of the fish is self-consumed by the fish farmer family)</li> <li>• Doesn't record in a notebook his activities and results</li> <li>• Doesn't use specific fish farming equipment</li> </ul>

Level 2: Intermediate	<ul style="list-style-type: none"> <li>• Has correct rice-field adaptations</li> <li>• Manages quite well the techniques, and is able to adapt it properly to his production mean</li> <li>• Needs fish-farming trainer only to refresh the initial training</li> <li>• Starts using specific rice-fish farming equipment</li> <li>• Sells fishes around him, at a local level</li> <li>• Registers data regarding his fish production, including expenses and income</li> </ul>
Level 3: Advanced	<ul style="list-style-type: none"> <li>• Is able to improve his production by himself every year</li> <li>• Has a model rice-field and is known by his community as a good rice-fish producer</li> <li>• Is experimenting new techniques (ex: to fight predators or to feed carps)</li> <li>• Is able to look for solutions on other concerns than production (ex: marketing)</li> <li>• Keeps contact with fish-farming trainer for specific question, or to share his experience with other rice-fish farmers</li> <li>• Uses specific equipment adapted to his needs (thermometer, scale, canister, aerator, etc.)</li> <li>• Sells at a regional level, can establish contracts with clients</li> </ul>

**Table 36: Categories for fingerlings producers (Variable: APDRAcatal):**

Category	Criteria
Level 1: Beginner	<ul style="list-style-type: none"> <li>• Produces between 0 and 3.000 fingerlings per production campaign, with a lot of difference from one cycle to the other</li> <li>• Doesn't use the right phenotype for breeding</li> <li>• Cannot identify well the sex of broodstock and their maturity</li> <li>• Doesn't use right ponds for spawning and transfer (too small, not dried out before fish transfer, too deep, poor water access, etc.)</li> <li>• Doesn't feed the fry</li> <li>• His production is not sufficient for sale</li> <li>• Doesn't record in a notebook his activities and results</li> </ul>
Level 2: Intermediate	<ul style="list-style-type: none"> <li>• Produces between 1.000 and 10.000 fingerlings per production campaign, with some difference from one cycle to the other</li> <li>• Can select properly the broodstock but doesn't feed them properly (doesn't pay attention to the feed composition)</li> <li>• Feed fry but not properly (doesn't pay attention to the feed composition)</li> <li>• Makes correct adaptations of his ponds</li> <li>• Sells fingerlings in the village but cannot transport properly the fingerlings</li> <li>• Starts using specific rice-fish farming equipment (mosquito nets as happa, landing nets)</li> <li>• Stores properly the brood stock</li> <li>• Uses appropriate spawning support</li> </ul>
Level 3: Advanced	<ul style="list-style-type: none"> <li>• Produces more than 8.000 fingerlings per production cycle (12.000 on average), without difference between production cycles</li> <li>• Can properly transport the fingerlings</li> <li>• Can manage properly the broodstock (number of female necessary for its surface, sex, phenotype, maturity)</li> <li>• Has accurate knowledge about fry and broodstock feeding</li> <li>• Makes his best to have big transfer rice-field to grow his fingerlings</li> <li>• Manages well the period of spawning to get more profit</li> <li>• Is experimenting new techniques (ex: to fight predators or to feed carps)</li> </ul>

	<ul style="list-style-type: none"> <li>• Manages well the genetics of his broodstock (good exchanges with other farmers to maintain a good genetic variability)</li> <li>• Registers data regarding his fish production, including expenses and income</li> <li>• Uses specific equipment adapted to his need (canister, aerator, etc.)</li> <li>• Sells at a communal level, giving good technical advises to his clients</li> </ul>
Level 4: Autonomous	<ul style="list-style-type: none"> <li>• Produces up to 40.000 per production cycle (15.000 on average)</li> <li>• Perfect use of transfer ponds (9 are / broodstock)</li> <li>• Pays attention to the quality of his fingerlings</li> <li>• Can develop networking with support organization</li> <li>• Innovates, tests and analyses well his practices</li> <li>• Sells brood stock</li> <li>• Sells fingerlings at a regional level, with regular clients</li> <li>• Can manage the fish reproduction of other species (Nilotica, Blackbass, Koï, etc.)</li> <li>• Registers data regarding his fish production, with details and can analyze the results</li> <li>• Has modern equipment adapted to his needs (thermometer, oxymeter, pH meter, motorbike or car rental)</li> <li>• Doesn't need external support for fingerlings production</li> </ul>

Table 37 provides an overview about the level of sophistication split by fish farmer activity and region of interviewed fish farmers.

**Table 37: Overview about the level of sophistication split by fish farmer activity and region of interviewed fish farmers (N=644)**

Fish farmer activity	Grow out				Fingerling producer				Grow out if fingerling is beginner, intermediate, advanced or autonomous				Not applicable
	B	I	AD	AU	B	I	AD	AU	B	I	AD	AU	NA
AM	111	86	21	0	16	14	9	2	71	93	33	1	4
HM	44	50	18	0	1	0	0	0	12	29	27	0	2
All	155	136	39	0	17	14	9	2	83	122	60	1	6

Overall, most fish farmers are grow out beginners (N=155), followed by grow out intermediates (N=136) and grow out intermediates, also producing fingerlings (N=122). Next, the status of the harvest is presented and the implications for the report are discussed.

### ***Fish farmers: Harvest status***

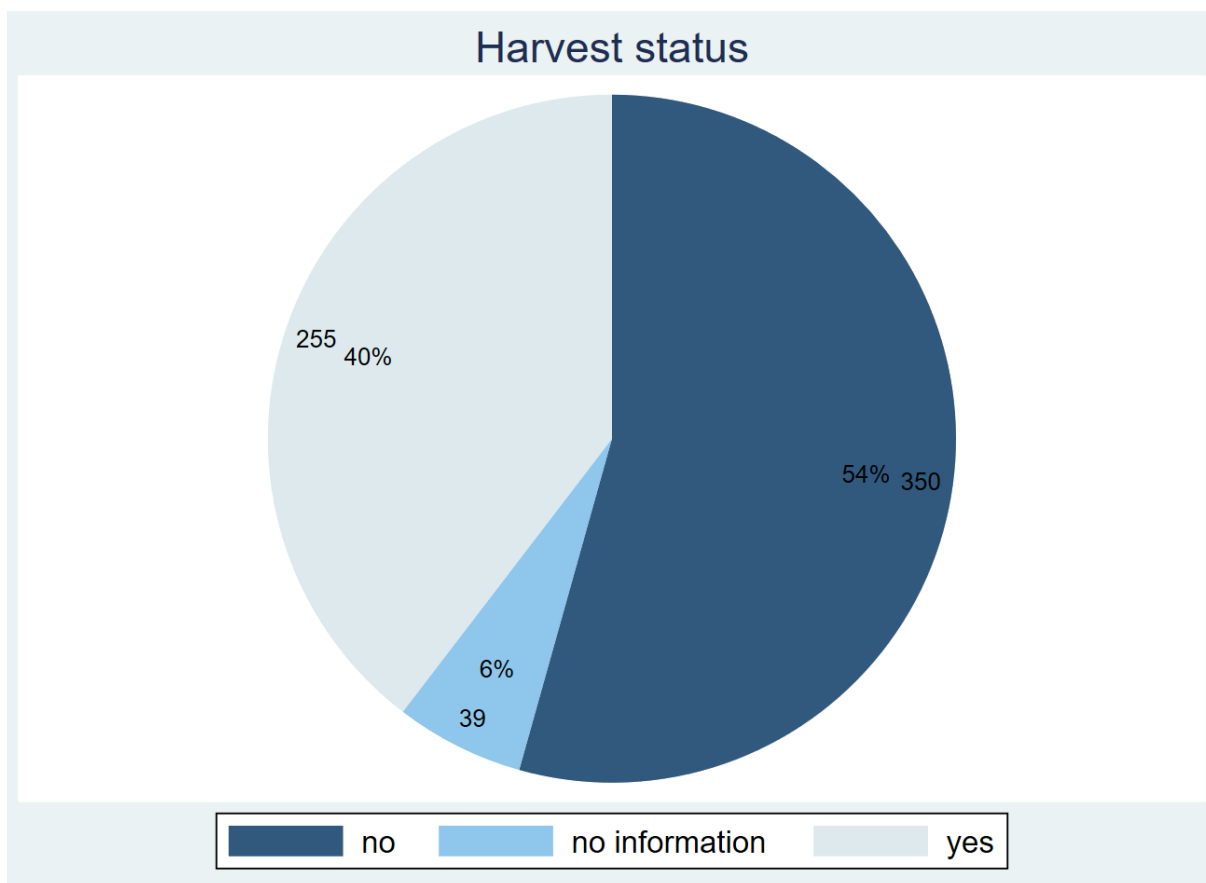
The midline data were collected in September/October 2021. In this period, the harvest of a fish cycle is normally finished or at least very close to be finished. Notably, there is no implication on fingerling production due to the survey timing. The Endline data were collected already in July. It was expected that many fish farmers did not finish their harvest up to this time. Since the reporting should exclude fish farmers who have not finished their harvest, some background data is provided here. The respective question opens in the questionnaire if a fish farmer produces grow out fish and is willing to share respective income information. Table 38 and Figure 37 provide an overview about the harvest status split by region and districts and

levels of grow out sophistication (only fish farmers with willingness to share income information and grow out production).

**Table 38: Overview about harvest status split by region and districts and levels of grow out sophistication (only fish farmers with willingness to share income information and grow out production (fish farmers, N=605))**

Sophistication	Region/Harv. Finished	District	Begin.		Intermed.		Adv.		Auton.		Not appl.		N
			Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	
	Amoron'i Mania	Ambositra	22	42	18	38	14	15	0	0	3	2	154
	Amoron'i Mania	Fandriana	34	35	26	43	5	14	0	1	2	6	166
	Amoron'i Mania	Manandriana	17	29	22	30	1	4	0	0	1	1	105
	Haute Matsiatra	Ambalavao	10	15	17	13	8	10	0	0	0	0	73
	Haute Matsiatra	Fianarantsoa I	0	0	0	0	1	0	0	0	0	0	1
	Haute Matsiatra	Isandra	2	0	2	1	2	4	0	0	0	0	11
	Haute Matsiatra	Lalangina	5	3	7	7	2	2	0	0	0	0	26
	Haute Matsiatra	Vohibato	11	9	13	18	9	7	0	0	1	1	69
<b>Total</b>			<b>101</b>	<b>133</b>	<b>105</b>	<b>150</b>	<b>42</b>	<b>56</b>	<b>0</b>	<b>1</b>	<b>7</b>	<b>10</b>	<b>605</b>

Note: Harv. Finished = harvest finished; begin.= beginner; intermed. = intermediate; adv. = advanced; auton. = autonomous; not applic. = not applicable

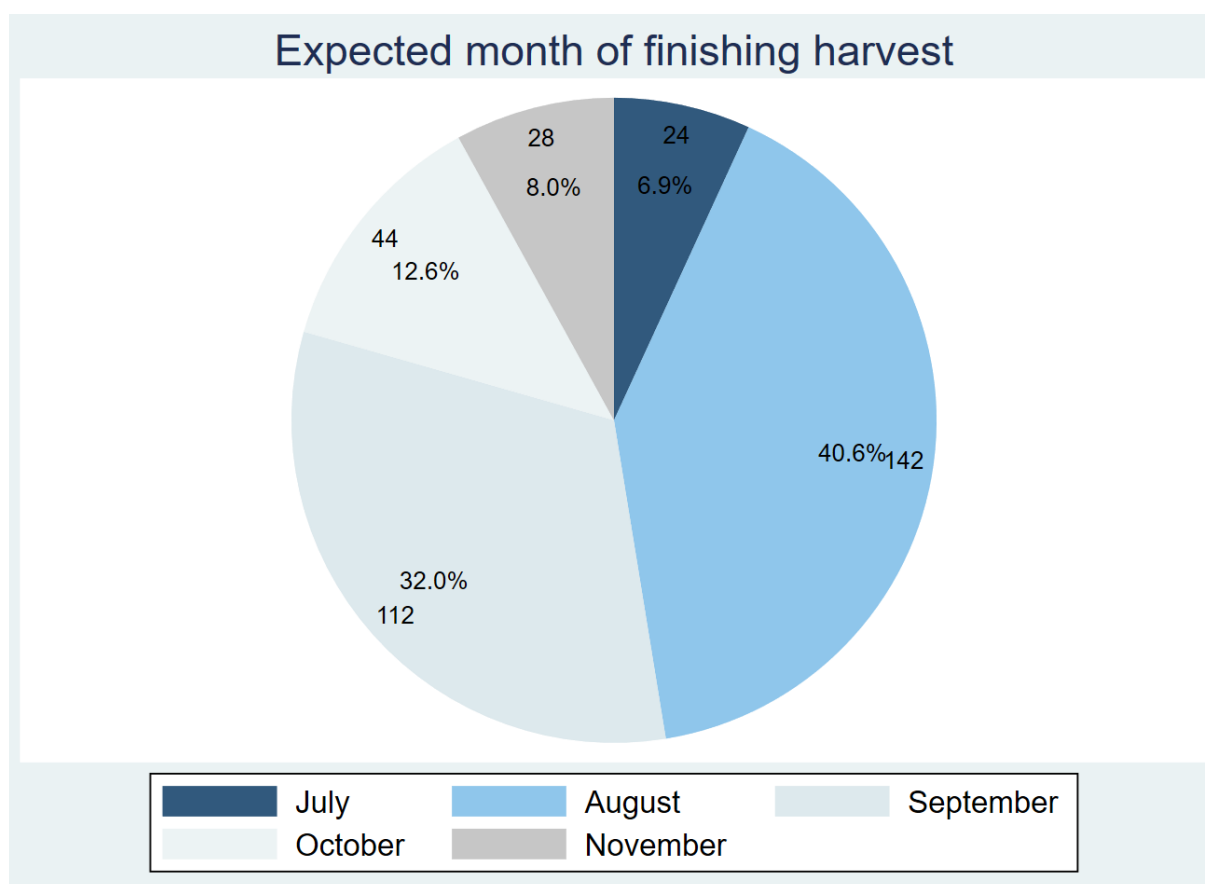


**Figure 37: Information on the harvest status (fish farmers only, N=644)**

Out of the 644 interviews, information on the harvest status is available for 605 fish farmers. Among these fish farmers, 255 have finished their harvest and 350 not. Focusing on the level of sophistication shows that over the levels of beginner, intermediate and advanced all groups are covered. There is only one observation with an autonomous level, this observation has not finished the harvest. Next, the expected month of finishing the harvest is summarized in Table 39 and Figure 38.

**Table 39: Expected month to finish harvest (only fish farmers with not-finished harvest)**

Expected month to finish harvest	Frequency	Share (%)
July	24	6.9
August	142	40.6
September	112	32.0
October	44	12.6
November	28	8.0
<b>Total</b>	<b>350</b>	<b>100</b>



**Figure 38: Expected month to finish harvest (only fish farmers with not-finished harvest, N = 350)**

Among the 350 fish farmers who have not finished their harvest, the majority expects to finish in September or before. August is the most popular month, with 142 observations, followed by September with 112 observations. Only 44 fish farmers expect to finish in October and 28 in November. Table 40, Figure 39 and Figure 40 provide statistics about the fish production depending on the harvest status and split by sophistication.

**Table 40: Fish farmer production (kg/ fresh round/ year) by harvest status, sample of fish farmers with non-missing profit**

Status	N	Min.	10%	Median	Mean	90%	Max.	Min.
All fish farmers	617	0	5	30	55	120	940	0
No fish production	32	0	0	0	0	0	0	0
<b>Harvest finished</b>								
All fish farmers	247	2	8	30	48	108	303	2
All levels of sophistication (1-4)	241	2	8	30	49	108	303	2
Beginner	97	2	7	29	37	70	303	2
Intermediate	103	2	8	34	54	115	266	2
Advanced	41	5	16	49	63	120	221	5
Autonomous	0							
Not applicable	6	5	5	35	37	85	85	5
<b>Harvest not finished</b>								
All fish farmers	338	0	6	34	65	145	940	0
All levels of sophistication (1-4)	328	0	7	34	64	145	940	0
Beginner	128	0	4	26	51	140	500	0
Intermediate	143	1	10	38	56	114	583	1
Advanced	56	0	12	45	111	325	940	0
Autonomous	1	108	108	108	108	108	108	108
Not applicable	10	0	1	40	100	352	580	0

Note: Level of sophistication: 1 = beginner; 2. = intermediate; 3 = advanced; 4. = autonomous; 5. = not applicable

Mean: Fish farmer production by sophistication and harvest status  
Left-side: harvest finished; Right-side: harvest not-finished

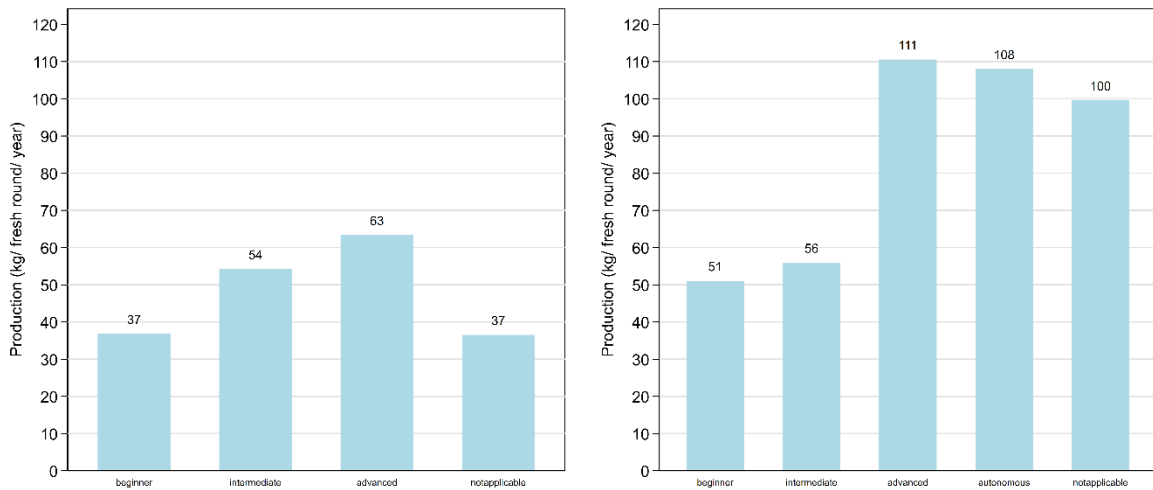


Figure 39: Fish farmer production (kg/ fresh round/ year), fish farmers only, harvest finished, non-missing profit (N=247)

Median: Fish farmer production by sophistication and harvest status  
Left-side: harvest finished; Right-side: harvest not-finished

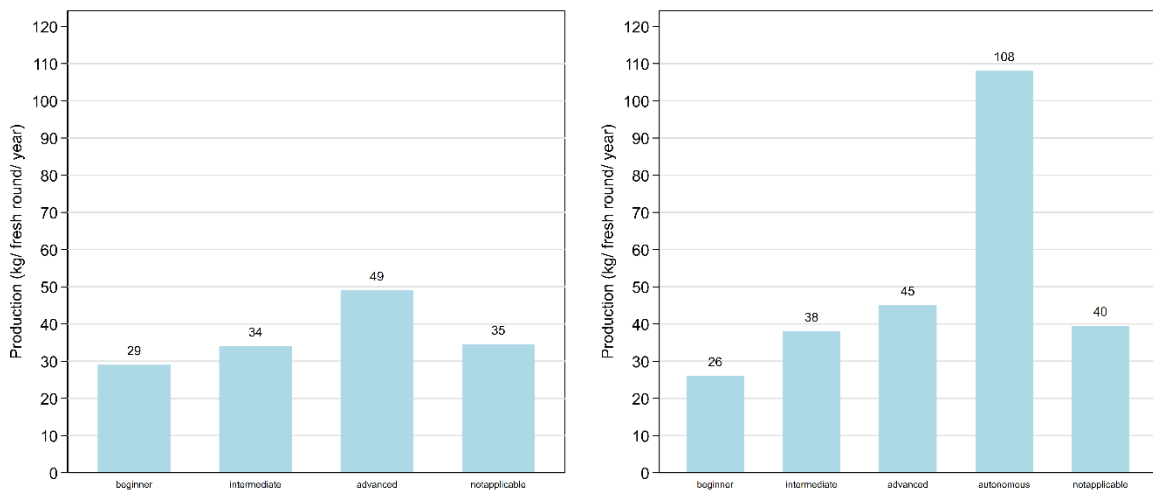


Figure 40: Fish farmer production (kg/ fresh round/ year), fish farmers only, harvest not-finished, non-missing profit (N=338)

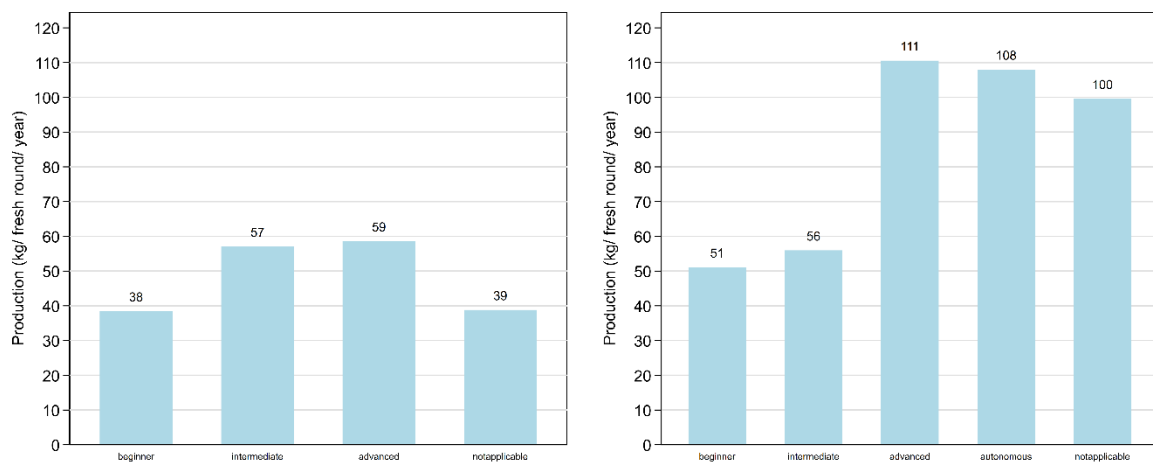
Both the, mean and median is slightly bigger for fish farmers who have not finished their harvest yet. The median of fish farmers who have finished the harvest is 30 kg and the mean is 48 kg. For fish farmers who have not finished their harvest the median is 34 kg and the mean is 64 kg, respectively. This indicates that bigger producers have not finished their harvest yet and might result in an underestimation of the average production amount of fish farmers who have benefited by the project activities once the sample is limited to fish farmers who have finished their harvest. Table 41, Figure 41 and Figure 42 provide similar statistics about the fish production depending on the harvest status and split by sophistication for fish farmers in Amoron'i Mania.

**Table 41: Amoron'i Mania: Fish farmer production (kg/ fresh round/ year) by harvest status, sample of fish farmers with non-missing profit**

Status	N	Min.	10%	Median	Mean	90%	Max.	Min.
All fish farmers	435	0	4	30	56	124	940	0
No fish production	30	0	0	0	0	0	0	0
<b>Harvest finished</b>								
All fish farmers	157	2	7	30	48	110	303	2
All levels of sophistication (1-4)	152	2	7	30	49	110	303	2
Beginner	69	2	8	29	38	70	303	2
Intermediate	64	2	6	40	57	129	266	2
Advanced	19	5	13	47	59	123	170	5
Autonomous	0							
Not applicable	5	5	5	44	39	85	85	5
<b>Harvest not finished</b>								
All fish farmers	248	0	7	37	68	163	940	0
All levels of sophistication (1-4)	239	0	7	36	66	163	940	0
Beginner	101	0	6	30	58	165	500	0
Intermediate	104	4	13	40	63	145	583	4
Advanced	33	0	12	33	101	270	940	0
Autonomous	1	108	108	108	108	108	108	108
Not applicable	9	0	0	51	108	580	580	0

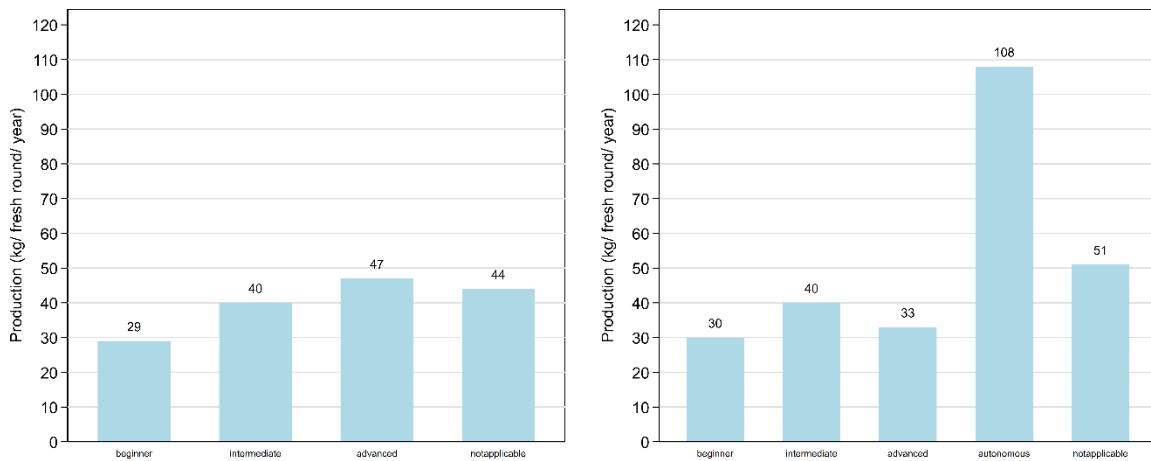
Note: Level of sophistication: 1 = beginner; 2. = intermediate; 3 = advanced; 4. = autonomous; 5. = not applicable

**Amoron'i Mania:**  
**Mean: Fish farmer production by sophistication and harvest status**  
**Left-side: harvest finished; Right-side: harvest not-finished**



**Figure 41: Amoron'i Mania: Fish farmer production (kg/ fresh round/ year), fish farmers only, harvest finished, non-missing profit (N=157)**

**Amoron'i Mania:**  
**Median: Fish farmer production by sophistication and harvest status**  
**Left-side: harvest finished; Right-side: harvest not-finished**



**Figure 42: Amoron'i Mania: Fish farmer production (kg/ fresh round/ year), fish farmers only, harvest not-finished, non-missing profit (N=248)**

The mean for fish farmers with a level of sophistication and who have finished their harvest is 49 kg/year. For fish farmers who have not finished their harvest, the mean is with 66 kg/year higher. The median is with 30 kg/year compared to 36 kg/year also higher for fish farmers who have finished their harvest. Table 42, Figure 43 and Figure 44 provide similar statistics about the fish production depending on the harvest status and split by sophistication for fish farmers in Haute Matsiatra.

**Table 42: Haute Matsiatra: Fish farmer production (kg/ fresh round/ year) by harvest status, sample of fish farmers with non-missing profit**

Status	N	Min.	10%	Median	Mean	90%	Max.	Min.
All fish farmers	182	0	7	30	51	100	800	0
No fish production	2	0	0	0	0	0	0	0
<b>Harvest finished</b>								
All fish farmers	90	3	11	33	48	100	257	3
All levels of sophistication (1-4)	89	3	10	35	49	100	257	3
Beginner	28	3	5	30	33	70	93	3
Intermediate	39	9	11	30	50	114	257	9
Advanced	22	12	17	53	68	120	221	12
Autonomous	0							
Not applicable	1	25	25	25	25	25	25	25
<b>Harvest not finished</b>								
All fish farmers	90	0	5	28	55	115	800	0
All levels of sophistication (1-4)	89	0	5	28	56	120	800	0
Beginner	27	0	0	19	26	55	110	0
Intermediate	39	1	7	27	36	70	170	1
Advanced	23	7	15	60	124	329	800	7
Autonomous	0							
Not applicable	1	28	28	28	28	28	28	28

Note: Level of sophistication: 1 = beginner; 2. = intermediate; 3 = advanced; 4. = autonomous; 5. = not applicable

Haute Matsiatra:  
 Mean: Fish farmer production by sophistication and harvest status  
 Left-side: harvest finished; Right-side: harvest not-finished

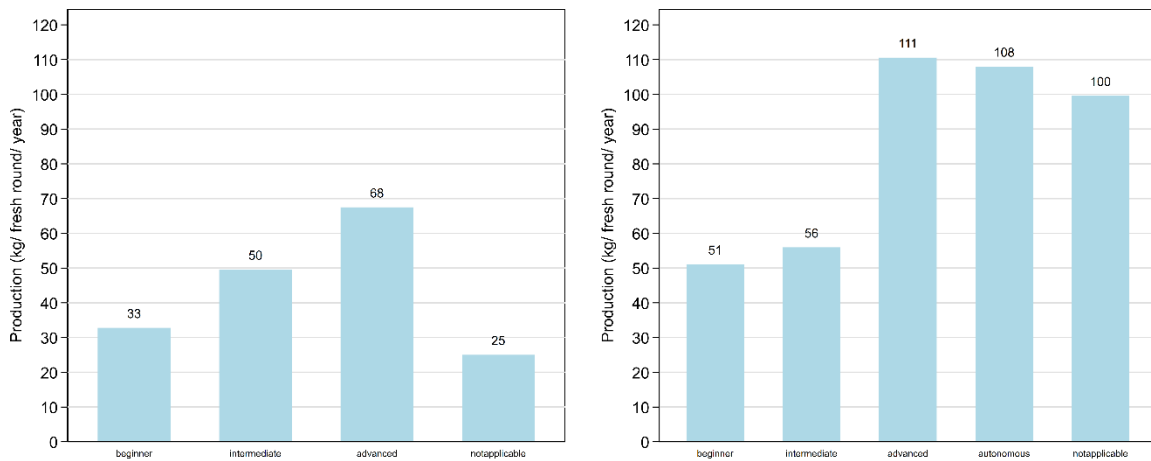


Figure 43: Haute Matsiatra: Fish farmer production (kg/ fresh round/ year), fish farmers only, harvest finished, non-missing profit (N=90)

Haute Matsiatra:  
 Median: Fish farmer production by sophistication and harvest status  
 Left-side: harvest finished; Right-side: harvest not-finished

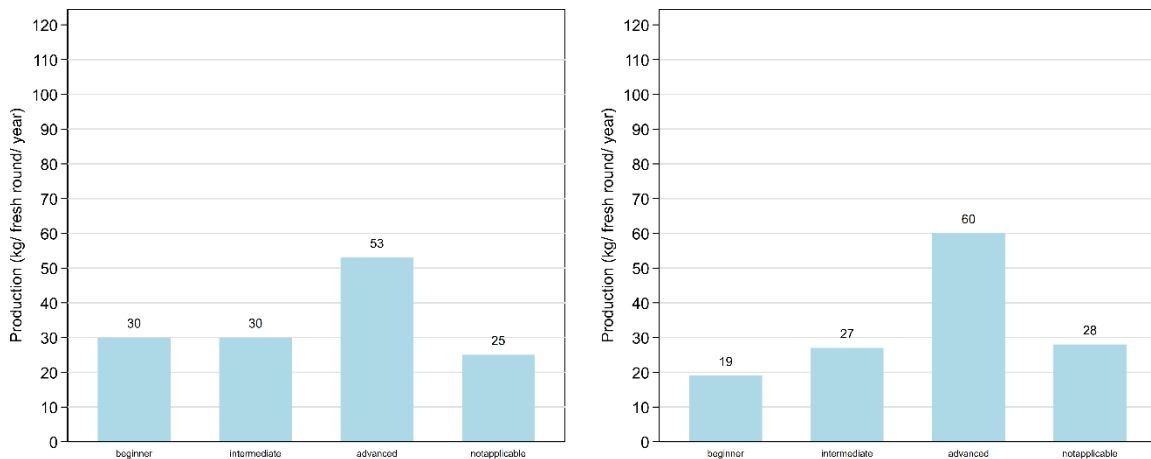


Figure 44: Haute Matsiatra: Fish farmer production (kg/ fresh round/ year), fish farmers only, harvest not-finished, non-missing profit (N=90)

The mean for fish farmers with a level of sophistication and who have finished their harvest is 49 kg/year. For fish farmers who have not finished their harvest, the mean is with 66 kg/year higher. The median is with 30 kg/year compared to 36 kg/year also higher for fish farmers who have finished their harvest.

**Production-related sample**

As a reminder, a profit has been calculated for 617 fish farmers interviewed. However, due to the harvest timing and eligibility to be classified as a beneficiary (measured by the level of sophistication), the sample size for the production-related reporting considerably decreases. Table 43 provides an overview about the respective relevance of each assumption considered to determine the production- related sample.

**Table 43: Fish farmer: sample overview for production-related statistics**

Aspect	Applicable	New sample size
Number of observations for which Pprofit can be is calculated	617	617
Harvest not finished	338	279
APDRAcatalAL is not applicable but there is fingerling production	12	267
APDRAcatalGR is not applicable but there is grow out production	5	262
APDRAcatalAL is not applicable AND APDRAcatalGR is not applicable	0	262
<b>Production-related sample</b>	<b>262</b>	<b>262</b>

Note: APDRAcatalAL measures the level of sophistication of fingerling producers; APDRAcatalGR measures the level of sophistication of grow-out fish farmers

As stated above, 350 fish farmers stated not to have finished their harvest. Out of these interviews, for 338 a profit has been calculated. These interviews are excluded from the production-related sample. Next, there are some fingerling producers with a not applicable level of sophistication. This reduces the sample by additional 12 fish farmers. A similar pattern is observable for 5 fish farmers who have grow out production but not applicable level of sophistication. Lastly, there are no further interviews excluded from the relevant sample due to not applicable statements in grow out and fingerling sophistication. The resulting production-related sample is 262. Next, the sample for the production-related reporting of value chain actors is presented.

#### ***Value chain actors production-related sample***

For value chain actors, the sample is reduced to interviews with fish-related income and no missing information on key information, such as costs or fish purchased. Table 44 reports the overview of the sample for the production-related statistics.

**Table 44: Value chain actor: sample overview for production-related statistics**

Aspect	Applicable	New sample size
Value chain actor interviews	0	89
No willingness to share income information	0	89
Production weight information is incomplete (grow out or fingerlings)	0	89
Sale price information is incomplete (grow out or fingerlings)	0	89
No fish-related income	3	86
Investment information is incomplete	0	86
Cost information incomplete	0	86
Fish purchasing information incomplete	2	84
<b>Profit is calculated</b>	<b>84</b>	<b>84</b>

Overall, the sample decreases from 89 interviews to 84 interviews. For 3 interviews there is no fish-related income reported. Additionally, 2 interviews include incomplete information on fish purchasing. Notably, ten respondents mentioned do not know for the investment amount (stated as 8888 in the interviews). Similar to the fish farmers, these values have been replaced by zeros and hence the interviews remain in the sample. The report continues with accessibility of fish products.

### 3.3.1.2 ACCESSIBILITY OF FISH PRODUCTS

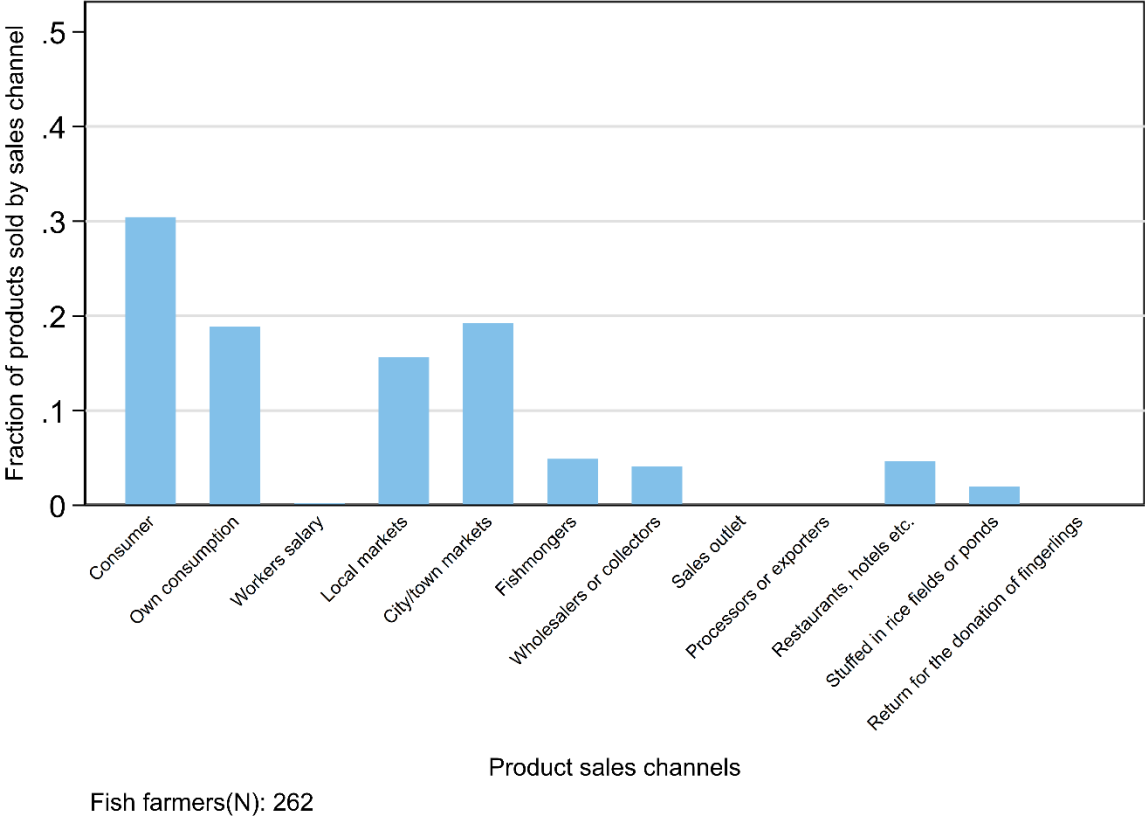
In the next section, we look at sales channels of fish farmers in order to analyze the accessibility of fish and fish products for the local population. Market channels “own consumption” and “used as salary for workers or as trade for other produce, goods, or services” are included, even though they are per definition not accessible to the local consumers. For the category “sold directly to processors or exporters” it is not possible to exclude the share that is sold to exporters thus it is also listed here for the sake of completeness, but should be treated with caution as it is technically not fully accessible for local consumers.

The accessible price for local consumers is defined at the 9th decile of prices consumers who are food insecure (moderately and severely food insecure) paid per kg of fresh round fish equivalent for their last meal that included fish. This accessible price includes all fish species bought by consumers, which excludes fingerlings. Afterwards this price of 14,400 MGA (3.68 EUR) is instrumented to identify the productions of producers on markets physically and directly accessible for consumers. This price reflects the equivalent fresh round fish price. Reported production weights are transformed into fresh round fish and fingerlings are excluded. Table 45 summarize the total and available production of fish across markets, without fingerlings, come closest to “Indicator 1” of the “Wirkungsmatrix” as it monitors fish production over different markets. As described in the section before, the sample is limited to fish farmers with complete information and who have already finished their harvest.

**Table 45: Production (kg/year) without fingerlings by fish farmers; in total and share of total accessible to food insecure (FIES level=Food insecure) persons (price < 14,400 MGA, 3.68 EUR), (production-related sample, N=262)**

SALES CHANNEL	FISH FARMERS TOTAL PROD. (kg/year)	FISH FARMERS ACC. PROD. (kg/year)
Sold directly to consumer	3,348	2,892
Used for own consumption	2,073	1,904
Used as salary for workers or as exchange for other produce, goods or services	21	21
Sold at local markets	1,721	1,575
Sold at city markets	2,118	1,471
Sold to fishmongers or table-top sellers/retailers	539	434
Sold to wholesalers or collectors	450	330
Sold to a sales outlet	0	0
Sold directly to processors or exporters	0	0
Sold to restaurants, hotels or institutions	510	211
Stocked in rice fields or ponds	220	159
Payment in return for the donation of fingerlings	0	0
<b>Total</b>	<b>11,000</b>	<b>8,997</b>

Figure 45 illustrate the fraction of fish products sold by productions sales channels for fish farmers without fingerlings.



**Figure 45: Fraction of fish products sold by productions sales channels (only considering fresh round fish and no sales of fingerlings)**

Sales directly to consumer make the highest share with 0.304, corresponding to 30.4%. Next, sales in the city/town markets follow with 0.193, corresponding to 19.3%. Much of the fish production is used for own consumption with a share of 0.188. The next section provides details on the income of the aquaculture actors.

**3.3.2 INCOME OF WOMEN AND MEN IN THE AQUACULTURE VALUE CHAIN**

**3.3.2.1 INCOME OF FISH FARMERS**

During the survey, information was gathered on income, expenditures and long-term investments related to fishing activities. The profit is calculated on a yearly basis. As income, the value of fish sold plus the value of the fish consumed by the household is considered. As profit, the income minus production related expenditures and long-term investments as yearly share over 10 years is calculated.

Income and related indicators are also calculated as “per FTE (own)” for comparability reasons. FTE (own) refers to the respondent’s FTE and is calculated in the questionnaire as:  $\text{\{monthsperyear\}} * \text{\{dayspermonth\}} * \text{\{hoursperday\_own\}} \text{ div } 1800$ . I.e. one job a full-time working equivalent (FTE) is considered to be 8 h work per day and 225 days of work per year. Income per person refers to the income of a person regardless of the number of hours and days worked.

The financial and production indicators for 262 fish farmers, focusing only on fish farmers with complete information to calculate the profit, are provided in Table 46 disaggregated by gender. It is not possible to differentiate fingerling and non-fingerling inputs, including labor, costs and investments. Table 47 complements the statistic by also reporting on revenues and profits.

**Table 46: Costs (EUR/year) and production (kg/year) of fish farmers disaggregated by gender, only production-related sample<sup>6</sup>**

RESP. TYPE	GENDER	N	FTE (own)	AGGR. VAR. COSTS (EUR/year)	AGGR. INVESTMENT SHARE (EUR/year)	INVESTMENT SHARE (EUR/year) / FTE	PRODUCTION, w.o. fingerling (kg/year)	PRODUCTION FING. (PIECES/YEAR)
Fish farmer	M	204	22.4	4,601	796	35	8,813	336,595
	F	58	4.3	1,127	227	53	2,187	28,290
<b>Total</b>	-	<b>262</b>	<b>26.7</b>	<b>5,727</b>	<b>1,022</b>	<b>38</b>	<b>11,000</b>	<b>364,885</b>

**Table 47: Income (EUR/year) and profits (EUR/year) of fish farmers disaggregated by gender, only production-related sample<sup>8</sup>**

RESP. TYPE	GENDER	N	REVENUE, w.o. fingerling (EUR/year)	REVENUE, fingerling (EUR/year)	REVENUE (BOTH)	PROFIT (EUR/year)	AGGR. PROFIT (EUR/year) / FTE (own)	GROSS MARGIN
Fish farmer	M	204	28,541	23,155	51,696	46,299	2,065	47,095
	F	58	6,688	1,848	8,537	7,184	1,670	7,410
<b>Total</b>	-	<b>262</b>	<b>35,230</b>	<b>25,003</b>	<b>60,233</b>	<b>53,483</b>	<b>2,001</b>	<b>54,505</b>

Note: Profit is the gross margin minus the investment share. The gross margins are revenue (both) minus variable costs

Large disparities between male and female respondents in terms of contribution to overall production and profit can be observed, indicating differing financial success between genders. However, it needs to be considered that participation of men and women differs with 205 male fish farmers and 58 female fish farmers being part of the study and active in the sector. Variations in accumulated income and production parameters are therefore influenced by differences in the respective sample sizes. However, aggregated profit divided FTE (own) allows for some comparison and backs the gender differences. While the profit per FTE (own) is 2,065 EUR for male fish farmers, it is only 1,670 EUR for female fish farmers. To allow for more direct comparison, the profit and the investments per FTE (own) are provided in Figure 46. The figure visualizes the differences in Profit/FTE (own) and Investment/FTE (own) by gender for fish farmers. There are differences in the calculation basis for these tables and figures: This is due to different approaches<sup>9</sup> to calculate these indicators and to fit the differential purposes of the table and figure. The table functions as a sector overview of key financial and production indicators of fish farmers. To keep consistency within the table, Profit/FTE (own) was calculated with the aggregated totals. The figure follows a more precise

<sup>6</sup> Costs include costs for fingerling and non-fingerling production. Statistics only focus on the production-related sample. Aggregated statistic refers to Sum(x) / Sum(y).

<sup>7</sup> FTE (own) includes only the respondent's FTE. Generally, FTE (total) refers to FTE from own, family and hired labor.

<sup>8</sup> Profits and gross margins include income related to fingerlings and non-fingerlings. Aggregated statistic refers to Sum(x) / Sum(y).

<sup>9</sup> Table calculations are based on Sum(x) / Sum(y), while figure calculations are based on Sum(x/y) / n.

approach, only considering observations where both profit and FTE (own) indicators are reported.

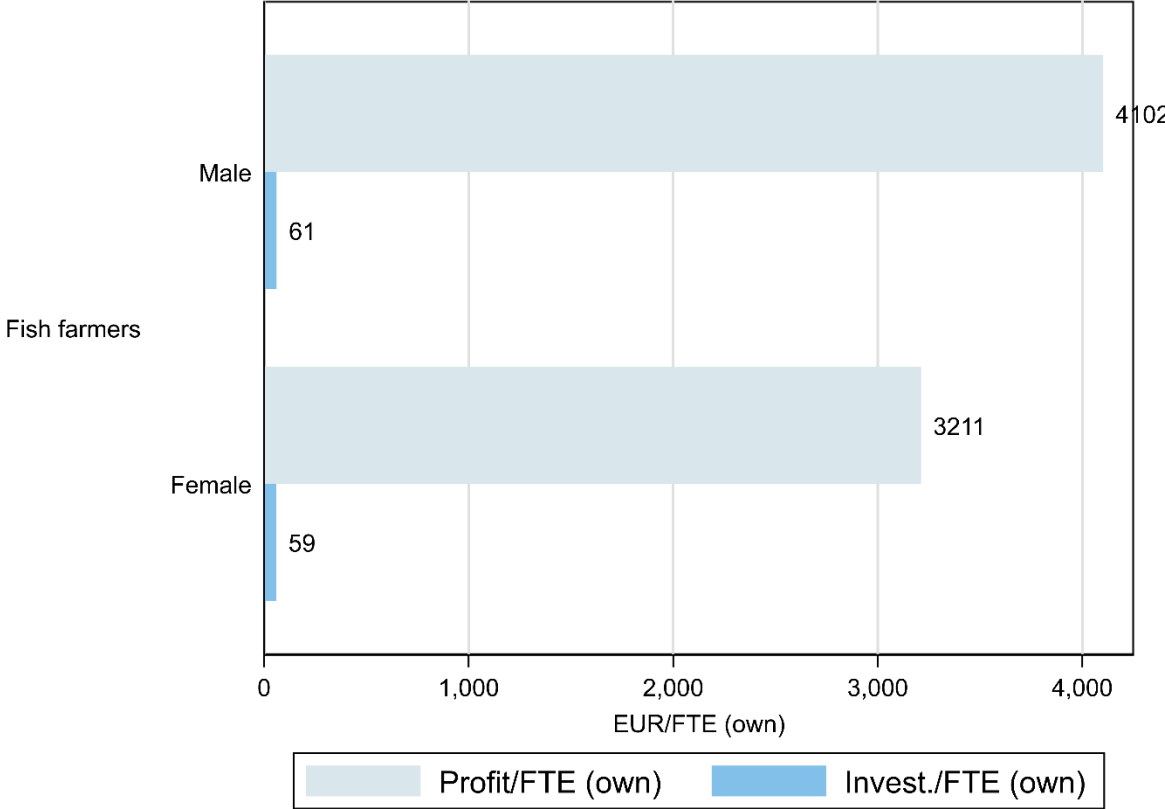


Figure 46: Investment and profit (both, fingerling and non-fingerling) per FTE (own) in EUR (at the individual level  $\text{Sum}(x/y) / n$ ), production-related sample (N=259).

The sample size reduces by further three observations because of an FTE (own) of zero. Accordingly, dividing by FTE (own) leads to a missing. As in the table male fish farmers report higher Profit/FTE (own) with 4,102 EUR compared to female fish farmers with 3,211. The investment per FTE (own) is with 61 EUR for male fish farmers compared with 59 EUR for female fish farmers relatively similar. The next section presents statistics on the income of worked hired by fish farmers.

**3.3.2.2 INCOME OF WORKERS HIRED BY FISH FARMERS**

Table 48 summarizes the income of hired labor by fish farmers. The worker types are split by gender. The analyzed sample is limited to the production-related sample. The variables “workerpaid” and “workerpaidhowmuch” are used to calculate the annual payment of a worker (referring to income (EUR/year/person)). Accordingly, for fish farmers who stated to pay wages every day, the amount paid got multiplied by 365. In the case an employee is only hired for specific services or seasonally (FTE is below 1), the resulting income is above the income the employee in reality received.

**Table 48: Income (EUR/year) and FTEs for fish farmers hired workers by category, aggregated statistic refers to Sum(x)/Sum(y), only production-related sample**

GENDER OF WORKER	WORKER TYPE	EMPLOYEES	MEAN INCOME (EUR/YEAR/ PERSON)	MEAN FTE (PERSON/YE AR)	MEDIAN INCOME (EUR/YEAR/ PERSON)	MEDIAN FTE (PERSON/YE AR)	AGGR. INCOME / FTE (EUR/FTE/ YEAR)
F	Fish carrier	2	466	0.02	466	0.02	26,211
F	Fish seller	6	1,398	0.01	1,398	0.01	104,846
F	Grow-out	2	61	0.00	61	0.00	18,384
F	Harvesting assistance	3	466	0.00	466	0.00	104,846
F	Other	35	362	0.01	373	0.02	26,436
F	Pond constructor	14	366	0.01	373	0.00	46,598
M	Fish carrier	2	61	0.04	61	0.04	1,532
M	Grow-out	2	1,895	0.04	1,895	0.04	53,285
M	Harvesting assistance	21	457	0.03	466	0.04	15,455
M	Other	13	359	0.01	466	0.01	36,708
M	Pond constructor	200	463	0.01	466	0.01	51,949
	Across all types	300	465	0.01	466	0.01	40,920

Note: Only the variables “workerpaid” and “workerpaidhowmuch” have been considered for the calculation of workers’ income. Since FTE is not considered, this can result in an overestimation of the yearly income if workers are only seasonally employed, e.g. a daily payment is stated but this is not received 365 times per year

Overall, 300 workers are employed by the fish farmers. The mean income is 465 EUR per year and person. The median is very similar with 466 EUR. The labor input is very low with only 0.01 FTE per worker and year. Notably, the low labor input results in an estimated very high income per year. To this end, the aggregated income of all workers is divided by the aggregated FTEs, resulting in an amount of 40,920 EUR/FTE/year. As noted above, the value assumes that the employee worked on the similar task the complete year, since this is not the reality, it is significantly higher than the true amount received. Since FTE values are relatively small and hence an overestimation of the yearly income of workers is likely, an adjusted calculation has been developed. Thereby, the respective payment received has been multiplied by the respective statements of work duration. In more detail, for monthly payment, the months worked (Variable “monthspereyear\_w”) have been considered. For daily payment, the days worked (Variable “monthspereyear\_w” multiplied with Variable “dayspermonth\_w”). And for weekly payment, the number of days worked has been divided by five, hence assuming a five-day working week. Unfortunately, there is no information on the number of weeks worked. Table 49 reports on the adjusted income statistics.

**Table 49: Adjusted income (EUR/year) and FTEs for fish farmers hired workers by category, aggregated statistic refers to Sum(x)/Sum(y), only production-related sample**

GENDER OF WORKER	WORKER TYPE	EMPLOYEES	MEAN ADJ. INCOME (EUR/YEAR/ PERSON)	MEAN FTE (PERSON/YE AR)	MEDIAN ADJ. INCOME (EUR/YEAR/ PERSON)	MEDIAN FTE (PERSON/YE AR)	AGGR. ADJ. INCOME / FTE (EUR/FTE/ YEAR)
F	Fish carrier	2	10	0.02	10	0.02	574
F	Fish seller	6	63	0.01	63	0.01	3,447
F	Grow-out	2	18	0.00	18	0.00	1,532
F	Harvesting assistance	3	1	0.00	1	0.00	287
F	Other	35	4	0.01	4	0.02	264
F	Pond constructor	14	6	0.01	2	0.00	258
M	Fish carrier	2	15	0.04	15	0.04	383
M	Grow-out	2	22	0.04	22	0.04	574
M	Harvesting assistance	21	46	0.03	63	0.04	381
M	Other	13	4	0.01	4	0.01	361
M	Pond constructor	200	16	0.01	5	0.01	382
	Across all types	300	16	0.01	4	0.01	441

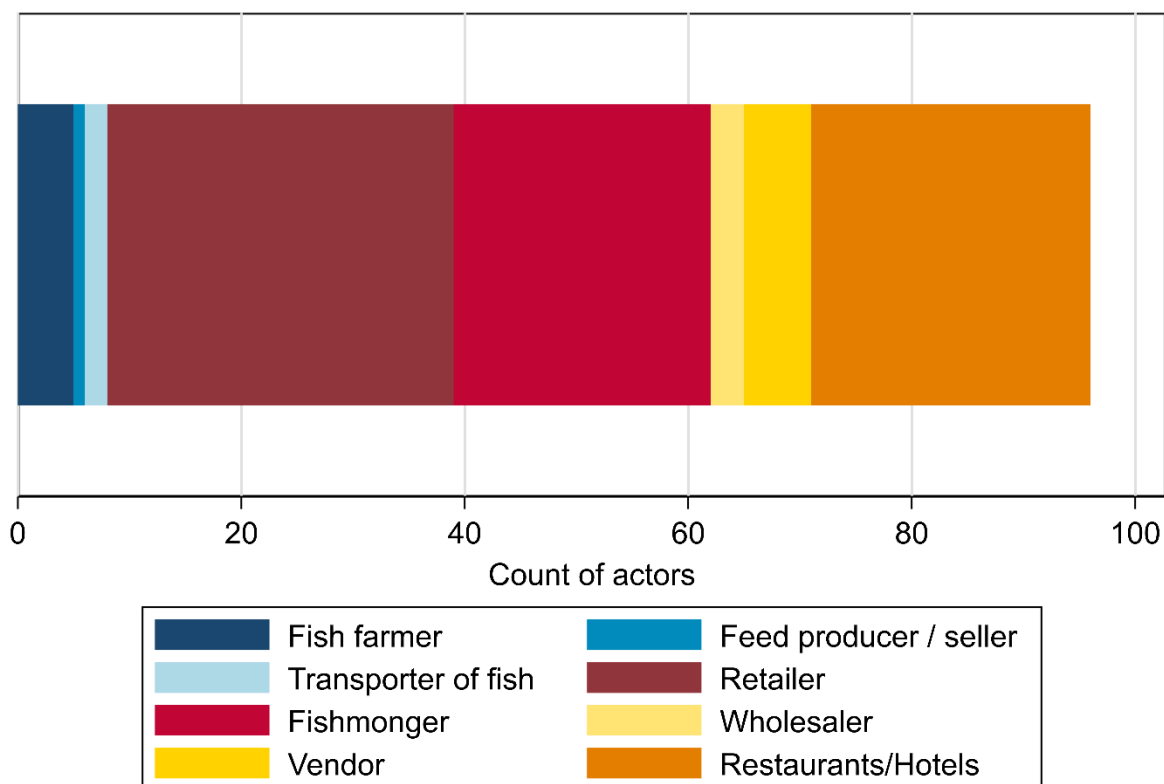
In line with expectation, the mean, median and aggregated income statistics are significantly lower. At the aggregated level, the income per FTE is between 258 EUR for female pond constructors and 3,447 EUR for female fish seller.

### 3.3.2.3 INCOME OF VALUE CHAIN ACTORS

Table 50 and Figure 47 provide insights on the income of value chain actors. The table includes an overview about the average, median and aggregated production per year in fresh round. The figure illustrates the distribution of the sample of value chain actors interviewed. The sum of all value chain actors does not equal the total sample size because some value chain actors identify themselves as multiple actors.

**Table 50: VCAs by actor category (89 of 89 VCAs answered, production-related sample, N=87), no fingerlings**

ACTOR	N	PROPORTION (%)	AVG. TURNOVER (KG/YEAR/ ACTOR)	MED. TURNOVER (KG/YEAR/ ACTOR)	AGGR. TURNOVER (KG/YEAR/ ACTOR)
Fisher or fish farmer	5	5.7	1,114	252	5,572
Feed producer / seller	1	1.1	372	372	372
Transporter of fish	2	2.3	2,080	2,080	4,160
Retailer	31	35.6	5,314	2,600	164,742
Fishmonger	23	26.4	2,599	1,080	59,774
Wholesale	3	3.4	18,547	4,160	55,640
Vendor	6	6.9	1,815	1,776	10,887
Restaurants/Hotels	25	28.7	513	200	12,814
<b>Total</b>	<b>87</b>	<b>100</b>	<b>2,790</b>	<b>819</b>	<b>242,711</b>



Note: 89 VCAs from 89 responded to the question, 87 are part of the production-related sample.

**Figure 47: VCAs by actor category (89 of 89 VCAs answered, production-related sample, N=87)**

Most value chain actors are retailer (N=31), restaurants/hotels (N=25) and fishmonger (N=23). Of the 87 value chain actors that are part of the production-related sample, some define themselves as multiple actor, resulting in 96 actor type observations. The highest median production per year in fresh round is observable for wholesaler with 4,160 kg/year/fresh round. The income of the 87 value chain actors working directly with fish (see respective actor types above) is provided in Table 51 disaggregated by gender.

**Table 51: Income (EUR/year) and production (kg/year) of VCAs disaggregated by gender (aggregated totals), (production-related sample, N=87)<sup>10</sup>**

GENDER	N	FTE (OWN)	REVENUE (EUR/year)	VAR. COSTS (EUR/year)	GROSS MARGIN (EUR/year)	INVESTMENT SHARE (EUR/year)	INVESTMENT SHARE/ FTE (OWN)	PROFIT (EUR/year)	PROFIT (EUR/year) / FTE (OWN)	TURNOVER (kg/year)
M	15	9.8	138,665	106,495	138,665	106	11	32,058	3,277	40,148
F	72	60.0	369,133	288,955	369,133	134	2	80,045	1,334	202,563
<b>Σ</b>	<b>87</b>	<b>69.8</b>	<b>507,798</b>	<b>395,451</b>	<b>507,798</b>	<b>240</b>	<b>3</b>	<b>112,103</b>	<b>1,606</b>	<b>242,711</b>

Since all variables are at the aggregated level, there is not much sense in a direct interpretation of differences between female and male value chain actors. The 87 value chain actors produced 242,711 kg over the last year. Only investment/ FTE (own) and profit/ FTE (own) can be directly compared. Male value chain actors (N=15) invest more with 11 EUR/year and have

<sup>10</sup> Aggregated statistic refers to Sum(x) / Sum(y).

a higher profit per FTE (own) with 3,277 EUR/year. Overall, the total profit is with 112,103 EUR/year relatively high compared to the Midline. Dividing the profit by the number of observations, which is 87, results in an average profit of 1289 EUR/year (compared to 413 EUR/year in the Midline). However, the high mean is driven by some value chain actors with substantially higher profits. The top three profits of value chain actors are 14,946 EUR/year, 9,742 EUR/year and 8,526 EUR/year. In line with this, the median is with 396 EUR/year substantially smaller. Next, Figure 48 visualizes the differences in Profit/FTE (own) and production/FTE (own) by gender for VCAs. However, the calculation is on a different basis because it is calculated at the individual level.

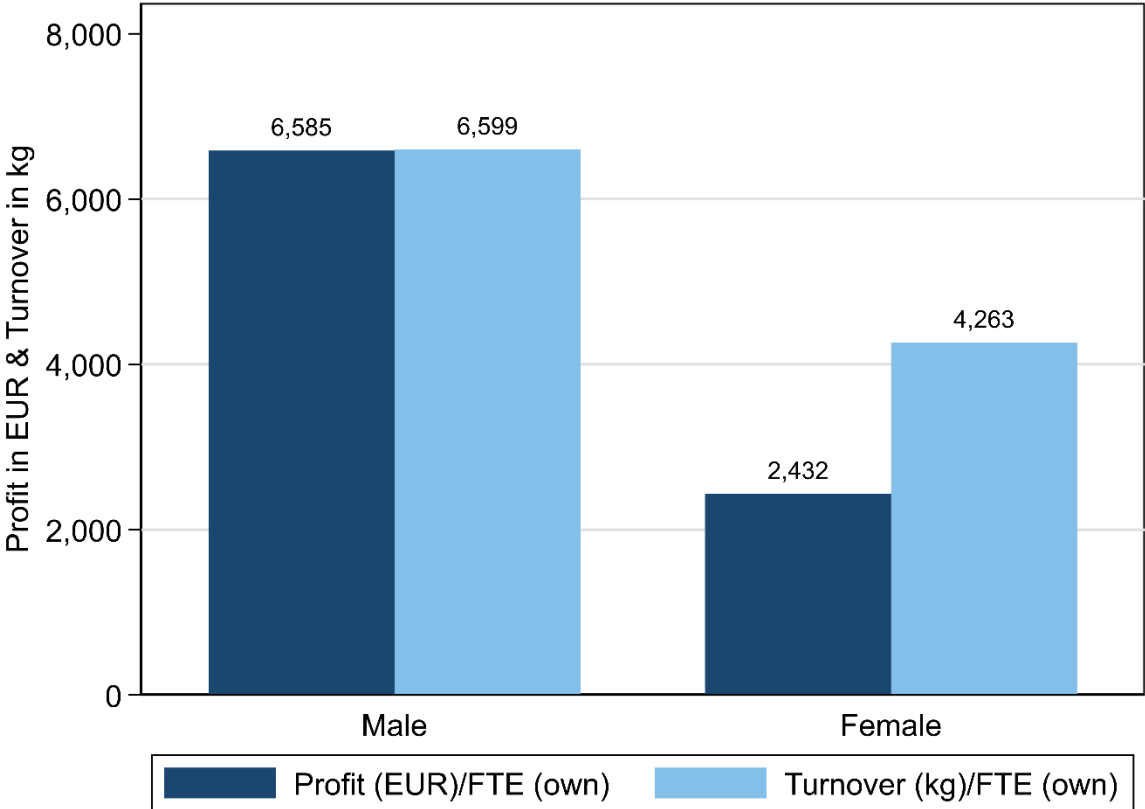


Figure 48: VCAs profit per FTE and turnover per FTE disaggregated by gender, excluding observations with missing profits (at the individual-level:  $\text{Sum}(x/y) / n$ )

Male VCAs report both a higher production per FTE (production in kg per FTE (own)) and a higher profit/FTE (own) on average. Interestingly, the profit per FTE (own) is higher for male and females compared to Table 51. The pattern indicates to some small or even negative values of profit (EUR/year). While males reached a profit per FTE (own) of 6,585 EUR/year, females reached a profit per FTE (own) of 2,432 EUR/year. Next, the VCA income by category is presented. Profit was computed the following way: days per month \* months per year \* average revenue per day, substituted by profit indicator where NA (and respondent willing to share income data) because of improbable results from the profit computation in the survey. Table 52 splits value chain actors into different types and reports the previously used financial indicators as well as production.

**Table 52: VCA profit (EUR<sup>11</sup>/year) and production (kg/year) by actor category and gender (production-related sample, N=87)**

ACTOR	GENDER	N	FTE (own)	AVG. PROFIT (EUR/year /Actor)	MED. PROFIT (EUR/year /Actor)	AGGR. PROFIT (EUR/year/N)	AVG. PROFIT / FTE (EUR /year/Actor)	AGGR. TURNOVER (Kg/year/N)
Fisher or fish farmer	M	2	0.69	7,890	7,890	15,781	24,492	4,884
	F	3	0.80	119	122	357	721	688
Food producer / seller	M	0	-	-	-	-	-	-
	F	1	0.09	571	571	571	6,427	372
Fertilizer producer/dealer	M	0	-	-	-	-	-	-
	F	0	-	-	-	-	-	-
Fingerling producer	M	0	-	-	-	-	-	-
	F	0	-	-	-	-	-	-
Transporter of fish	M	1	0.05	-	-	-	-	0
	F	1	1.39	619	619	619	446	4,160
Fish gear producer/dealer	M	0	-	-	-	-	-	-
	F	0	-	-	-	-	-	-
Retailer	M	6	3.87	3,755	1,791	22,530	11,134	16,914
	F	25	23.92	1,130	722	25,996	1,547	147,828
Fishmonger	M	6	3.91	3,918	1,189	23,510	9,083	26,536
	F	17	12.25	2,158	809	36,684	3,622	33,238
Wholesaler	M	1	0.04	700	700	700	15,741	1,800
	F	2	2.95	1,017	1,017	2,033	676	53,840
Processor	M	0	-	-	-	-	-	-
	F	0	-	-	-	-	-	-
Vendor	M	1	1.73	286	286	286	165	720
	F	5	9.12	557	273	2,783	277	10,167
Collector	M	0	-	-	-	-	-	-
	F	0	-	-	-	-	-	-
Service provider	M	0	-	-	-	-	-	-
	F	0	-	-	-	-	-	-
Restaurants/ Hotels	M	1	1.60	32	32	32	20	288
	F	24	15.85	636	209	15,263	2,739	12,526
Total	M	15	9.78	2,290	767	32,058	6,585	40,148
	F	72	60.00	1,143	378	80,045	2,432	202,563

Notes: 51 VCAs have income from fish-related activities. In addition, 87 of the 89 VCAs are part of the production-related sample.

In total, statistics of 87 VCAs are part of the production-related sample. Some of the VCA have multiple activities. Notably, only fish-related income is considered when calculating the profit. Among all value chain actors, the median profit (EUR/year) is 378 for female value chain actors and 767 (EUR/year) for male value chain actors. Figure 49 visualizes the profit per FTE

<sup>11</sup> Prices are converted from MGA to € by taking the exchange rate of the baseline (1€ = 3,916.47 MGA). Rate according to Deutsche Bundesbank.

(own) of value chain actors. However, the values can differ because some value chain actors are active in several forms. The figure considers the combinations as additional categories.

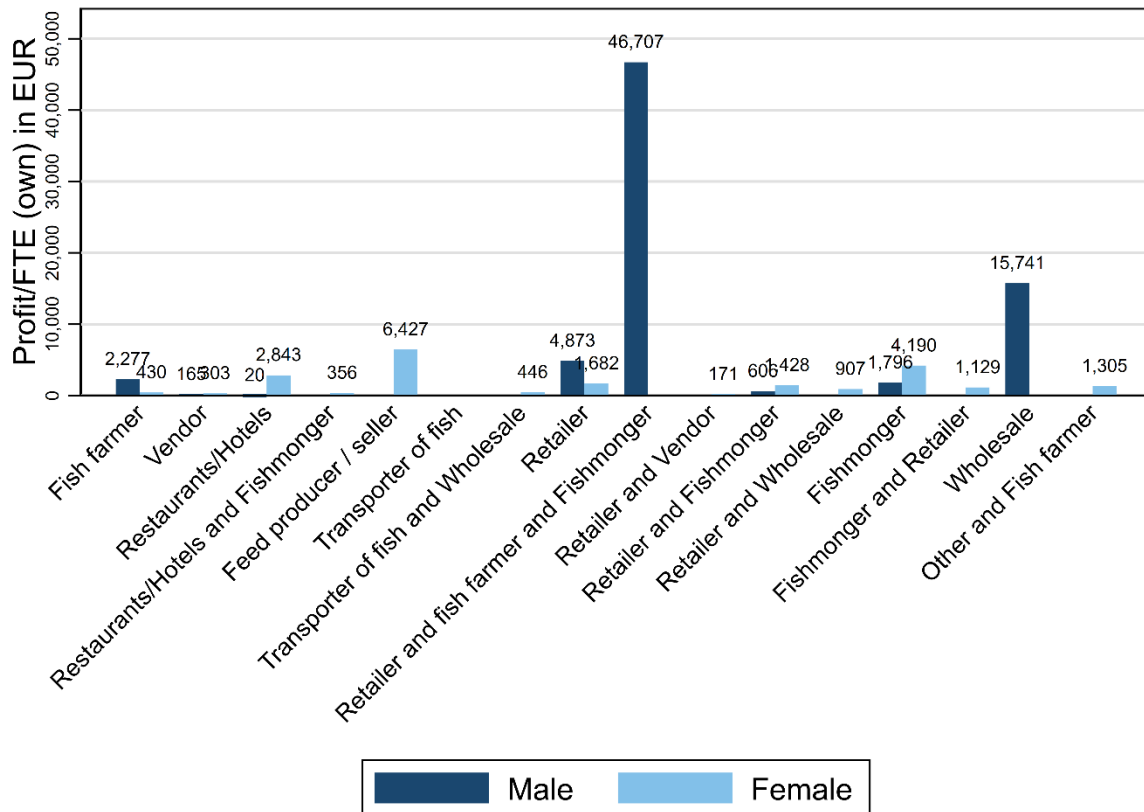


Figure 49: VCA profit (EUR/year/FTE (own)) by actor category and gender (at the individual-level:  $\text{Sum}(x/y) / n$ ), (VCAs production-related sample, N=87)

There is one actor active as retailer, fish farmer and fishmonger. This value chain actor shows with 46,707 EUR/year a very high profit per FTE (own). In addition, there is one value chain actor only being active as wholesaler. This respondent has the second highest value with 15,741 EUR/year. Among retailers, a sample of 25 observations, the average profit per FTE (own) is 4,873 EUR/year for males and 1,682 EUR/year for females. The next section presents the result related to income of workers hired by value chain actors.

Since there are some high values which reduce the readability, the same graph is reproduced by excluding entries higher than 15,000 EUR/year. This excludes 6 observations. Figure 50 illustrates the respective statistics.

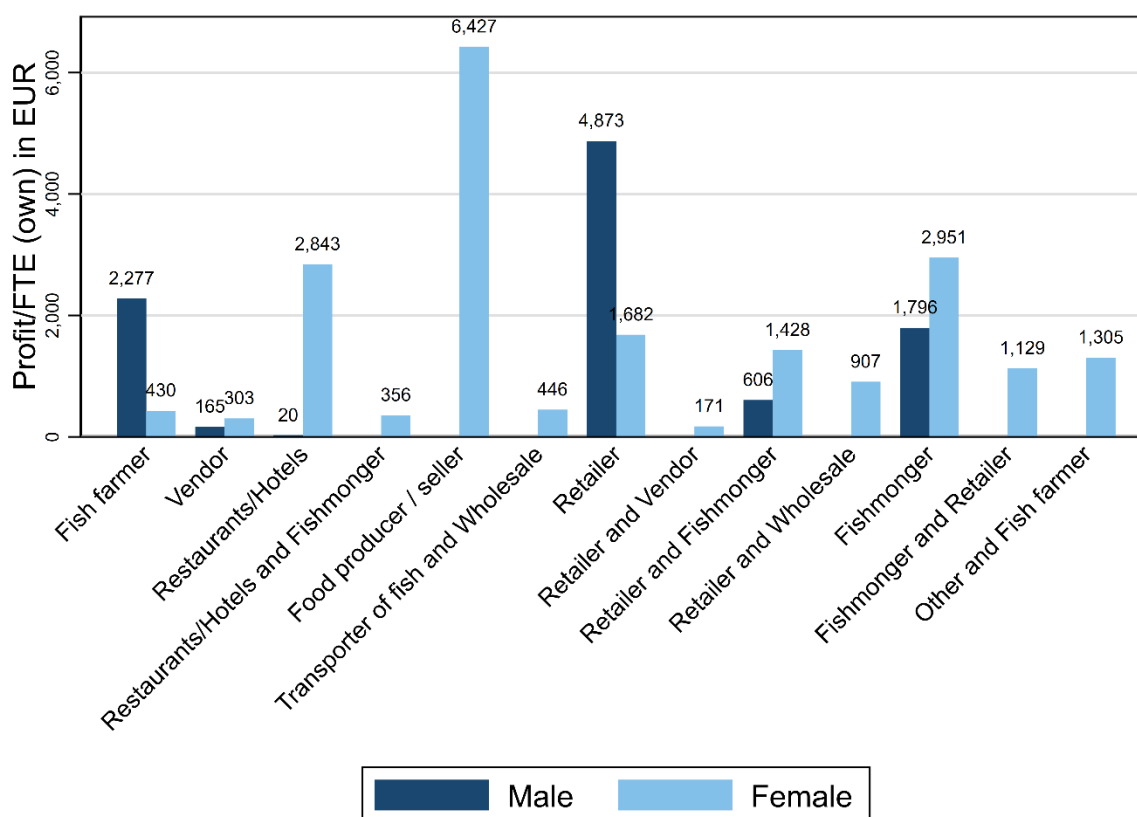


Figure 50: VCA profit (EUR/year/FTE (own)) by actor category and gender, excluding entries above 15,000 EUR (at the individual-level:  $\text{Sum}(x/y) / n$ ), (VCAs production-related sample, N=81)

### 3.3.2.4 INCOME OF WORKERS HIRED BY VALUE CHAIN ACTORS

Table 53 shows statistics on the hired labor for fish farmers disaggregated by worker type and gender. The statistics are weighted by the number of employees.

Table 53: Income (EUR/year) of VCA hired workers disaggregated by gender (11 of 89 VCAs report hired workers and are part of the production-related sample), aggregated statistic refers to  $\text{Sum}(x)/\text{Sum}(y)$

GENDER	WORKER TYPE	EMPLOYEES	MEAN INCOME (EUR/YEAR/ PERSON)	MEAN FTE (PERSON/YE AR)	MEDIAN INCOME (EUR/YEAR/ PERSON)	MEDIAN FTE (PERSON/YE AR)	AGGR. INCOME / FTE (EUR/FTE/ YEAR)
F	Grow-out	4	252	0.58	256	0.35	434
F	Other	2	216	1.08	216	1.08	200
M	Grow-out	2	153	0.87	153	0.87	177
M	Office worker	2	116	0.07	116	0.07	1,589
M	Other	3	257	0.09	153	0.06	2,737
	<b>Across all types</b>	13	212	0.51	153	0.21	414

There is only a small sample size. In total, 13 employees are hired by 11 value chain actors. Since the sample size is quite small, I do not directly interpret the respective values. I cannot

further distinguish between family members and other hired workers. The next section turns back to the fish farmers interviewed.

### 3.3.3 PRODUCTION AND SALES: “MORE FISH, MORE WORK”

#### 3.3.3.1 AQUACULTURE FARMS HAVE INCREASED THEIR PRODUCTION FROM SUSTAINABLE RICE-FISH FARMING

The total yearly production for the respondent fish farmers is provided in Table 54 and divided by sales channels.

**Table 54: Total production in fresh round (kg/year) of all fish products per year from 262 fish farmers (production-related sample), no fingerlings**

MARKETING CHANNEL	PRODUCTION (kg/year)	PRODUCTION (%)	AVERAGE SALES PRICE (EUR)	N
Sold directly to consumer	3,348	30.43	3.08	133
Used for own consumption	2,073	18.85	2.98	197
Used as salary for workers or as exchange for other produce, goods or services	21	0.19	2.89	6
Sold at local markets	1,721	15.65	3.21	48
Sold at city markets	2,118	19.25	3.34	53
Sold to fishmongers or table-top sellers/retailers	539	4.90	3.21	19
Sold to wholesalers or collectors	450	4.09	3.36	7
Sold to a sales outlet	0	0.00	0.00	0
Sold directly to processors or exporters	0	0.00	0.00	0
Sold to restaurants, hotels or institutions	510	4.64	3.53	11
Stocked in rice fields or ponds	220	2.00	3.12	31
Payment in return for the donation of fingerlings	0	0.00	0.00	0
<b>Total (Global Average Sell Price)</b>	<b>11,000</b>	<b>100</b>	<b>3.07</b>	<b>262</b>

The highest proportion of fish (kg/year/fresh round) is sold directly to consumers with 30.43%. The average price per kg fresh round is 3.08 EUR. Next, a high share is used for consumption with 18.85%. The average price is 2.98 EUR. Summary statistics for distribution of yearly production in kg divided into sales and own consumption and food security status are shown in Table 55.

**Table 55: Production per actor type by sales channel (1 and 2) and FIES level, in fresh round and without fingerlings, fish farmers only (production-related sample)**

TYPE	SALES OR OWN CONSUMPTION	FOOD SECURE (N=36)	MILDLY FOOD INSECURE (N=141)	MODERATELY FOOD INSECURE (N=75)	SEVERELY FOOD INSECURE (N=10)	Total (N=262)
Fish farmer	Sold directly to consumer (kg/year)	535	1,912	820	81	3,348
	Sold directly to consumer (Share in %)	16%	57%	24%	2%	100%
	Sold directly to consumer (kg per fish farmer)	15	14	11	8	13
	Used for own consumption (kg/year)	300	1,043	613	117	2,073
	Used for own consumption (Share in %)	14%	50%	30%	6%	100%
	Used for own consumption (per fish farmer)	8	7	8	12	8
<b>Total</b>	<b>All Sales Channels</b>	<b>2,221</b>	<b>5,846</b>	<b>2,430</b>	<b>503</b>	<b>11,000</b>
<b>Total</b>	<b>All Sales Channels (Share in %)</b>	<b>20%</b>	<b>53%</b>	<b>22%</b>	<b>5%</b>	<b>100%</b>
<b>Average production (kg/year)</b>	<b>All Sales Channels</b>	<b>62</b>	<b>41</b>	<b>32</b>	<b>50</b>	<b>42</b>
<b>Median production (kg/year)</b>	<b>All Sales Channels</b>	<b>41</b>	<b>26</b>	<b>20</b>	<b>28</b>	<b>28</b>

This shows data per interviewed fish farmer. Most fish are produced by mildly food insecure fish farmers with 17,618 kg/year in fresh round. However, the sample is with 141 considerable bigger compared to other groups. Focusing on statistics per fish farmers and sales directly consumers reveal that food secure fish farmers sell on average the most with 15 kg per year in fresh round. However, the difference to mildly food insecure is marginal (14 kg per year in fresh round). Table 56 provides insights on the proportion of sales and own consumption split by FIES level.

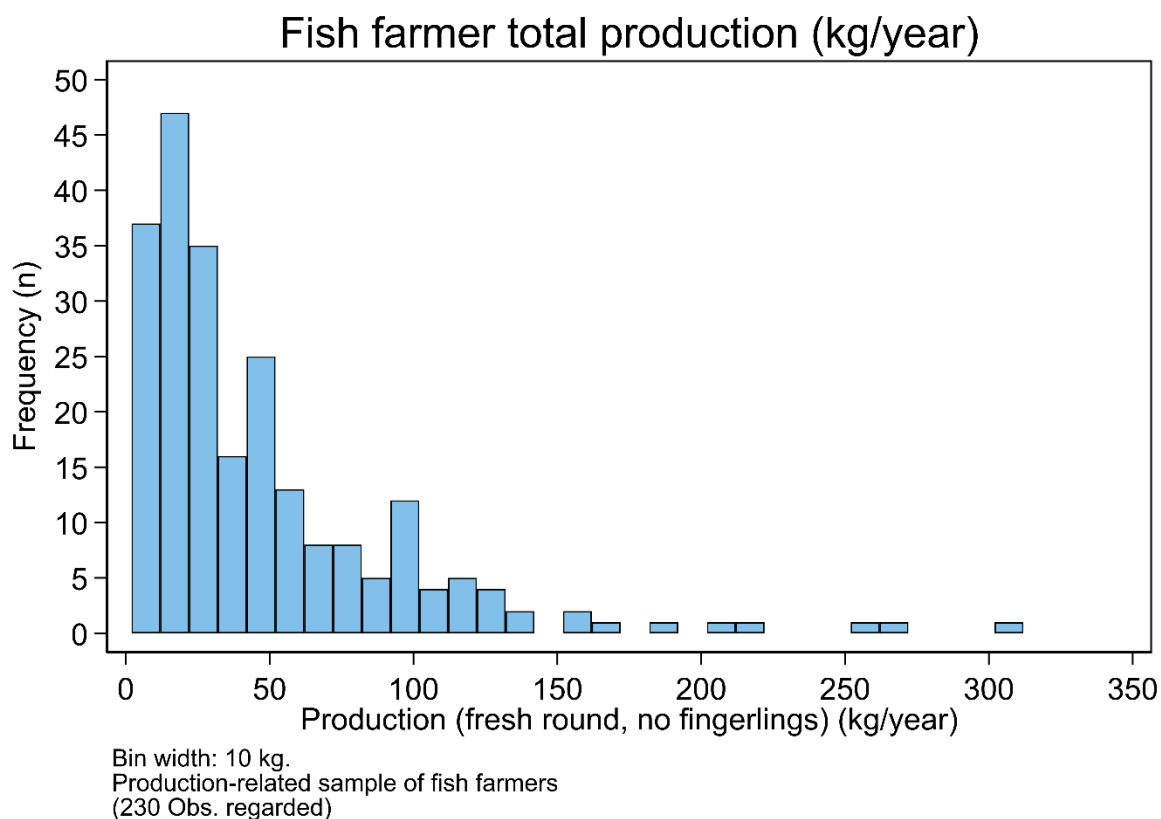
**Table 56: Proportion of sales and fish consumption split by FIES level, without fingerlings (fish farmers only, production-related sample, N=262)**

SALES OR OWN CONSUMPTION	Food Secure (N=177)	Food Insecure (N=85)
Mean production (kg/year)	45	35
Median production (kg/year)	29	21
% Fish production sold to consumer	9.7 %	9.4 %
% Fish production used for home consumption	5.3 %	7.6 %
Kg sold/FF	13.8	10.6
Kg used/FF	7.6	8.6

Among the fish farmers suffering under food insecurity, 9.4% of fish production is directly sold to consumer. The share among food secure fish farmers is relatively equal with 9.7%. The own consumption of food secure fish farmers is 5.3% and for food insecure fish farmers 7.6%. Summary statistics for distribution of yearly production in kg by fish farmers and value chain actors are provided in Table 57, with accompanying histogram for fish farmers in Figure 51. It is not possible to further differentiate which amount of the total production can be attributed to hired workers. The production was transformed into fresh round and does not include fingerlings. Furthermore, fish farmers who have stated a production of zero kg/year are excluded.

**Table 57: Summary statistics for distribution of production (Kg/year/producer), fresh round, without fingerlings and only production-related sample with positive fish production**

SURVEY	N	MIN.	10%	MEDIAN	MEAN	90%	MAX.
Fish farmers	230	2	8	30	48	104	303
VCA	84	24	89	1,002	2,889	5,472	49,680



**Figure 51: Distribution of production (kg/ year/ fresh round) for fish farmers, only production-related sample**

The average production of fish farmers is 48 kg fresh round per year, the median is with 30 kg fresh round per year significantly lower. The figure further illustrates that many fish farmers harvest amounts below 50 kg/year. Only a few manage to harvest more than 100 kg. The maximum is 303 kg. Among value chain actors, the amounts are significantly higher, reaching even a maximum of 49,680 kg fresh round per year. The next section presents statistics related to job creation.

### **3.3.3.1 NUMBER OF JOBS IN THE AQUACULTURE VALUE CHAIN**

To assess the number of jobs currently in the value chain, the full time equivalent (FTE) job calculations was used to provide a standardized way of quantifying total jobs amongst respondents with different schedules. The relationship between income/jobs and the kg of fish turned over or produced is also used to calculate the impact of the increased production achieved by the project intervention. One FTE job is considered to be 225 days of work per year at 8 hours per day. Table 58 and Table 59 give a detailed overview about the financial indicators of fish farmers and fish farmer workers by category and gender. The total profit/income includes the profit already discussed above for fish farmers and for hired workers the respective annual wage received.

**Table 58: Financial indicators of fish farmers and fish farmer workers by category and gender (part I)**

GENDER OWNER	CATEGORY	WORKER TYPE	EMPLOYEES	AVG. PROFIT/INCOME (EUR/year)	MED. PROFIT/INCOME (EUR/year)	TOTAL PROFIT/INCOME (EUR/year)	MEAN FTE	MED. FTE	TOTAL FTE
Male	Owner	-	204	227	102	46,299	0.11	0.06	22.42
	Family Members	All genders	296	-	-	-	0.09	0.05	13.92
	Hired Labor	Fish carrier (M)	2	61	61	123	0.04	0.04	0.08
		Fish seller (F)	6	1,398	1,398	8,388	0.01	0.01	0.08
		Harvesting assistance (F)	3	466	466	1,398	0.00	0.00	0.01
		Harvesting assistance (M)	15	466	466	6,990	0.04	0.04	0.60
		Office worker (F)	2	61	61	123	0.00	0.00	0.01
		Office worker (M)	1	3,728	3,728	3,728	0.00	0.00	0.00
		Other (F)	31	373	373	11,556	0.02	0.02	0.47
		Other (M)	13	359	466	4,670	0.01	0.01	0.13
		Pond constructor (F)	14	366	373	5,126	0.01	0.00	0.11
		Pond constructor (M)	168	445	466	74,743	0.01	0.01	1.25
		All genders	255	-	-	116,843	-	-	2.74
		M	199	-	-	90,253	-	-	2.06
		F	56	-	-	26,590	-	-	0.68
	<b>All</b>	<b>Owner, family members, hired labor</b>	<b>755</b>	<b>-</b>	<b>-</b>	<b>163,142</b>	<b>-</b>	<b>-</b>	<b>39.09</b>
Female	Owner	-	58	124	48	7,184	0.07	0.05	4.30
	Family Members	All genders	76	-	-	-	0.11	0.07	4.86
	Hired Labor	Fish carrier (F)	2	466	466	932	0.02	0.02	0.04
		Harvesting assistance (M)	6	435	466	2,609	0.00	0.00	0.02
		Office worker (M)	1	61	61	61	0.07	0.07	0.07
		Other (F)	4	280	280	1,118	0.00	0.00	0.01
		Pond constructor (M)	32	557	559	17,814	0.02	0.02	0.53
		All genders	45	-	-	22,535	-	-	0.66
		M	39	-	-	20,485	-	-	0.62

		F	6	-	-	2,050	-	-	0.04
	All	Owner, family members, hired labor	179	-	-	29,719	-	-	9.82
<b>Fish farmer</b>	<b>Owner</b>		<b>262</b>	<b>204</b>	<b>89</b>	<b>53,483</b>	<b>0.10</b>	<b>0.06</b>	<b>26.72</b>
	<b>All categories</b>		<b>934</b>	<b>-</b>	<b>-</b>	<b>192,861</b>	<b>-</b>	<b>-</b>	<b>48.91</b>

Only 262 of the 644 fish farmers are part of the production-related sample. FTE for owner refers to FTE (own), FTE family for all family members except (own) and for hired labor the total FTE of the labor category.

Table 59: Financial indicators of fish farmers by category and gender (part II)

GENDER OWNER	CATEGORY	Observations	AVG. PRODUCTION (kg/year), no-fing.	MED. PRODUCTION (kg/year), no-fing.	TOTAL PRODUCTION (kg/year), no-fing.	AVG. PRODUCTION (kg/year), fing.	MED. PRODUCTION (kg/year), fing.	TOTAL PRODUCTION (kg/year), fing.	AVG. PROFIT (EUR)/ PRODUCTION (EUR/kg/year, no-fing.)	MED. PROFIT (EUR)/ PRODUCTION (kg/year, no-fing.)	AVG. PRODUCTION (kg/year, no-fing.)/FTE (own)	MED. PRODUCTION (kg/year, no-fing.)/ FTE (own)
M	Owner	204	43	30	8,813	1,650	0	336,595	4.46	2.92	888	376
F	Owner	58	38	20	2,187	488	0	28,290	2.62	2.55	1,116	255
All gender		<b>262</b>	<b>42</b>	<b>28</b>	<b>11,000</b>	<b>1,393</b>	<b>0</b>	<b>364,885</b>	<b>4.07</b>	<b>2.84</b>	<b>937</b>	<b>370</b>

Only 262 of the 644 fish farmers are part of the production-related sample.

Including the owner, fish farmers' family members and hired labor, in total 934 persons are involved in the fish production. Of these 934 persons, 300 are hired labor, with 238 males and 62 female workers. Most hired workers are pond constructors with 214 workers. Beyond this, harvesting assistance is a notable labor input, with 24 workers. Over all types of labor, the labor input is relatively low. The maximum average FTE is observable for male fish farmers and family members of female fish farmers with 0.11 FTEs, respectively. Focusing on the financial indicators of fish farmers, reveals a median production of 42 kg (year/fresh round) and a median of 28 kg (year/fresh round). Notably, the average of females is slightly lower with 38 kg (year/fresh round). However, a significantly lower median of 20 kg (year/ fresh round) indicates that many female fish farmers show relatively low volumes of harvest. The average profit per kg is 4.07 EUR and the median is 2.28 EUR. Similarly, as for production, male fish farmers show a better performance, with an average of 4.46 EUR compared to females with 2.62 EUR. Interestingly, female fish farmers have a higher average production per FTE (own). The

production per FTE (own) is 1,383 kg/year compared to 1,093 kg/year for males. The latter pattern points to a better labor productivity of female farmers. Table 60 shows the financial and FTE job related indicators for value chain actors.

**Table 60: Financial indicators of VCA actors and VCA workers by category and gender**

ACTOR TYPE	GENDER OWNER	CATEGORY	WORKER TYPE	EMPLOYEES	AVG. PROFIT/INCOME (EUR/year)	MED. PROFIT/INCOME (EUR/year)	TOTAL PROFIT/INCOME (EUR/year)	MEAN FTE	MED. FTE	TOTAL FTE	AVG. PRODUCTION (kg/year)	MED. PRODUCTION (kg/year)	TOTAL PRODUCTION (kg/year)	AVG. PROFIT (EUR)/ PRODUCTION (EUR/kg/year)	MED. PROFIT (EUR)/ PRODUCTION (EUR/kg/year, no-)	AVG. PRODUCTION (kg/year, no- fmg./FTE (own))	MED. PRODUCTION (kg/year, no- fmg./FTE (own))
Fisher or fish farmer	M	Owner	-	2	7,890	7,890	15,781	0.343	0.343	0.687	2,442	2,442	4,884	3.27	3.27	7,581	7,581
		Family	All genders	2	-	-	-	0.278	0.278	0.557	-	-	-	-	-	-	-
		Hired	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fisher or fish farmer	F	Owner	-	3	119	122	357	0.266	0.180	0.799	229	96	688	1.28	1.27	745	675
		Family	All genders	1	-	-	-	0.036	0.036	0.036	-	-	-	-	-	-	-
		Hired	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Fisher or fish farmer</b>	<b>All</b>	<b>Owner</b>		<b>5</b>	<b>3,228</b>	<b>235</b>	<b>16,138</b>	<b>0.297</b>	<b>0.320</b>	<b>1.486</b>	<b>1,114</b>	<b>252</b>	<b>5,572</b>	<b>2.07</b>	<b>2.55</b>	<b>3,479</b>	<b>687</b>
<b>Subtotal Fisher or fish farmer</b>				<b>8</b>	<b>-</b>	<b>-</b>	<b>16,138</b>	<b>-</b>	<b>-</b>	<b>2.078</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
Feed producer / seller	M	Owner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Feed producer / seller	F	Owner	-	1	571	571	571	0.089	0.089	0.089	372	372	372	1.54	1.54	4,185	4,185
		Family	All genders	2	-	-	-	0.080	0.080	0.080	-	-	-	-	-	-	-
		Hired	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Feed producer / seller</b>	<b>All</b>	<b>Owner</b>		<b>1</b>	<b>571</b>	<b>571</b>	<b>571</b>	<b>0.089</b>	<b>0.089</b>	<b>0.089</b>	<b>372</b>	<b>372</b>	<b>372</b>	<b>1.54</b>	<b>1.54</b>	<b>4,185</b>	<b>4,185</b>
<b>Subtotal Feed producer / seller</b>				<b>3</b>	<b>-</b>	<b>-</b>	<b>571</b>	<b>-</b>	<b>-</b>	<b>0.169</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
Retailer	M	Owner	-	6	3,755	1,791	22,530	0.644	0.604	3.867	2,819	1,475	16,914	1.21	0.6	5,853	4,884

ACTOR TYPE	GENDER OWNER	CATEGORY	WORKER TYPE	EMPLOYEES	AVG. PROFIT/INCOME (EUR/year)	MED. PROFIT/INCOME (EUR/year)	TOTAL PROFIT/INCOME (EUR/year)	MEAN FTE	MED. FTE	TOTAL FTE	AVG. PRODUCTION (kg/year)	MED. PRODUCTION (kg/year)	TOTAL PRODUCTION (kg/year)	AVG. PROFIT (EUR)/ PRODUCTION (EUR/kg/year)	MED. PROFIT (EUR)/ PRODUCTION (EUR/kg/year, no-)	AVG. PRODUCTION (kg/year, no-fing.)/FTE (own)	MED. PRODUCTION (kg/year, no-fing.)/FTE (own)
		Family	All genders	7	-	-	-	0.974	0.960	2.922	-	-	-	-	-	-	-
		Hired	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Retailer	F	Owner	-	25	1,130	722	25,996	0.957	0.867	23.916	5,913	2,700	147,828	0.45	0.25	7,667	2,813
		Family	All genders	16	-	-	-	1.327	0.867	11.947	-	-	-	-	-	-	-
		Hired	Fish seller (M)	2	153	153	306	0.867	0.867	1.733	-	-	-	-	-	-	-
			Other (M)	1	153	153	153	0.060	0.060	0.060	-	-	-	-	-	-	-
			fish transporter (M)	2	116	116	233	0.073	0.073	0.147	-	-	-	-	-	-	-
			All	5	-	-	693	-	-	1.940	-	-	-	-	-	-	-
			M	5	-	-	693	-	-	1.940	-	-	-	-	-	-	-
			F	0	-	-	-	-	-	-	-	-	-	-	-	-	-
Retailer	All	Owner		31	1,673	889	48,526	0.896	0.867	27.782	5,314	2,600	164,742	0.61	0.46	7,316	2,885
<b>Subtotal Retailer</b>				<b>59</b>	<b>-</b>	<b>-</b>	<b>49,218</b>	<b>-</b>	<b>-</b>	<b>44.591</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
Fishmonger	M	Owner	-	6	3,918	1,189	23,510	0.651	0.413	3.906	4,423	1,675	26,536	0.84	0.43	6,290	4,441
		Family	All genders	3	-	-	-	0.690	0.062	2.069	-	-	-	-	-	-	-

ACTOR TYPE	GENDER OWNER	CATEGORY	WORKER TYPE	EMPLOYEES	AVG. PROFIT/INCOME (EUR/year)	MED. PROFIT/INCOME (EUR/year)	TOTAL PROFIT/INCOME (EUR/year)	MEAN FTE	MED. FTE	TOTAL FTE	AVG. PRODUCTION (kg/year)	MED. PRODUCTION (kg/year)	TOTAL PRODUCTION (kg/year)	AVG. PROFIT (EUR)/ PRODUCTION (EUR/kg/year,	MED. PROFIT (EUR)/ PRODUCTION (EUR/year, no-	AVG. PRODUCTION (kg/year, no-fing,)/FTE (own)	MED. PRODUCTION (kg/year, no-fing,)/FTE (own)
	M	Hired	Other	1	466	466	466	0.009	0.009	0.009	-	-	-	-	-	-	-
	All			1	-	-	466	-	-	0.009	-	-	-	-	-	-	-
	M			1	-	-	466	-	-	0.009	-	-	-	-	-	-	-
	F			0	-	-	-	-	-	-	-	-	-	-	-	-	-
Fishmonger	F	Owner	-	17	2,158	809	36,684	0.721	0.636	12.252	1,955	1,056	33,238	1.19	1.02	3,221	1,920
		Family	All genders	5	-	-	-	3.700	3.700	7.400	-	-	-	-	-	-	-
		Hired	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fishmonger	All	Owner		23	2,617	889	60,194	0.703	0.578	16.158	2,599	1,080	59,774	1.1	1.02	4,022	2,527
<b>Subtotal Fishmonger</b>				<b>32</b>	<b>-</b>	<b>-</b>	<b>60,660</b>	<b>-</b>	<b>-</b>	<b>25.636</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
Transporter of fish	M	Owner	-	1	-	-	-	0.053	0.053	0.053	0	0	0	-	-	0	0
		Family	All genders	0	-	-	-	-	-	-	-	-	-	-	-	-	-
		Hired	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Transporter of fish	F	Owner	-	1	619	619	619	1.387	1.387	1.387	4,160	4,160	4,160	0.15	0.15	3,000	3,000
		Family	All genders	1	-	-	-	0.107	0.107	0.107	-	-	-	-	-	-	-
		Hired	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

ACTOR TYPE	GENDER OWNER	CATEGORY	WORKER TYPE	EMPLOYEES	AVG. PROFIT/INCOME (EUR/year)	MED. PROFIT/INCOME (EUR/year)	TOTAL PROFIT/INCOME (EUR/year)	MEAN FTE	MED. FTE	TOTAL FTE	AVG. PRODUCTION (kg/year)	MED. PRODUCTION (kg/year)	TOTAL PRODUCTION (kg/year)	AVG. PROFIT (EUR)/ PRODUCTION (EUR/kg/year)	MED. PROFIT (EUR)/ PRODUCTION (EUR/kg/year, no-)	AVG. PRODUCTION (kg/year, no- fmg.)/FTE (own)	MED. PRODUCTION (kg/year, no- fmg.)/FTE (own)
Transporter of fish	All	Owner		2	619	619	619	0.720	0.720	1.440	2,080	2,080	4,160	0.15	0.15	1,500	1,500
<b>Subtotal: Transporter of fish</b>				<b>3</b>	<b>-</b>	<b>-</b>	<b>619</b>	<b>-</b>	<b>-</b>	<b>1.547</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
Wholesale	M	Owner	-	1	700	700	700	0.044	0.044	0.044	1,800	1,800	1,800	0.39	0.39	40,500	40,500
		Family	All genders	0	-	-	-	-	-	-	-	-	-	-	-	-	-
		Hired	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wholesale	F	Owner	-	2	1,017	1,017	2,033	1.473	1.473	2.947	26,920	26,920	53,840	0.09	0.09	17,423	17,423
		Family	All genders	1	-	-	-	0.107	0.107	0.107	-	-	-	-	-	-	-
	M	Hired	Other (M)	1	153	153	153	0.060	0.060	0.060	-	-	-	-	-	-	-
			All	1	-	-	153	-	-	0.060	-	-	-	-	-	-	-
			M	1	-	-	153	-	-	0.060	-	-	-	-	-	-	-
			F	0	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Wholesale</b>	<b>All</b>	<b>Owner</b>		<b>3</b>	<b>911</b>	<b>700</b>	<b>2,733</b>	<b>0.997</b>	<b>1.387</b>	<b>2.991</b>	<b>18,547</b>	<b>4,160</b>	<b>55,640</b>	<b>0.19</b>	<b>0.15</b>	<b>25,115</b>	<b>31,846</b>
<b>All</b>				<b>5</b>	<b>-</b>	<b>-</b>	<b>2,886</b>	<b>-</b>	<b>-</b>	<b>3.158</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
Vendor	M	Owner	-	1	286	286	286	1.733	1.733	1.733	720	720	720	0.40	0.40	415	415

ACTOR TYPE	GENDER OWNER	CATEGORY	WORKER TYPE	EMPLOYEES	AVG. PROFIT/INCOME (EUR/year)	MED. PROFIT/INCOME (EUR/year)	TOTAL PROFIT/INCOME (EUR/year)	MEAN FTE	MED. FTE	TOTAL FTE	AVG. PRODUCTION (kg/year)	MED. PRODUCTION (kg/year)	TOTAL PRODUCTION (kg/year)	AVG. PROFIT (EUR)/ PRODUCTION (EUR/kg/year,	MED. PROFIT (EUR)/ PRODUCTION (EUR/kg/year, no-	AVG. PRODUCTION (kg/year, no- fing,)/FTE (own)	MED. PRODUCTION (kg/year, no- fing,)/FTE (own)
		Family	All genders	0	-	-	-	-	-	-	-	-	-	-	-	-	-
		Hired	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vendor	F	Owner	-	5	557	273	2,783	1.824	1.733	9.120	2,033	2,400	10,167	0.23	0.11	1,159	1,534
		Family	All genders	5	-	-	-	0.893	0.907	3.573	-	-	-	-	-	-	-
		Hired	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Vendor</b>	<b>All</b>	<b>Owner</b>	<b>-</b>	<b>6</b>	<b>512</b>	<b>280</b>	<b>3,069</b>	<b>1.809</b>	<b>1.733</b>	<b>10.853</b>	<b>1,815</b>	<b>1,776</b>	<b>10,887</b>	<b>0.26</b>	<b>0.22</b>	<b>1,035</b>	<b>1,029</b>
<b>Subtotal Vendor</b>				<b>11</b>	<b>-</b>	<b>-</b>	<b>3,069</b>	<b>-</b>	<b>-</b>	<b>14.427</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
Restaurants/H otels	M	Owner	-	1	32	32	32	1.600	1.600	1.600	288	288	288	0.11	0.11	180	180
		Family	All genders	2	-	-	-	1.600	1.600	1.600	-	-	-	-	-	-	-
		Hired	Fish seller (F)	1	280	280	280	0.187	0.187	0.187	-	-	-	-	-	-	-
			All	1	-	-	280	-	-	0.187	-	-	-	-	-	-	-
			M	0	-	-	-	-	-	-	-	-	-	-	-	-	-
			F	1	-	-	280	-	-	0.187	-	-	-	-	-	-	-
Restaurants/H otels	F	Owner	-	24	636	209	15,263	0.661	0.293	15.853	522	184	12,526	1.42	1.09	2,156	881

ACTOR TYPE	GENDER OWNER	CATEGORY	WORKER TYPE	EMPLOYEES	AVG. PROFIT/INCOME (EUR/year)	MED. PROFIT/INCOME (EUR/year)	TOTAL PROFIT/INCOME (EUR/year)	MEAN FTE	MED. FTE	TOTAL FTE	AVG. PRODUCTION (kg/year)	MED. PRODUCTION (kg/year)	TOTAL PRODUCTION (kg/year)	AVG. PROFIT (EUR)/ PRODUCTION (EUR/kg/year)	MED. PROFIT (EUR)/ PRODUCTION (EUR/kg/year, no-)	AVG. PRODUCTION (kg/year, no-fing.)/FTE (own)	MED. PRODUCTION (kg/year, no-fing.)/FTE (own)
		Family	All genders	23	-	-	-	1.106	0.640	16.583	-	-	-	-	-	-	-
		Hired	Fish seller (F)	3	243	233	728	0.711	0.480	2.133	-	-	-	-	-	-	-
			Other (F)	2	216	216	433	1.080	1.080	2.160	-	-	-	-	-	-	-
			Other (M)	1	153	153	153	0.213	0.213	0.213	-	-	-	-	-	-	-
			All	6	-	-	1,314	-	-	4.507	-	-	-	-	-	-	-
			M	1	-	-	153	-	-	0.213	-	-	-	-	-	-	-
			F	5	-	-	1,161	-	-	4.293	-	-	-	-	-	-	-
<b>Restaurants/Hotels</b>	<b>All</b>	<b>Owner</b>		<b>25</b>	<b>612</b>	<b>195</b>	<b>15,295</b>	<b>0.698</b>	<b>0.320</b>	<b>17.453</b>	<b>513</b>	<b>200</b>	<b>12,814</b>	<b>1.37</b>	<b>1.07</b>	<b>2,077</b>	<b>862</b>
<b>Subtotal Restaurants/Hotels</b>				<b>57</b>	<b>-</b>	<b>-</b>	<b>16,889</b>	<b>-</b>	<b>-</b>	<b>40.330</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

Notes: 89 of 89 VCAs selected at least one actor type. Furthermore, only 87 of the 89 VCAs are part of the production-related sample. As multiselection was used, it is possible that one VCA is reported in multiple categories. Subsequently, total aggregates are not provided. FTE for owner refers to FTE (own), FTE family for all family members except (own) and for hired labor the total FTE of the labor category.

Due to the significant size of the table, a detailed discussion of the financial indicators split by value chain actors goes beyond the writing of the report.

Figure 52 and Figure 53 visualize the last four columns of the previous table for fish farmers by gender.

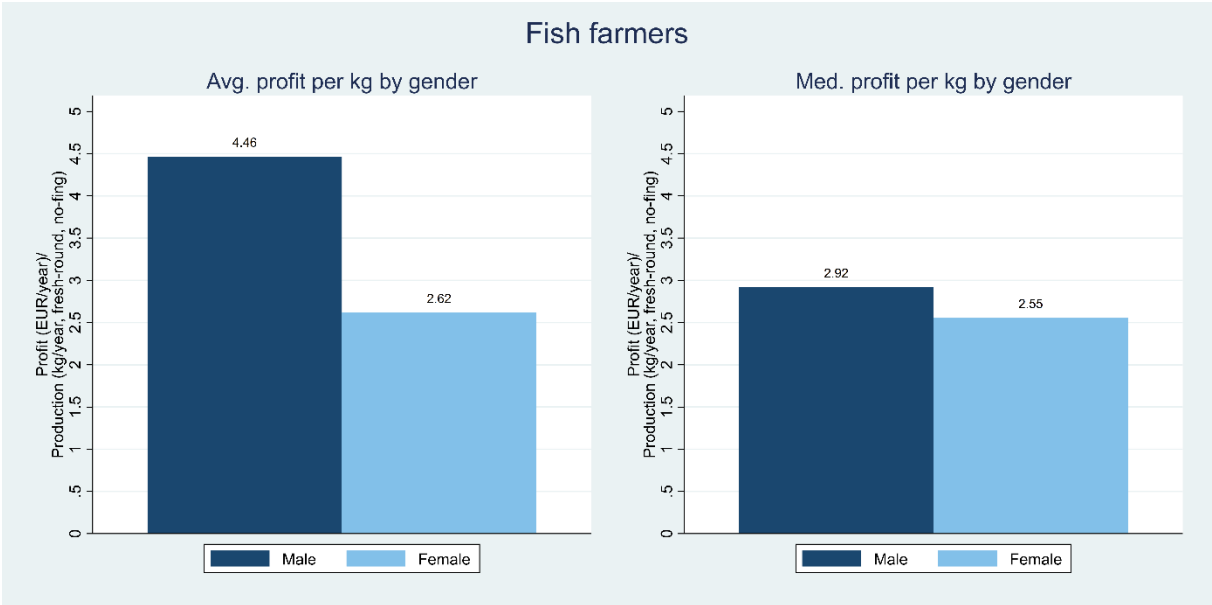


Figure 52: Average and median profit per kg by gender for fish farmers (EUR/ kg/year, no-fingerlings), only non-missing profits

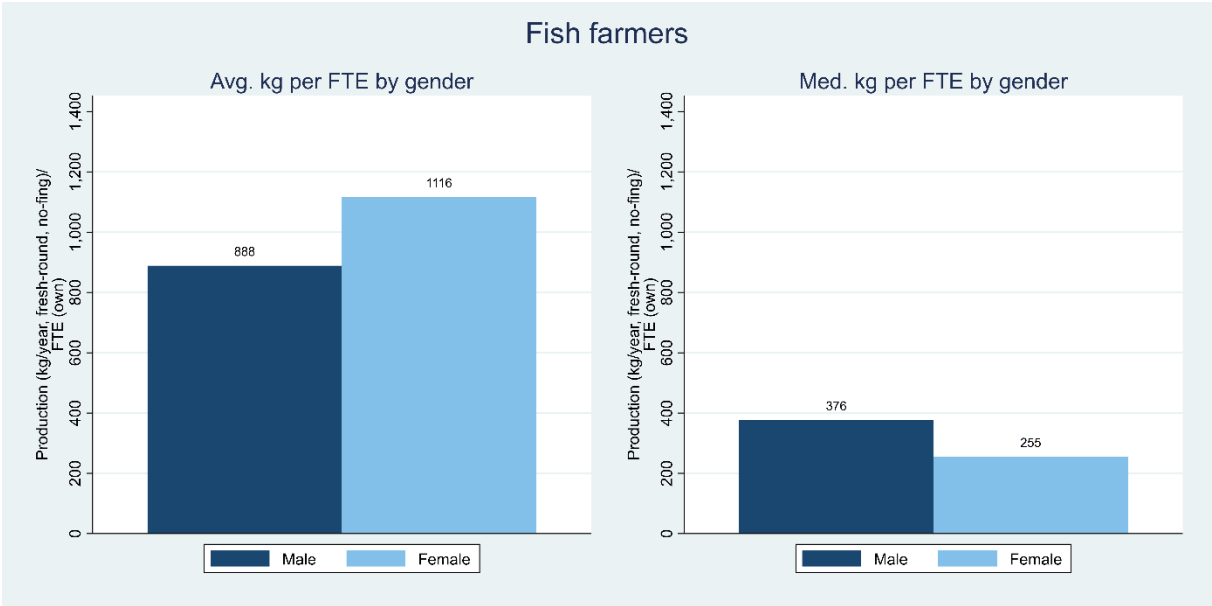


Figure 53: Average and median production per FTE by gender for fish farmers (kg/ FTE/year, no-fingerlings), only non-missing profits

As discussed above, male fish farmers show higher profits per kg fresh round. The average profit per kg by gender is 4.46 EUR/year for male fish farmers and 2.62 EUR/year for female fish farmers. The standard deviations are 10.3 and 2.6, respectively. The relatively high standard deviation for male fish farmers indicates the presence of some high values. In line with this, the median is with 2.92 EUR/year significantly lower. For female fish farmers, the distribution is quite equal and the median is with 2.55 EUR/year only slightly lower compared to the mean. However, and interestingly, female fish farmers have on average a higher labor productivity measured as kg of fresh round produced per FTE (own). However, the median is with 376 kg/year higher for males, indicating that the majority of female fish farmers show lower labor productivity. The standard deviations are 1,415 and 2,401, respectively. Running the

Kruskal–Wallis equality-of-populations reveals that there is a significant difference at the five percent level in profit per kg by gender (p-value = 0.026) but no significant difference in the average kg per FTE by gender (p-value = 0.7293).

Figure 54 and Figure 55 do the same for value chain actors, i.e. they visualize the last four columns of the previous table on value chain actors by gender. In these figures, every value chain actor is counted only once, even if he or she stated several types of value chain actors. Accordingly, the statistics of these figures and the tables do not directly match.

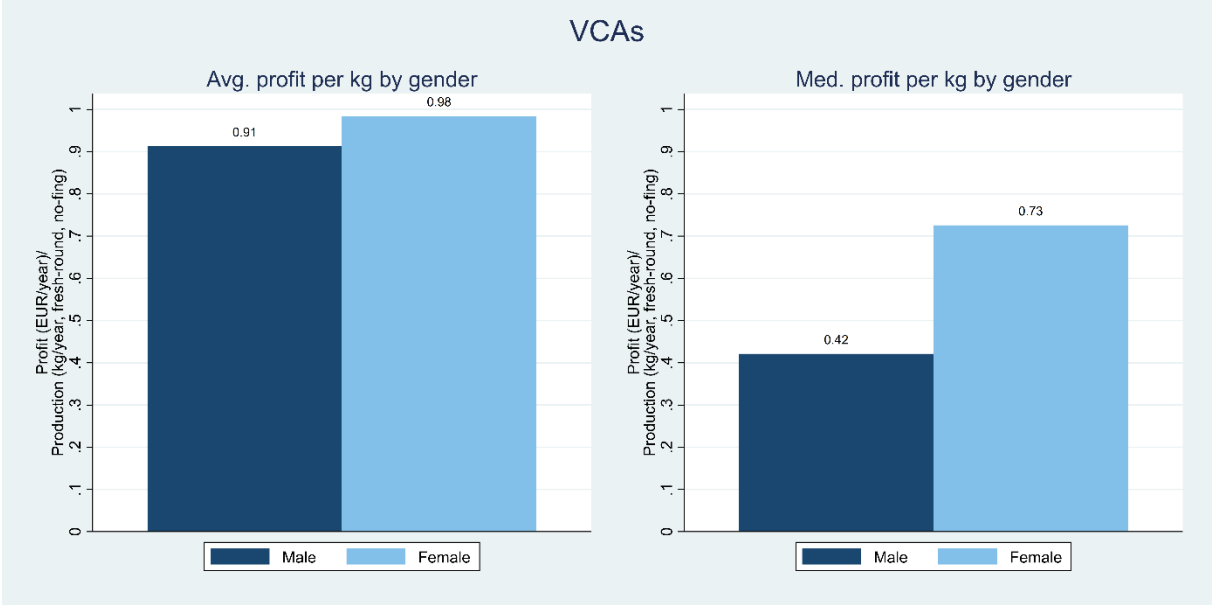


Figure 54: Average and median profit per kg by gender for value chain actors (EUR/ kg/year, no-fingerlings), production-related sample

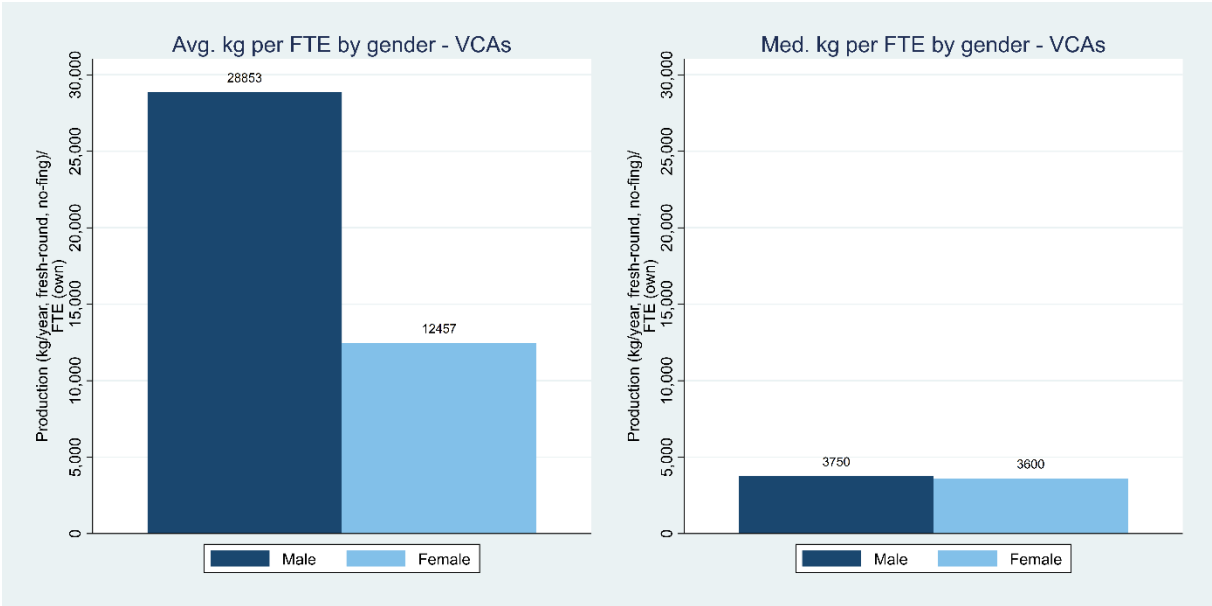
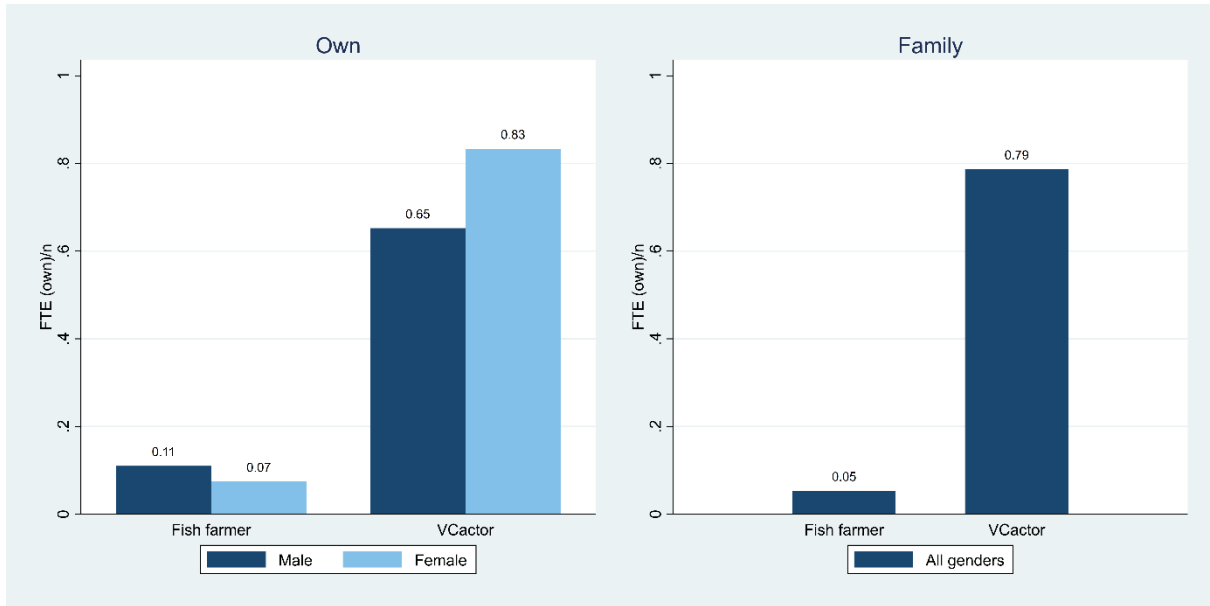


Figure 55: Average and median production per FTE by gender for value chain actors (kg/ FTE/year, no-fingerlings), production-related sample

The average profit per kg (fresh round/ year) is 0.91 EUR for male value chain actors and 0.98 EUR for female value chain actors. Similarly, the median is higher for female value chain actors than for male value chain actors (0.73 EUR vs. 0.42 EUR, respectively).

Figure 56 shows the average FTE input of fish farmers and value chain actors.



Fish farmers only have a FTE (own) of 0.11 (males) and 0.07 (females). The labor input of value chain actors is with 0.65 for males and 0.83 for females higher; however, it is still significantly below one. The family labor is 0.05 for fish farmers and 0.79 for value chain actors. Figure 57 visualizes the importance of own FTE depending on the value chain position.

Figure 56: FTE/n of actors in the fish value chain (own FTE and family FTE), focusing on production-related sample

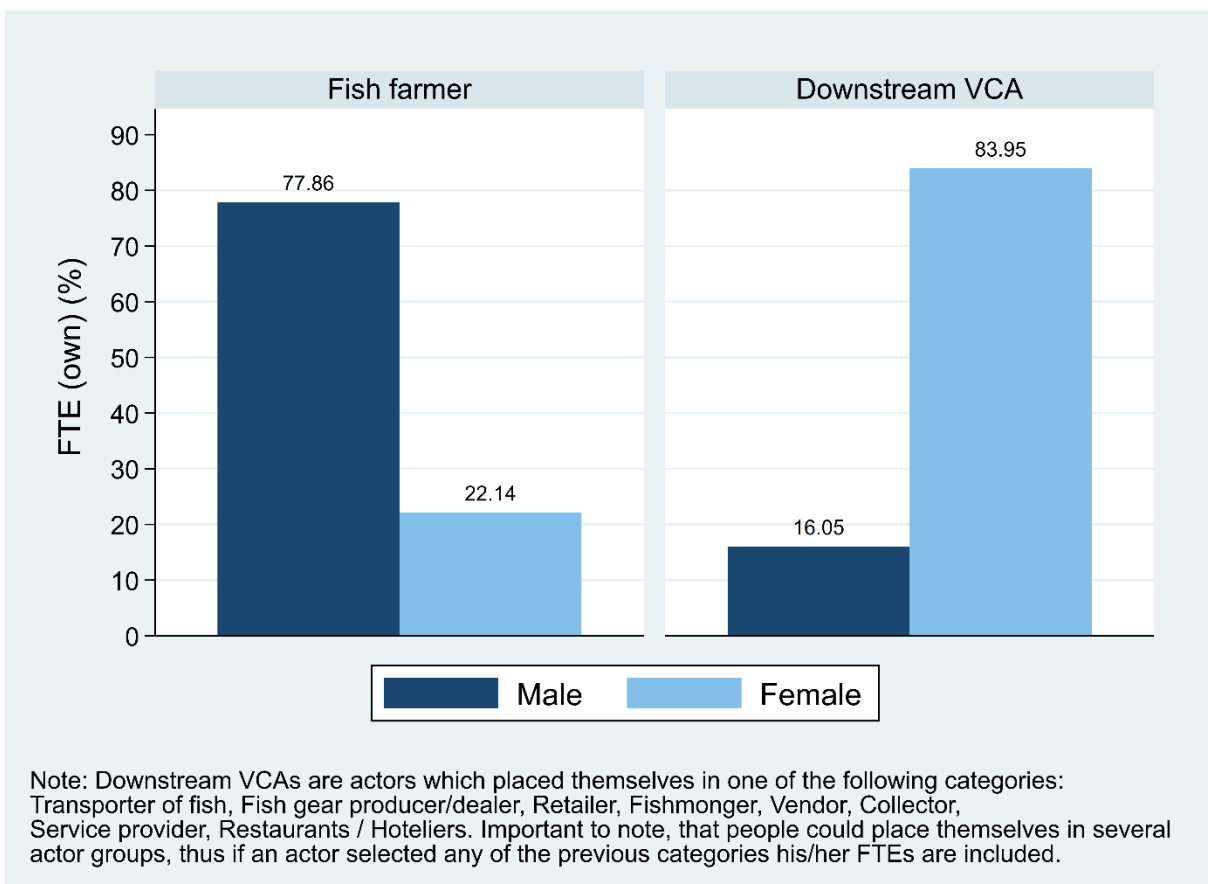
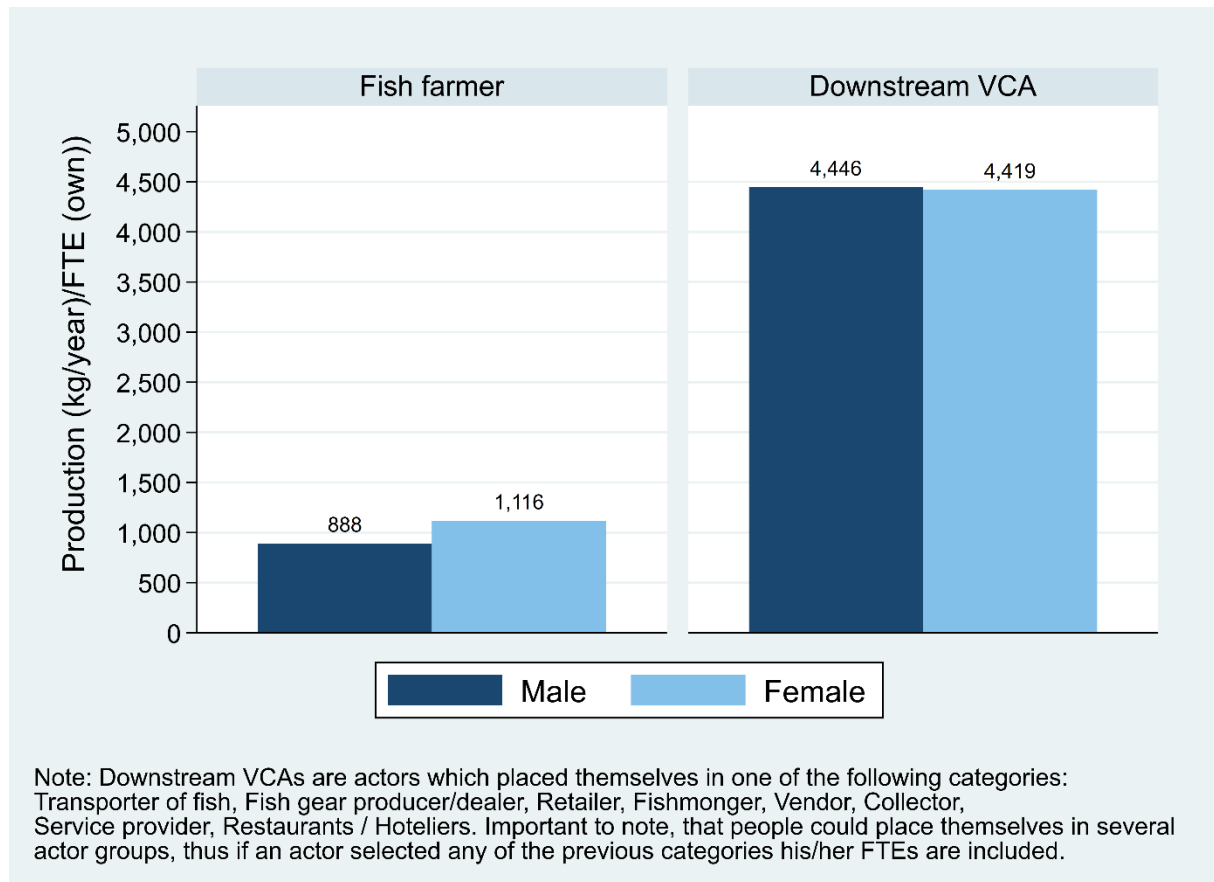


Figure 57: Distribution of jobs expressed in FTE (own) by gender, only production-related sample

For upstream position, fish farmers, the FTE (own) is male dominated (77.86%), while for downstream positions a higher importance of female own FTE (83.95%) is observable.

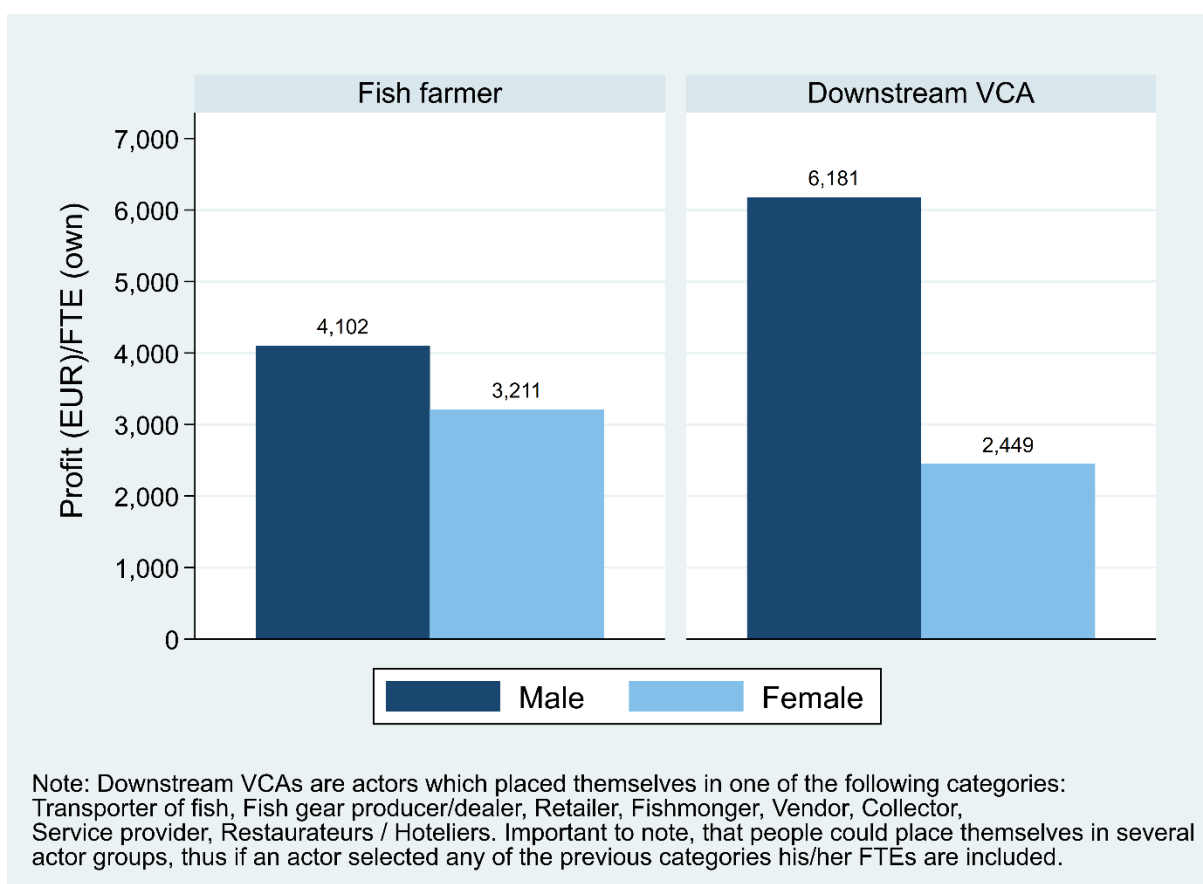
However, as already discussed over the report, most fish farmers are male and most interviewed value chain actors are female. Figure 58 visualizes the differences in production (kg/ fresh round/ year)/ FTE (own) by gender for fish farmers and value chain actors.<sup>12</sup>



**Figure 58: Production excluding fingerling per FTE (own) by gender and actor, only production-related sample**

There are only minor differences between male and female fish farmers (888 kg for males vs. 1,116 kg for females). Going in downstream positions, the volume produced is 4,446 kg for males and 4,419 kg for females. Figure 59 illustrates the profit per FTE.

<sup>12</sup> Table calculations are based on  $\text{Sum}(x) / \text{Sum}(y)$ , while figure calculations are based on  $\text{Sum}(x/y) / n$ . The two approaches are an inequality.



**Figure 59: Profit (EUR/year), per FTE (own) by gender and actor, only production-related sample**

There are some gender disparities observable. The average profit per FTE (own) for male fish farmers are 4,102 EUR compared to 3,211 EUR for female fish farmers. For downstream value chain actors, the difference is even bigger. Male downstream value chain actors show a profit of 6,181 EUR per FTE (own) and female value chain actors a value of 2,449 EUR per FTE (own).

### 3.3.4 COUNTRY-SPECIFIC INFORMATION

This section refers to country-specific statistics which should help the local team to get a project-specific overview about the situation of the target group. Table 61 illustrates the respective production of fish farmers split by sophistication. The sample is limited to the production-related sample of fish farmers and only fish farmers with positive fish production. Some of these fish farmers also produce fingerlings. All fingerling statistic only refer to this sub-group.

**Table 61: Fish famers' production (kg, fresh round, year) split by level of sophistication (APDRAcatGR, production-related sample, only fish farmers with fish-production regarded (aggregated productivity (Sum(x)/Sum(y)))**

Sophistication	Obs.	Av. production	Med. production	Aggr. production	Av. ricefield (ha)	Med. ricefield (ha)	Aggr. ricefield (ha)	Aggr. productivity (kg/ha)	Fingerling producers	Av. fingerlings (pieces)	Med. fingerlings (pieces)	Aggr. fingerlings (pieces)
Amoron'i Mania: Beginner	67	37	29	2,500	0.14	0.08	9.39	266	14	2,651	883	37,116
Amoron'i Mania: Intermediate	60	56	42	3,352	0.17	0.10	10.31	325	22	4,224	1,530	92,918
Amoron'i Mania: Advanced	17	64	49	1,095	0.42	0.20	7.11	154	8	3,523	1,761	28,186
Amoron'i Mania: Autonomous	-	-	-	-	-	-	-	-	-	-	-	-
Haute Matsiatra: Beginner	24	35	33	842	0.13	0.10	3.22	261	4	1,225	1,100	4,900
Haute Matsiatra: Intermediate	38	50	31	1,908	0.19	0.10	6.71	285	10	2,536	1,500	25,360
Haute Matsiatra: Advanced	21	60	50	1,264	0.46	0.29	9.72	130	14	5,369	3,900	75,160
Haute Matsiatra: Autonomous	-	-	-	-	-	-	-	-	-	-	-	-

The highest median production is observable for advanced fish farmers in Haute Matsiatra with 50 kg/ fresh round. Similar to the previous table, Table 62 illustrates the respective production of fish farmers producing fingerlings split by sophistication. In contrast to other tables, the sample is not limited to the production-related sample because fingerling production is already closed. However, to keep the sample constant over different tables, it focuses on fish farmers for whom a profit could be calculated. This follows the approach of the Midterm. By definition, fish farmers who stated to be fingerling producers are only considered.

**Table 62: Fish famers' production (fingerling producers (pieces)) split by level of sophistication (APDRAcatal), only fish farmers with a non-missing profit and with stated fingerling production regarded (AL+GR) (aggregated productivity (Sum(x)/Sum(y)))**

Sophistication	Obs.	Av. fingerlings (pieces)	Med. fingerlings (pieces)	Aggr. fingerlings (pieces)	Aggr. ricefield (ha)	Productivity (fingerlings/ha)	Fresh round producers	Av. fresh round fish (kg)	Med. fresh round fish (kg)	Aggr. fresh round fish (kg)
Amoron'i Mania: Beginner	52	3,718	900	193,357	13	14,885	50	70.44	36.88	3,522
Amoron'i Mania: Intermediate	70	4,020	2,000	281,418	22	12,821	69	84.3	55.0	5,817
Amoron'i Mania: Advanced	33	6,289	3,100	207,530	16	13,052	32	79.61	36.0	2,627
Amoron'i Mania: Autonomous	4	9,163	10,250	36,650	2	15,207	4	171.5	121.5	686
Haute Matsiatra: Beginner	18	2,016	675	36,290	5	6,992	17	45.59	38.0	775
Haute Matsiatra: Intermediate	22	3,260	2,085	71,710	9	7,661	22	56.59	46.5	1,245
Haute Matsiatra: Advanced	17	4,918	2,950	83,610	7	12,592	17	95.41	60.0	1,622
Haute Matsiatra: Autonomous	2	1,650	1,650	3,300	0	13,750	2	42.0	42.0	84

The highest median production of fingerlings is observable in Amoron'i Mania for autonomous fish farmers with 10,250 pieces.

The next four tables illustrate the fish farmers' total investment (EUR), the investment share over the last 10 years (EUR) by pond size, region and production type.

**Table 63: Fish famers' total investment (EUR) and investment share (EUR) by pond size (all), fish farmers with a non-missing profit**

Type	Obs. investment	Av. investment	Med. investment	Aggr. investment	Obs. investment share	Av. investment share (EUR)	Med. investment share	Aggr. investment share (EUR)
fingerlingprod in Amoron'i Mania	190	424	20	80,604	213	83	13	17,697
fingerlingprod in Haute Matsiatra	58	63	26	3,662	65	54	13	3,518
ricefieldgross in Amoron'i Mania	365	246	15	89,653	404	63	13	25,390
ricefieldgross in Haute Matsiatra	153	42	8	6,469	175	35	3	6,179
pondgross in Amoron'i Mania	-	-	-	-	-	-	-	-
pondgross in Haute Matsiatra	-	-	-	-	-	-	-	-

**Table 64: Fish famers' total investment (EUR) and investment share (EUR) by pond size (small <0.2 ha), fish farmers with a non-missing profit**

Type	Obs. investment	Av. investment	Med. investment	Aggr. investment	Obs. investment share	Av. investment share (EUR)	Med. investment share	Aggr. investment share (EUR)
fingerlingprod in Amoron'i Mania	88	54	20	4,730	105	44	13	4,596
fingerlingprod in Haute Matsiatra	28	46	8	1,289	29	40	1	1,152
ricefieldgross in Amoron'i Mania	236	46	15	10,916	261	40	10	10,495
ricefieldgross in Haute Matsiatra	95	26	5	2,432	104	22	2	2,244

**Table 65: Fish famers' total investment (EUR) and investment share (EUR) by pond size (medium = 0.2 to 0.9 ha), fish farmers with a non-missing profit**

Type	Obs. investment	Av. investment	Med. investment	Aggr. investment	Obs. investment share	Av. investment share (EUR)	Med. investment share	Aggr. investment share (EUR)
fingerlingprod in Amoron'i Mania	59	1,202	26	70,911	61	149	19	9,102
fingerlingprod in Haute Matsiatra	22	67	31	1,463	27	54	19	1,454
ricefieldgross in Amoron'i Mania	113	660	17	74,558	122	95	15	11,585
ricefieldgross in Haute Matsiatra	45	58	15	2,618	57	49	3	2,769

**Table 66: Fish famers' total investment (EUR) and investment share (EUR) by pond size (large >0.9 ha), fish farmers with a non-missing profit**

Type	Obs. investment	Av. investment	Med. investment	Aggr. investment	Obs. investment share	Av. investment share (EUR)	Med. investment share	Aggr. investment share (EUR)
fingerlingprod in Amoron'i Mania	13	282	102	3,669	16	175	64	2,793
fingerlingprod in Haute Matsiatra	5	174	64	872	6	146	55	874
ricefieldgross in Amoron'i Mania	15	279	102	4,180	19	174	51	3,308
ricefieldgross in Haute Matsiatra	7	198	64	1,386	8	142	55	1,133

Table 67 splits production (kg/year) and income related statistics by different income sources, namely only fish-related income, only fingerling-related income and income from both sources. In addition, the statistics are split by gender. The sample returns back to the production-related sample for fish farmers active in grow out. Only for fish farmers that exclusively generate income by fingerling sales, the sample is restricted to fish farmers with a non-missing profit.

Table 67: Aggregated costs (EUR/year) and production (kg/year) of fish farmers disaggregated by gender, samples depend on the respondent type (see Note)

Resp. Type	Gender	N	FTE (own)	Var. costs	Investment share	Investment share / FTE	Production, w.o. fing. (kg/year)	Production, fing. (pieces/year)	Revenue (w.o. fing.)	Revenue (fing.)	Revenue (both)	Profit (EUR/year)	Profit (EUR/year) /FTE	Gross margin (EUR/year)
Only fish income	M	116	9.2	1,882	202	22	4,499	0	14,127	0	14,127	12,044	1,019	12,245
Only fish income	F	42	2.6	821	118	46	1,932	0	5,843	0	5,843	4,904	415	5,022
<b>Only fish income</b>	-	<b>158</b>	<b>11.8</b>	<b>2,702</b>	<b>320</b>	<b>27</b>	<b>6,431</b>	<b>0</b>	<b>19,970</b>	<b>0</b>	<b>19,970</b>	<b>16,947</b>	<b>1,434</b>	<b>17,267</b>
Only fingerling income	M	25	3.0	271	55	19	0	99,035	0	7,215	7,215	6,889	1,741	6,944
Only fingerling income	F	8	1.0	128	86	88	0	7,300	0	585	585	372	94	457
<b>Only fingerling income</b>	-	<b>33</b>	<b>4.0</b>	<b>398</b>	<b>141</b>	<b>36</b>	<b>0</b>	<b>106,335</b>	<b>0</b>	<b>7,800</b>	<b>7,800</b>	<b>7,260</b>	<b>1,835</b>	<b>7,401</b>
Both income sources	M	65	10.3	2,510	560	54	4,314	242,560	14,414	16,272	30,686	27,616	2,475	28,176
Both income sources	F	7	0.9	107	21	24	255	21,080	846	1,269	2,115	1,987	178	2,008
<b>Both income sources</b>	-	<b>72</b>	<b>11.2</b>	<b>2,617</b>	<b>581</b>	<b>52</b>	<b>4,569</b>	<b>263,640</b>	<b>15,260</b>	<b>17,541</b>	<b>32,801</b>	<b>29,603</b>	<b>2,653</b>	<b>30,184</b>

Note: For only fingerling producers, only fish farmers with a non-missing profit and with stated fingerling production are considered. In all other cases, the sample is restricted to the production-related sample.

Most fish farmers with positive fish-related income have no additional fingerling income. Among 158 fish farmers with only fish income.

Table 68 illustrates the different training content of the interviewed beneficiaries split by provider.

**Table 68: Fish famers' number of observations and percentage of beneficiaries of training per training provider and per region (all fish farmer regarded)**

Training	Amoron'i Mania (N=461)	Haute Matsiatra (N=183)
Benefited (all)	91.97%	96.17%
APDRA	90.24%	93.99%
Other (1,2,3,4,5,6,10)	8.89%	13.11%

Next, Table 69 focuses on the application of training content. The analysis limits to respective training participants. The majority stated training by APDRA.

**Table 69: Fish famers' percentage of application per provider and per region (all fish farmer regarded)**

Training	Amoron'i Mania	Haute Matsiatra
APDRA	96.86%	95.93%
Other (1,2,3,4,5,6,10)	82.00%	63.04%

In all categories, high application rates are observable, even close to 100% for APDRA.

## 4 APPENDIX

### 4.1 APPENDIX 1: RESULTS MATRIX

#### Anlage 1: Wirkungsmatrix des Moduls

Bezeichnung des TZ-Moduls

Nachhaltige Süßwasser Aquakulturentwicklung in Madagaskar

Projektnummer

2016.0126.9-003

Land/Region

Madagaskar

Wirkungsmatrix erstellt am

07.05.2021

Ziele	Indikatoren	Quellen	Annahmen
<p><b>Programmziel:</b> Entfällt.</p> <p>Das Modul leistet einen Beitrag zur Zielerreichung der BMZ-Sonderinitiative „EINEWELT ohne Hunger“ (SEWOH) zur Beseitigung von extremer Armut und Hunger. Fischprodukte aus nachhaltigem und ressourcenschonendem Wildfang und Aquakultur durch handwerkliche Betriebe tragen zur Bekämpfung von Unter- und Mangelernährung entscheidend bei.</p> <p>Dieses Globalvorhaben ist keinem der 6 Aktionsfelder der SEWOH zugeordnet.</p>			
<p><b>Modulziel</b></p> <p>Der Bevölkerung, die in ausgewählten Regionen der Ostküste, des Hochlandes und im Großraum Antananarivo unter Ernährungsunsicherheit leidet, stehen mehr Fischprodukte und ein höheres Einkommen aus nachhaltiger klein- und mittelbäuerlicher Aquakultur zur Verfügung.</p>	<p><b>1:</b> Die für ernährungsunsichere Bevölkerung zugängliche Menge an Fischprodukten aus Aquakultur ist gestiegen.</p> <p>Basiswert: 37.000 kg im Hochland + 56.500 kg Ostküste Fischprodukte auf lokalen Märkten zum Preis bis zu 9.440 MGA/kg (entspricht 2,40 EUR/kg)</p> <p>Zielwert: 100.000 kg im Hochland + 59.500 kg Ostküste Fischprodukte auf lokalen Märkten zum Preis bis zu 9.440 MGA/kg (entspricht 2,40 EUR/kg)</p>	<p>Auswertung von Studien und Statistiken zur Fischproduktion aus Aquakultur und ihrer lokalen, bzw. Regionalen Verkaufs- bzw. Konsumraten (lokale/urbane Märkte, Farm- und Straßenverkäufe).</p>	<p>Im Land herrscht politische Stabilität.</p> <p>Die politische Unterstützung der Entwicklung des Aquakultursektors bleibt bestehen.</p> <p>Es treten keine extremen Naturkatastrophen und Wetteranomalien auf.</p>
	<p><b>2:</b> Das Einkommen in der Wertschöpfungskette Aquakultur ist gestiegen.</p>	<p>Auswertung von Gender-Studien zur Arbeitsplatz- und</p>	

Ziele	Indikatoren	Quellen	Annahmen
	<p>Basiswert: 0,8 Milliarden MGA/Jahr (entspricht 204.266 EUR/Jahr) Einkommen Frauen und 1,7 Milliarden MGA/Jahr (entspricht 434.064 EUR/Jahr) Einkommen Männer im Hochland + 0,77 Milliarden MGA/Jahr (entspricht 192.295 EUR/Jahr) Einkommen Frauen und 0,79 Milliarden MGA/Jahr (entspricht 198.707 EUR/Jahr) Einkommen Männer an der Ostküste</p> <p>Zielwert: 2 Milliarden MGA/Jahr (entspricht 510.664 EUR/Jahr) Einkommen Frauen und 3,3 Milliarden MGA/Jahr (entspricht 842.596 EUR/Jahr) Einkommen Männer im Hochland + 0,92 Milliarden MGA/Jahr (entspricht 230.673 EUR/Jahr) Einkommen Frauen und 0,95 Milliarden MGA/Jahr (entspricht 238.365 EUR/Jahr) Einkommen Männer an der Ostküste.</p>	Einkommenssituation in der Reis-Fisch-Kultur und Teichwirtschaft.	
	<p><b>3:</b> Madagaskar setzt Maßnahmen zur nachhaltigen Nutzung und zum Erhalt der natürlichen Ressourcen in Binnen- und Küstengewässern gemäß den FAO-Richtlinien für Aquakultur um.</p> <p>Basiswert: 11 Maßnahmen aus FAO-konformen Aquakulturstrategien, Bewirtschaftungsplänen, Aktionsplänen in der Umsetzung</p> <p>Zielwert: 15 Maßnahmen aus FAO-konformen Aquakulturstrategien, Bewirtschaftungsplänen, Aktionsplänen in der Umsetzung</p>	Auswertung von Plänen und Umsetzungsdirektiven des MAEP.	
<p><b>Output A:</b> <b>„MEHR FISCH, MEHR ARBEIT“</b> Die Produktion und der damit einhergehende Bedarf an Arbeitskräften in der Reis-Fisch-</p>	<p><b>A.1:</b> Betriebe der Reis-Fisch-Kultur haben ihre Produktion gesteigert. Basiswert: 0 kg/Jahr Produktionsleistung von 0 Betrieben Zielwert: 104.000 kg/Jahr Produktionsleistung von 6.500 Betrieben</p>	Auswertung von Gender-Studien zur Arbeitsplatz- und Einkommenssituation in der Nassreis-Aquakultur und Teichwirtschaft.	Es entstehen keine Wasser- und Landnutzungskonflikte.

Ziele	Indikatoren	Quellen	Annahmen
Kultur sind in der Zielregion erhöht.	<p><b>A.2:</b> Die Anzahl von Arbeitsplätzen in der Wertschöpfungskette Reis-Fisch-Kultur ist gestiegen. Basiswert: 0 Arbeitsplätze Frauen und 0 Arbeitsplätze Männer Zielwert: 963 zusätzliche Arbeitsplätze Frauen und 353 zusätzliche Arbeitsplätze Männer</p>	Auswertung von Gender-Studien zur Arbeitsplatz- und Einkommenssituation in der Reis-Fisch-Kultur.	
	<p><b>A.3:</b> Lokale Brutbetriebe in ausgewählten Distrikten der Zielregion produzieren mehr Besatzfische für die Reis-Fisch-Kultur. Basiswert: 0 Brutbetriebe produzieren 0 Besatzfische im Hochland Zielwert: 950 Brutbetriebe produzieren 3,2 Millionen Besatzfische im Hochland</p>	Auswertung von Daten und Statistiken der betreffenden MAEP Distriktbüros; Projekterhebungen und berichte; Baseline-, Follow-on und Enderhebungen.	
	<p><b>A.4:</b> Die Fläche nachhaltiger und klimaresilienter Fischproduktion in der Reis-Fisch-Kultur in ausgewählten Distrikten des Hochlandes ist angestiegen. Basiswert: 0 ha nachhaltige Fischproduktion im Nassreisfeldbau im Hochland Zielwert: 650 ha nachhaltige Fischproduktion im Nassreisfeldbau im Hochland</p>	Auswertung von Daten und Statistiken der betreffenden MAEP Distriktbüros; eigene Erhebungen.	
<p><b>Output B:</b> <b>„MEHR FISCH, MEHR ARBEIT“</b> Die Produktion und der damit einhergehende Bedarf an Arbeitskräften in der Teichwirtschaft in den Zielregionen (Hochland, Ostküste) sind erhöht.</p>	<p><b>B.1:</b> Betriebe der Teichwirtschaft im Hochland und an der Ostküste haben ihre Produktion gesteigert. Basiswert: 76.000 kg/Jahr Produktionsleistung von 600 Betrieben im Hochland + 284.600 kg/Jahr Produktionsleistung von 340 Betrieben an der Ostküste Zielwert: 103.300 kg/Jahr Produktionsleistung von 600 Betrieben im Hochland + 341.400 kg/Jahr Produktionsleistung von 380 Betrieben an der Ostküste</p>	Auswertung von Daten und Statistiken der betreffenden MAEP Distriktbüros und von TDE; Projekterhebungen und berichte; Baseline-, Follow-on und Enderhebungen.	Es entstehen keine Wasser- und Landnutzungskonflikte.

Ziele	Indikatoren	Quellen	Annahmen
	<p><b>B.2:</b> Die Anzahl von Arbeitsplätzen in der Wertschöpfungskette Teichwirtschaft im Hochland und an der Ostküste ist gestiegen. Basiswert: 425 Arbeitsplätze Frauen und 574 Arbeitsplätze Männer im Hochland + 621 Arbeitsplätze Frauen und 727 Arbeitsplätze Männer an der Ostküste Zielwert: 546 Arbeitsplätze Frauen und 655 Arbeitsplätze Männer im Hochland + 744 Arbeitsplätze Frauen und 872 Arbeitsplätze Männer an der Ostküste</p>	Auswertung von Gender-Studien zur Arbeitsplatz- und Einkommenssituation in der Teichwirtschaft.	
	<p><b>B.3:</b> Die Produktion von qualitativ hochwertigen Besatzfischen (Karpfen und Tilapia) ist gesteigert. Basiswert: 350 Brutbetriebe im Hochland produzieren 3,16 Millionen hochwertige Besatzfische/Jahr + 1 Brutbetrieb an der Ostküste produziert 1,5 Millionen hochwertige Besatzfische/Jahr Zielwert: 350 Brutbetriebe im Hochland produzieren 5,6 Millionen hochwertige Besatzfische/Jahr + 1 Brutbetrieb an der Ostküste produziert 1,95 Millionen hochwertige Besatzfische/Jahr</p>	Auswertung der Daten und Statistiken der betreffenden MAEP Distriktbüros und des TDE Brutbetriebs an der Ostküste; eigene Erhebungen und Berichte; Dokumentationen von Ausbildungs- und Trainingsmaßnahmen sowie Monitoring ihrer Anwendung.	Periodisch oder erratisch auftretende Trockenzeiten schränken die Wasserverfügbarkeit und damit die Produktion des Brutbetriebes an der Ostküste nicht ein. Kein Virus- oder Krankheitsbefall in Brut- und Produktionsbetrieben
<p><b>Output C:</b> <b>„NACHHALTIGER FISCH“</b> Die Voraussetzungen für die Umsetzung einer nachhaltigen und ressourcenschonenden Aquakultur sind verbessert.</p>	<p><b>C.1:</b> In Madagaskar wurden Vorgaben zur nachhaltigen und ressourcenschonenden Aquakultur beschlossen. Basiswert: 13 Vorgaben Zielwert: 17 Vorgaben</p>	Auswertung der dokumentierten Vereinbarungen (z.B. Strategien, Aktionspläne, Bewirtschaftungspläne), Protokolle von Planungs- und Entscheidungssitzungen.	Die Fischereibehörde investiert in die Umsetzung der Aquakulturstrategie. Zusammenarbeit zwischen dem Privatsektor und öffentlichen Partnern verläuft konstruktiv.
	<p><b>C.2:</b> Eine Multi-Stakeholder-Plattform für Süßwasser-Aquakultur in Madagaskar hat 5 Mal getagt.</p>	Auswertung der Satzung der Plattform, Sitzungsprotokoll, Teilnehmerliste.	

Ziele	Indikatoren	Quellen	Annahmen
	<p>Basiswert: 0 Tagungen der Multi-Stakeholder-Plattform für Süßwasser Aquakultur (2017)</p> <p>Zielwert: 10 Tagungen der Multi-Stakeholder-Plattform für Süßwasser Aquakultur</p>		
	<p><b>C.3:</b> Ein Handbuch zu „Best Practices“ für nachhaltige und klimaresiliente Süßwasser Aquakultur in Madagaskar ist veröffentlicht.</p> <p>Basiswert: kein Handbuch zu „Best Practices“ in der Süßwasser Aquakultur (2017)</p> <p>Zielwert: 1 Handbuch zu „Best Practices“ in der Süßwasser Aquakultur ist veröffentlicht.</p>	<p>Auswertung des Handbuchs; Übergabe an nationale Ausbildungsinstitutionen und „Multiplikatoren“.</p>	
	<p><b>C.4:</b> Teilnehmer/innen an Trainingsmaßnahmen wenden die zur nachhaltigen Aquakultur vermittelten Inhalte an.</p> <p>Basiswert: 0 der 5.290 teilnehmenden Frauen und 0 der 10.230 teilnehmenden Männer im Hochland + 0 der 15 teilnehmenden Frauen und 0 der 35 teilnehmenden Männer an der Ostküste</p> <p>Zielwert: 1.840 der 5.290 teilnehmenden Frauen und 7.140 der 10.230 teilnehmenden Männer im Hochland + 12 der 15 teilnehmenden Frauen und 28 der 35 teilnehmenden Männer an der Ostküste</p>	<p>Auswertung von Trainings- und Ausbildungsmaterialien der Träger und Berater; Teilnehmerlisten; Gender-disaggregierte Erhebungen über die Anwendung verbesserter Verfahren und Aquakultur von Teilnehmerinnen und Teilnehmern an den Trainingsmaßnahmen des Moduls.</p>	
	<p><b>C.5:</b> Eine bewusstseinsbildende Kampagne über den ernährungsphysiologischen Wert von Fischkonsum ist entwickelt und im Hochland umgesetzt.</p> <p>Basiswert: 0 Kampagnen</p> <p>Zielwert: 1 breitenwirksame Kampagne über den Zeitraum von einem 1 Monat, 1 Schulkampagne über den Zeitraum von 2 Monaten</p>	<p>Auswertung von Berichten und Dokumentationen zur Identifikation und Analyse von verbesserungsfähigen Wertschöpfungsketten; Dokumentation der Modellentwicklungen und -pläne, Markt- und Wirtschaftlichkeitsstudien.</p>	

Output	Wesentliche Aktivitäten zu Outputs	Inputs / Geplante Instrumente	Annahmen
Output A	<ul style="list-style-type: none"> <li>• Training und Unterstützung von Bauern und Bäuerinnen in der Zielregion für die Anwendung nachhaltiger, verbesserter und/oder neuer klimaresilienter Aquakultur Techniken im Nassreisanbau (Düngung, Besatz, Ernte, Tiergesundheit)</li> <li>• Training und Unterstützung von Bauern und Bäuerinnen in der Zielregion zum Aufbau effizienter lokaler Brutbetriebe für Besatzfische in Nassreisanbauflächen</li> <li>• Stärkung kaufmännischer Kapazitäten</li> <li>• Förderung der Diversifizierung im Nassreisanbau durch Integration von Aquakultur</li> </ul>	<p>Grant Agreement mit der französischen NRO APDRA</p> <p>Internationale und nationale Langzeitfachkräfte</p> <p>Entwicklungshelferin</p>	
Output B	<p>Hochland:</p> <ul style="list-style-type: none"> <li>• Training und Unterstützung von Betreiberinnen und Betreibern von Teichwirtschaftsbetrieben im effizienten Teichmanagement (Teichkonstruktion, Düngung, Besatz, Fütterung, Ernte, Tiergesundheit)</li> <li>• Training und Unterstützung von Brutbetrieben für die Aufzucht hochwertiger Besatzfische</li> <li>• Training lokaler Futtermittelproduzenten in der Produktion und dem Vertrieb hochwertiger Futtermittel</li> <li>• Stärkung kaufmännischer Kapazitäten</li> </ul> <p>Ostküste:</p> <ul style="list-style-type: none"> <li>• Gründung einer neuen Kooperative von kleinbäuerlichen Tilapia Teichwirtinnen und Teichwirten (organisiert in 4 Farmergruppen mit jeweils mindestens 10 Mitgliedern)</li> <li>• Schulung und bedarfsgerechte Unterstützung neuer Betreiberinnen und Betreiber beim Aufbau ihrer Tilapia Teichwirtschaft</li> <li>• Ausbildung und technische Unterstützung neuer Betreiberinnen und Betreiber in einem effektiven, semi-intensiven Produktionsmanagement von Tilapia Teichwirtschaft</li> </ul>	<p>Leistungsvertrag mit dem Beratungskonsortium COFAD/GOPA</p> <p>Grant Agreement mit der norwegischen NRO Norges Vel</p> <p>Nationale und Internationale Langzeitfachkräfte</p>	

Output C	<ul style="list-style-type: none"> <li>• Beratung und Unterstützung des Fischereiministeriums beim Aufbau einer Süßwasser Aquakultur Plattform</li> <li>• Bedarfsgerechte Unterstützung zur Entwicklung von Kapazitäten des Fischerei Ministeriums und seiner untergeordneten Behörden zur Umsetzung der Aquakulturstrategie</li> <li>• Identifizierung und Analyse von „Best Practices“ in der Süßwasser Aquakultur Madagaskars, mit besonderem Fokus auf die Regionen des Moduls (Hochland und Großraum Antananarivo)</li> <li>• Durchführung von zwei Sensibilisierungs-Kampagnen zum Nährwert von Fisch; eine auf Ebene von Schulkindern und eine breiter angelegte Kampagne</li> </ul>	Internationale und nationale Langzeitfachkräfte	
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## **1.1. Appendix 2: Questionnaires**

The following questionnaire files have been regarded as basis for the data collection and were given by GIZ to us:

- For fish farmers, the following questionnaire was used: 070723\_Fishfarmer2023MAD\_FOS.xlsx and 140723\_Fishfarmer2023MAD\_2
- For value chain actors, the following questionnaire was used: 070723\_Supplychainactor2023MAD
- For consumers, the following questionnaire was used: 120623\_Consumer2023MAD

## **1.2. Appendix 3: Analysis code**

Code has been transmitted in separate files that can be opened with any text editor and used with STATA. The following do-files were used and are submitted as separate files:

- Master.do
- 1.Fishfarmer\_Cleaning.do
- 1.Consumer\_Cleaning.do
- 1.VCActor\_Cleaning.do
- 2.Corrections.do
- 3.Cleaning\_fullsample.do
- 4.Transformation.do
- 5.Daily\_update.do
- 6.Analysis.do
- 7a.overview\_table\_ff.do
- 7a.overview\_table\_vca.do
- 8.MDG\_specific\_analysis.do

## **1.3. Appendix 4: Daily data quality output**

- 230721\_quality checks\_update6.zip

## **1.4. Appendix 5: Data**

Data has been transmitted in separate files in STATA and CSV format:

- Raw data
- Final data