
RESEARCH STUDY ON INCREASED FISH CONSUMPTION

For the GIZ Aquaculture Value Chains for Higher Income and Food Security
Project in Malawi 2022



Implemented by



SEPTEMBER 2022

Dr. Judith Kuchenbecker and Dr. Christine Ludwig

Content

List of tables	2
List of figures	3
Acronyms and abbreviations	4
Acknowledgments	4
Summary of findings.....	5
1 Background.....	6
1.1 Country context and project information.....	6
1.2 Aim of AVCP project	7
1.3 Objectives and main indicators of the research study	7
2 Methods.....	8
2.1 Study design and sample size	8
2.2 Survey preparations.....	8
2.3 Study area and selection of study participants	8
2.4 Data collection	9
2.5 Indicators	9
Indicator 1 (nutrition): Household dietary diversity score	9
Indicator 2 (nutrition): Fish consumption	10
Indicator 3 (food security): Food consumption score	10
Indicator 4 (food security): Household Food Insecurity Experience Scale	11
2.6 Statistical analyses	11
3 Results.....	12
3.1 Socio-economic information	12
3.2 Access to land, crops cultivated, home gardens, and livestock husbandry.....	13
3.3 Participation in food security projects.....	15
3.4 Comparison of socio-economic status among three study groups	15
3.5 Water and sanitation	16
3.6 Fish farming activities with intermittent harvest technique	16
3.7 Indicator 1: Higher household dietary diversity in intervention group	18
3.8 Indicator 2: Higher fish consumption in intervention group	21
3.9 Indicator 3: Higher food consumption scores in intervention group	23
3.10 Indicator 4: Highest experienced food security in intervention group.....	25
3.11 Correlations of socio-economic factors and main indicators	26
3.12 Summary of results based on calculated average indicators	27
4 Strengths and limitations	28
5 Conclusions and recommendations	28
6 References.....	28
ANNEX A: Additional information on usage of trap and pairwise comparisons of indicators	29
ANNEX B: Questionnaire round 1 June 2022.....	31
ANNEX C: Questionnaire round 2 August 2022.....	40

List of tables

Table 1 Main results of research study of increased fish consumption through intermittent harvest systems in Northern Region, Malawi 2022	5
Table 2 Overview on data collection tools	9
Table 3 Food groups of the household dietary diversity score	10
Table 4 Food groups, food items, and weights of the food consumption score.....	11
Table 5 Performed statistical tests to examine differences between and within the three study groups	12
Table 6: Sociodemographic characteristics of households	13
Table 7: Crops cultivated	14
Table 8: Access to land, ownership of home garden, access to fruit, and main use of produce	14
Table 9: Livestock husbandry	14
Table 10: Participation in food security projects	15
Table 11 Summary of socio-economic information of three study groups	16
Table 12: Fish farming activities	17
Table 13: Construction and usage of innovative trap	17
Table 14 Household dietary diversity (indicator 1) assessed at both time points (June and August) among the three study groups with cross-sectional analyses between groups (horizontal p-values) and longitudinal analyses within group (vertical p-values).....	19
Table 15 Number of days during past 7 days food group was consumed at both assessment rounds	20
Table 16 Primary sources of consumed food groups at assessment round 1.....	21
Table 17 Fish consumption (based on 7-day FFQ) (indicator 2) assessed at both time points (June and August) among the three study groups with cross-sectional analyses between groups (horizontal p-values) and longitudinal analyses within group (vertical p-values)	21
Table 18 Small and big fish consumption based on 24h dietary recall and 7-day FFQ as well as primary source of fish among the three study groups at both assessment time points.....	22
Table 19 Food consumption score (indicator 3) assessed at both time points (June and August) among the three study groups with cross-sectional analyses between groups (horizontal p-values) and longitudinal analyses within group (vertical p-values).....	23
Table 20 Household food insecurity experience score (indicator 4) assessed at both time points (June and August) among the three study groups with cross-sectional analyses between groups (horizontal p-values) and longitudinal analyses within group (vertical p-values)	25
Table 21 Correlations of main indicators and socio-economic indices.....	27
Table 22 Conclusions and recommendations	27
Table 23 Additional information on usage of trap and harvest outcomes	29
Table 24 Pairwise comparisons for outcome variables; effect sizes were only calculated for main indicators.....	30

List of figures

Figure 1 Example of an individual fishpond, and female farmer harvesting with innovative wire mesh fish trap	6
Figure 2 Four dimensions of food security (FAO 2006) and linkages to main indicators of the research study in Northern Malawi in 2022, IND=indicator	7
Figure 3 Study flow chart.....	12
Figure 4 Usage of animal produce among three study groups	15
Figure 5 Percentage of households with access to safe drinking water (during dry season) and improved latrine	16
Figure 6 Percentage of intervention group households reporting their highest priority for fish fingerlings produce at two assessment rounds.....	18
Figure 7 Percentage of intervention and control group 1 households reporting their highest priority for fish produce at two assessment rounds.....	18
Figure 8 Average household dietary diversity score calculated from both assessment rounds.....	19
Figure 9 Consumption of food groups among the three study groups at two assessment rounds.....	20
Figure 10 Average fish consumption (eating occasion/week) calculated from both assessment rounds	22
Figure 11 Average food consumption score calculated based on both assessment rounds	24
Figure 12 Percentage of food consumption score categories of three study groups at two assessment rounds.....	24
Figure 13 Percentage of FCS categories based on calculated average of both assessment rounds.....	25
Figure 14 Percentage of household food insecurity experience scale categories of the three study groups at two assessment timepoints	26
Figure 15 Percentage of households based on calculated average from both assessment rounds.....	26
Figure 16 Summary of results regarding average nutrition and food security indicators among three study groups	27
Figure 17 Results of AVCP three-arm comparison study on innovative wire mesh fish trap in relation to food security.....	28

Acronyms and abbreviations

ASF	Animal source food
AVCP	Aquaculture value chain project
BMZ	German Federal Ministry for Economic Cooperation and Development
FAO	Food and Agriculture Organization of the United Nations
FCS	Food consumption score
FFQ	Food frequency questionnaire
GIZ	German International Cooperation/Deutsche Gesellschaft für Internationale Zusammenarbeit
HDDS	Household dietary diversity score
HFIES	Household food insecurity experience scale
WHO	World Health Organization

Acknowledgments

We would like to give our appreciation to all who have been involved in this research study for their effort and great teamwork. We deeply thank all people in the villages who assisted this survey, especially, all respondents who patiently answered all questions. Special appreciation goes to Zione Chikumbu and Innocent Pangapanga for their hard work as national consultants and invaluable contribution to the accomplishment of this study. In addition, we would like to thank all enumerator, supervisors, and drivers for their motivated and dedicated work. Our gratitude goes to the GIZ Team in Malawi, especially to Mara Gellner, Catherine Mfitlodze, and Buga Sinyangwe for their support and valuable inputs as well as Sven Genschick from GIZ Eschborn.

Judith Kuchenbecker and Christine Ludwig

Summary of findings

This three-arm comparison study was conducted in June and August 2022 to evaluate an innovative wire mesh fish trap for intermittent harvest of small fish, implemented among farmers as part of the Aquaculture Value Chain for Higher Income and Food Security Project (AVCP) by the German International Cooperation (GIZ) and partners. The intervention group had access to fishponds, tailored training on fish farming, and the innovative fish trap. Control group 1 had access to fishponds and general fish farming training, whereas control group 2 had no access to fishponds nor respective trainings. Main nutrition and food security indicators (based on scores) significantly differed between study groups at both assessment rounds (except for household food insecurity experience scale at round 1) with the intervention group achieving higher nutrition and food security scores compared to both control groups. Looking at food security categories, intervention households tended to be more food secure than both control groups. There were no significant changes within groups (no seasonal effect), except for fish consumption which increased among all study groups. **Table 1** presents results calculated as average values based on both assessment rounds.

The innovative trap was the major technique used by intervention households for intermittent harvest in both assessments. Farmers were generally satisfied with the amount as well as the size of harvested fish. The vast majority rated the work-benefit ratio of the trap positively. Regarding the usage of fish produce, own consumption as well as selling were highest priorities for small fish (fingerlings), whereas selling was the highest priority for usage of big fish.

Table 1 Main results of research study of increased fish consumption through intermittent harvest systems in Northern Region, Malawi 2022

Nutrition indicator	Intervention group (n=53)	Control group 1 (n=52)	Control group 2 (n=55)	p-value
Average household dietary diversity score (IND1)	8.0 (6.5, 9.0)	6.0 (6.5, 9.0)	5.5 (4.0, 7.0)	<0.001 ^a
Average fish consumption (eating occasion/week) (IND2)	3.5 (2.0, 5.0)	2.5 (1.3, 3.5)	1.5 (1.0, 3.0)	<0.001 ^a
Food security indicator				
Average food consumption score (IND3)	61 (49.5, 75.8)	46.8 (37.8, 61.7)	40.5 (30.5, 52.8)	<0.001 ^a
Food consumption score categories				0.115 ^b
Poor	0.0%	0.0%	1.8%	
Borderline	13.2%	15.4%	30.9%	
Acceptable	86.8%	84.6%	67.3%	
Household food insecurity experience scale (IND4)				0.074 ^b
Food secure	15.1%	8.0%	3.7%	
Mildly food insecure	35.8%	22.0%	24.1%	
Moderately food insecure	24.5%	38.0%	46.3%	
Severely food insecure	24.5%	32.0%	25.9%	

Differences between groups were tested with: ^aKruskal-Wallis test and ^bChi-square; Post-hoc pairwise comparison showed significant differences regarding IND 1 to 3 (scores) between intervention group and both control groups, but not between control groups; IND= indicator

1 Background

The Aquaculture Value Chain for Higher Income and Food Security Project (AVCP) of GIZ and partners was conducted to improve the food security situation of food insecure households in Malawi. One project activity included development of an innovative wire mesh fish trap, which was exclusively introduced in the Northern Region of Malawi among AVCP project areas. For its evaluation, a research study on increased fish consumption through intermittent harvest systems was conducted in 2022, which results are presented within this report. This first chapter provides an overview on the country context, project activities, and objectives of the research study.

1.1 Country context and project information

Malawi is a landlocked country located in Southern Africa with its economy depending on agriculture. It is divided into three regions (Northern, Central, Southern), with a total of 28 districts. Malawi has a population of around 19m with over 70% living under the poverty line of 2.15US\$/day (The World Bank Group 2022a; 2022b). Around 65% of households suffer from moderate to severe household food insecurity (IPC 2022). Thus, there is a need to develop projects and agendas to ameliorate the food insecurity situation.

AVCP of GIZ and partners is part of the GIZ Global Program ‘Sustainable Fisheries and Aquaculture’ under the German Federal Ministry for Economic Cooperation and Development’s (BMZ) special initiative ‘One World – No Hunger’. It supports the Malawian government in implementing the ‘National Fisheries and Aquaculture Policy’ and promotes fish production from sustainable and resource-conserving aquaculture to increase the supply of fish products for the food insecure population, to create employment in, and rise income along the aquaculture value chain. It has trained fish farmers on various topics that are relevant to the aquaculture value chain. Some of the topics include pond construction fingerling production; feed production, harvesting techniques, and the use of the fish traps (**Figure 1**).

One challenge faced by smallholder farmers in Malawi is the unavailability of mono-sex fingerlings. The management of mixed sex fishponds is difficult, and ponds easily get overcrowded, resulting in poor growth of the fish. Intermittent harvest aims at reducing the stock of fish offspring (fingerlings) by regularly harvesting them. Size-selective simple traps were designed, and suitable baits identified to catch the offspring. The regular harvest of offspring/fingerlings should eventually increase total production of the pond. Furthermore, the regularly harvested small fish can serve as additional income (sold as fingerlings alive or as food fish) or contribute to the food security of the households by increasing the consumption of nutritious small fish. The technology of an innovative wire mesh fish trap has been tested since beginning of 2020 both in controlled conditions on station and on farm with six households. According to qualitative data from participating fish farmers, the households were able to regularly harvest and consume their fish (twice per week) compared to the baseline scenario without trap. Initial on-station trials suggest that the total production can be increased using traps. Trap distribution and tailored training on its usage started in December 2021.



Figure 1 Example of an individual fishpond (left picture© Zione Chikumbu and Innocent Pangapanga), and female farmer harvesting with innovative wire mesh fish trap (right picture ©GIZ AVCP/Spotlight Photography)

1.2 Aim of AVCP project

In respect to food security and nutrition, AVCP aims at increasing the sustainable production of fish and availability of fish products for food insecure households. This in turn might positively affect overall food availability, access, and stability regarding the dimensions of food security (FAO 2006).

1.3 Objectives and main indicators of the research study

As the goal of the innovative wire mesh fish trap is to improve the availability of fish for food insecure households in the region, the research study aimed to evaluate its impact on nutrition aspects and food security (**Figure 2**). For this purpose, the research study applied three internationally validated as well as one study-derived indicator (refer chapter 2.5, p.9). In addition, the study aimed to collect information on the usage of the innovative fish trap.

Main objectives and indicators

- To examine dietary and nutritional benefit of the innovative wire mesh fish trap

Nutrition indicators:

- Household dietary diversity score (HDDS)
- Fish consumption

- To examine its benefit on food security

Food security indicators:

- Food Consumption Score (FCS)
- Household Food Insecurity Experience Scale (HFIES)

Secondary objectives

- To collect information on usage and practice of the innovative fish trap
- To assess seasonal impact
- To collect information on project coverage and potential for scaling up

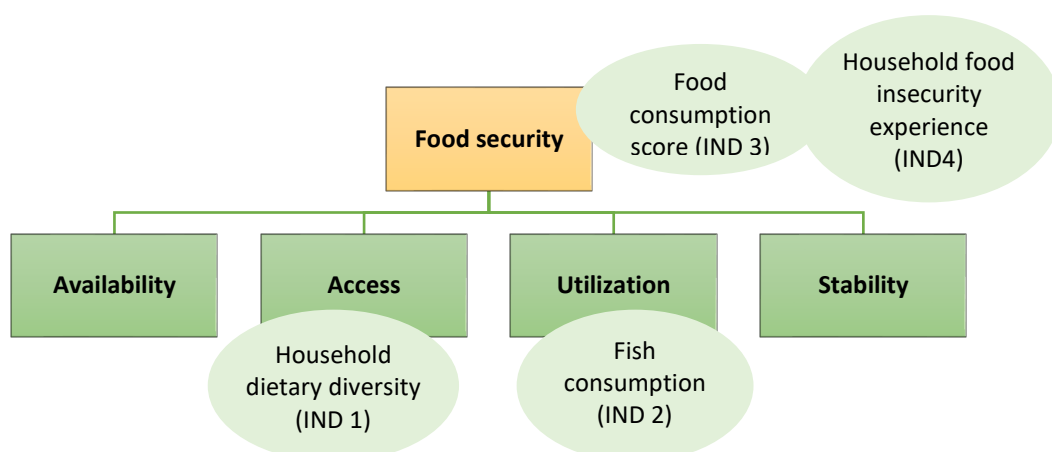


Figure 2 Four dimensions of food security (FAO 2006) and linkages to main indicators of the research study in the Northern Region of Malawi in 2022; IND=indicator

2 Methods

This chapter provides information on the study design, explains survey preparations and data collection procedures with detailed descriptions on assessed indicators.

2.1 Study design and sample size

This research was conducted as a three-arm comparison study with the following study groups:

- **Intervention group:** Households participating in AVCP, with access to fishponds, equipped with innovative wire mesh fish traps and specific aquaculture training
- **Control group 1:** Households participating in AVCP, with access to fishponds and general aquaculture training (no training on innovative fish trap)
- **Control group 2:** Households not participating in AVCP, with no access to fishponds nor aquaculture training

Data collection was conducted at two time points, namely June and August 2022, among all three groups allowing for cross-sectional analyses between groups and longitudinal analyses between and within groups.

There was no prior calculation of the sample size. At the timepoint of research planning, around 50 households had received the innovative wire mesh fish trap. Thus, the other two groups were also set to match the number of 50 households, leading to a total sample size of 150 households.

2.2 Survey preparations

Data collection tools were compiled by international consultants in collaboration with two national consultants. Respective questionnaires were translated into Chichewa and Tumbuka prior to training activities. To record data on electronic devices during field work, data collection tools were digitalized using Survey Solutions software by World Bank Group. The English version of questionnaires can be found in ANNEX B, p.31.

Prior to the enumerator training, national consultants were trained remotely by international consultants. In Malawi, national consultants conducted a 4-day training of enumerators as well as a pre-test. Final adaptation of data collection tools was done after a pre-test. For the second data collection round, questionnaires were adjusted and pre-tested following a short re-fresher training prior to assessment round 2.

The national consultants undertook a 2-day field trip to plan logistics of the upcoming survey in the Northern Region. Support in identifying households of the intervention and control group 1 was provided by local field coordinators of AVCP. Prior to starting the field work, village contact persons were informed about the up-coming research and asked for collaboration during the field work.

2.3 Study area and selection of study participants

The study was conducted in the Northern Region of Malawi in the districts of Nkhatabay and Mzimba (including Mzuzu). Within the two districts, eight extension planning areas (EPA) were included. To avoid a spill-over effect of project activities, different EPAs for each group was aimed for. To increase comparability between the three groups regarding living conditions, nearby EPAs were chosen. Visited EPAs were Emcizin, Mpamba (both intervention group), Chikangawa (intervention and control group 1), Kazomba, Mzenga (both control group 1), as well as Zombwe and Chintheche (control group 2).

Study participants of intervention and control 1 group were selected based upon provided beneficiary lists by the AVCP-project coordinator and confirmed by the field coordinator. For control group 2, participants were randomly selected at village sites after introducing the team and the purpose of this study to village leaders.

2.4 Data collection

The first round of data collection took place between 4th-9th June 2022. The second round was conducted between 8th-12th August 2022. Due to the finalization of overall project activities by the end of September 2022, no longer timespan between the assessment rounds was possible. Interviews were conducted in the local language of Chichewa or Tumbuka. After each survey day, data from the 24h recalls and food frequency questionnaires (FFQ) were checked for consistency between paper and electronic versions by supervisors and national consultants. In addition, after each survey round, scanned recalls and FFQs were sent via a secure platform and checked by international consultants. Any inconsistencies were corrected based on agreement of all consultants after re-checking with supervisors and if necessary, respondents. **Table 2** gives an overview on used data collection tools.

Table 2 Overview on data collection tools

Tool	Outcome	Assessment
General questionnaire*	Socioeconomic information of households	Via tablet only [#]
Fish farming questionnaire*	Usage of fish trap and harvest	Via tablet only [#]
Household food insecurity experience scale (Ballard 2013)	Food insecurity information of households (IND 3)	Via tablet only [#]
24h dietary recall (qualitative)	Household dietary diversity (IND1) (FAO 2011)	Paper-based records, then transfer to tablet
7-day Food frequency questionnaire	Fish consumption (IND2) Food consumption score (IND3) (WFP 2008)	Paper-based records, then transfer to tablet

*full set of questions were only applied for assessment round 1; for round 2 only questions on participation in food security projects remained; *only applied to intervention group; [#] Survey Solutions by World Bank Group, IND=indicator

2.5 Indicators

The innovative fish trap was evaluated by assessing two nutrition related indicators: HDDS and weekly fish consumption, as well as two food security indicators: FCS and HFIES (refer to chapter 1.3), which are described in the following paragraphs.

Indicator 1 (nutrition): Household dietary diversity score

The HDDS is used to capture the dietary diversity of a household, covering a time span of 24 hours. It shall reflect a household's economic ability to access a variety of foods. To assess dietary information from households, an open, qualitative 24h-recall was conducted, capturing dietary intake (foods and drinks) of all household members the day and night prior to the interview. The respondent had to be the person responsible for food preparation for the household on the previous day. Foods prepared in the home and consumed in the home or outside the home as well as foods purchased or gathered outside and consumed in the home were considered. Foods purchased outside the home and consumed outside were not considered. All recorded food items and drinks were assigned to predefined twelve food groups. Afterwards, HDDS was calculated by summing the number of food groups consumed in the household (FAO 2010). **Table 3**, p.10, presents the twelve food groups with locally consumed foods in Northern Malawi.

Table 3 Food groups of the household dietary diversity score

1	Cereals	Nsima, maize, porridge, bread/buns, rice, noodles, sweet beer or super shake/maheu, spaghetti, or other foods made from grains like sorghum, millet, rice, wheat, oats, corn-flakes, zitumbuwa, mandasi, mikate/vib
2	Roots and tubers	Sweet potatoes, Irish potatoes, yams, cassava (cassava-nsima, cassava-porridge (kondoole)), green unripe banana or any other foods made from white roots (zigege)
3	Vegetables	Dark green or medium-dark green leafy vegetables including wild green vegetables like cassava leaves, amaranthus, bean leaves, pumpkin leaves, rape, mustard, sweet potato leaves, cowpeas leaves, cabbage, eggplants (impwa), tomatoes, onions, green pepper, cucumber, thorny cucumber, okra, mushrooms (wowa), pumpkin, butternut, squash, carrots
4	Fruits	Ripe mangoes, ripe paw paws, granadilla, oranges, lemons, tangerines, bananas, avocado, coconut flesh, guava, custard apple, Mexican apple, watermelon, baobab, green mango, green pawpaw, grapes, strawberry, other wild fruits: masuku, mpundu, nthuza
5	Meat	Meat, such as beef, pork, lamb, mutton, goat, chicken, mice, rabbits, guinea pig, ducks, guinea fowls, small birds, wild game meat or sausage, Liver, kidney, heart, blood-based foods, or other organ meats
6	Eggs	Eggs from any kind of birds (chicken, duck, turkey, guinea fowls) including from wild birds
7	Fish and other seafood	Small fish (fingerlings eaten as whole fish): fresh, dried, fried, powdered, big fish (filet): fresh or dried fish, shellfish, or seafood, kapenta, kanyenya wa nsomba
8	Legumes, nuts and seeds	Mature beans or peas (fresh or dried), bambara nuts, lentils, soya (soya pieces, soya mince, soya sausage, soya milk), cowpeas, velvet beans, groundnuts (groundnut flour), sweet-mbalala, peanut-butter, tree-nuts (cashew nuts, macadamia nuts), pumpkin seeds, sunflower seeds
9	Milk and milk products	Milk (fresh or powder), cheese, yoghurt or other milk products
10	Oils and fats	Oil, fats or butter added to food or used for cooking, including extracted oils from nuts, fruits and seeds, and all animal fat
11	Sweets	Chocolates, sugar, sugar cane, honey, sweets, candies, cakes, or biscuits, ice cream, sweetened fruit juice or juice-drinks, sobo, soft drinks/fizzy drinks like, fanta, coca-cola, sprite, tea or coffee with sugar
12	Spices, condiments and beverages	Ingredients used in small amounts for flavor, such as chilies, pepper, ginger, spices, herbs, or fish powder, salt, tomato-paste, flavor cubs, beverages, tea or coffee without sugar

Indicator 2 (nutrition): Fish consumption

Fish consumption was calculated for each assessment round based on collected data from the FFQ. Results are presented as eating occasion/week. In addition, fish consumption was evaluated based on collected data via 24h dietary recall.

Indicator 3 (food security): Food consumption score

The FCS is used as a proxy indicator for food security. It measures how frequently (in terms of days of consumption) food is consumed and the diversity of household diets regarding nine different food groups (**Table 4**, p.11). To assess the different food groups consumed and the respective frequency, a 7-day FFQ was conducted, considering the 7 days prior to the interview (see questionnaire in ANNEX A p.29). The FCS was calculated using standardized weights for each food group reflecting its respective nutrient density and multiplying it with consumption frequency. Households were then classified as having “poor (0-21)”, “borderline (21.5-35)”, or “acceptable (>35)” food consumption based on standard thresholds of FCS (WFP 2008).

Table 4 Food groups, food items, and weights of the food consumption score

	Food group	Food items (examples)	Weight
1	Main staples	Maize, maize porridge, rice, sorghum, millet pasta, bread, other cereals, cassava, potatoes, sweet potatoes, other tubers, plantains	2
2	Pulses, nuts and seeds	Beans, peas, lentils, soya, groundnuts and cashew nuts	3
3	Vegetables	Tomatoes, carrots, beans, pumpkin, orange sweet potatoes, pumpkin leaves, cassava leaves, bean leaves, okra, mushrooms	1
4	Fruits	Banana, lemon, mango, papaya, guavas, avocado, oranges	1
5	Meat, eggs, and fish	Goat, beef, chicken, pork, bush mice, bush meat, kidney, heart, other organ meats, eggs, fish (dried or fresh) (meat and fish consumed in large quantities and not as a condiment)	4
6	Milk and other dairy products:	Fresh or powdered milk, sour milk, yogurt, other dairy products (Exclude margarine / butter or small amounts of milk for tea /coffee)	4
7	Oil and fats	Vegetable oil, margarine, animal fat and other fats / oil	0.5
8	Sugar and sweets	Sugar, honey, jam, cakes, candy, cookies, sugary drinks	0.5
9	Condiments	Spices, fish powder, small amounts of milk for tea, coffee	0

Indicator 4 (food security): Household Food Insecurity Experience Scale

The HFIES was applied to assess the food insecurity situation of the households (see questionnaire in ANNEX B, p.31). It measures the experience of a household's perceived food insecurity by applying eight occurrence questions with a reference period of the previous 4 weeks (Ballard et al. 2011). Afterwards, raw scores were calculated, and participants grouped into four categories of either "food secure (0)", "mildly food insecure (1-3)", "moderately food insecure (4-6)", or "severely food insecure (7-8)". In addition to presenting results on HFIES categories, calculated raw scores were used to calculate correlations with other variables as well as to better examine differences within and between groups, as numbers within categories of study groups were low, affecting statistical power.

2.6 Statistical analyses

Data were cleaned and analyzed using IBM SPSS Statistics Version 27 (IBM Corp. Released 2016. IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY: IBM Corp.). Descriptive analyses were conducted for all assessed variables. Values for main indicators were calculated for both assessment rounds as well as an average of both rounds. Inference analyses were conducted for main indicators as well as for calculated scores on socio-economic information to test for overall differences between groups. Regarding indicators based on scores, pairwise comparisons with post-hoc analyses were conducted. **Table 5**, p. 12 gives an overview on the applied statistical tests, based on meeting parametric assumptions. As FCS for round 2, did not have homogeneity of variances, WELCH-ANOVA, as a more robust test, was applied. As most variables were not normally distributed, correlations between metric variables were calculated and interpreted based on Spearman's rho. A p-value of <0.05 was considered as statistically significant.

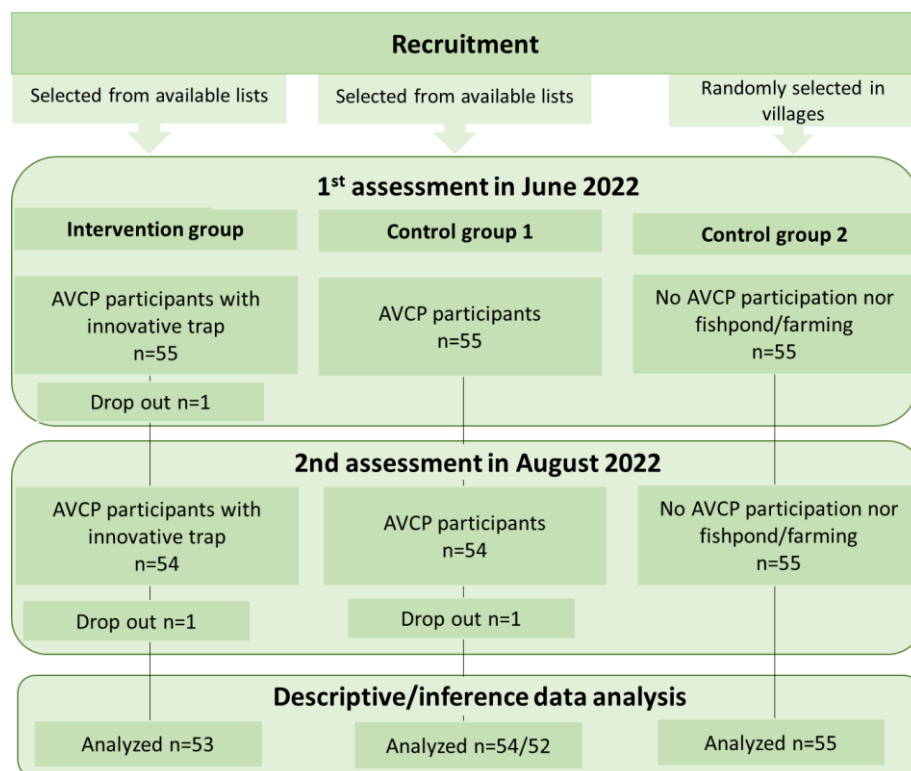
Table 5 Performed statistical tests to examine differences between and within the three study groups

Indicator	Test between groups	Test within groups
HDDS round 1 and 2	Kruskal-Wallis*	Wilcoxon test
Fish consumption round 1 and 2	Kruskal-Wallis*	Wilcoxon test
FCS	ANOVA*	Paired t-test
FCS round 2	WELCH-ANOVA*	
FCS categories	Chi-square	n.a.
HFIES raw score	Kruskal-Wallis*	Wilcoxon test
HFIES categories	Chi-square	n.a.

*Post-hoc tests for pairwise comparisons were done using Bonferroni-correction for Kruskal-Wallis test and Tukey and Dunnett-3 for (WELCH) ANOVA; HDDS=household dietary diversity score, FCS=food consumption score, HFIES=household food insecurity experience scale

3 Results

The research study included a total of 165 participants in the first assessment round (**Figure 3**) and 163 at round 2. One household was lost during follow-up and one household was interviewed as separate households during phase one and then combined at the second assessment. During data cleaning, two households were excluded as they did no longer meet the criteria of one study group, but rather switched to another. For two other households, no data from the 24h dietary recall and FFQ was available for round two. However, all other information was collected and included into the analyses.

**Figure 3 Study flow chart**

3.1 Socio-economic information

After the two assessment rounds, data of 163 study participants were available. Results are presented as mean±SD or frequencies with respective number of participants for the socio-economic information and regarding results from the fish farming questionnaire. Based on the distribution of variables, results of the main indicators are presented as median and interquartile range, mean±SD, or frequencies.

The main interviewee was the household head (**Table 6**). Most respondents were married monogamous. The majority of households of all three study groups had senior primary education. Notably, a higher share of households from control group 2 were casual laborers as compared to the other two groups.

Table 6: Sociodemographic characteristics of households

Characteristics	Intervention group (n=53)	Control group 1 (n=54)	Control group 2 (n=55)
Respondent to interview [n (%)]			
Household head	36 (67.9%)	33 (61.1%)	20 (36.4%)
Age of household head in years [mean±SD]	50.5±14.8	55.6±15.0	47.5±14.3
Sex of household head is male [%]	81.1%	66.7%	74.5%
Marital status of respondent [n (%)]			
married monogamous	38 (71.7%)	33 (61.1%)	38 (69.1%)
married polygamous	4 (7.5%)	4 (7.4%)	3 (5.5%)
widowed	3 (5.7%)	15 (27.8%)	9 (16.4%)
divorced/separated	4 (7.5%)	2 (3.7%)	3 (5.5%)
single	4 (7.5%)	-	2 (3.6%)
Education of household head [n (%)]			
No schooling	1 (1.9%)	1 (1.9%)	4 (7.3%)
junior primary (Standard 1-4)	4 (7.5%)	14 (25.9%)	8 (14.5%)
senior primary (Standard 5-8)	29 (54.7%)	28 (51.9%)	24 (43.6%)
junior secondary (Forms 1-2)	7 (13.2%)	8 (14.8%)	9 (16.4%)
senior secondary (Forms 3-4)	10 (18.9%)	3 (5.6%)	8 (14.5%)
More than secondary	1 (1.9%)	-	1 (1.8%)
don't know	1 (1.9%)	-	1 (1.8%)
Main occupation of household head [n (%)]			
Farmer	49 (92.5%)	41 (75.9%)	34 (61.8%)
Craftsmen	1 (1.9%)	4 (7.4%)	4 (7.3%)
Formal employment	1 (1.9%)	2 (3.7%)	4 (7.3%)
Casual labor (Ganyu)	-	2 (3.7%)	10 (18.2%)
Business	1 (1.9%)	4 (7.4%)	2 (3.6%)
None	1 (1.9%)	1 (1.9%)	1 (1.8%)
Main income sources [n (%)]			
Sale of own produced crops	49 (92.5%)	52 (96.3%)	37 (67.3%)
Sale of own produced fish products	50 (94.3%)	41 (75.9%)	-
Sale of own produced livestock products	19 (35.8%)	12 (22.2%)	5 (9.1%)
Sale of own produced/gathered goods	5 (9.4%)	2 (3.7%)	5 (9.1%)
Casual labor / temporary employment	13 (24.5%)	14 (25.9%)	22 (40%)
Petty trade / small business	7 (13.2%)	8 (14.8%)	16 (29.1%)
Employment / regular salary	2 (3.8%)	1 (1.9%)	4 (7.3%)
Remittance from relatives / husband	4 (7.5%)	9 (16.7%)	4 (7.3%)
Sale / exchange of public transfers	-	1 (1.9%)	-

3.2 Access to land, crops cultivated, home gardens, and livestock husbandry

The following section provides information on the households' access to arable land, different crops cultivated, ownership of home gardens, cultivation of vegetables, access to fruits as well as ownership of livestock. All households, except for one from control group 1, had access to arable land. Staples such as maize, cassava, and sweet potatoes (white and orange) were mainly cultivated. Groundnuts were mostly grown by households of control group 1, while beans were the main pulses grown by households of intervention and control group 2 (**Table 7**, p.14). Ownership of home gardens was lowest in control group 2 (9%), while in intervention and control group 1, more than 50% of households had a home garden (**Table 8**, p.14). Similarly, control group 2 had the lowest livestock keeping practice (**Table 9**, p.14). Although, the majority of households in all study groups used their livestock produce

for own consumption, sale of produce was more often practiced by households of intervention and control group 1 (**Figure 4**, p.15).

Table 7: Crops cultivated

	Intervention group (n=53)	Control group 1 (n=54)	Control group 2 (n=55)
Access to land [%]	100	98.1	100
Crop [%]		(n=53)	
Maize	98.1	92.5	80
Cassava	67.9	69.8	76.4
White sweet potato	52.8	69.8	61.8
Orange sweet potato	52.8	56.6	41.8
Rice	17	9.4	10.9
Plantain	7.5	5.7	3.6
Yams	7.5	9.4	0
Irish potato	11.3	13.2	0
Groundnuts	20.8	58.5	21.8
Soya	22.6	30.2	20
Beans	43.4	24.5	40
Cow peas	1.9	5.7	1.8
Green peas	5.7	1.9	3.6
Vegetables	66	45.3	45.5
Fruit	34	45.3	32.7
Sugar cane	18.9	13.2	7.3
Bambara nuts	1.9	0	5.5
Tobacco	0	1.9	1.8

Table 8: Access to land, ownership of home garden, access to fruit, and main use of produce

Variable [n (%)]	Intervention group (n=53)	Control group 1 (n=54)	Control group 2 (n=55)
Access to land	53 (100%)	53 (98.1%)	55 (100%)
Ownership of a home garden	28 (52.8%)	28 (51.9%)	5 (9.1%)
Cultivation of vegetables			
Only during the wet season	7 (13.2%)	7 (13.0%)	2 (3.6%)
Only during the dry season	8 (15.1%)	12 (22.0%)	-
All year round	13 (24.5%)	8 (14.8%)	3 (5.5%)
No cultivation	-	1 (1.9%)	-
Access to fruit	52 (98.1%)	51 (94.4%)	54 (98.2%)
Main use of fruit produce			
Mainly consumption	32 (61.5%)	36 (70.6%)	42 (77.8%)
Mainly Sale	9 (17.3%)	8 (15.7%)	6 (11.1%)
Both (approx. equal)	11 (21.2%)	7 (13.7%)	6 (11.1%)

Table 9: Livestock husbandry

	Intervention group (n=53)	Control group 1 (n=54)	Control group 2 (n=55)
Household owns livestock [n (%)]	47 (88.7%)	50 (92.6%)	41 (74.5%)
Poultry	44 (83.0%)	49 (90.7%)	39 (70.9%)
Cattle	15 (28.3%)	7 (13.0%)	3 (5.5%)
Pigs	14 (26.4%)	9 (16.7%)	3 (5.5%)
Goats	10 (18.9%)	25 (46.3%)	5 (9.1%)
Rabbits	3 (5.7%)	1 (1.9%)	-
Sheep	1 (1.9%)	-	-

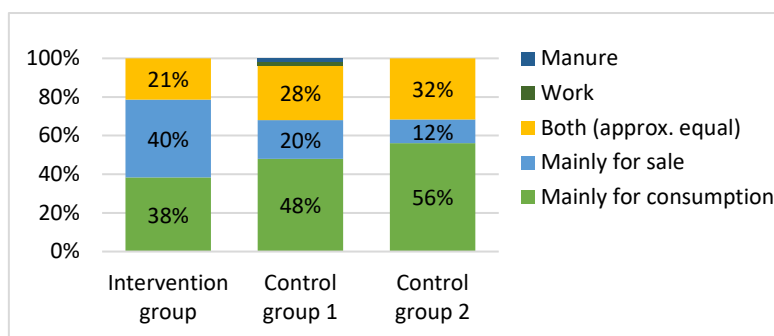


Figure 4 Usage of animal produce among three study groups

3.3 Participation in food security projects

Respondents were asked about their participation in food security projects currently implemented in the study area. An overview of implemented projects and the frequency of participation in each group is presented in **Table 10**. Households of control group 2 participated in less food security projects than the other two groups.

Table 10: Participation in food security projects

Food security project	Intervention group (n=53)	Control 1 group (n=54)	Control 2 group (n=55)
1st round June 2022 [n (%)]			
School feeding	18 (34.0%)	16 (29.6%)	8 (14.5%)
Agricultural Affordable Input Programme	33 (62.3%)	35 (64.8%)	28 (50.9%)
Agricultural Development Projects	36 (67.9%)	35 (64.8%)	25 (45.5%)
Public Works Programme	20 (37.7%)	23 (42.6%)	17 (30.9%)
Cash transfer	3 (5.7%)	4 (7.4%)	2 (3.6%)
Village Saving and Lending	32 (60.4%)	38 (70.4%)	35 (63.6%)
Home gardens	28 (52.8%)	26 (48.1%)	8 (14.5%)
Food Aid	3 (5.7%)	3 (5.6%)	2 (3.6%)
Project score 1st round [mean ± SD]	3.3 ± 1.6	3.3 ± 1.7	2.3 ± 1.5
2nd round August 2022 [n (%)]			
School feeding	23 (43.4%)	20 (37.7%)	8 (14.4%)
Agricultural Affordable Input Programme	35 (66.0%)	26 (49.1%)	27 (49.1%)
Agricultural Development Projects	52 (98.1%)	50 (94.3%)	41 (74.5%)
Public Works Programme	20 (37.7%)	25 (47.2%)	24 (43.6%)
Cash transfer	2 (3.8%)	9 (17.0%)	3 (5.5%)
Village Saving and Lending	34 (64.2%)	38 (71.7%)	32 (58.2%)
Home gardens	31 (58.5%)	29 (54.7%)	10 (18.2%)
Food Aid	-	1 (1.9%)	-
Project score 2nd round [mean ± SD]	3.7 ± 1.3	3.7 ± 1.5	2.6 ± 1.3

3.4 Comparison of socio-economic status among three study groups

To better compare the socio-economic status of households between the three study groups, mean scores of above presented information (refer to chapter 3.1, 3.2, and 3.3) were calculated and tested for differences using Kruskal-Wallis test with post-hoc analyses for pairwise comparison (**Table 11**, p.16). Income source score, livestock diversity score as well as food security participation scores were significantly lower in control group 2 compared to intervention and control group 1 (ANNEX A: **Table 24**, p.30). The latter two groups did not differ statistically significant. The higher income score of both AVCP groups might be linked to the extra source of income from selling fish, which is missing in all households of control group 2 as they were chosen as households with no access to fishponds (refer

Table 6, p.13). Similarly, participation in overall AVCP project activities might explain the higher food security project participation score of these two groups compared to control group 2.

Table 11 Summary of socio-economic information of three study groups

Socio-economic variable [mean±SD]	Intervention group (n=53)	Control group 1 (n=53)	Control group 2 (n=55)	p-value
Income source score	2.8±1.1	2.6±1.1	1.7±0.8	<0.001*
Crop diversity score	5.3±2.1	5.6±2.3	4.5±2.3	n.s.
Livestock diversity score	1.9±0.8	1.8±0.9	1.2±0.5	<0.001*
Food security participation score	3.5±1.3	3.6±1.4	2.5±1.3	<0.001*

*Pairwise comparisons: Control group 2 significantly differed from intervention group and control group 1; intervention group and control group 1 did not differ.

3.5 Water and sanitation

To have a better insight into living conditions of participating households, main source of drinking water and access to sanitation was assessed. **Figure 5** shows that the share of households to safe drinking water was best in control group 1 and worst in control group 2. Access to improved latrine was low among all study groups.

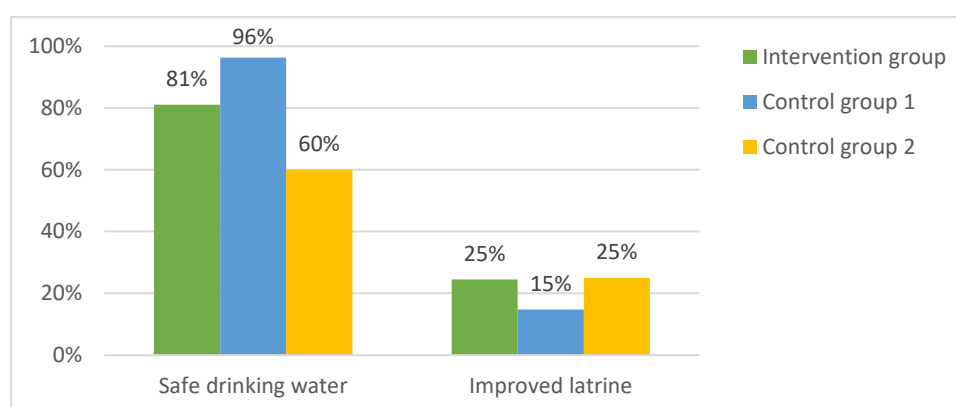


Figure 5 Percentage of households with access to safe drinking water (during dry season) and improved latrine

In summary, results regarding socio-economic and living conditions show that control group 2 seemed to be disadvantaged compared to intervention and control group 1. Thus, comparison between groups regarding main indicators and their differences between groups need to be considered with caution.

3.6 Fish farming activities with intermittent harvest technique

As intervention and control group 1 households were both beneficiaries of the overall AVCP, they were asked a set of questions regarding their fish farming activities with a focus on intermittent harvest of fingerlings and the technique used. The innovative wire mesh trap was the most commonly harvesting technique in the intervention group in both assessment rounds, while control group 1 used regular fish nets for intermittent harvests. All households except for one, used individual ponds and most received their pond from a family member (**Table 12**, p.17).

Table 12: Fish farming activities

	Intervention group (n=53)	Control group 1 (n=54)
Type of fishpond used [n (%)]		
Individual pond	53 (100%)	53 (98.1%)
Communal pond	-	1 (1.9%)
Number of ponds used [mean \pm SD]	1.5 \pm 0.8	1.4 \pm 0.7
Way pond was acquired [n (%)]		
Allocated by a family member	34 (64.2%)	30 (55.6%)
Inherited from a family member	4 (7.5%)	14 (25.9%)
Purchased	8 (15.1%)	3 (5.6%)
Granted by local leaders	6 (11.3%)	4 (7.4%)
Gift from a non-household member	1 (1.9%)	1 (1.9%)
Leasehold	-	1 (1.9%)
Moved in without permission	-	1 (1.9%)
Used intermittent harvest technology 1st round [n (%)]		
Hook and line	1 (1.9%)	6 (11.1%)
Reed or bamboo fence	1 (1.9%)	1 (1.9%)
Regular fish nets	15 (28.3%)	45 (83.3%)
Local fish trap	-	3 (5.6%)
Innovative wire mesh fish trap	48 (90.6%)	-
Used intermittent harvest technology 2nd round [n (%)]		
Hook and line	2 (3.8%)	13 (24.1%)
Reed or bamboo fence	-	1 (1.9%)
Regular fish nets	16 (30.2%)	46 (85.2%)
Local fish trap	1 (1.9%)	1 (1.9%)
Innovative wire mesh fish trap	52 (98.1%)	-

Further, intervention households were asked about the training received on the usage and construction of the innovative trap (**Table 13**). In June 2022, 89% of respective households had received the training, and when the second set of data was collected, all households were trained. However, only 80% had received all necessary parts to construct the trap by August 2022. Nonetheless, by August 2022, all intervention households stated that they had either started using the trap more than 6 months ago (29%) or within the last six months (71%). Some households were using borrowed traps or constructed the trap with their own materials. In June 2022, most households had used the innovative trap within the last week (51%) prior to the interview. In August 2022, most households had not used the trap for more than a week (67%). This might be due to the colder weather and the related lower reproduction rate of the fish. Regarding households training other farmers on how to use the trap, a total of 19 households (n=12 round 1, n=7 round 2) stated to have trained fellow farmers. More information on usage of the innovative trap can be found in the **Table 23**, ANNEX A, p.29.

Table 13: Construction and usage of innovative trap

	Intervention group	
Fish farming training and activity	Round 1 (n=48)	Round 2 (n=53)
Received training on innovative trap [n (%)]	47 (88.7%)	53 (100%)
Received parts to construct		
Some parts	15 (28.3%)	11 (0.8%)
All parts	38 (79.2%)	42 (79.2%)
Started using the trap		
More than six months ago	3 (6.3%)	15 (28.8%)
Within last six months	44 (91.7%)	37 (71.2%)
Trap last used		
within the last 3 days	2 (4.3%)	4 (7.7%)
within the last 7 days	24 (51.1%)	13 (25.0%)
no use for more than a week	21 (44.7%)	35 (67.3%)

To gain insight into the usage of produced fish fingerlings, intervention group households were asked to rate aspects of consumption, sale, restocking, exchange, or others (**Figure 6**). At assessment round 1 in June 2022, 36% stated that consumption was their highest priority of their fingerlings, while at round 2 in August 2022, almost 50% stated it as their highest priority. As fish fingerlings production was assumed to have been reduced during July and early August, the remaining output of fingerlings was rather used for consumption than for restocking.

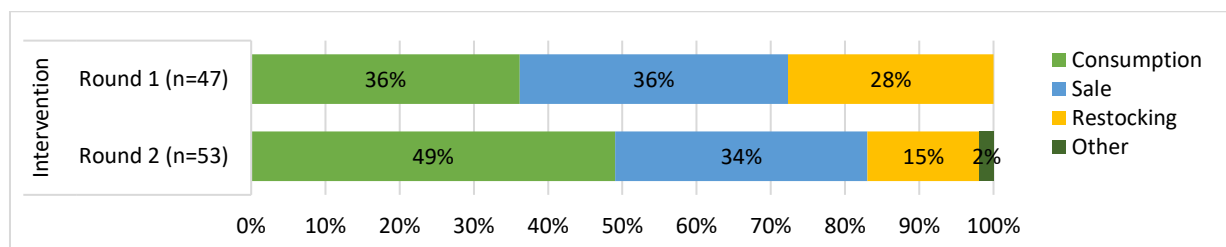


Figure 6 Percentage of intervention group households reporting their highest priority for fish fingerlings produce at two assessment rounds

Intervention and control group 1 households were further asked to rate the aforementioned aspects regarding the produce of big fish. In both groups, at both assessment rounds, the aspect of sale was rated as highest priority by majority of households (**Figure 7**).

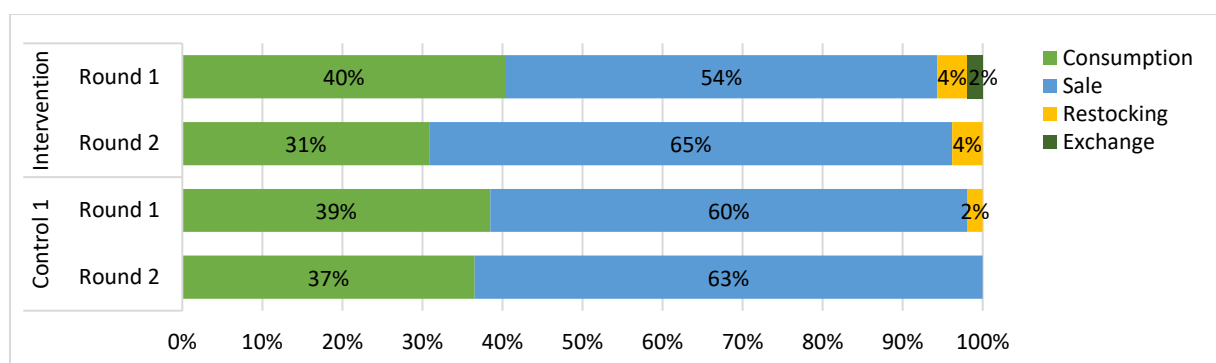


Figure 7 Percentage of intervention and control group 1 households reporting their highest priority for fish produce at two assessment rounds

3.7 Indicator 1: Higher household dietary diversity in intervention group

As this research study did not include baseline assessments (data before any project activity was done), it was not possible to measure a direct impact of the innovative wire mesh fish trap on the indicators. However, the results of this research study provide a solid foundation to compare the three different study groups at the two assessment timepoints.

Dietary diversity of households significantly differed between the three study groups at both assessment time points, with highest dietary diversity achieved in the intervention group (**Table 14**, p.19). Pairwise comparisons showed that households of the intervention group had significantly higher HDDS than control group 1 and control group 2, whereas HDDS did not differ between both control groups (**Figure 8**). Looking at effect sizes, the significant effect between intervention and control group 2 was stronger than between intervention and control group 1. This was the case for all calculated HDDS. Details on p-values and effect sizes can be found in **Table 24**, ANNEX A, p.30. There was no difference within groups or between groups regarding a change of HDDS from June to August. This might be due to similar climate conditions and seasons during the two assessment points.

Table 14 Household dietary diversity (indicator 1) assessed at both time points (June and August) among the three study groups with cross-sectional analyses between groups (horizontal p-values) and longitudinal analyses within group (vertical p-values)

indicator 1 (nutrition)	Intervention group (n=53)	Control group 1 (n=54 ^{1st})/(n=52 ^{2nd})	Control group 2 (n=55)	p-value
Household dietary diversity score (HDDS)				
HDDS ^{1st} (June)	8.0 (6.0, 9.0)	6.5 (4.8, 8.0)	5.0 (4.0, 7.0)	<0.001
HDDS ^{2nd} (August)	8.0 (6.0, 9.0)	6.0 (4.0, 7.8)	5.0 (4.0, 7.0)	<0.001
p-value	0.670	0.108	0.979	
Change in HDDS	0.0 (-2.0, 1.0)	0.0 (-2.0, 1.0)	0.0 (-1.0, 1.0)	0.525
Average HDDS	8.0 (6.5, 9.0)	6.0 (5.0, 7.4)	5.5 (4.0, 7.0)	<0.001

Values are presented as median and interquartile range, differences between groups were calculated with Kruskal-Wallis test; differences within groups were calculated with Wilcoxon test.

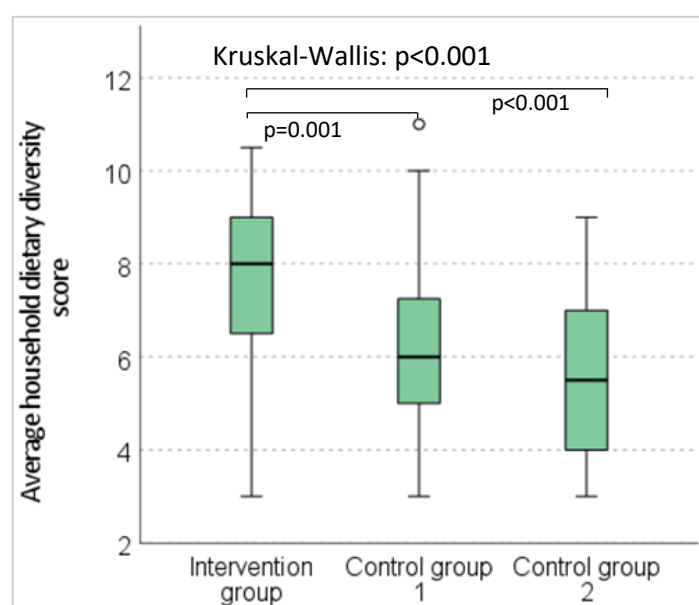


Figure 8 Average household dietary diversity score calculated from both assessment rounds

Figure 9, p.20, shows frequencies of consumed food groups assessed during the 24h dietary recall for both assessment rounds. Main consumed food groups, by all three groups, were “cereals”, “roots and tuber”, “vegetables”, and “spices, condiments, beverages”. Notably, food groups “fish”, “meat”, “fruits”, “oils and fats”, “sweets” were consumed by more households of the intervention group compared to control group 1 and control group 2. This indicates that the intervention group had a better access to a higher variety of foods. Similar results were obtained when analyzing the assessed consumption frequency of different food groups by FFQ (**Table 15**, p.20). It seemed that the purchase power was better, as most primary sources for the mentioned food groups was purchase (**Table 16**, p.21). This assumption is supported by pairwise comparisons between groups regarding consumption of oil and sugar, which are mainly purchased food items. At round one, the intervention group had significantly higher consumption of oil and sugar compared to control group 2 ($p=0.018$, $p=0.001$, respectively). At round two, the intervention group had significantly higher consumption of oil and sugar compared to both control groups (vs. control group 1: $p=0.024$, 0.001 ; vs. control group 2: $p=0.007$, <0.001 , respectively). However, whether the higher consumption of these food groups is a direct impact of an increased purchase power due the innovative intermittent harvest technique should be evaluated during focus group discussions with beneficiaries.

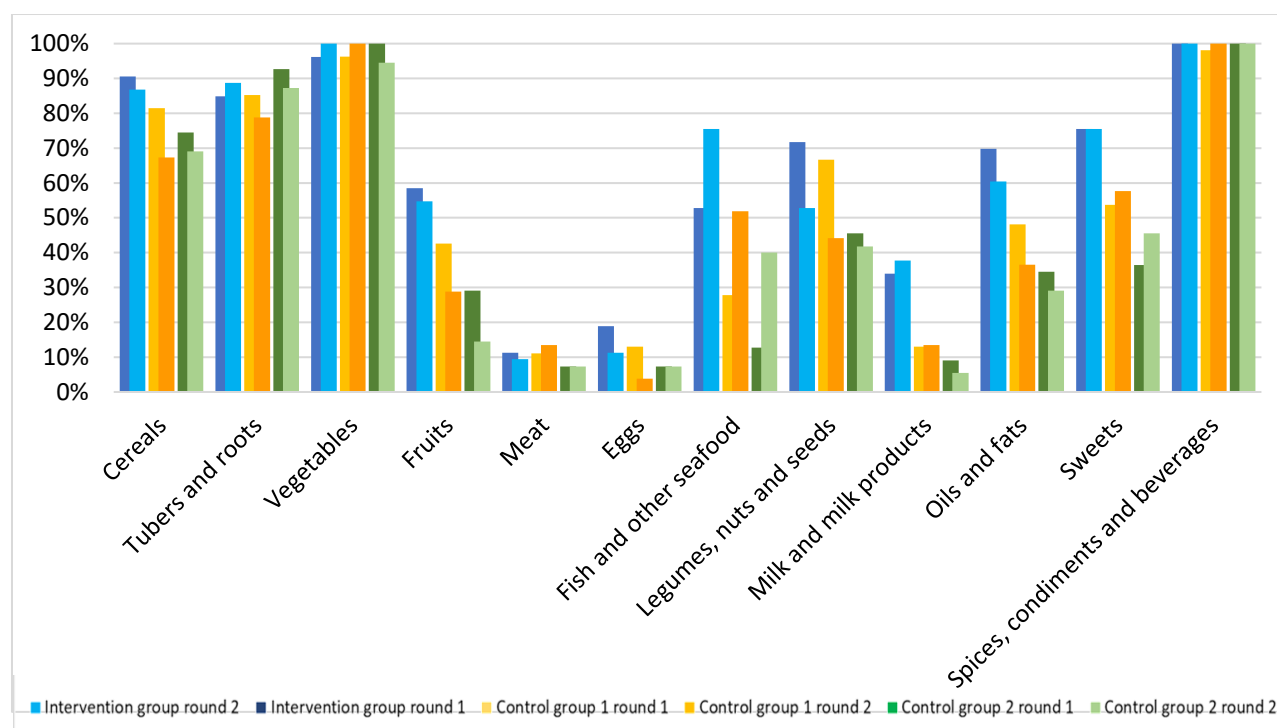


Figure 9 Consumption of food groups among the three study groups at two assessment rounds

Table 15 Number of days during past 7 days food group was consumed at both assessment rounds

Food group [mean±SD]	Intervention group		Control group 1		Control group 2	
	Round 1 (n=53)	Round 2 (n=53)	Round 1 (n=54)	Round 2 (n=52)	Round 1 (n=55)	Round 2 (n=55)
Cereals						
Maize	6.3±1.4	5.9±2.1	5.9±1.9	4.6±2.9	4.8±2.9	4.8±2.9
Rice	1.1±1.5	1.8±1.7	1.1±1.7	1.3±1.8	0.6±1	1±1.2
Wheat	1.7±1.9	1.2±1.7	0.5±0.9	0.5±1.3	0.2±0.6	0.3±0.7
Tubers	5.4±1.8	4.8±2.2	5.3±2	4.6±2.5	5.7±2	5.4±2.2
Vegetables	5.6±1.9	5.6±1.8	5.8±1.8	6.2±1.5	6±1.6	6±1.4
Fruit	3.9±2.9	3.4±2.7	3.4±2.8	2.3±2.1	2.2±2.4	1.3±1.9
Meat						
Red meat	0.5±0.8	0.4±0.8	0.5±0.9	0.4±0.8	0.1±0.4	0.2±0.6
Poultry	0.8±0.9	0.8±1	0.5±0.7	0.6±0.8	0.4±0.6	0.4±0.7
Eggs	0.9±1	1±1.2	0.9±1.2	0.7±1.2	0.7±1.1	0.7±1.4
Legumes	3±2.1	2.8±2.1	3.2±2.2	2.3±2.1	2±1.9	1.8±0.6
Milk						
Milk	1.1±2.2	1.3±2.4	-	-	0.3±1.3	0.02±0.1
Milk in tea	2.6±3	2±2.7	0.9±2	0.5±1.3	0.5±1.6	0.5±1.5
Oil	3.6±2.9	4±2.9	3.1±3	2.5±2.8	2.1±2.5	2.2±2.6
Sugar	4.6±2.5	5.1±2.5	3.7±3	3.3±2.9	2.7±2.8	2.7±3.1

Table 16 Primary sources of consumed food groups at assessment round 1

	Intervention group (n=53)	Control group 1 (n=54)	Control group 2 (n=55)
Food group	Primary source	Primary source	Primary source
Cereals			
Maize	Own production (83%)	Own production (80%)	Own production (55%)
Rice	Purchase (75%)	Purchase (73%)	Purchase (56%)
Wheat	Purchase (92%)	Purchase (93%)	Purchase (89%)
Tubers	Own production (81%)	Own production (94%)	Own production (91%)
Vegetables	Own production (87%)	Own production (91%)	Own production (89%)
Fruit	Own production (81%)	Own production (71%)	Own production (75%)
Meat			
Red meat	Purchase (100%)	Purchase (88%)	Purchase (100%)
poultry	Own production (50%)	Own production (76%)	Own production (70%)
Eggs	Purchase (62%)	Purchase (59%)	Own production (54%)
Legumes	Own production (63%)	Own production (65%)	Own production (67%)
Milk			
Milk	Own production (58%)	-	Purchase (75%)
Milk in tea	Purchase (75%)	Purchase (92%)	Purchase (57%)
Oil	Purchase (100%)	Purchase (94%)	Purchase (97%)
Sugar	Purchase (75%)	Own production (54%)	Purchase (49%)

3.8 Indicator 2: Higher fish consumption in intervention group

Among the three study groups, fish consumption (small and big fish combined) significantly differed at both assessment rounds, with highest consumption observed in the intervention group, followed by control group 1, and control group 2. Similar to results of dietary diversity, pairwise comparisons revealed that households of the intervention group had significantly higher fish consumption than control group 1 and control group 2, with no difference between both control groups (**Figure 10**, p.22). The significant effect between intervention and control group 2 was stronger than between intervention and control group 1, for all fish consumption variables. P-values and effect sizes can be found in **Table 24**, ANNEX A, p.30.

Within all three groups there was a significant increase in fish consumption between June and August (**Table 17**). This might be due to an awareness effect of the research study or saturated fish market. To guarantee safe fish consumption, an analysis of the fish from fishponds is advised to examine amounts of potential residues of pesticides or other non-wanted components in fish.

Table 17 Fish consumption (based on 7-day FFQ) (indicator 2) assessed at both time points (June and August) among the three study groups with cross-sectional analyses between groups (horizontal p-values) and longitudinal analyses within group (vertical p-values)

Indicator 2 (nutrition)	Intervention group (n=53)	Control group 1 (n=54 ^{1st})/(n=52 ^{2nd})	Control group 2 (n=55)	p-value
Fish consumption (occasion/week)				
Fish consumption ^{1st} (June)	3.0 (1.5, 4.0)	2.0 (0.8, 3.0)	1.0 (0.0, 2.0)	<0.001
Fish consumption ^{2nd} (August)	4.0 (2.0, 5.5)	3.0 (2.0, 4.0)	2.0 (1.0, 4.0)	<0.001
p-value	<0.001	0.001	0.001	
Change in fish consumption	1.0 (0.0, 2.0)	1.0 (0.0, 2.0)	1.0 (0.0, 2.0)	0.464
Average fish consumption	3.5 (2.0, 5.0)	2.5 (1.1, 3.5)	1.5 (1.0, 3.0)	<0.001

Values are presented as median and interquartile range, differences between groups were calculated with Kruskal-Wallis test; differences within groups were calculated with Wilcoxon test.

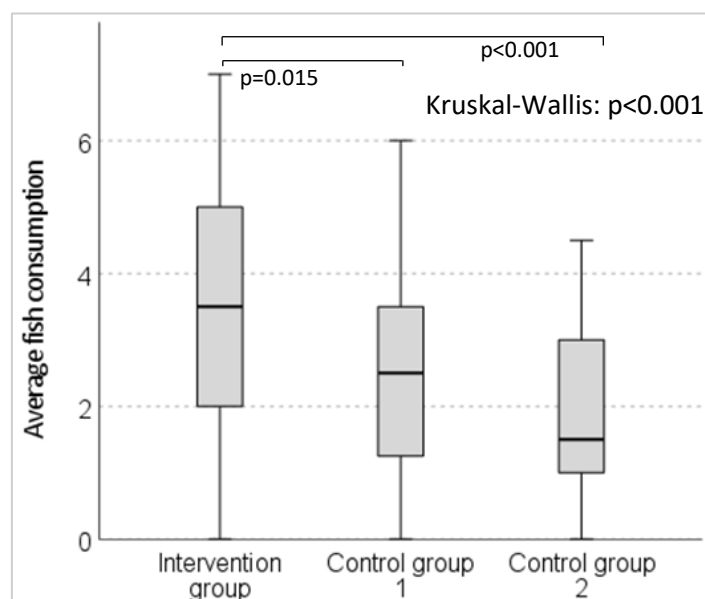


Figure 10 Average fish consumption (eating occasion/week) calculated from both assessment rounds

The research study further inquired whether small or big fish was consumed and the primary source for the fish (e.g., purchased, own production). **Table 18**, cont.p.23, shows that small fish tended to be eaten more often among groups. The majority of small and big fish were purchased. Notably, the share of fish coming from own production was higher in the intervention group compared to control group 1. However, own production as main source for small fish decreased from around 40% to 10% within intervention group, which was also consistent with results from the fish farming questionnaire. Here, 67% of households had reported not to have harvested with the innovative fish trap within the last seven days which is the same timeframe of the applied FFQ to assess fish consumption.

Notably, the more food insecure situation of control group 2 might also be depicted by the share of households who received fish as gift or traded it for other goods.

Table 18 Small and big fish consumption based on 24h dietary recall and 7-day FFQ as well as primary source of fish among the three study groups at both assessment time points

	Intervention group (n=53)	Control group 1 (n=54)	Control group 2 (n=55)
1st round June 2022			
Fish consumption [n (%)]			
Small fish consumed in past 24h	16 (30.2%)	8 (14.8%)	3 (5.5%)
Big fish consumed in past 24h	13 (24.5%)	7 (13.0%)	4 (7.3%)
Small fish consumed past 7 days [mean±SD]	1.45±1.7	0.74±1.0	0.84±1.3
Big fish consumed past 7 days [mean±SD]	1.49±1.6	1.20±1.7	0.58±1.1
Primary source of fish consumed [n (%)]			
Small fish	(n=32)	(n=22)	(n=24)
Purchase	19 (59.4%)	22 (100%)	23 (95.8%)
Own production	13 (40.6%)	-	-
Traded/bartered	-	-	1 (4.2%)
Big fish	(n=34)	(n=25)	(n=15)
Purchase	21 (61.8%)	19 (76.0%)	14 (93.3%)
Own production	13 (38.2%)	6 (24.0%)	-
Received as gift	-	-	1 (6.7%)

Table 18 continued

	Intervention group (n=53)	Control group 1 (n=52)	Control group 2 (n=55)
2nd round August 2022			
Fish consumption [n (%)]			
Small fish consumed in past 24h	31 (58.5%)	20 (37.0%)	19 (34.5%)
Big fish consumed in past 24h	16 (30.2%)	9 (17.3%)	4 (7.3%)
Small fish consumed past 7 days [mean±SD]	2.79±1.6	2.06±1.6	2.09±1.7
Big fish consumed past 7 days [mean±SD]	1.32±1.6	0.90±1.2	0.29±0.6
Primary source of fish consumed [n (%)]			
Small fish	(n=49)	(n=46)	(n=45)
Purchase	43 (87.8%)	40 (87.0%)	38 (84.4%)
Own production	5 (10.2%)	3 (6.5%)	-
Traded/bartered	1 (2.0%)	1 (2.2%)	4 (8.9%)
Received as gift	-	2 (4.3%)	2 (6.7%)
Big fish	(n= 31)	(n=25)	(n=11)
Purchase	17 (54.8%)	18 (72.0%)	11 (100%)
Own production	14 (54.2%)	6 (24.0%)	-
Traded/bartered	-	1 (4.0%)	-

3.9 Indicator 3: Higher food consumption scores in intervention group

To evaluate the food security situation among the three groups, the FCS as a metric variable as well as FCS categories were calculated. The FCS reflects a more “usual” diet compared to the HHDS, since it covers a 7-day recall period compared to the last 24-hours used in the HHDS. The FCS significantly differed between the three groups at both assessment rounds, with highest scores observed in the intervention group, followed by control group 1 and control group 2. Pairwise comparisons revealed significantly higher FCS for the intervention group compared to both control groups, but not difference between control groups (**Figure 11**, p.24). For all calculated FCS, the significant effect between intervention and control group 2 was stronger than between intervention and control group 1. P-values and effect sizes can be found in the (**Table 24**, ANNEX A, p.30). There were no significant differences within and between groups regarding the two assessment rounds (**Table 19**).

Table 19 Food consumption score (indicator 3) assessed at both time points (June and August) among the three study groups with cross-sectional analyses between groups (horizontal p-values) and longitudinal analyses within group (vertical p-values)

Indicator 3 (food security)	Intervention group (n=54)	Control group 1 (n=54 ^{1st})/(n=52 ^{2nd})	Control group 2 (n=55)	p-value
Food consumption score (FCS)				
FCS ^{1st} (June)	59.7±21.4	49.7±16.7	41.9±17.9	<0.001
FCS ^{2nd} (August)	62.5±21.2	48.9 ±16.5	42.1±14.7	<0.001
p-value	0.319	0.659	0.901	
Change in FCS	5.5 (-10.5, 17.5)	-2.8 (-9.9, 10.4)	1.5 (-6.0, 9.0)	0.951
Average FCS	61.1±18.8	49.4 ±14.7	42.0±13.9	<0.001

Values are presented as mean±SD, or median and interquartile range; differences between groups were calculated with ANOVA for FCS^{1st}, WELCH-ANOVA for FCS^{2nd}, Kruskal-Wallis test for change in FCS and average FCS; differences within groups were calculated with paired-t-test

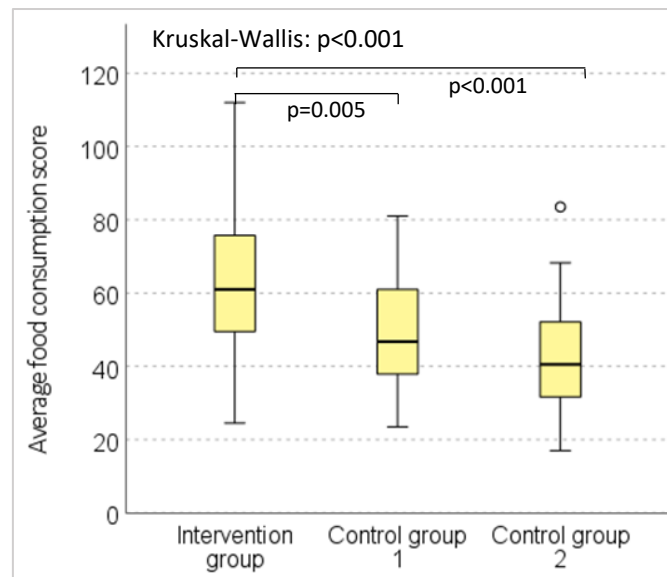


Figure 11 Average food consumption score calculated based on both assessment rounds

Regarding the allocation of households into “poor”, “borderline”, or acceptable” food scores categories, there were significant differences between groups ($p=0.033$ for assessment round 1, $p=0.019$ for assessment round 2) with highest shares of households of the intervention group having acceptable FCS (**Figure 12**). However, when conducting the Chi-square test for the calculated average categories, there was no significant difference between groups. This is due to the fact that after calculating the average of both assessments, more households had scores in the range of acceptable food consumption (**Figure 13**, p.25).

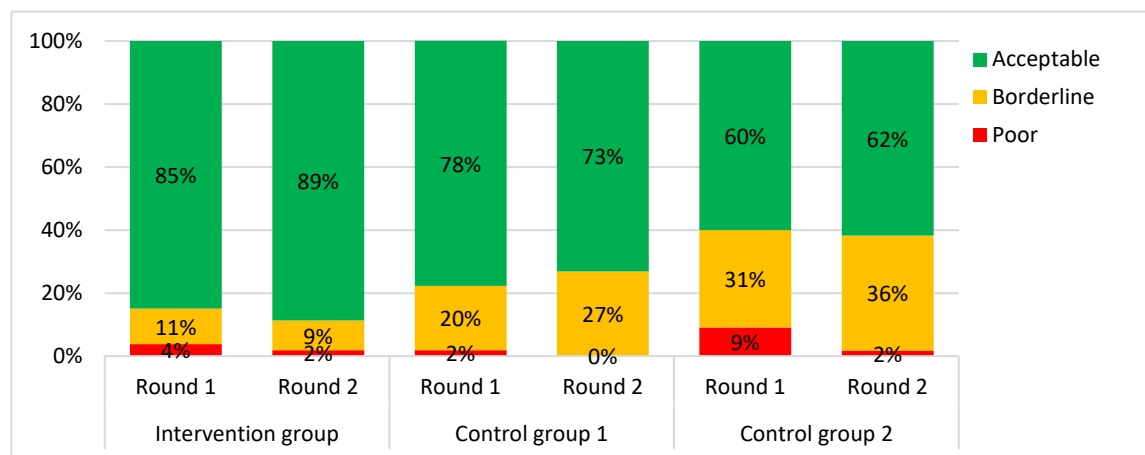


Figure 12 Percentage of food consumption score categories of three study groups at two assessment rounds

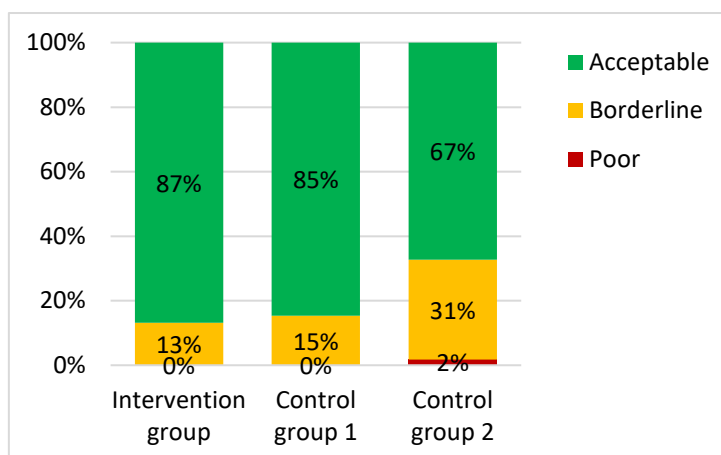


Figure 13 Percentage of FCS categories based on calculated average of both assessment rounds

3.10 Indicator 4: Highest experienced food security in intervention group

The second food security indicator applied in the research study was the HFIES. Regarding the HFIES raw score, there was no statistically significant difference between groups at the first assessment, but at the second assessment, with the lowest scores observed in the intervention group (the lower the score, the better the food security experience) (**Table 20**). There was no statistical change within groups between the two assessment rounds.

Table 20 Household food insecurity experience score (indicator 4) assessed at both time points (June and August) among the three study groups with cross-sectional analyses between groups (horizontal p-values) and longitudinal analyses within group (vertical p-values)

Indicator 4	Intervention group (n=54)	Control group 1 (n=54 ^{1st})/(n=52 ^{2nd})	Control group 2 (n=55)	p-value
Household food insecurity experience scale (HFIES)				
HFIES raw score ^{1st} (June)	4.0 (0.5, 7.0)	5.0 (1.3, 7.0)	5.0 (3.0, 7.0)	0.171
HFIES raw score ^{2nd} (August)	3.0 (1.0, 6.0)	6.0 (4.0, 7.0)	5.0 (3.0, 6.0)	0.018
p-value	0.269	0.058	0.120	
Change in HFIES	0.0 (-1.0, 1.0)	0.0 (-0.3, 2.0)	0.0 (-2.0, 1.0)	0.058
Average HFIES raw score	3.0 (1.0, 6.3)	5.5 (3.0, 6.6)	5.0 (3.0, 6.5)	0.069

Values are presented as median and interquartile range; differences between groups were calculated with Kruskal-Wallis test and Bonferroni correction for pairwise comparison, differences within groups were calculated with Wilcoxon test

Looking at the allocation of households into the categories (**Figure 14**, p.26), overall, the study groups significantly differed at assessment round 2, with the highest share of food secure households in the intervention group (p=0.215 for assessment round 1, p=0.002 for assessment round 2).

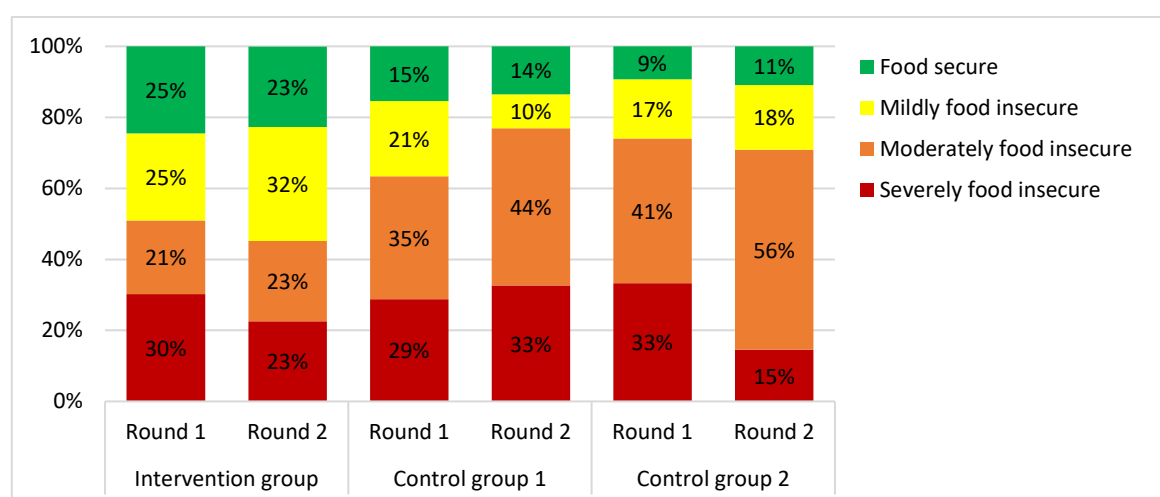


Figure 14 Percentage of household food insecurity experience scale categories of the three study groups at two assessment timepoints

To summarize both rounds, an average HFIES raw score was calculated. To fit the defined HFIES categories, new calculated scores were adjusted by rounding up decimal numbers to the next higher integer, e.g. 0.5 → 1, 3.5 → 4, if needed. As can be seen in **Figure 15**, this resulted in a lower share of households who were considered as food secure. There was no statistical difference between the three groups, but a higher share of intervention households seemed to be food secure or mildly food insecure compared to both control groups. The latter two groups had around 60% of households being moderately and severely food insecure which was similar to national surveys (IPC 2022). As the assessment was conducted during harvest and post-harvest season, food insecurity levels might increase during lean seasons. Whether results regarding differences in food security between groups are also still prevalent during lean seasons, should be examined by assessing HFIES at different seasons.

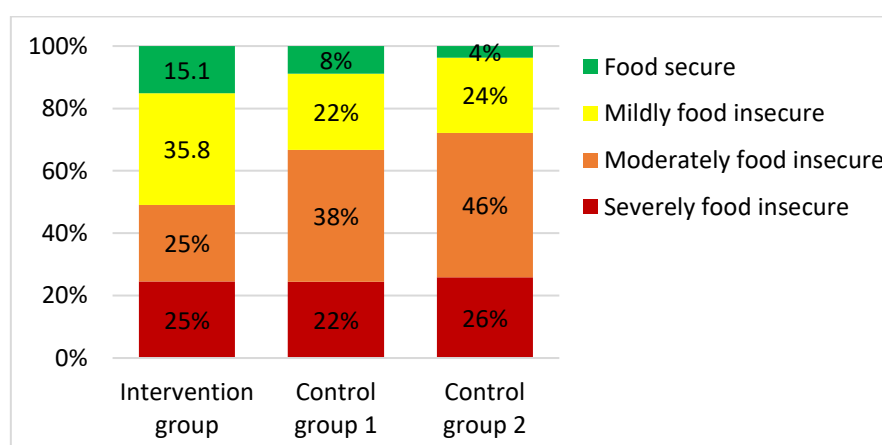


Figure 15 Percentage of households based on calculated average from both assessment rounds

3.11 Correlations of socio-economic factors and main indicators

A mean value of both assessment timepoints was chosen to calculate correlations between main indicators and socio-economic variables. Only statistically significant correlation coefficients are presented in **Table 21**, p.27. Expectedly, HDDS positively correlated with fish consumption and FCS. Further, the results show the importance of income and diverse agriculture/husbandry for dietary diversity and food consumption aspects, as they were positively correlated. Also logically, the higher the food insecurity experience was, the lower the HDDS and FCS, which supports the internal validity of the collected data.

Table 21 Correlations of main indicators and socio-economic indices

	HDDS	FCS	HFIESraw	Fishcon.	Income	Crop diversity	Livestock diversity	Food security project participation
HDDS		0.858	-0.605	0.553	0.369	0.344	0.282	0.344
FCS			-0.513	0.746	0.331	0.292	0.327	0.346
HFIESraw				-0.360	n.s.	-0.231	-0.242	n.s.
Fishcon.					0.193	n.s.	n.s.	n.s.
Income						0.385	0.263	0.385
Crop diversity							n.s.	0.387
Livestock diversity								0.372

n.s.=not significant, all presented correlation coefficients are significant at $p < 0.001$ (Spearman rho); HFIES=household food insecurity experience scale, Fishcon= fish consumption

3.12 Summary of results based on calculated average indicators

To provide a short summary of the main indicators, calculated average values of main indicators from both assessment rounds are depicted in **Figure 16**. In all four indicators, the intervention group had higher scores compared to control group 1 and 2 (see also Table 14, Table 17, Table 19).

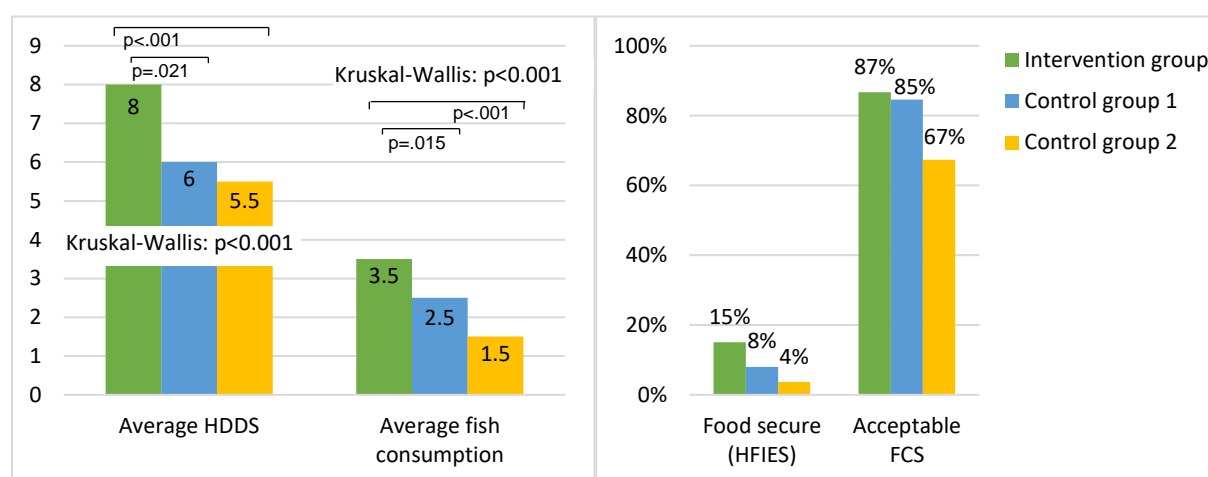


Figure 16 Summary of results regarding average nutrition and food security indicators among three study groups; HDDS=Household dietary diversity score, HFIES=Household food insecurity experience scale, FCS=Food consumption score

4 Strengths and limitations

This research study has several strengths and limitations. There was no prior calculation of sample size. Rather, the sample sized was based on the available number of current intervention households. Since there were no baseline data regarding main indicators, a direct impact of the innovative trap could not be derived. Data show that intervention and control group 1 were significantly better off compared to control group 2, which might be the impact of the AVCP and leading to a reduced comparability regarding socio-economics and living conditions of the three study groups. Selection bias cannot be ruled out. There was no random selection of beneficiaries who received trap training and material as well as no random selection of study participants for intervention and control group 1. Recall bias for the dietary assessments cannot be ruled out as well. Amongst the strengths of the study is the study design, with three groups for comparison and the usage of standardized and validated tools. Furthermore, data were collected repeatedly (two assessment rounds) with same survey team, increasing data quality. Adequate training and enumerators and thorough data quality checks during data collection produced a high validity of data which was reflected by the same direction of nutrition scores with different data collection tools. Compliance of participants was high, reflected by the low drop-out during the study period.

5 Conclusions and recommendations

This research study, conducted in June and August 2022, aimed to evaluate the aquaculture project activities implemented by the GIZ and partners to improve the food security situation of food insecure households in the Northern Region of Malawi. **Figure 17** shows how the results can be linked to the conceptual framework of food security. As this research study was a comparison study and did not include baseline values, a direct impact of the innovative wire mesh fish trap on the measured outcome could not be assessed. However, results showed that access and availability to food by dietary diversity and fish consumption as well as food security reflected by food consumption scores was highest in the intervention group using the innovative trap. **Table 22**, p.27, provides main results with conclusions as well as recommended actions for future projects. For future scientific evaluations of a direct impact of the innovative traps, it is recommended to plan a baseline survey prior to any project activities considering sample size collection, matching control group, and random selection of participants. Already collected data of control group 1 might be used as a baseline survey (before roll-out of innovative fish traps) within the current project area. Data of control group 2 might be used as baseline information before any fish farming activities or ponds are planned in that area.

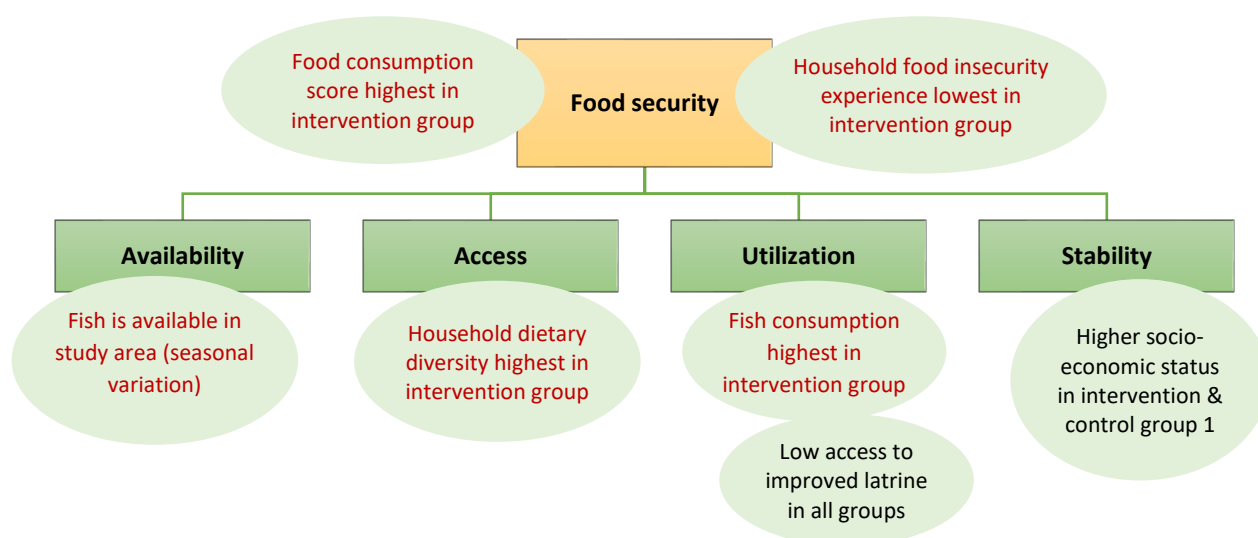


Figure 17 Results of AVCP three-arm comparison study on innovative wire mesh fish trap in relation to food security

Table 22 Conclusions and recommendations

Main results and conclusion	Recommendations
Food access, availability, and utilization (indicator 1 and 2)	
<p>Household Dietary diversity scores (HDDS) were significantly different between the three study groups at both assessment points. The intervention group achieved highest HDDS in both surveys with 8 food groups compared to 6.5 and 6 for control group 1 and 5 for control group 2. A higher score indicates a higher access to a variety of foods for the intervention group. This might be linked to a higher purchasing power to also buy foods such as fish, eggs, oils and fat, legumes, sweets, and fruits. Overall, consumption of animal source foods (ASF) (except for fish) was low among all groups. There was no difference between both assessment rounds, probably due to the short timespan between rounds and similar seasonal condition.</p> <p>Fish consumption was significantly higher in the intervention group compared to control group 1 and 2. It further significantly increased between June and August in all groups. Despite assumed lower reproduction rates of small fish in August, fish consumption increased in August. Maybe as an awareness effect due to the research study or sufficient availability of fish from other sources and low market price. Small fish consumption was especially prevalent within intervention and control group 1. However, it remains unclear if own production or the ability of purchasing small fish was the main driver. General use of fingerlings remains unclear. Fingerling produce might be sold at once at a market day and households then buy what they need on a daily basis at a local vendor.</p> <p>Almost all households had access to land. Crop and livestock keeping diversity as well as home gardening was higher in intervention and control group 1 compared to control group 2. In addition, control group 2 lacked the income source of fish farming and participated in less food security project activities. This might have affected the food availability for control group 2 which had lowest dietary diversity.</p>	<ul style="list-style-type: none"> - Assess HDDS at different seasons to differentiate changes due to project activities or season related food availability. Since both assessments were in the post-harvest season, additional data from the lean season could close the data gap. - Link dietary diversity information with local market prices of respective food groups to gain more insight in purchasing activities. - Analyse fish for safe consumption, e.g., residues of pesticides or un-wanted chemicals - Conduct focus group discussions on: how much contributes sale of fingerlings from intermittent harvest to the income generated and how this income is used? How often are households selling fingerlings or big fish and to whom (vendor, market, etc.)? - Integration of nutrition education units to ensure access to fish and greater diversity of foods for vulnerable groups such as infants, young children, and women. - Nutrition counselling on benefits of ASF and enabling to make healthy choices to buy nutritious food such as ASF or fruit and little sugar - Assess the impact of home gardening and livestock husbandry on general food availability
Food security (indicator 3 and 4)	
<p>Food Consumption Score (FCS) was calculated to examine the food security situation. The intervention group achieved the highest scores at both assessment points. Almost 90% of intervention households achieved an acceptable diet compared to around 65% of households from the two control groups. This relates to the findings of the higher dietary diversity of intervention households.</p> <p>Household Food Insecurity Experience Scale (HFIES) was used to measure the perceived food insecurity experience of the surveyed households. Moderately and severely experienced food insecurity levels of control group 1 and 2 (around 60%) were similar to national data, whereas it was lower among intervention group households (50%). These results indicate that the higher ability to consume different foods on a stable basis (intervention group had highest scores at both assessment rounds) may have also led to a less severe experienced food insecurity.</p>	<ul style="list-style-type: none"> - Assess FCS and HFIES at different seasons to differentiate between project related or seasons related changes, if any

Table 22 continued

Main results and conclusion	Recommendations
<p>Fish farming</p> <p>Results regarding fish farming activities and harvest were positive. The trap was the predominantly used harvest technology for intermittent harvest. Farmers appreciated the work-benefit ratio when using the trap and the majority was satisfied with the amount as well as the size of fish harvested. However, intra-household dynamics revealing additional income or even the usage of such were not assessed. A seasonal impact on the usage of the trap could be observed with lower usage in the colder month of August. During the first assessment in June, roll-out of training activities and complete sets for constructing the trap seemed not to be on schedule at every site, however, by August, these problems were solved.</p>	<ul style="list-style-type: none"> - Conduct focus group discussions on how to best prepare a pond for safe fish farming activities, create a calendar or timeframe of farming activities, appropriate feeding and restocking, and fixing of broken traps. - Conduct focus group discussion to develop a problem-solution matrix for usage of trap (maintenance of trap) - Closely monitor seasonal impacts of reproduction rates in colder months (purchasing power, access to food, availability of food) - For better nutritional outcomes and food availability, assess possibility to combine fishponds with fruits trees such as pawpaws along the pond.

6 References

- Ballard, TJ, Kepple AW, and Cafiero C. 2013. 'The Food Insecurity Experience Scale. Development of a Global Standard for Monitoring Hunger Worldwide'. Rome: Food and Agriculture Organization of the United Nations.
- FAO. 2006. 'Policy Brief. Food Security'. Rome: FAO's Agriculture and Development Economics Division (ESA) with support from the FAO Netherlands Partnership Programme (FNPP) and the EC-FAO Food Security Programme.
- FAO. 2011. 'Guidelines for Measuring Household and Individual Dietary Diversity'. Rome: Food and Agriculture Organization.
- IPC. 2022. Malawi IPC Chronic Food Insecurity Report. Malawi: Integrated Food Security Phase Classification.
https://www.ipcinfo.org/fileadmin/user_upload/ipcinfo/docs/IPC_Malawi_ChronicFoodInsec_2022May_report.pdf
- The World Bank Group. 2022a. 'Malawi | Data'. World Bank. 2022.
<https://data.worldbank.org/country/MW>.
- The World Bank Group. 2022b. 'Overview-Malawi'. World Bank. 2022.
<https://www.worldbank.org/en/country/malawi/overview>.
- WFP. 2008. Food Consumption Analysis Calculation and Use of the Food Consumption Score in Food Security Analysis. Rome: World Food Programme, Vulnerability Analysis and Mapping Branch.

ANNEX A: Additional information on usage of trap and pairwise comparisons of indicators**Table 23 Additional information on usage of trap and harvest outcomes**

Intervention group	1 st assessment (n=48)	2 nd assessment (n=52)
Reason for not using the trap	(n=13)	(n=22)
Inadequate weather/breeding conditions	8 (61.5%)	10 (45.5%)
Household has other urgent duties	4 (30.8%)	8 (36.4%)
Respondent is sick	1 (7.7%)	1 (4.5%)
Trap is broken*	-	1 (4.5%)
Household has enough fish for own consumption	-	1 (4.5%)
Waiting for higher market price for fish	-	1 (4.5%)
Plans on using the trap again	(n=13)	(n=24)
When weather/breeding conditions improve	8 (61.5%)	12 (54.5%)
When urgent duties are done	4 (30.8%)	9 (40.9%)
After recovery	1 (7.7%)	1 (4.5%)
When market supply is low	-	1 (4.5%)
When own trap is constructed	-	1 (4.5%)
Change of harvest in past four weeks	(n=47)	(n=52)
Same harvest	7 (14.9%)	4 (7.7%)
Increased harvest	28 (59.6%)	21 (40.4%)
Decreased harvest	4 (8.5%)	3 (5.8%)
No harvesting in past four weeks	8 (17%)	21 (40.4%)
Don't know	-	3 (5.8%)
Reason for increased harvest	(n=28)	(n=21)
Different harvesting technique	25 (89.3%)	7 (33.3%)
Improved feeding	3 (10.7%)	8 (38.1%)
Due to weather condition	-	6 (28.6%)
Reason for decreased harvest	(n=4)	(n=3)
Different harvesting technique	2	
Due to weather condition	2	2
Fish is eaten by a pest (katumbwi)	-	1
	(n=47)	(n=52)
Satisfied with amount of fish harvested with trap		
No, never	2 (4.3%)	4 (7.7%)
Yes, sometimes	15 (31.9%)	18 (34.6%)
Yes, all the time	30 (63.8%)	30 (57.7%)
Satisfied with size of fish harvested with trap		
No, never	5 (10.6%)	2 (3.8%)
Yes, sometimes	9 (19.1%)	20 (38.5%)
Yes, all the time	33 (70.2%)	30 (57.7%)
Workload-benefit ratio for using the trap		
Not happy with workload, but still practicing it	2 (4.3%)	2 (3.8%)
Workload is worth the harvest	44 (93.6%)	49 (94.2%)
I don't know	1 (2.1%)	1 (1.9%)

Table 24 Pairwise comparisons for outcome variables; effect sizes were only calculated for main indicators

Variable	Group comparison	Adjusted significance	
Socio-economic scores			
Income source score	Intervention vs. control 1	0.952	
	Intervention vs. control 2	<0.001	
	Control 1 vs. control 2	<0.001	
Livestock diversity score	Intervention vs. control 1	1.0	
	Intervention vs. control 2	<0.001	
	Control 1 vs. control 2	0.002	
Food security participation score	Intervention vs. control 1	1.0	
	Intervention vs. control 2	<0.001	
	Control 1 vs. control 2	<0.001	
Nutrition indicators			Effect size
Household dietary diversity score Round 1	Intervention vs. control 1	0.013	0.275
	Intervention vs. control 2	<0.001	0.467
	Control 1 vs. control 2	0.136	
Household dietary diversity score; Round 2	Intervention vs. control 1	0.001	0.348
	Intervention vs. control 2	<0.001	0.468
	Control 1 vs. control 2	0.646	
Average Household dietary diversity score	Intervention vs. control 1	0.001	0.351
	Intervention vs. control 2	<0.001	0.515
	Control 1 vs. control 2	0.265	
Fish consumption; Round 1	Intervention vs. control 1	0.021	0.260
	Intervention vs. control 2	<0.001	0.398
	Control 1 vs. control 2	0.258	
Fish consumption; Round 2	Intervention vs. control 1	0.039	0.243
	Intervention vs. control 2	<0.001	0.396
	Control 1 vs. control 2	0.340	
Average fish consumption	Intervention vs. control 1	0.015	0.273
	Intervention vs. control 2	<0.001	0.450
	Control 1 vs. control 2	0.203	
Food security indicators			
Food consumption score; Round 1	Intervention vs. control 1	0.016	0.255
	Intervention vs. control 2	<0.001	0.413
	Control 1 vs. control 2	0.083	
Food consumption score; Round 2	Intervention vs. control 1	0.001	0.336
	Intervention vs. control 2	<0.001	0.487
	Control 1 vs. control 2	0.082	
Average food consumption score	Intervention vs. control 1	0.005	0.307
	Intervention vs. control 2	<0.001	0.522
	Control 1 vs. control 2	0.081	
Household food insecurity experience scale (raw score); Round 1	Intervention vs. control 1	n.s.	
	Intervention vs. control 2		
	Control 1 vs. control 2		
Household food insecurity experience scale (raw score); Round 2	Intervention vs. control 1	0.005	0.276
	Intervention vs. control 2	0.107	
	Control 1 vs. control 2	0.210	
Average household food insecurity experience scale (raw score)	Intervention vs. control 1	n.s.	
	Intervention vs. control 2		
	Control 1 vs. control 2		












AVCP Fish consumption study 1st Assessment Round Malawi

Household Identification					
Given consent for participation		0= no → end the interview 1= yes	CONSENT	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	
A	Date	Record date	DATETOD	<div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div><div><div></div><div></div><div></div><div></div></div></div> <div>Day Month Year</div>	
B	District	1= Mzimba 2= Nkhatabay	DISTRICT		
C	EPA	1= Chikangawa 2= Emcizin 3= Kazomba 4= Zombwe 5= Chintheche 6= Chikwina 7= Mpamba 8= Mzenga	EPA		
D	TA name	Enter TA name	TA		
E	GVH name	Enter GVH name	GVH		
F	Village	Enter village name	VILLAGE		
G1	HH identification code	See household ID on 24h recall printout	HHIDENT		
G2	HH head name	Enter HH head name	HHNAME		
G3	Respondent name	Enter respondent name	RESNAME		
H1	Enumerator 1	Enter enumerator 1 ID	ENUMID1		
H2	Enumerator 2	Enter enumerator 2 ID	ENUMID2		
I	Supervisor	Enter Supervisor ID	SUPERID		
J	Has this household access to a fishpond?	0= no 1= yes	POND		
K	Treatment arm (study group)	1= intervention group 2= control group 1 3= control group 2 → Q2	STUDYGR		
L	Start time of interview	Record current time	STARTTIME		

AVCP Fish consumption study 1st Assessment Round Malawi

Fish farming questionnaire				
Ask only if: CONSENT= yes, and STUDYGR=1, or STUDYGR=2				
1	What is your GIZ project ID number? (Record number)	88= don't know 97= did not receive number, but is part of project	NUMBER	
1a	What kind of fishpond do you use?	1= individual pond 2= communal pond 3= both, individual and communal pond	TYPEPOND	
1b	How many fishponds are you currently using?	Record number of fishponds	NFISHP	
1b1	How did you or your household mainly acquire the piece of land used for fishpond(s)?	1= granted by local leaders 2= inherited by death of family member 3= Bride price 4= purchase 5= leasehold 6= rented short-term 7= farming as a tenant 8= borrowed for free 9= moved in without permission 10= allocated by a family member 11= gift from a non-household member	AQUIREPOND	
1c	Which intermittent harvest technologies do you use? (Show picture of trap to respondent in case they are using a fish trap) Record multiple answers	0= not practicing intermittent harvest 1= hook and line 2= reed or bamboo fence 3= regular fish nets 4= local fish trap (made from bamboo or reed) 5= innovative wire mesh fish trap	HARTECH	
Please show picture of traps to confirm which is used				
1c1	Where is the innovative wire mesh trap coming from? Ask only if: HARTECH= innovative wire mesh fish trap	1= using a borrowed trap 2= got trap as a gift 3= bought/traded the trap 4= using my own constructed trap	SOUTRAP	
1d	Did you receive any coaching/training on the technology of intermittent harvest using the innovative wire mesh fish trap? Probe for training on using and constructing the wire mesh trap	0= no 1= yes	RECTRAI	
1e	Did you received any material from the AVCP GIZ fish project in order to build your own innovative wire mesh fish trap? Probe, whether all necessary material was provided Ask only if: STUDYGR= intervention group	0= no → 1g 1= yes, but only some parts 2= yes, all necessary parts	BENEFIC	
1f	Did you already construct your innovative wire mesh fish trap?	0= no 1= yes → 1f2	CONTRAP	
1f1	If no, why did you not yet construct the innovative mesh wire fish trap? Record multiple answers Ask only if: CONTRAP= no	1= material incomplete (did not receive all material needed) 2= material got stolen 3= material is broken 4= forgot how to construct it 5= did not have time to construct it yet 6= other, specify: _____	NOCONST	
1f2	Have you ever lent your innovative wire mesh trap to other households?	0= no → 1g 1= yes	TRAINTRA	
1f3	To how many households have you or any member of your household lent the innovative mesh wire fish trap?	Record number of households	TRAPLENDHH	
1g	When did you first start using the innovative wire mesh fish trap? (Own, or borrowed) Ask only if: HARTECH= innovative wire mesh fish trap	1= more than six months ago 2= within the last 6 months 3= yet to start using it → 1m	TRASTART	
1g1	Are you currently (within last 7 days) using the innovative wire mesh fish trap? Please probe for source and if it is own trap Ask only if: TRASTART= more than six months ago, or TRASTART= within the last 6 months	0= no 1= yes → 1i	TRACURR	
1g2	Why are you currently (within last 7 days) not using the innovative wire mesh trap? Record multiple answers Ask only if: TRACURR= no	1= got stolen 2= gave it away 3= fish trap is not working due to broken material → 1h 4= difficult weather/breeding conditions for using trap 5= respondent/household has other urgent duties 6= materials inadequate to assemble a fish trap 88= don't know 99= other, specify: _____	TRAUSE	

AVCP Fish consumption study 1st Assessment Round Malawi

1h	Do you know how to fix the trap? Ask only if: TRAUSE= fish trap not working due to broken material	0= no 1= yes, but I can't afford spare parts 2= yes, I can fix it and buy spare parts 88= don't know 99= other, specify:	TRAFIX	
1g3	Are you planning on using the fish trap again?	0= no 1= yes, once it is fixed 2= yes, once weather/breeding conditions have improved 3= yes, once other urgent issues are resolved 88= don't know 99= other, specify:	TRAREUSE	
1i	When was the last time you used the innovative wire mesh trap? Ask only if: HARTECH= innovative wire mesh fish trap, and TRASTART= more than six months ago, or TRASTART= within the last 6 months	1= within the last 3 days 2= within the last 7 days 3= no use for more than a week 88= don't know	TRAPUSE	
1i1	Has the fish harvest using the innovative wire mesh trap changed compared to last 4 weeks? Ask only if: HARTECH= innovative wire mesh fish trap, and TRASTART= more than six months ago, or TRASTART= within the last 6 months	0 =no, same harvest 1= yes, harvest increased → 1i2 2= yes, harvest decreased → 1i3 3= have not been harvesting for last 4 weeks 88 = don't know	TRAPHAR	
1i2	Why did the fish harvest using the innovative wire mesh trap increase? Ask only if: TRAPHAR= yes, harvest increased	0 = did not increase (control answer) 1= due to weather conditions 2= due to different harvesting technique 3= improved feeding 88= don't know 99= other, specify:	INCREASE	
1i3	Why did the fish harvest using the innovative wire mesh trap decrease? Ask only if: TRAPHAR= yes, harvest decreased	0 = did not decrease (control answer) 1= due to weather conditions 2= due to different harvesting technique 3= lack of feed 88= don't know 99= other, please specify	DECREASE	
1j	Are you generally satisfied with the number of fish (fingerlings) caught/harvested using the innovative wire mesh trap?	0= no, never 1= yes, sometimes 2= yes, all the time	SATAMOU	
1k	Are you generally satisfied about the fish sizes (fingerlings) caught with the innovative wire mesh trap?	0= no, never 1= yes, sometimes 2= yes, all the time	SATFISI	
1l	Are you happy with the workload using the innovative wire mesh fish trap compared to the previous techniques (reed or bamboo fence, nets, hook and line)	0= no, not happy, too much work 1= not happy with workload, but still practicing it 2= yes, workload is worth harvest 88= don't know 99= other, specify:	TRACOB	
1m	Please rate how you use your fish produce (fingerlings) from the intermittent harvest from most to least. <i>Read answers out loud to respondent</i>	1= consumption 2= sale 3= restocking 4= exchange for goods/other foods 88= don't know 99= other, please specify	USEFISH	
1n	Please rate how you use all other fish produce from most to least. <i>Read answers out loud to respondent</i>	1= consumption 2= sale 3= restocking 4= exchange for goods/other foods 88= don't know 99= other, please specify	USEFISH2	

AVCP Fish consumption study 1st Assessment Round Malawi

Socio-economic Information				
2	Which of the following projects is your household participating in?	1= School feeding 2= AIP 3= Agricultural Development Projects 4= Public Works Programme 5= Cash transfer 6= Village Saving and Lending 7= Home gardens 8= Food aid	FOODSECH	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
3	What is your marital status?	1= married monogamous 2= married polygamous 3= widowed 4= divorced or separated 5= single	MARSTAT	<input type="checkbox"/> <input type="checkbox"/>
4	What is the sex of the household head?	1= male 2= female	HEADHH	<input type="checkbox"/> <input type="checkbox"/>
5	Respondent is household head	0= no 1=yes	RESPHH	<input type="checkbox"/> <input type="checkbox"/>
6	What is your year of birth or age in years?	<i>Record year of birth (e.g. 1986) OR Record age in years (e.g. 44) 88= don't know</i>	AGERESP	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
7	What is the year of birth or age of household head? Ask only if: RESPHH= no	<i>Record year of birth (e.g. 1986) OR Record age in years (e.g. 44) 88= don't know</i>	AGERESPH	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
8	Please list people who are permanently living in your household?	<i>Record total number</i>	HHMEMNO	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
9	What is the highest level of school you attended: primary, secondary, or higher?	0= no schooling 1= junior primary (Standard 1-4) 2= senior primary (Standard 5-8) 3= junior secondary (Forms 1-2) 4= senior secondary (Forms 3-4) 5= more than secondary	EDUCLEV	<input type="checkbox"/> <input type="checkbox"/>
9a	What is the highest level of school the household head attended: primary, secondary, or higher? Ask only if: RESPHH= no	0= no schooling 1= junior primary (Standard 1-4) 2= senior primary (Standard 5-8) 3= junior secondary (Forms 1-2) 4= senior secondary (Forms 3-4) 5= more than secondary	EDUCLHH	<input type="checkbox"/> <input type="checkbox"/>
10	What is your main occupation?	1= Farmer 2= Carpenter 3= Tailor 4= Charcoal Maker 5= Brick Maker 6= Formal Employment 7= Casual Labour (Ganyu) 8= Business 9= non 99= other, specify: _____	OCCP	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
10a	What is the main occupation of household head? Ask only if: RESPHH= no	1= Farmer 2= Carpenter 3= Tailor 4= Charcoal Maker 5= Brick Maker 6= Formal Employment 7= Casual Labour (Ganyu) 8= Business 9= non 99= other, specify: _____	OCCPHH	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
11	What are the sources of income of your household throughout the year? <i>Record multiple answers</i>	1= sale of own produced crops 2= sale of own produced fish products 3= sale own produced other animal products (cattle, goat, poultry, rabbits, etc.) 4= sale of own produced or gathered goods/crafts	INCOME	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

AVCP Fish consumption study 1st Assessment Round Malawi

		5= casual labour/temporary salary 6= petty trade / small business 7= employment/ regular salary 8= remittances from relatives/husband 9= income generated by sale or exchange of public transfers (cash for work, food for work, food vouchers, fertilizer or seed vouchers etc.) 10= none (subsistence farming only) 99= other, specify: _____		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
12	Does any member of this household have access to any land that can be used for agriculture?	0= no → Q 13 1= yes	HHLAND	<input type="checkbox"/>
12a	Which crops do you grow on the land? <i>Record multiple answers</i>	1= maize 2= cassava 3= white sweet potato 4= orange sweet potato 5= groundnuts 6= soya 7= beans 8= cowpeas 9= tobacco 10= cotton 11= sunflowers 99= other, specify: _____	CROPS	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
13	Do you have a home garden?	0= no → Q 15 1= yes	HOMEGAR	<input type="checkbox"/>
14	Do you grow vegetables?	0= no → Q 15 1= yes, but only during the wet-season 2= yes, but only during the dry season 3= yes, year-round	GARVEG	<input type="checkbox"/>
14a	Main use of vegetables produced?	1= mainly own consumption 2= mainly for sale 3= both (in approx. equal amounts) 99= other (specify): _____	USEVEG	<input type="checkbox"/>
15	Do you have any fruit or fruit trees at your homestead or accessible to you and your family?	0= no → Q 16 1= yes	GARFRUIT	<input type="checkbox"/>
15a	Main use of fruits	1= mainly own consumption 2= mainly for sale 3= both (in approx. equal amounts) 99= other (specify): _____	USEFRU	<input type="checkbox"/>
16	Does this household own any livestock herds, or farm animals, or poultry?	0= no → Q 17 1= yes	ANIMALS	<input type="checkbox"/>
16a	What kind of animals does this household own? <i>Record multiple answers</i>	1= Cattle 2= Goat 3= Poultry 4= Rabbits 5= Pig 6= Sheep 99= Other, specify: _____	ANIMALKIND	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
16b	Main use of animal produce?	1= mainly own consumption 2= mainly for sale 3= both (in approx. equal amounts) 4= for work 99= other (specify): _____	USEANC	<input type="checkbox"/>
16c	Does this household own any fishponds?	0= no 1= yes	KINDANF	<input type="checkbox"/>
16d	Main use of fish produced?	1= mainly own consumption 2= mainly for sale 3= both (in approx. equal amounts) 99= other (specify): _____	USEANF	<input type="checkbox"/>
17	What is the main source of drinking water for members of your household during the rainy season?	1= public tap/standpipe, borehole, protected hand dug well, rainwater collection, protected spring 2= unprotected spring, surface water (river, stream, dam, pond, canal, irrigation channel)	DRINKWAW	<input type="checkbox"/>
18	What is the main source of drinking water for members of your household during the dry season?	1= public tap/standpipe, borehole, protected hand dug well, rainwater collection, protected spring	DRINKWAD	<input type="checkbox"/>

AVCP Fish consumption study 1st Assessment Round Malawi

		2= unprotected spring, surface water (river, stream, dam, pond, canal, irrigation channel)		
19	What kind of toilet facility do members of your household usually use?	1= pit latrine with slab, composting toilet 2= pit latrine without slab/open pit, bucket 3= open defecation	LATRINE	<input type="checkbox"/>
Household Food Insecurity Experience Scale				
20	Now I would like to ask you some questions about food. During the last 4 weeks, was there a time when.....			
a	You or others in your household worried about not having enough food to eat because of a lack of money or other resources?	0= no 1= yes 88= don't know 98= refused	WORRIED	<input type="checkbox"/>
b	Still thinking about the last 4weeks, was there a time when you or others in your household were unable to eat healthy and nutritious food because of a lack of money or other resources?	0= no 1= yes 88= don't know 98= refused	HEALTHY	<input type="checkbox"/>
c	Was there a time when you or others in your household ate only a few kinds of foods because of a lack of money or other resources?	0= no 1= yes 88= don't know 98= refused	FEWFOODS	<input type="checkbox"/>
d	Was there a time when you or others in your household had to skip a meal because there was not enough money or other resources to get food?	0= no 1= yes 88= don't know 98= refused	SKIPPED	<input type="checkbox"/>
e	Still thinking about the last 4 weeks, was there a time when you or others in your household ate less than you thought you should because of a lack of money or other resources?	0= no 1= yes 88= don't know 98= refused	ATELESS	<input type="checkbox"/>
f	Was there a time when your household ran out of food because of a lack of money or other resources?	0= no 1= yes 88= don't know 98= refused	RANOUT	<input type="checkbox"/>
g	Was there a time when you or others in your household were hungry but did not eat because there was not enough money or other resources for food?	0= no 1= yes 88= don't know 98= refused	HUNGRY	<input type="checkbox"/>
i	Was there a time when you or others in your household went without eating for a whole day because of a lack of money or other resources?	0= no 1= yes 88= don't know 98= refused	WHOLEDAY	<input type="checkbox"/>
Use printout for the 24-h recall of foods!				

Thank the interviewee for their time and cooperation.

**Household 24h-recall
Date:**

**Interviewee:
Interviewer 1:**

**Village:
Interviewer2:**

Household:

Malawi

21) Was yesterday a celebration or feast day where you ate special foods or where you ate more or less than usual?	0= no 1= yes 88= don't know / don't remember	FIUSUAL	<input type="text"/>
First food after waking up			
Anything else?			
Anything else?			
Anything else?			
Anything else?			
Anything else?			
Anything else?			
Cereals: Nsima, maize, porridge, bread/buns, rice, noodles, sweet beer or super shake/maheu, spaghetti, or other foods made from grains like sorghum, millet, rice, wheat, oats, corn-flakes zitumbuwa, mandasi, mikate/vib		HDDSA	<input type="text"/>
White roots and tubers: White sweet potatoes, irish potatoes, white yams, cassava (cassava-nsima, cassava-porridge), green unripe banana or any other foods made from white roots (zigege)		HDDSB	<input type="text"/>
Orange roots/tubers: Sweet potatoes that are yellow or orange inside		HDDSC1	<input type="text"/>
Orange vegetables: Pumpkin, butternut, squash, carrots		HDDSC2	<input type="text"/>
Green leafy vegetables: Any dark green or medium-dark green leafy vegetables including wild green vegetables like cassava leaves, amaranthus, bean leaves, pumpkin leaves, rape, mustard, sweet potato leaves, cowpeas leaves		HDDSD	<input type="text"/>
Other vegetables: cabbage, eggplants, tomatoes, onions, green pepper, cucumber, thorny cucumber, okra, mushrooms, impwa		HDDSE	<input type="text"/>
Orange fruit: Ripe mangoes, Ripe Paw paws, Granadilla		HDDSF	<input type="text"/>
Other fruits: oranges, lemons, tangerines, bananas, avocado, coconut flesh, guava, custard apple, Mexican apple, watermelon, baobab, green mango, green pawpaw, grapes, strawberry, other wild fruits: masuku, mpundu, nthuza. coconut		HDDSG	<input type="text"/>
Organ meat: Liver, kidney, heart, blood-based foods, or other organ meats (including from wild game)		HDDSH	<input type="text"/>
Flesh meat: Any meat, such as beef, pork, lamb, mutton, goat, chicken, mice, rabbits, guinea pig, ducks, guinea fowls, small birds, wild game meat or sausage		HDDSI	<input type="text"/>

**Household 24h-recall
Date:**

**Interviewee:
Interviewer 1:**

**Village:
Interviewer2:**

Household:

Malawi

Insects: termites, grasshoppers, crickets, crabs, insect eggs, land and sea snails, inswa, fulufute, caterpillars, visenola, cenze	HDDSJ	<input type="text"/>
Eggs: Eggs from any kind of birds (chicken, duck, turkey, guinea fowls) including from wild birds	HDDSK2	<input type="text"/>
Small fish (eaten as whole fish): fresh, dried, fried, powdered	HDDSL1	<input type="text"/>
Big fish (filet): fresh or dried fish, shellfish, or seafood, kapenta, kanyenya wa nsomba	HDDSL2	<input type="text"/>
Pulses: mature beans or peas (fresh or dried), bambara nuts, lentils, soya (soya pieces, soya mince, soya sausage, soya milk), cowpeas, velvet beans	HDDSM	<input type="text"/>
Nuts and seeds: groundnuts (groundnut flour), sweet-mbalala, peanut-butter, tree-nuts (cashew nuts, macadamia nuts), pumpkin seeds, sunflower seeds	HDDSN	<input type="text"/>
Milk and milk-products: Milk (fresh or powder), cheese, yoghurt or other milk products	HDDSO	<input type="text"/>
Oils/Fats: Oil, fats or butter added to food or used for cooking, including extracted oils from nuts, fruits and seeds, and all animal fat	HDDSP	<input type="text"/>
Sugar and sugary foods: chocolates, sugar, sugar cane, honey, sweets, candies, cakes, or biscuits, ice cream	HDDSQ	<input type="text"/>
Sweet drinks: Sweetened fruit juice or juice-drinks, sobo, soft drinks/fizzy drinks like, fanta, coca-cola, sprite, tea or coffee with sugar	HDDSR	<input type="text"/>
Spices and Condiments: Ingredients used in small amounts for flavor, such as chilies, pepper, ginger, spices, herbs, or fish powder, salt, tomato-paste, flavor cubs	HDDSS	<input type="text"/>
Did you or anyone in your household eat anything (meal or snack) OUTSIDE the home yesterday?	0= no 1= yes	FIOUT <input type="text"/>

The respondent should be the person responsible for food preparation for the household on the previous day

Included foods: Prepared in the home and consumed in the home or outside the home; or purchased or gathered outside and consumed in the home

Does not include foods: Purchased outside the home and consumed outside (Those foods are not included because the respondent may not know which other household members purchased and eat outside the home)

FFQ
Household:
Date:

Interviewee:
Interviewer 1:

Village:
Interviewer2:

22) I would like to ask you about all the different foods that all your household members have eaten in the last 7 days. I will name several food groups and you please tell me on how many days in the past week your household has eaten the foods from the following food groups?

(For each food group, ask what the primary source of each food item eaten that week was, as well as the second main source of food, if any.)

(Exclude, small amounts of food consumed as seasonings or condiments.)

Food item	DAYS eating in past week (0-7 days)	Sources of food (codes below)			
		primary		secondary	
Maize (maize products)		FFQMAIZE		MAIZESOU	MAIZESOU
Rice		FFQRICE		RICESOU	RICESOU2
Bread/wheat/pasta		FFQWHEAT		WHEATSOU	WHEATSOU2
Tubers		FFQTUB		TUBSOU	TUBSOU2
Groundnuts & pulses		FFQPUL		PULSOU	PULSOU2
Small fish (fingerlings) eaten as whole		FFQFISH		FISH1SOU	FISH1SOU2
Big fish (fillet) eaten as main food)		FFQFISH		FISH2SOU	FISH2SOU2
Fish powder (used for flavor only)		FFQFISHP		FISHPSOU	FISHPSOU2
Red meat (sheep/goat/beef)		FFQMEAT		MEATSOU	MEATSOU2
White meat (poultry)		FFQPOUL		POULSOU	POULSOU2
Vegetable oil, fats		FFQOIL		OILSOU	OILSOU2
Eggs (from any type of poultry)		FFQEEG		EGGSOU	EGGSOU2
Milk and dairy products (main food)		FFQMILK		MILKSOU	MILKSOU2
Milk in tea in small amounts		FFQMILKT		MILKTSOU	MILKTSOU2
Vegetables (including leaves)		FFQVEG		VEGSOU	VEGSOU2
Fruits (juice made from fruits)		FFQFRUIT		FRUITSOU	FRUITSOU2
Sweets, sugar		FFQSUGAR		SUGARSOU	SUGARSOU2

Food source codes:

Purchased	=1	Own production	=2	Traded good/services, barter	=3
Borrowed	=4	Received as gift	=5	Food aid	=6
Collected in the wild	=7	Other (please specify)	=8		

Notes:

For round 2, the farming questionnaire and socio-economic questionnaires were adapted. Both 24h recall and FFQ remained the same.

AVCP Fish consumption study 2nd Assessment Round Malawi

Household Identification					
Given consent for participation		0= no → <i>end the interview</i> 1= yes	CONSENT2		
A	Date	Record date Record start time of interview _____	DATETOD2	<div>Day</div> <div>Month</div> <div>Year</div>	
B	District	1= Mzimba 2= Nkhatabay	DISTRICT2		
C	EPA	1= Chikangawa 2= Ensizi 3= Kazomba 4= Chinteché 5= Mpamba 6= Mzenga	EPA2		
D	TA name	Enter TA name	TA2		
E	GVH name	Enter GVH name	GVH2		
F	Village	Enter village name	VILLAGE2		
G1	HH identification code	See household ID on 24h recall printout	HHIDENT		
G2	HH head name	Enter HH head name	HHNAME2		
H1	Enumerator 1	Enter enumerator 1 ID	ENUMID12		
H2	Enumerator 2	Enter enumerator 2 ID	ENUMID22		
I	Supervisor	Enter Supervisor ID	SUPERID2		
J	Has this household access to a fishpond?	0= no 1= yes	POND2		
K	Treatment arm (study group)	1= intervention group 2= control group 1 3= control group 2 → Q2	STUDYGR2		

AVCP Fish consumption study 2nd Assessment Round Malawi

Fish farming questionnaire				
Ask only if: CONSENT= yes, and STUDYGR2=1, or STUDYGR2=2				
1	What is your GIZ project ID number? (Record number)	88= don't know 97= did not receive number, but is part of project	NUMBER2	
1c	Which intermittent harvest technologies do you use? (Show picture of trap to respondent in case they are using a fish trap) (Emphasized that this question only refers to intermittent harvest, not big fish) Record multiple answers	1= hook and line 2= reed or bamboo fence 3= regular fish nets 4= local fish trap (made from bamboo or reed) 5= innovative wire mesh fish trap	HARTECH2	
Please show picture of traps to confirm which is used				
1c1	Where is the innovative wire mesh trap coming from? Ask only if: HARTECH2= innovative wire mesh fish trap	1= using a borrowed trap 2= got trap as a gift 3= bought/traded the trap 4= using my own constructed trap (provided by GIZ) 5= using my own constructed trap (not provided by GIZ)	SOUTRAP2	
1d	Did you receive any coaching/training on the technology of intermittent harvest using the innovative wire mesh fish trap? <i>Probe for training on using and constructing the wire mesh trap</i> Ask only if: STUDYGR2=2 or HHIDENT= 14 or 25, or 26, or 28, or 29, or 30 or 42	0= no 1= yes	RECTRAI2	
1e	Did you received any material from the AVCP GIZ fish project in order to build your own innovative wire mesh fish trap? <i>Probe, whether all necessary material was provided</i> Ask only if: STUDYGR2= 2 or HHIDENT= 21, or 30, or 42	0= no → 1g 1= yes, but only some parts 2= yes, all necessary parts	BENEFIC2	
1f	Did you already construct your innovative wire mesh fish trap? Ask only if: BENEFIC2= 1 or 2, or HHIDENT= 21, or 30	0= no 1= yes → 1f2	CONTRAP2	
1f1	If no, why did you not yet construct the innovative mesh wire fish trap? <i>Record multiple answers</i> Ask only if: CONTRAP2= no	1= material incomplete (did not receive all material needed) 2= material got stolen 3= material is broken 4= forgot how to construct it 5= did not have time to construct it yet 6= other, specify: _____	NOCONST2	
1f2	Have you borrowed your innovative wire mesh trap to other households? Ask only if: CONTRAP2 = yes	0= no → 1g 1= yes	TRAINTRA2	
1g	When did you first start using the innovative wire mesh fish trap? (Own, or borrowed) Ask only if: HARTECH2= innovative wire mesh fish trap and STUDYGR2 = 2, or HHIDENT= 19, or 30, or 33, or 36, or 42, or 53	1= more than six months ago 2= within the last 6 months 3= yet to start using it → 1m	TRASTART2	
1g1	Are you currently (within last 7 days) using the innovative wire mesh fish trap? <i>Please probe for source and if it is own trap</i> Ask only if: TRASTART2= more than six months ago, or TRASTART2= within the last 6 months	0= no 1= yes → 1i	TRACURR2	
1g2	Why are you currently (within last 7 days) not using the innovative wire mesh trap? <i>Record multiple answers</i> Ask only if: TRACURR2= no	1= got stolen 2= gave it away 3= fish trap is not working due to broken material → 1h 4= difficult weather/breeding conditions for using trap 5= respondent/household has other urgent duties 6= materials inadequate to assemble a fish trap 88= don't know 99= other, specify: _____	TRAUSE2	

AVCP Fish consumption study 2nd Assessment Round Malawi

Socio-economic Information				
2	Which of the following projects is your household participating in? <i>Please indicate 0= no, and 1=yes in each line</i>	1= School feeding 2= AIP 3= Agriculture Development Projects (Climate Smart Agriculture, Conservation Agriculture, Agroforestry, Manual Application) 4= Public Works Programme 5= Cash transfer 6= Village Saving and Lending (COMSIP, Bank mkhonde) 7= Home gardens 8= Food aid 99= other, specify: _____	FOODSECH2	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Household Food Insecurity Experience Scale				
20	<i>Now I would like to ask you some questions about food. During the last 4 weeks, was there a time when.....</i>			
a	You or others in your household worried about not having enough food to eat because of a lack of money or other resources?	0= no 1= yes 88= don't know 98= refused	WORRIED2	<input type="checkbox"/> <input type="checkbox"/>
b	Still thinking about the last 4 weeks, was there a time when you or others in your household were unable to eat healthy and nutritious food because of a lack of money or other resources?	0= no 1= yes 88= don't know 98= refused	HEALTHY2	<input type="checkbox"/> <input type="checkbox"/>
c	Was there a time when you or others in your household ate only a few kinds of foods because of a lack of money or other resources?	0= no 1= yes 88= don't know 98= refused	FEWFOODS2	<input type="checkbox"/> <input type="checkbox"/>
d	Was there a time when you or others in your household had to skip a meal because there was not enough money or other resources to get food?	0= no 1= yes 88= don't know 98= refused	SKIPPED2	<input type="checkbox"/> <input type="checkbox"/>
e	Still thinking about the last 4 weeks, was there a time when you or others in your household ate less than you thought you should because of a lack of money or other resources?	0= no 1= yes 88= don't know 98= refused	ATELESS2	<input type="checkbox"/> <input type="checkbox"/>
f	Was there a time when your household ran out of food because of a lack of money or other resources?	0= no 1= yes 88= don't know 98= refused	RANOUT2	<input type="checkbox"/> <input type="checkbox"/>
g	Was there a time when you or others in your household were hungry but did not eat because there was not enough money or other resources for food?	0= no 1= yes 88= don't know 98= refused	HUNGRY2	<input type="checkbox"/> <input type="checkbox"/>
i	Was there a time when you or others in your household went without eating for a whole day because of a lack of money or other resources?	0= no 1= yes 88= don't know 98= refused	WHOLEDAY2	<input type="checkbox"/> <input type="checkbox"/>
Use printout for the 24-h recall of foods!				

