



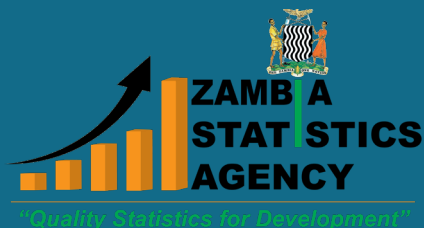
REPUBLIC OF ZAMBIA

MINISTRY OF FISHERIES
AND LIVESTOCK



REPUBLIC OF ZAMBIA

MINISTRY OF FINANCE
AND NATIONAL PLANNING



2023 AQUACULTURE SURVEY

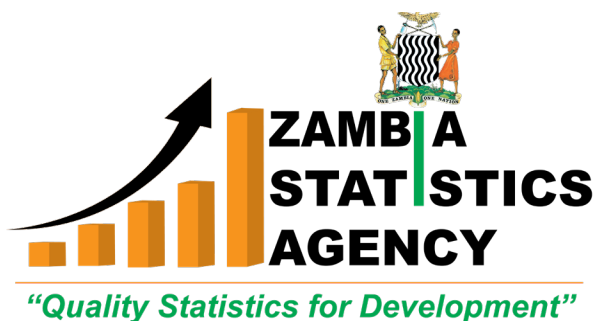
MAIN REPORT





REPUBLIC OF ZAMBIA

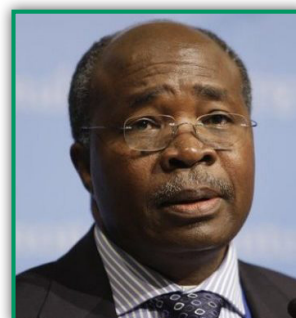
MINISTRY OF FISHERIES AND LIVESTOCK



2023 AQUACULTURE SURVEY MAIN REPORT



FOREWORD



The Government of the Republic of Zambia has prioritized the fisheries and livestock subsectors as key drivers in the socio-economic transformation agenda of the country. The Government also places emphasis on evidence-based planning, monitoring and evaluation as a basis for implementing programmes being undertaken across all sectors and also as a way of measuring their impact. In order to achieve this, high-quality statistics are necessary. Aquaculture statistics are, therefore, crucial in revealing sector performance against set targets as well as assessing the contribution of the subsector to the National Gross Domestic Product (GDP).

Up-to-date and accurate aquaculture statistics also assist the country in accurately reporting and providing evidence-based information on key programmes such as the Malabo Declaration and the Sustainable Development Goals (SDGs), Vision 2030, National Development Plans and the National Agricultural Implementation Plan (NAIP) the, among others.

Furthermore, quality statistics are needed to demonstrate the importance and relevance of the aquaculture sector with respect to employment creation, incomes and livelihoods of households.

It is therefore our sincere hope that the results of the 2023 Aquaculture Survey will be used to measure the performance of the aquaculture subsector and its contribution to the economy as well as a tool for determining future policy actions. We are confident that the results of this survey will assist policy-makers in making informed decisions, allocating resources and justifying investments in the subsector.



Hon. Makozi Chikote, MP
**MINISTER OF FISHERIES AND
LIVESTOCK**



Hon. Dr. Situmbeko Musokotwane, MP
**MINISTER OF FINANCE AND NATIONAL
PLANNING**

October, 2023



ACKNOWLEDGEMENTS



The 2023 Aquaculture Survey was conducted in April 2023 in cognizance of the importance of robust and rigorous statistics critical for informed decision and policy formulation. Since the 2017/2018 Livestock and Aquaculture Census, there has never been nationwide aquaculture data collection and consequently hence the country has relied on a non-robust administrative data sources that often do not accurately reflect what is obtaining on the ground.

The success of the 2023 Aquaculture Survey was attributed to the availability of funds and technical support. Therefore, we would like to express our sincere gratitude to all institutions that provided such assistance.

The Government of the Republic of Zambia is profoundly grateful for the funds provided by the European Union (EU) through the Zambia Aquaculture Project (ZAP) and the African Development Bank (AfDB) project, Zambia Aquaculture Enterprise Development Project (ZAEDP). ZAP supported the entire survey process from frame and instruments development through to report writing stages and printing of the final report. ZAEDP provided funds for the development of the survey instruments. Sincere appreciation also goes to the Indaba Agricultural Policy Research Institute for its technical guidance which assisted in shaping and fine-tuning the 2023 Aquaculture Survey instruments. The institution's involvement was also critical during the data processing and analysis stages.

Finally, gratitude is extended to all the technical and support staff at both the Ministry of Fisheries and Livestock and the Zambia Statistics Agency, the Provincial Administrators, and the Enumerators for their effort and dedication to the whole survey process. It is our sincere hope that the statistics contained herein will contribute to improving decision-making and policy formulation in the aquaculture sub-sector.

Himba Cheelo
PERMANENT SECRETARY
MINISTRY OF FISHERIES AND LIVESTOCK

Danies K. Chisenda
PERMANENT SECRETARY
MINISTRY OF FINANCE AND NATIONAL PLANNING

October, 2023

STATISTICIAN GENERAL'S STATEMENT



The Zambia Statistics Agency was established under the Statistics Act No. 13 of 2018. The main focus of the Act is to develop an integrated National Statistical System, provide mechanisms for coordination, collection, management and dissemination of statistics, as well as promote the use of statistical data and information at all levels. By the same Act, the Zambia Statistics Agency is the sole designated entity responsible for the publication of official statistics. The Agency is also required to provide for the production and compilation of official statistics in a transparent and impartial manner.

It is against this background that I am pleased that the Ministry of Fisheries and Livestock collaborated with the Agency in conducting the 2023 Aquaculture Survey.

The 2023 Aquaculture Survey used a sound methodology and internationally accepted fundamental principles for the production of official statistics. It was designed to provide aquaculture estimates at national, provincial as well as rural and urban levels. It collected information on demographic characteristics of fish farming households, table-size fish production and productivity, fingerling production, fish feed production, access to loans, credit and grants as well as challenges faced by both households and establishments.

I hope the results contained in this report and the dataset will find use among policymakers, programme managers, researchers and other data users for the development of the aquaculture industry and the entire country. The 2023 Aquaculture Survey datasets and any specialized tabulations can be made available to users upon request.



Mulenga J. J. Musepa
STATISTICIAN-GENERAL
ZAMBIA STATISTICS AGENCY

October, 2023



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ACRONYMS AND ABBREVIATIONS

8NDP	Eighth National Development Plan
AfDB	African Development Bank
CATSP	Comprehensive Agriculture Transformation Support Programme
EA	Enumeration Area
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
MFL	Ministry of Fisheries and Livestock
MT	Metric tonnes
NAIP	National Agriculture Investment Plan
NGOs	Non-Governmental Organizations
PACRA	Patents and Companies Registration Agency
PSU	Primary Sampling Unit
SGDs	Sustainable Development Goals
ZABS	Zambia Bureau of Standards
ZAEDP	Zambia Aquaculture Enterprise Development Project
ZamStats	Zambia Statistics Agency
ZAP	Zambia Aquaculture Project
ZRA	Zambia Revenue Authority





CHAPTER 1: BACKGROUND

1.0 Introduction

According to the FAO, aquaculture production has continued to rapidly increase globally in recent years with a 2.7% growth reported in 2020. Zambia is among the leading fish-farming countries in Africa and number one in Southern Africa (FAO 2018). The aquaculture industry has exponentially grown (MFL 2021) in the last two decades owing to the country's successive supportive policy frameworks which include the National Aquaculture Strategy (2005), National Aquaculture Development Plan (2010), the first and second National Agriculture Policy, National Agriculture Investment Plan (2014), National Development Plans and Vision 2030. These frameworks have provided policy direction and created an enabling environment that continues to attract investments into the aquaculture industry, both local and foreign. Most large aquaculture investments have been established in the Zambezi Basin due to its favorable climate for aquaculture and availability of market and water for both land-based aquaculture operations. The small-scale fish farmers are mainly concentrated in the northern region; Northern, Luapula, Muchinga, Copperbelt and Northwestern provinces.

Despite this rapid growth, there has not been a parallel robust information available to measure the aquaculture subsector performance and demonstrate its contribution to the national economy. The only nationwide aquaculture assessment which has so far been undertaken is the 2017/18 Livestock and Aquaculture Survey. Since then, the country has been relying on extrapolations from administrative data sources which are usually outdated and not reliable.

Therefore, the 2023 Aquaculture Survey was the first of its kind in Zambia and is envisioned to provide comprehensive and updated statistics on aquaculture. The survey provides baseline data on performance indicators for the key policy frameworks such as the Comprehensive Agricultural Transformation Support Programme (CATSP) and Eight National Development Plan (8NDP) as they contribute towards the country's long-term aspirations stipulated in the Vision 2030. The survey will also be critical in demonstrating the subsector's contribution to the GDP.

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1.1 Objectives of the 2023 Aquaculture Survey

The overall objective of the survey was to collect updated, reliable and credible aquaculture statistics to guide policy formulation, cooperating partners' support and private sector decisions regarding investments and the development of the Aquaculture sub-sector. The specific objectives were:

- To generate statistics which are critical in analyzing and assessing the sector's performance and contribution to the National Gross Domestic Product among others;
- To collect data from the aquaculture sub-sector that will form a benchmark upon which future surveys will be based;
- To show the importance of fish farming with respect to employment, livelihoods, and resilience capacity of the nation and firms engaged in aquaculture production;
- To determine the characteristics and distribution of fish farming households;
- To understand the fish farming management practices being used by households and establishments;
- To understand the fish marketing aspects at both household and establishment levels;
- To understand the extent to which fish biosecurity measures and climate-smart aquaculture are being practiced by both fish farming households and establishments;
- To understand access to funds for aquaculture at both household and establishment levels;
- To understand the fish post-harvest practices being used by households and establishments;
- To determine the quantity and distribution aspects of fish feed in the country;
- To determine the major challenges affecting fish farming in Zambia;
- To determine the aquaculture production contribution to the annual fisheries production.



CHAPTER 2: CONCEPTS AND DEFINITIONS

2.0. Introduction

The 2023 Aquaculture Survey adopted the following concepts and definitions as articulated by the Ministry of Fisheries and Livestock (MFL) in collaboration with Zambia Statistical Agency.

2.1. Concepts and definitions

A paid employee:	This is a worker who holds the type of job defined as ‘paid employment’ where the individual holds an explicit (written or oral) or implicit employment contract that gives them a basic remuneration (salary) that is not directly dependent on the revenue of the unit for which they work.
Acre	a unit of area equal to 4,047 square meters or 0.405 hectares
Aquaculture accessories:	These are equipment and materials necessary in the farming of fish and other aquatic organisms.
Aquaculture Establishment:	is the type of agriculture where large quantities aquaculture products are produced through industrialized techniques for the purpose of sale.
Aquaculture facility:	Means any equipment, construction, enclosure, place or area, whether on-land or in water, in which aquaculture is conducted (e.g. tanks, ponds, raceways, cages)
Aquaculture farm:	An aquaculture production unit (either land- or water-based), usually consisting of holding facilities (tanks, ponds, raceways, cages), plant (buildings, storage, processing), service equipment and stock.
Aquaculture:	It is the cultivation, propagation or farming of fish, aquatic vegetation, or other living aquatic resources whether from eggs, spawn, spat or seed or by rearing fish lawfully taken from the wild or lawfully imported into the country, or by other similar processes.
Artificial breeding of fish:	females are given one or more injections of chemicals which regulate the final ripening of dormant eggs in the ovaries, as soon as the eggs are ripe, they are stripped from the female. Eggs are then artificially fertilised with sperm obtained from males and reared in controlled conditions.
Biosecurity:	management practices, procedures & policies to prevent introduction and spread of pathogens (Bacteria, viruses and fungi).

Cages:	type of culturing facility consisting of a framed net open at the top and floating on the surface, or when completely enclosed, the cage is kept below the water surface by adjustable buoyancy or suspending from the surface.
Certified Hatchery:	It is a hatchery that has been approved by the Zambia Bureau of Standards (ZABS) to produce fingerlings.
Climate-smart aquaculture:	the use of technologies that improve production efficiency while mitigating environmental impact (e.g. reduced pollution, escaped fish, access to feed, predator management, wastes and loss reduction)
Collateral:	an asset or form of physical wealth that the borrower owns like house, vehicle etc pledged as security for a loan.
Commercial feed:	Feed produced by an established feed manufacturing company with ingredients that are well-balanced and labelled.
Contaminant:	any biological or chemical agent, foreign matter or substances not intentionally added to feed or water that may compromise food safety.
Contributing family workers:	Assists a family member or household member in a market-oriented enterprise operated by the family or household member, or in a job in which the assisted family or household member is an employee or dependent contractor. They do not receive regular payments, such as a wage or salary, in return for the work performed, but may benefit in kind or receive irregular payments in cash because of the outputs of their work through family or intra-household transfers, derived from the profits of the enterprise or from the income of the other person. They do not make the most important decisions affecting the enterprise or have responsibility for it.
Control measure:	any action or activity that can be used to prevent or eliminate disease outbreak, food safety hazard or reduce it to an acceptable level.
Credit:	money or resources obtained and repaid without interest.
Cross breeding:	is the mating of two different strains or breeding lines of a species.
Disease:	means a deviation from the state of complete physical or social wellbeing of an organism of an aquatic animal.
Employer:	An employer is a person working on his/her own economic account or with one or few partners. He/she holds a self-employment job and in his/her capacity has engaged on a continuous basis, one or more persons to work for him/her as employees for pay, either in cash or in kind.



Fingerling:	Development stage of fish following fry stage and continuing into the first three months of its life.
Fish farming:	all activities relating to the raising of fish in an aquaculture facility e.g. in ponds, tanks, cages and small water bodies.
Fish feed:	Food intended for fish in aquaculture facilities, in any form and of any composition.
Fish nursery:	An aquaculture farm where fry is raised to fingerlings.
Fish pond:	A fish pond is an artificial structure used for the culturing of fish which can either be earthen, concrete or semi concrete.
Fish production:	this is the rearing or raising of table-size fish, fingerlings or fry for sale or consumption.
Fish:	Means any vertebrate aquatic animal alive or dead and any part thereof, whether or not preserved in any form, and includes fin, shellfish, the young and eggs.
Footbath:	This is a walk-through area to disinfect the feet.
Fry:	Development stage of fish immediately after the larvae stage, at an age less than a week.
Grant:	resources given by Government or other Organisations for a purpose without paying back.
Guarantee:	an undertaking to answer for the payment of performance of another person debt or obligation in the event of a default by the person primarily responsible for it.
Hand wash:	this is washing of hands with disinfectant.
Hatchery:	Installations for housing facilities for breeding, nursing and rearing seed of fish, invertebrates or aquatic plants to fry, fingerlings or juvenile stages.
Head of Household:	the Head of the Household is the person who normally makes day-to-day decisions of the household and he/she is acknowledged as such by the other members of the household. In case of a one-member household, the member will be the head of the household.
Hectare	a unit of area equal to 10,000 square meters.

Household based aquaculture production units	are farms with small production volume, and/or relatively small surface area, mainly without permanent labour, and typically lacking the technical and financial capacity to support individual certification (not registered with ZRA or PACRA). Most of the labour for this kind of farms come from the household members (paid or unpaid family workers). Usually, there is no clear distinction between household and farm activities.
Household Membership	A household member is one who has been living with the household for most of the last twelve months (i.e. for at least six months) or intends to live with the household for at least six months. He/she may or may not be related to the other household members by blood, marriage, or may be a house-helper or farm-labourer.
Household:	a household is defined as "a group of persons who normally live and eat together; these people may or may not be related by blood, but make common provision for food or other essentials for living and they have one person whom they all regard as head of the household." Such people are called members of the household if they normally live and eat together even if they do not sleep under one roof. There could also be situations where people live under one roof but have separate cooking and eating arrangements. Such persons are considered to be separate households. There can also be a one-member household where a person makes provision for his/her own food or other essentials for living. Such a person is the head of his/her household.
Ingredients:	these are materials used in the production of fish feed which could be single or multiple; for example, maize bran, fish meal, soya bean meal, blood meal etc.
Lima	a unit of area equal to 2,500 square meters.
Loan:	money or resources obtained and paid back with interest.
Market:	an actual or nominal place where forces of demand and supply operate and where buyers and sellers interact.
Monoculture:	culture and breeding of a single fish species in a facility.
Natural breeding of fish:	male and female fish are placed together in a breeding area such as a small pond or an enclosure where they spawn naturally.
On-farm feeds:	Feeds in pellet or other forms, consisting of one or more artificial and/or natural feedstuffs, produced for the exclusive use of a particular farming activity, not for commercial sale or profit.
Pen:	Fixed enclosure using materials such as bamboos, metal poles or netting materials in which the bottom is the bed of the water body for the purpose of culturing an aquaculture organism.



Polyculture:	two or more fish species being reared in the same aquaculture facility.
Post-harvest practices:	activities following the stage of fish capture or harvest which includes cleaning, sorting, packing, chilling and other processing approaches to reduce or avoid product deterioration.
Predator:	an organism that primarily obtains food by killing and consuming other organisms such as birds, and water monitors etc.
Preservation methods:	this is a process which strives or endeavours to keep the fish in a fresh state so that there are minimal changes in texture, appearance and taste of the fish e.g. chilling and freezing.
Processing:	these are techniques or methods that are used to add value to the fish e.g. smoking, salting, filleting, drying etc.
Production cycle (fry and fingerlings):	The period during which fish is grown from egg stage to fingerling size in an aquaculture facility.
Production cycle (table size fish):	The period during which fish is grown from stocking stage to market size in an aquaculture facility.
Quality fingerlings:	fingerlings that produce the most profitable harvest at the shortest possible time. Quality fingerlings grow fast to reach market size, gains the largest weight for every weight of feed given, of uniform size and grows at the same pace, and absence of injury or deformity that could lead to a loss.
Quarantine facility:	a place of isolation in which fish (live) that have arrived from outside the country or another catchment or been exposed to infection/contagious disease or substance are placed.
Raceway:	it is an aquaculture facility usually elongated in shape, in which water enters at one end and exits through the other.
Recirculatory aquaculture system (RAS):	it is an aquaculture system which involves water reuse and bio-mechanical filtration.
Relevant authority:	The government, statutory or public body having jurisdiction over matters of fish.
Sex reversed fingerling:	an artificially manipulated female fingerling administered with a male hormone for a minimum period of 15 days but not exceeding 30 days. (a fry whose sex has been changed from female to male).

Square meter (m²)	the area of a square whose sides are one meter each.
Standard pond:	is one with well-calculated dimensions; size of pond should be 500-1500m ² or more but not less than 300m ² , maximum depth of 1.5m, with the shallow end having a depth of 0.80-1m while the deep end 1-1.8m depth. A dyke width of 1-3m and a height of 1.8-2.20m. Presence of an inlet and outlet canal, for taking water into and out of the pond respectively.
Stocking:	deliberate introduction (planting) of live fish into an aquaculture facility.
Tanks:	it is a culturing facility usually 10 meters square or less in size made of different kinds of material such as fibre, concrete and fibreglass.
Wheel bath:	A drive-through disinfection area, consisting of a shallow area filled with disinfectant, to disinfect vessel wheels.



CHAPTER 3: SURVEY METHODOLOGY AND ORGANIZATION

3.0 Introduction

In reviewing the results of this 2023 Aquaculture Survey, it should be noted that the results of the survey can only be generalized to the entire population at the national and provincial as well as rural and urban levels.

The reference period for data collection, pertaining to the production of fish was 1st January 2022 to 31st December 2022. Therefore, a comparison of the results of this survey with data obtained through administrative sources is not allowed due to the differences in the data capture methods and the reference periods.

At the time of sampling the only recent data available with known statistical precision was the 2022 Census of Population and Housing. The census data provided the proportions of households that were practicing aquaculture during the reference period. The census lists of households engaged in aquaculture per district served as a sampling frame for the survey. This information was also used to categorize districts according to the percentage of households engaged in aquaculture. This was done to avoid under-representing households practicing aquaculture production in the sample.

In some instances, during data collection, the best-able person was not available to respond to the interview, which means that data was not in all cases provided by the person responsible for aquaculture production.

However, data from this survey provide current insights on aquaculture in the country and is very useful for planning and policy formulation. Administrative data for the same period may not reflect changes in loss of harvest due to predators, disease and poor management of aquaculture facilities.

3.1 Coverage and sample design

The main objective of the 2023 Aquaculture Survey was to collect comprehensive data on the fish farming sector, to obtain statistics for use in determining the deficit or surplus status of the different types of aquaculture products produced in Zambia, and to provide a basis for determining the export potential of the country with regard to fish products.

3.1.1 Coverage and target population

The target population for the survey included all households who said they were engaged in aquaculture production in the 2022 Census of Population and Housing. The survey was conducted in all the ten (10) provinces of Zambia. In addition, all commercial establishments engaged in fish production were also covered on a hundred percent basis.

3.1.2 Sampling design

A two-stage stratified-cluster sampling method was adopted for this survey. The survey covered a representative sample of 7,716 households out of 55,800 households identified to have had at least

one member engaged in aquaculture production during the 2022 Census of Population and Housing. Unlike most surveys, the 2023 Aquaculture Survey used districts as primary sampling units (PSU). This was so because, aquaculture is a rare phenomenon amongst households in Zambia and hence EAs, wards or even constituencies would have not yielded enough sample points to warrant them being options for PSUs. A total of 79 districts with more fish farming households were selected out of 116 nationwide.

3.1.3 Sampling frame

The sampling frame for the 2023 Aquaculture Survey was based on the 2022 Census of Population and Housing. The country is administratively demarcated into 10 provinces, which are further subdivided into 116 districts. The districts constituted the Primary Sampling Unit (PSU) for the survey. In order to have reasonable estimates at the provincial level and at the same time, take into account variations in the sizes of the provinces, the survey adopted the optimal square root allocation method (Leslie Kish, 1987). This approach offers a better compromise between equal and proportional allocation, that is, small-sized strata (provinces) are allocated larger samples compared to proportional allocation.

3.1.4 Sample allocation

Sample allocation to the provinces was done using the optimal square root allocation method. This method moderates oversized provinces (strata) and overestimates the undersized provinces.

SAMPLE ALLOCATION BY PROVINCE

Domain / Stratum	Household Allocation			Districts
Name / ID	Urban	Rural	Total	
Central	270	428	699	7
Copperbel	387	196	583	6
Eastern	179	436	615	6
Luapula	316	657	973	10
Lusaka	448	205	653	6
Muchinga	226	483	709	7
Northern	367	757	1124	12
North western	256	470	726	8
Southern	296	467	762	8
Western	256	614	870	9
Total	3,001	4,714	7,716	79

3.1.5 Sample selection

The sample was selected using a two-stage stratified-cluster sampling method. The first stage involved the selection of clusters corresponding to districts from the frame developed for this survey. The second stage involved the selection of households within the selected districts (clusters). In each district, aquaculture households were selected proportionately to the number of aquaculture farmer identified in the district. On average, a sample of 97 households were selected using systematic random sampling in each district.



3.1.6 Selection of clusters - PSUs

A district was the ultimate area unit retained in the survey. The procedure for selecting a district in each province involved:

For each stratum (province, rural/urban), a list of districts, ordered by district identification numbers was developed. The number of aquaculture farmers of each district was used as the measure of size.

For each stratum, a sampling interval, (I_h) was determined by dividing the total population (total number of districts), by the number of sample districts allocated to the stratum (province), (a_h) .

$$I_h = \frac{\sum_{i=1}^{N_h} M_{hi}}{a_h}$$

where M_{hi} is the population (total number of farmers in the district) in stratum h ,

$\sum_{i=1}^{N_h} M_{hi}$ is the size of the stratum (total aquaculture farmers in the province according to the 2022 census) and a_h is the number of districts to be selected in the stratum.

A random number between 1 and I was then selected. This was the random start (R) for the systematic PPS selection of districts.

When determining the selected districts from the selection numbers, the calculations will be as follows: $S_{hi} = R_h + [I_h * (i - 1)]$, where $i = 1, 2, \dots, n_h$, rounded up to the next integer. The sample districts in the stratum was the one with the cumulated measure of size closest to the selection number, without exceeding it.

3.1.7 Estimation

In order for the survey estimates to be representative at the national or any domain level, it will be necessary to weight the sample data with appropriate expansion factors. Weighted analysis of sample survey results is needed to achieve unbiased or nearly unbiased estimates of population parameters. Weights compensate for unequal selection probabilities.

3.1.8 Weights

The weight for each sample unit is equal to the reciprocal/ inverse of its probability of selection. The probability of selecting cluster i was calculated as;

$$P_{hi} = \frac{a_h M_{hi}}{\sum_{i=1}^{N_h} M_{hi}}$$

The weight or boosting factor is, thus, given as

$$w_{hi} = \frac{1}{P_{hi}}$$

where: P_{hi} is the first stage sampling probability of selections (districts), a_h is the number of districts selected in stratum h , M_{hi} is the size (population) of the i th district in stratum h , and $\sum M_{hi}$ is the total size of stratum h .

The selection probability of the household was calculated as:

$$p_h = \frac{1}{I_h}$$

where, Y_h is the sampling interval for the i th district in stratum h .

Let y_{hij} be an observation on variable Y for the j^{th} household in the i^{th} district of the h^{th} stratum. Then the estimated total for the h^{th} stratum is:

$$y_h = \sum_{i=1}^{a_h} \sum_{j=1}^{n_h} w_{hi} y_{hij}$$

where, y_h is the estimated total for the h^{th} stratum., w_{hi} is the weight for the j^{th} household in the i^{th} district of the h^{th} stratum, $j = 1 - a_h$ is the number of selected clusters in the stratum, $j = 1 - n_h$ is the number of sample households in the stratum.

The rural and urban estimate is given by:

$$y = \sum_{h=1}^H y_h$$

where, y is the overall estimate, $h = 1, \dots, H$ is the total number of strata. For the purposes of this survey $H = 10$ (Provinces).



CHAPTER 4: CHARACTERISTICS OF FISH FARMING HOUSEHOLDS

This chapter highlights the demographic characteristics of household heads engaged in aquaculture as at 31st December, 2022. The main demographic characteristics discussed under this section include sex, age, education level and marital status for the fish farming households.

4.1 Distribution of fish farming households

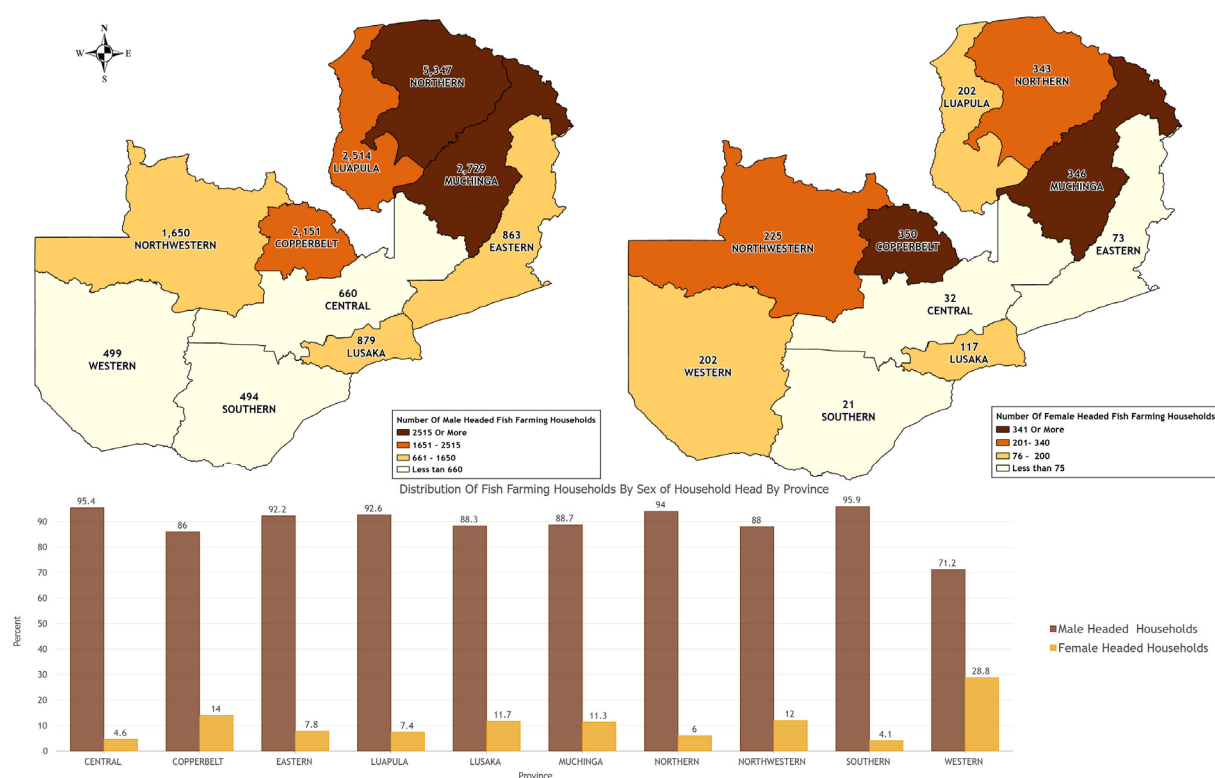
Table 4.1 shows that a total of 19,697 households were engaged in fish farming as at 31st December 2022. Among the provinces, Northern Province had the highest number of fish farming households at 5,690 followed by Muchinga Province at 3,075, Southern Province had the lowest number of fish farming households at 515.

Southern Province recorded the highest percentage of Male-headed households at 95.9% while Western recorded the lowest at 71.2%. On the other hand, Western recorded the highest percentage of female-headed households at 28.8% and Southern Province was the lowest percentage at 4.1%.

TABLE 4.1: DISTRIBUTION OF FISH FARMING HOUSEHOLDS BY SEX OF HOUSEHOLD HEAD AND PROVINCE

Province	sex of household heads				Total Fish Farming Households	
	Male		Female			
	Number	Percent	Number	Percent	Number	Percent
Central	660	95.4	32	4.6	692	100
Copperbelt	2,151	86	350	14	2,501	100
Eastern	863	92.2	73	7.8	936	100
Luapula	2,514	92.6	202	7.4	2,716	100
Lusaka	879	88.3	117	11.7	996	100
Muchinga	2,729	88.7	346	11.3	3,075	100
Northern	5,347	94.0	343	6	5,690	100
Northwestern	1,650	88.0	225	12	1,875	100
Southern	494	95.9	21	4.1	515	100
Western	499	71.2	202	28.8	701	100
Zambia	17,786	90.3	1,911	9.7	19,697	100

FIGURE 4.1: DISTRIBUTION OF FISH FARMING HOUSEHOLDS BY SEX OF HOUSEHOLD HEAD AND PROVINCE



4.1.2 Distribution of households engaged in fish farming by rural and urban areas

Table 4.2 shows the distribution of households engaged in fish farming in rural and urban areas. A total of 14,358 households were based in the rural area, which accounted for 72.9% of the total fish farming households while the remaining 27.1% were urban-based.

At provincial level, Northern had the highest percentage of rural fish farming households at 93.0% while Copperbelt recorded the lowest at 11.2%. Conversely, Copperbelt Province recorded the highest percentage of urban fish farming households at 88.8% while Northern Province was the lowest at 7.2%.

TABLE 4.2: DISTRIBUTION OF HOUSEHOLDS ENGAGED IN FISH FARMING BY RURAL AND URBAN AREAS BY PROVINCE

Province	Region				Total	
	Rural		Urban			
	Number	Percent	Number	Percent	Number	Percent
Central	510	73.7	182	26.3	100	692
Copperbelt	279	11.2	2,222	88.8	100	2,501
Eastern	668	71.4	269	28.7	100	936
Luapula	2,286	84.2	430	15.8	100	2,716
Lusaka	292	29.4	704	70.6	100	996
Muchinga	2,545	82.8	530	17.2	100	3,075
Northern	5,292	93	398	7	100	5,690
Northwestern	1,641	87.5	235	12.5	100	1,875
Southern	309	60	206	40	100	515
Western	536	76.5	165	23.5	100	701
Zambia	14,358	72.9	5,339	27.1	100	19,697



4.2 Distribution of heads of fish farming households by marital status

Table 4.3 shows the percentage distribution of fish farming households’ heads by marital status and province. Overly, 84.5% of fish farming household heads were married (82.1% monogamous and 2.4% polygamous) and 5.6% of households were single. Meanwhile, 5.5% were widowed and 3.0% were divorced.

Among provinces, Northern Province had the highest percentage of monogamously married household heads at 88.2% while Western Province had the lowest percentage at 64.2%. Southern Province had the highest percentage of polygamously married household heads at 10.8%. Lusaka Province had the highest percentage of widowed household heads at 10.5% while Southern Province had the lowest percentage at 1.4%.

TABLE 4.3: DISTRIBUTION OF HEADS OF FISH FARMING HOUSEHOLDS BY MARITAL STATUS AND PROVINCE

Province	Percentage distribution of household heads by marital status						Total	Total fish farming households
	Single (Never married)	Monogamously married	Polygamously married	Divorced	Widowed	Separated		
Central	4.6	84.6	3	1.6	4.6	1.6	100	692
Copperbelt	9.4	78.5	0	2.8	8.4	0.9	100	2,501
Eastern	3.4	82.6	3.8	1.5	6.3	2.3	100	936
Luapula	2.3	85.2	2.5	2.9	5.4	1.8	100	2,716
Lusaka	9	77.6	0	3	10.5	0	100	996
Muchinga	7.4	78.8	3.2	3.8	4.6	2.1	100	3,075
Northern	1.8	88.2	2.3	2.7	3.8	1.3	100	5,690
North-western	9.4	78.7	3.1	1	6.2	1.5	100	1,875
Southern	6.7	75.6	10.8	5.5	1.4	0	100	515
Western	17.1	64.2	0	8.8	7.8	2	100	701
Zambia	5.6	82.1	2.4	3	5.5	1.4	100	19,697

4.3 Distribution of fish farming household heads by sex and age group

Table 4.4 shows the distribution of fish farming household heads by sex and age group. Overly, the age group (50-54) reported the highest number at 2,675 followed by 40-44 and 45-49 with 2,583 and 2,445, respectively. Meanwhile, the age group (40-44) had the highest number of male household heads at 2,379 and the age group of (50-54) had the highest number of female-headed households engaged in fish farming.w

TABLE 4.4: DISTRIBUTION OF FISH FARMING HOUSEHOLD HEADS BY SEX AND AGE GROUP

Age Group	Sex of the head of the households				Total	
	Male		Female			
	Number	Percent	Number	Percent	Number	Percent
10-14	10	100.0	0	0.0	100.0	10
15 - 19	75	96.2	3	3.8	100.0	78
20 - 24	730	91.3	70	8.8	100.0	800
25 - 29	1,371	93.8	90	6.2	100.0	1,461
30 - 34	1,867	90.1	204	9.9	100.0	2,071
35 - 39	1,752	94.2	108	5.8	100.0	1,860
40 - 44	2,379	92.1	204	7.9	100.0	2,583
45 - 49	2,189	89.5	256	10.5	100.0	2,445
50 - 54	2,377	88.9	298	11.1	100.0	2,675
55 - 59	1,632	87.7	228	12.3	100.0	1,860
60 - 64	1,460	91.8	130	8.2	100.0	1,590
65 - 69	896	82.9	185	17.1	100.0	1,081
70 - 74	598	88.3	79	11.7	100.0	677
75 -79	226	89	28	11	100.0	254
80+	226	89.7	26	10.3	100.0	252
Total	17,788	90.3	1,909	9.7	100.0	19,697

4.3.2 Distribution of fish farming households by sex of household head

Table 4.5 shows the distribution of fish farming households by sex of household head and age group. The majority were 35 years and older (77.57%) while youth-headed households (15-34 years) accounted for 22.38% of the total fish farming household heads.

The most common age group among the male-headed households was 35 years and older accounting for 77.2% followed by those between 15 and 34 years at 22.7%. Among the female-headed household heads, the age group 35 and older was still the majority at 80.8%.

TABLE 4.5: DISTRIBUTION OF FISH FARMING HOUSEHOLDS BY SEX OF HEADS OF HOUSEHOLDS AND AGE CATEGORY

Age Group	Distribution of household heads by sex				Total	
	Male		Female			
	Number	Percent	Number	Percent	Number	Percent
Less than 15 years old	10	0.1	0	0	10	0.05
15 to 34 years old	4,043	22.7	366	19.2	4,409	22.38
35 years and older	13,735	77.2	1543	80.8	15,278	77.57
Total	17,788	100	1,909	100	19,697	100

Table 4.6 shows the participation in fish farming by youth and non-youth-headed households by province. Among provinces, Northern accounted for the highest number of youth-headed households at 28.4%, followed by Northwestern and Muchinga with 24.5% and 23.8% respectively. The lowest was Southern at 12.0%. Meanwhile, Southern Province reported the highest percentage of household heads 35 years and older at 87.8%, followed by Eastern and Central Provinces at 87.4% and 84.7% respectively.


TABLE 4.6: DISTRIBUTION OF FISH FARMING HOUSEHOLD HEADS BY AGE AND PROVINCE

Province	Distribution of fish farming household heads by age group and province						Total	
	Less than 15 years old		15 to 34 years old		35 years and older			
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Central	0	0	106	15.3	586	84.7	692	100
Copperbelt	0	0	443	17.7	2,058	82.3	2,501	100
Eastern	0	0	118	12.6	818	87.4	936	100
Luapula	0	0	538	19.8	2,178	80.1	2,716	100
Lusaka	0	0	176	17.7	820	82.1	996	100
Muchinga	0	0	733	23.8	2,342	76.2	3,075	100
Northern	0	0	1,616	28.4	4,074	71.5	5,690	100
North-western	10	0.5	460	24.5	1,405	74.9	1,875	100
Southern	0	0	62	12	453	87.8	515	100
Western	0	0	158	22.5	543	77.5	701	100
Zambia	10	0.1	4,410	22.4	15,277	77.5	19,697	100

4.4 Age Group and Sex of Members of Fish Farming Households

Table 4.7 shows the age group and sex of members of Fish farming households in the country. The total number of members in the fish farming households was 106,553 of which 55,828 (52.4%) were male and 50,725 (47.6%) were female. Additionally, the age group 15-19 for both males and females was highest at 8,419 (51.5%) and 7,234 (48.5%), respectively.

TABLE 4.7: SEX OF HOUSEHOLD MEMBERS BY AGE GROUP

Age Group	Distribution of household members by sex by age group				Total	
	Male		Female			
	Number	Percent	Number	Percent	Number	Percent
0 - 4	4,417	52.2	4,052	47.8	100	8,469
05-Sep	6,078	49.8	6,139	50.2	100	12,217
Oct-14	7,295	51.5	6,881	48.5	100	14,176
15 - 19	8,419	53.8	7,234	46.2	100	15,653
20 - 24	6,541	54.3	5,515	45.7	100	12,056
25 - 29	4,001	50.3	3,955	49.7	100	7,956
30 - 34	3,099	51.5	2,914	48.5	100	6,013
35 - 39	2,243	46	2,638	54	100	4,881
40 - 44	2,733	51.4	2,584	48.6	100	5,317
45 - 49	2,495	49.7	2,521	50.3	100	5,016
50 - 54	2,604	52.9	2,316	47.1	100	4,920
55 - 59	1,911	56.6	1,467	43.4	100	3,378
60 - 64	1,508	59	1,049	41	100	2,557
65 - 69	1,111	59.5	756	40.5	100	1,867
70 - 74	661	68.1	309	31.9	100	970
75 -79	289	56.7	221	43.3	100	510
80+	423	70.9	174	29.1	100	597
Total	55,828	52.4	50,725	47.6	100	106,553

4.5 Household heads by highest level of education

Table 4.8 shows the distribution of fish farming household heads by highest level of education completed by province. Out of the 19,697 heads of fish farming households, the majority of them attained primary education (30.1%) followed by junior secondary at 23.6% while 1.3% had never been to school.

TABLE 4.8: HOUSEHOLD HEADS BY HIGHEST LEVEL OF EDUCATION

Province	Total households	Percentage distribution of household heads by highest level of education attained								
		None	Primary	Junior secondary	Senior secondary	A- level	College/ Undergrad-uate	Certificate/ Diploma	Bachelor's degree	Master's degree and beyond
Central	692	0	26.1	18.5	24.5	0	0	17	4.6	9.2
Copperbelt	2,501	0	6.5	15	29	0	3.7	29	7.5	9.4
Eastern	936	1.7	35.9	14.5	27.5	0	3.2	12.4	4.8	0
Luapula	2,716	1.8	36.3	24.1	24.2	0	0.2	7	4.1	2.3
Lusaka	996	2.9	10.3	11.8	8.8	0	2.9	25	17.7	20.6
Muchinga	3,075	0.7	29.8	35	26.4	0	0.4	4.6	2.4	0.7
Northern	5,690	1.1	45.2	30.9	17.4	0.2	0.9	3.4	0.9	0
Northwestern	1,875	2.6	23.4	24.9	31.3	0	4.7	8.8	3.7	0.5
Southern	515	5.2	21.4	13.4	26.6	0	2.7	18.6	9.3	2.7
Western	701	0	17.4	28.4	32.7	0	5.9	11.3	3.9	0.4
Zambia	19,697	1.3	30.1	25.3	23.6	0.1	1.8	10.5	4.2	3.1

4.6 Size of Households practicing Fish Farming

Table 4.9 shows that the overall average household size for male-headed households was 5 while that of female-headed was 4. Among provinces, Northwestern had the largest size (7), for male-headed households while Lusaka Province had the smallest size at 4. Eastern, Northern, and Northwestern provinces had the highest number (5) of households headed by females while Central and Lusaka had the least (3).

TABLE 4.9: SIZE OF HOUSEHOLDS PRACTICING FISH FARMING

Average household size of fish farming households by sex of heads and province		
Province	Average of household size	
	Male-headed	Female-headed
Central	5	3
Copperbelt	5	4
Eastern	5	5
Luapula	6	4
Lusaka	4	3
Muchinga	5	4
Northern	6	5
Northwestern	7	5
Southern	6	4
Western	5	4
Zambia	5	4



CHAPTER 5: FISH FARMING MANAGEMENT

This chapter highlights fish farming management aspects such as source of water used for fish farming, the source and cost of inputs used by households and establishments in aquaculture production, the proportion of households that received extension services and the type of information received. The chapter further discusses information on the inputs used by households and establishments in fish farming, the distance covered by the households in sourcing their inputs, the proportion of households that used the extension service information and reasons for the households that did not use the information.

5.1 Source of water used in fish production

Table 5.1 indicates that the main source of water for fish farming was streams/rivers used by 57.2% of the households. Swamps/dambos/wetlands and boreholes were the next common water source accounting for 17.3% and 10.6% of the households, respectively.

TABLE 5.1: PERCENTAGE DISTRIBUTION OF HOUSEHOLDS BY MAIN WATER SUPPLY BY PROVINCE

Province	Total households		Percentage distribution of households by source of water for fish farming							
	Number	Percent	Stream/ river	Spring	Lake	Dam/ reservoir	Swamp/ dambo/ wetlands	Borehole	Water utility company	Other specify
Central	692	100.0	38.4	4.6	0.0	1.6	10.7	41.6	0.0	3.0
Copperbelt	2,501	100.0	41.1	11.2	0.0	1.9	22.4	16.8	4.7	1.9
Eastern	936	100.0	12.8	9.3	0.0	3.2	45.0	17.5	1.5	10.8
Luapula	2,716	100.0	60.1	21.2	0.0	0.9	16.9	0.4	0.0	0.2
Lusaka	996	100.0	20.6	2.9	0.0	1.5	1.5	69.2	1.5	2.9
Muchinga	3,075	100.0	70.3	3.5	0.0	5.6	17.1	3.2	0.0	0.4
Northern	5,690	100.0	65.3	6.8	0.5	6.4	19.0	0.7	0.0	1.3
Northwestern	1,875	100.0	87.0	5.2	0.0	1.5	4.7	0.5	0.5	0.5
Southern	515	100.0	21.4	1.4	1.4	10.7	4.1	54.6	5.4	1.4
Western	701	100.0	56.5	7.8	0.0	0.4	23.0	11.7	0.4	0.0
Zambia	19,697	100.0	57.2	8.4	0.2	3.8	17.3	10.6	0.9	1.5

5.2 Distribution of Households by type of inputs used in Fish Production

Table 5.2 indicate numbers of households in each province who used different types of inputs in fish production. Northern and Luapula had the largest number of households supplied with fingerlings having 4,041 and 2,385 respectively, and also were at the same time having more compost/manure input than other provinces.

TABLE 5.2: TYPE OF INPUTS USED BY HOUSEHOLDS IN FISH FARMING

Province	Fingerlings	Commercial Feed	Own made feed (ingredients)	Fertilizer	Lime	Compost / Manure	Others, specify
Central	489	384	223	42	42	298	64
Copperbelt	1,800	1,425	374	47	258	608	397
Eastern	811	322	480	30	22	327	65
Luapula	2,385	613	1255	25	0	729	281
Lusaka	923	908	102	15	29	249	15
Muchinga	1,365	641	1,274	140	22	881	375
Northern	4,041	507	1,815	202	0	1,154	1,425
Northwestern	1,339	616	789	20	29	568	108
Southern	350	336	151	0	21	172	55
Western	619	492	120	48	154	271	31

5.3 Source of input for Fish Farming

The most common input source was purchasing from agro-dealers reported by 10,450 households, followed by self-produced (7,808) while the least source was others which recorded 1,099 households (See Table 5.3).

TABLE 5.3: SOURCE OF INPUT FOR FISH FARMING

Province Name	Own (self produced)	Purchased from dealer	Purchased from farmer	NGO or government	Friend, neighbor, or family	Others,
Central	383	542	202	53	11	64
Copperbelt	679	2,525	443	211	70	93
Eastern	435	716	207	313	124	81
Luapula	1,562	1,102	1284	348	226	367
Lusaka	249	1,582	132	59	29	44
Muchinga	721	269	580	473	344	140
Northern	2,718	1,124	2,216	251	651	182
Northwestern	742	1,077	663	186	166	39
Southern	158	480	110	0	48	62
Western	161	1,033	79	147	161	27
Zambia	7,808	10,450	5,916	2,041	1,830	1,099

5.4 Distance from the Homestead to Fish Farming input source

Table 5.4 shows the distribution of fish farming households by the distance ranges from the homestead to the fish farming input source. In most provinces, the households accessed most of their inputs within a kilometer radius (14,847 households), with Northern Province recording more households (5,219), followed by Luapula Province (2,369) and then Muchinga Province (2,269).



TABLE 5.4: DISTRIBUTION OF FISH FARMING HOUSEHOLDS FROM HOMESTEAD TO INPUT SOURCE BY PROVINCE

Province Name	Less than kilometers	1 to 5km	5.1 to 10km	10.1 to 20km	20.1 to 50km	50.1 to 100km	100.1 to 200km	200.1 to 500km	500.1 to 1000km	1000.1 +km
Central	542	256	107	117	202	233	21	53	0	11
Copperbelt	1,450	935	585	725	888	187	94	23	0	0
Eastern	650	481	209	178	145	73	82	160	79	0
Luapula	2,369	1,095	520	343	490	202	116	92	43	18
Lusaka	307	307	279	381	528	365	44	15	0	0
Muchinga	2,269	991	409	292	227	118	219	162	11	0
Northern	5,219	2,074	617	455	408	172	160	20	20	0
Northwestern	1,366	811	245	78	284	225	127	176	147	10
Southern	261	124	89	82	185	151	151	41	0	0
Western	414	151	79	120	175	177	124	317	175	3
Total	14,847	7,225	3,139	2,771	3,532	1,903	1,138	1,059	475	42

5.5 Proportion of Households Accessing Extension Services

Table 5.5 shows that out of a total 19,697 fish farming households, 12,958 representing 65.8% received extension services. Among provinces, Western recorded the highest percentage at 96.0% followed by Lusaka (80.9%) and Copperbelt (76.6%) while Muchinga reported the lowest at 48.2%.

TABLE 5.5: DISTRIBUTION OF HOUSEHOLDS THAT RECEIVED EXTENSION SERVICES BY PROVINCE

Province	Total households	Households that received extension services	
		Number	Percent
Central	692	500	72.3
Copperbelt	2,501	1,916	76.6
Eastern	936	714	76.3
Luapula	2,716	2,061	75.9
Lusaka	996	806	80.9
Muchinga	3,075	1,482	48.2
Northern	5,690	3,243	57.0
Northwestern	1,875	1,171	62.5
Southern	515	391	75.9
Western	701	673	96.0
Zambia	19,697	12,958	65.8

5.6 Types of Fish Farming Information received by Households

Table 5.6 shows the number of households in the province that had access to information on fish farming. Fish production was the most received type of information (11,406 households) followed by fish inputs and fish marketing at 6,845 and 2,659 respectively. Credit, micro-finance or savings information was the least at 1,654 households.

TABLE 5.6: HOUSEHOLDS THAT ACCESSED VARIOUS TYPES OF FISH FARMING INFORMATION BY PROVINCE

Province	Distribution of households by type of information received							
	Fish input		Fish production		Fish marketing		Credit, micro-finance, or savings information	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Central	192	2.8	447	3.9	117	4.4	53	3.2
Copperbelt	1,100	16.1	1,799	15.8	492	18.5	351	21.2
Eastern	520	7.6	671	5.9	212	8.0	137	8.3
Luapula	1,138	16.6	1,994	17.5	520	19.6	300	18.2
Lusaka	439	6.4	689	6.0	161	6.1	117	7.1
Muchinga	762	11.1	966	8.5	43	1.6	311	18.8
Northern	1,151	16.8	2,829	24.8	515	19.4	81	4.9
Northwestern	770	11.2	1,015	8.9	254	9.6	147	8.9
Southern	261	3.8	371	3.3	69	2.6	7	0.4
Western	513	7.5	625	5.5	276	10.4	151	9.1
Zambia	6,845	100.0	11,406	100.0	2,659	100.0	1,654	100.0

5.7 Proportion of Households that used Fish Farming Information

Table 5.7 shows that out of the 6,845 households that received fish input information, 86.4% used it, 7.0% partially used it while the remaining 6.6% did not use it. At provincial level, all households in Lusaka used (100%) the fish input information received from extension service while Northern recorded the highest percentage of households that did not use (15.9%) with North-western reporting the highest (34.0%) partially used that partially use the information.

TABLE 5.7: PERCENTAGE DISTRIBUTION OF HOUSEHOLDS THAT USED AND DID NOT USE FISH INPUT INFORMATION BY PROVINCE

Province	Distribution of Households			
	That received, used and did not use fish input information			
	Total (received)	Used	Not used	Partially used
		Percent	Percent	Percent
Central	192	94.5	0.0	5.5
Copperbelt	1100	83.0	6.4	10.7
Eastern	520	94.5	5.5	0.0
Luapula	1138	92.5	3.2	4.3
Lusaka	439	100.0	0.0	0.0
Muchinga	762	87.3	8.4	4.2
Northern	1151	83.3	15.9	0.9
Northwestern	770	63.5	2.5	34.0
Southern	261	89.5	10.5	0.0
Western	513	96.0	4.0	0.0
Zambia	6,845	86.4	6.6	7.0



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Table 5.8 shows that out of the 11,406 households that received fish production information, 86.5% used it, 6.5% partially used it while 7.0% did not use it. At provincial level, Lusaka households used (100%) of every fish production information received from extension service while Northern recorded the highest (13.2%) not used with North-western reporting the highest (25.8%) partially used.

TABLE 5.8: PERCENTAGE DISTRIBUTION OF HOUSEHOLDS THAT USED AND DID NOT USE FISH PRODUCTION INFORMATION BY PROVINCE

Province	Distribution of Households			
	That received, used and did not use fish production information			
	Total (received)	Used	Not used	Partially used
		Percent	Percent	Percent
Central	447	95.2	2.4	2.4
Copperbelt	1,799	79.2	10.4	10.4
Eastern	671	91.2	5.6	3.2
Luapula	1994	89.9	4.0	6.1
Lusaka	689	100.0	0.0	0.0
Muchinga	966	97.8	1.1	1.1
Northern	2,829	82.5	13.2	4.2
Northwestern	1,015	68.4	5.8	25.8
Southern	371	88.9	11.1	0.0
Western	625	98.4	0.5	1.1
Zambia	11,406	86.5	7.0	6.5

Table 5.9 shows that out of the 2,659 households that received fish marketing information across the country, 86.5% used it, 5.2% partially used it while 8.2% did not use it. At provincial level, Western households reported the highest used (98.8%) fish marketing information received from extension service while Muchinga recorded the highest partially and not used both at 25%.

TABLE 5.9: PERCENTAGE DISTRIBUTION OF HOUSEHOLDS THAT USED AND DID NOT USE FISH MARKETING INFORMATION BY PROVINCE

Province	Percentage distribution of Households			
	That received, used and did not use fish marketing information			
	Total Households (received)	Used	Not used	Partially used
		Percent	Percent	Percent
Central	117	90.9	9.1	0
Copperbelt	492	76.2	9.6	14.3
Eastern	212	86.6	13.4	0
Luapula	520	83.6	7	9.4
Lusaka	161	90.9	9.1	0
Muchinga	43	50	25	25
Northern	515	92.2	7.8	0
Northwestern	254	88.5	7.7	3.8
Southern	69	89.9	10.1	0
Western	276	98.8	1.2	0
Zambia	2,659	86.5	8.2	5.2

Table 5.10 shows that out of the 1,654 households that received Credit, micro-finance, or savings information across the country, 57.1% used it, 0.9% partially used it while 42.0% did not use it. At provincial level, Southern households used (100%) of every Credit, micro-finance, or savings information received from extension service while Muchinga recorded the highest (82.7%) not used with Luapula reporting the highest (4.1%) partially used.

TABLE 5.10: PERCENTAGE DISTRIBUTION OF HOUSEHOLDS THAT USED AND DID NOT USE CREDIT, MICRO-FINANCE, OR SAVINGS INFORMATION BY PROVINCE

Province	Households			
	That received, used and did not use credit, micro-finance, or savings information			
	Total (received)	Used Percent	Not used Percent	Partially used Percent
Central	53	39.9	60.1	0
Copperbelt	351	80	20	0
Eastern	137	73.9	26.1	0
Luapula	300	46.9	49	4.1
Lusaka	117	37.4	62.6	0
Muchinga	311	17.3	82.7	0
Northern	81	50.3	49.7	0
Northwestern	147	80.2	19.8	0
Southern	7	100	0	0
Western	151	90.9	6.8	2.3
Zambia	1,654	57.1	42	0.9

5.8 Household reasons for not using Information received from Extension Service

Table 5.11 shows that out of the 931 households that did not use fish input information received from extension service across the country, 45.7% reported that it was due to inadequate funds, 33.2% lack of suppliers of inputs, 9.7% message not clear while 11.5% other reasons such as did not stock fish, did not take it seriously and extension service not being available.

At provincial level, Western households reported inadequate funds (100%) as the main reason for not using fish input information received from extension service, for Northern lack of suppliers of inputs (62.5%), Central message not clear (100%) and Southern other reasons at 74.9%.

TABLE 5.11: PERCENTAGE DISTRIBUTION OF HOUSEHOLD REASONS FOR NOT USING FISH INPUT INFORMATION BY PROVINCE

Province	Distribution of Households				
	Reasons for not using fish input information				
	Total (Not and partially used)	Inadequate funds Percent	Lack of suppliers of inputs Percent	Message not clear Percent	Other Percent
Central	11	0	0	100	0
Copperbelt	187	74.9	0	0	25.1
Eastern	29	50.7	25.3	0	24.1
Luapula	86	85.7	7.1	7.2	0
Lusaka	0	0	0	0	0
Muchinga	97	11.1	11.1	44.4	33.4
Northern	193	26.9	62.5	10.6	0
Northwestern	281	38	58.5	3.5	0
Southern	27	25.1	0	0	74.9
Western	21	100	0	0	0
Zambia	931	45.7	33.2	9.7	11.5

Table 5.12 shows that out of the 1,543 households that did not use fish production information received from extension service across the country, 59.2% reported that it was due to inadequate funds, 16.8% lack of suppliers of inputs, 13.6% message not clear while 10.3% was due to other reasons such as did not stock fish, did not take it seriously and extension service not being available.



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At the provincial level, households reported inadequate funds (100%) as the main reason for not using fish production information received from extension service in Western, for Muchinga the majority reported lack of suppliers of inputs (50.0%), while in Central and Muchinga, message not being clear was the major reason both at 50%.

TABLE 5.12: PERCENTAGE DISTRIBUTION OF HOUSEHOLD REASONS FOR NOT USING FISH PRODUCTION INFORMATION BY PROVINCE

Province	Distribution of Households				
	Reasons for not using fish production information				
	Total (Not and partially used)	Inadequate funds	Lack of suppliers of inputs	Message not clear	Other
	Number	Percent	Percent	Percent	Percent
Central	21	50	0	50	0
Copperbelt	374	62.5	0	12.5	25
Eastern	59	36.7	12.3	39.3	11.7
Luapula	201	78.8	6.1	6.1	9
Lusaka	0	0	0	0	0
Muchinga	22	0	50	50	0
Northern	494	37.1	38.6	20.2	4.1
Northwestern	321	87.9	12.1	0	0
Southern	41	33.4	0	16.8	49.9
Western	10	100	0	0	0
Zambia	1,543	59.2	16.8	13.6	10.3

Table 5.13 shows that out of the 358 households that did not use fish marketing information received from extension service across the country, 39.5% reported that it was due to inadequate funds, lack of suppliers of inputs (24.8%), messages not clear (16.4%) while 19.4% other reasons such as did not stock fish, did not take it seriously and extension service not being available.

At provincial level, Copperbelt households reported inadequate funds (79.9%) as the main reason for not using fish marketing information received from extension service, for Northern lack of suppliers of inputs (75.0%), Central and Southern message not clear both at 100% and Western other reasons at 100%.

TABLE 5.13: PERCENTAGE DISTRIBUTION OF HOUSEHOLD REASONS FOR NOT USING FISH MARKETING INFORMATION BY PROVINCE

Province	Distribution of Households				
	Reasons for not using fish marketing information				
	Total (Not and partially used)	Inadequate funds	Lack of suppliers of inputs	Message not clear	Other
	Number	Percent	Percent	Percent	Percent
Central	11	0	0	100	0
Copperbelt	117	79.9	20.1	0	0
Eastern	28	25.5	0	50.3	24.2
Luapula	86	35.7	28.5	7.1	28.6
Lusaka	15	0	0	0	0
Muchinga	22	0	50	50	0
Northern	40	0	75	0	25
Northwestern	29	33.1	0	33.4	33.4
Southern	7	0	0	100	0
Western	3	0	0	0	100
Zambia	358	39.5	24.8	16.4	19.4

Table 5.14 shows that out of the 710 households that did not use Credit, micro-finance, or savings information received from extension service across the country, 11.0% reported that it was due to inadequate funds, 1.0% lack of suppliers of inputs, 59.3% message not clear while 28.7% other reasons such as did not stock fish, did not take it seriously and extension service not being available.

At the provincial level, Copperbelt households reported inadequate funds (33.4%) as the main reason for not using Credit, micro-finance, or savings information received from extension service, for Eastern lack of suppliers of inputs (20.4%), Muchinga and Western message not clear both at 75.0% and Northwestern other reasons at 100%.

TABLE 5.14: PERCENTAGE DISTRIBUTION OF HOUSEHOLD REASONS FOR NOT USING CREDIT, MICRO-FINANCE, OR SAVINGS INFORMATION BY PROVINCE

Province	Households				
	Reasons for not using Credit, micro-finance, or savings information				
	Total (Not and partially used)	Inadequate funds	Lack of suppliers of inputs	Message not clear	Other
	Number	Percent	Percent	Percent	Percent
Central	32	0	0	66.5	33.5
Copperbelt	70	33.4	0	66.6	0
Eastern	36	0	20.4	59.6	20.1
Luapula	159	7.7	0	50.1	42.2
Lusaka	73	0	0	0	0
Muchinga	257	12.5	0	75	12.5
Northern	40	25	0	50.1	24.9
Northwestern	29	0	0	0	100
Southern	0	0	0	0	0
Western	14	0	0	75	25
Zambia	710	11	1	59.3	28.7



CHAPTER 6: FISH PRODUCTION AND PRODUCTIVITY

This chapter covers fish production and productivity of households and establishments engaged in fish farming between 1st January 2022 and 31st December 2022. It highlights information on the total number of active fish farming facilities by type managed by households and establishments, the area and volume occupied by the facilities and the number of production cycles. Further, fish species produced, stocking density and yields by facility type and province are reported under this chapter.

6.1 Types of Fish Produced by Households and Establishments

Table 6.1 shows that at the household level, table-size fish producers were prominent accounting for 91.6% followed by those producing a combination of table-size and fingerling at 6.4% and the least were fingerling producers at 2.0%. Under establishments, the majority (87.1%) produced table-size fish, followed by table-size and fingerlings producers at 12.7%. The lowest were fingerling producers only at 0.1%.

TABLE 6.1: NUMBER AND PERCENTAGE OF HOUSEHOLDS AND ESTABLISHMENTS BY TYPE OF FISH PRODUCED

Type of Fish	Households		Establishments		Total	
	Number	Percent	Number	Percent	Number	Percent
Table-Size	18,034	91.6	1,176	87.1	19,210	91.3
Fingerlings	399	2.0	2	0.1	401	1.9
Table-Size and fingerling	1,264	6.4	172	12.7	1,436	6.8
Zambia	19,697	100.0	1,350	100	21,047	100.0

6.2 Fish Farming Facilities by type Managed by Households and Establishments

The types of fish farming facilities that were used for fish production by both households and establishments were ponds, cages, tanks, raceways, pens and dams. A total of 61,968 ponds were reported to have been managed by both households and establishments out of which Northern Province recorded the highest at 18,801 followed by Luapula Province with 11,079 while Southern Province accounted for the lowest at 1,166. Cages totaled 919 out of which Southern Province reported the highest at 550 followed by Copperbelt Province and Northern Province with 144 and 45 respectively (See Table 6.2).

TABLE 6.2: DISTRIBUTION OF FISH FARMING FACILITIES USED BY HOUSEHOLDS AND ESTABLISHMENTS BY PROVINCE

Province	Number of Facilities for Households					
	Ponds	Cages	Tanks	Raceways	Pens	Dams
Central	1,447	21	21	-	-	-
Copperbelt	6,310	-	117	-	23	-
Eastern	1,832	-	7	-	-	-
Luapula	10,720	-	6	-	6	-
Lusaka	1,715	-	29	-	-	-
Muchinga	7,266	-	32	-	-	-
Northern	17,769	10	41	20	20	-
North-western	4,886	68	-	20	-	-
Southern	878	7	-	-	21	-
Western	974	14	-	-	-	-
Zambia	53,797	120	253	40	70	-
Number of Facilities for Establishments						
Central	438	12	10	0	0	0
Copperbelt	2,208	144	32	21	10	1
Eastern	231	0	11	0	0	5
Luapula	359	38	0	0	0	2
Lusaka	1,283	0	31	0	0	4
Muchinga	770	15	23	0	0	0
Northern	1,032	35	44	13	0	0
North-western	706	2	0	36	0	0
Southern	288	543	10	12	4	1
Western	856	10	74	0	0	0
Zambia	8,171	799	235	82	14	13
Total Number of Facilities						
Central	1,885	33	31	-	-	-
Copperbelt	8,518	144	149	21	33	1
Eastern	2,063	-	18	-	-	5
Luapula	11,079	38	6	-	6	2
Lusaka	2,998	-	60	-	-	4
Muchinga	8,036	15	55	-	-	-
Northern	18,801	45	85	33	20	-
North-western	5,592	70	-	56	-	-
Southern	1,166	550	10	12	25	1
Western	1,830	24	74	-	-	-
Zambia	61,968	919	488	122	84	13

6.3 Size of Fish Farming Facilities managed by Households and Establishments

Table 6.3 shows that 41,561 fish farming facilities were stocked out of a total 54,280 that were managed by households while at establishment level, all 8,663 facilities were stocked.



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Further, the total stocked area for fish ponds from both households and establishments was 19,597,323 square metres and the volume for cages was 657,977 cubic metres.

TABLE 6.3: FISH FARMING FACILITIES MANAGED BY HOUSEHOLDS AND ESTABLISHMENTS

Fish farming facility	Households		Stocked facilities		Establishments		Total stocked facilities (Households and Establishments)	
	Total facilities				Stocked facilities			
	Number	Area/ Volume (m2/ m3)	Number	Area/ Volume (m2/ m3)	Number	Area/ Volume (m2/ m3)	Number	Area/ Volume (m2/ m3)
Ponds	53,797	17,399,204	41,192	13,561,387	7,573	6,035,936	48,765	19,597,323
Cages	120	9,350	78	3,821	799	654,156	877	657,977
Tanks	253	547,192	225	546,276	161	3,747	386	550,023
Raceways	40	15,864	20	11,910	82	7,288	102	19,198
Pens	70	17,613	46	12,587	14	53,500	60	66,087
Dams	0	0	0	0	34	252,425	34	252,425
Totals	54,280		41,561		8,663		50,224	

6.4 Fish Production by Households and Establishments by Province

Table 6.4 and Figure 6.1 shows fish production by both households and establishments was 52,922 metric tonnes out of which establishments contributed 41,757 metric tonnes while households contributed 11,165 metric tonnes.

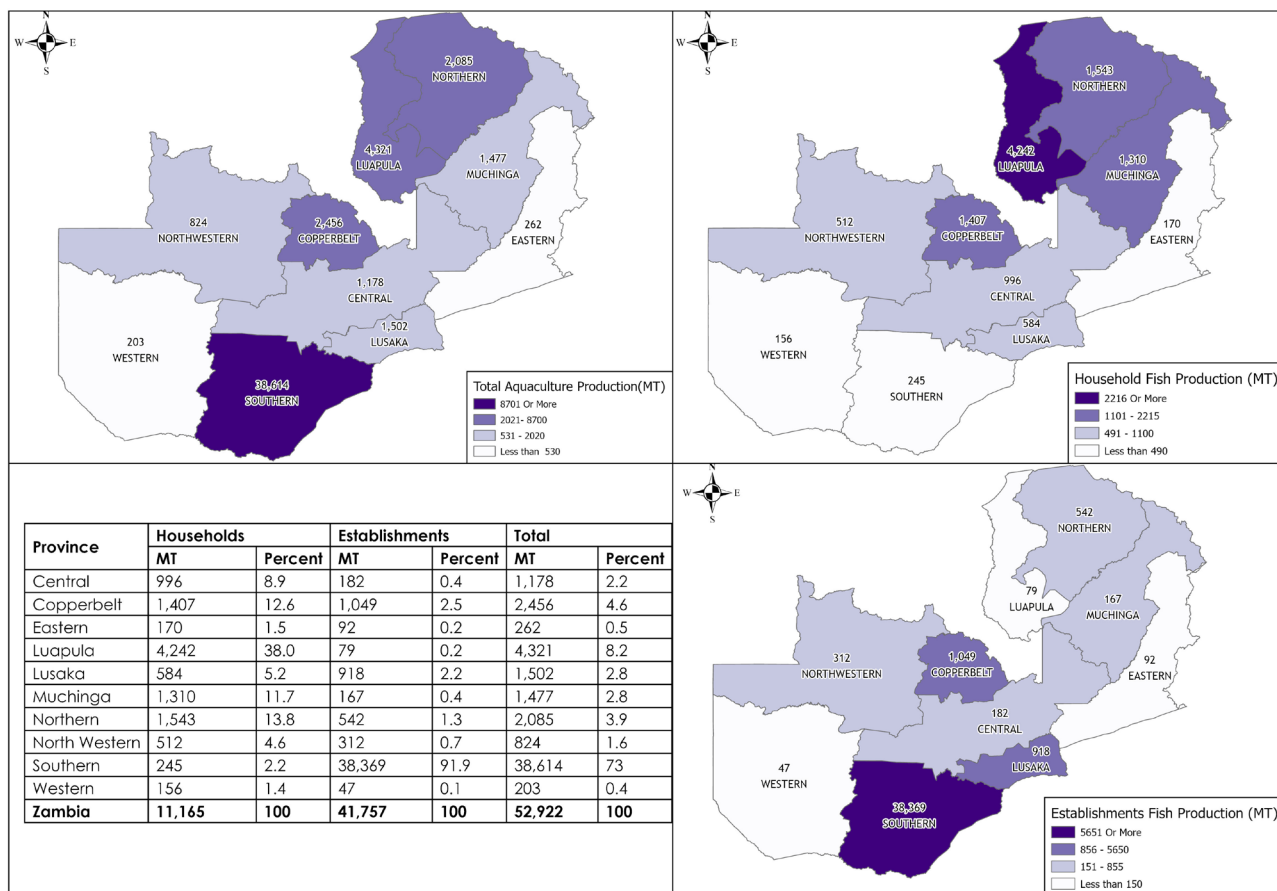
At the household level, Luapula Province reported the highest fish production of 4,242 metric tonnes (38.0%) followed by Northern Province at 1,543 metric tonnes representing 13.8%.

Southern Province was highest at the establishment level recording 38,614 metric tonnes (91.9%) of fish production, followed by Copperbelt and Lusaka at 1,049 metric tonnes (2.5%) and 918 metric tonnes (2.2 %), respectively.

TABLE 6.4: FISH PRODUCTION BY HOUSEHOLDS AND ESTABLISHMENTS BY PROVINCE

Province	Households		Establishments		Total	
	Metric Tonnes	Percent	Metric Tonnes	Percent	Metric Tonnes	Percent
Central	996	8.9	182	0.4	1,178	2.2
Copperbelt	1,407	12.6	1,049	2.5	2,456	4.6
Eastern	170	1.5	92	0.2	262	0.5
Luapula	4,242	38.0	79	0.2	4,321	8.2
Lusaka	584	5.2	918	2.2	1,502	2.8
Muchinga	1,310	11.7	167	0.4	1,477	2.8
Northern	1,543	13.8	542	1.3	2,085	3.9
North Western	512	4.6	312	0.7	824	1.6
Southern	245	2.2	38,369	91.9	38,614	73
Western	156	1.4	47	0.1	203	0.4
Zambia	11,165	100	41,757	100	52,922	100

FIGURE 6.1: FISH PRODUCTION BY HOUSEHOLDS AND ESTABLISHMENTS BY PROVINCE



6.5 Fish Production by Households and Establishments by Species

The major cultured fish species in Zambia recorded were breams (Three-spotted tilapia, Green-headed tilapia, Red-breasted tilapia, Nile tilapia and Tanganyika bream), Common carp fish and Catfish. At the household level, Red-breasted tilapia accounted for the highest percentage of fish produced at 27.2%, followed by Mixed species and Green-headed tilapia at 25.6% and 23.9%, respectively.

Under establishments, Nile tilapia (94.6%) constituted the largest percentage, followed by Red-breasted tilapia (1.9%) and Green-headed tilapia at 1.7%.

TABLE 6.5: FISH PRODUCTION BY HOUSEHOLDS AND ESTABLISHMENTS BY SPECIES

Fish Species	Households		Establishments		Total	
	Metric Tonnes	Percent	Metric Tonnes	Percent	Metric Tonnes	Percent
Three-spotted tilapia	1,787	16	676	1.6	2,463	4.7
Green-headed tilapia	2,671	23.9	724	1.7	3,395	6.4
Red-breasted tilapia	3,036	27.2	811	1.9	3,847	7.3
Nile tilapia	761	6.8	39,486	94.6	40,247	76.1
Carp fish	15	0.1	2	0.00005	17	0.03
Catfish	27	0.2	23	0.1	50	0.09
Tanganyika bream	20	0.2	17	0.04	37	0.07
Mixed species	2,848	25.6	18	0.04	2,866	5.4
Total	11,165	100	41,757	100	52,922	100



6.6 Quantity of Fish Produced by Households and Establishments by Species

Table 6.6 shows that at provincial level, Nile tilapia was the most produced fish species at 39,486 metric tonnes with Southern province being the highest producer at 38,330 metric tonnes. Red-breasted tilapia was the second most produced species at 3,036 metric tonnes and Luapula was the main producer at 855 metric tonnes. The least produced species was Carp fish at 2 metric tonnes, and Central province was the only producer. Other species included Nchenga, crossbreeds, Philander, gomogomo etc.

TABLE 6.6: QUANTITY OF FISH PRODUCED BY HOUSEHOLDS AND ESTABLISHMENTS BY PROVINCE

Province	Quantity of Fish Species produced under Households (MT)									
	Three spotted	Green headed	Red breasted	Nile Tilapia	Carp fish	Cat fish	Tanganyika bream	other specify	Mixed species	Total production
Central	124	44	783	8	0	8	3	26	1	997
Copperbelt	318	30	240	156	0	0	0	0	663	1,407
Eastern	83	21	29	4	0	19	0	0	16	172
Luapula	280	1,877	855	0	0	0	0	0	1,229	4,241
Lusaka	190	2	1	334	15	0	0	0	42	584
Muchinga	165	533	410	48	0	0	8	0	145	1,309
Northern	172	156	659	2	0	0	10	0	544	1,543
North Western	348	5	43	39	0	0	0	1	75	511
Southern	6	2	15	172	0	0	0	0	51	246
Western	101	0	2	0	0	0	0	0	54	157
Zambia	1,787	2,671	3,036	761	15	27	20	28	2,820	11,165
Province	Quantity of Fish Species produced under Establishments (MT)									
	Three spotted	Green headed	Red breasted	Nile Tilapia	Carp fish	Cat fish	Tanganyika bream	other specify	Mixed species	Total production
Central	72	4	21	76	2	0	0	9	0	184
Copperbelt	225	8	597	219	0	0	0	0	0	1,049
Eastern	84	1	4	3	0	0	0	0	0	92
Luapula	48	15	9	0	0	0	0	7	0	79
Lusaka	12	0	52	850	0	3	0	0	0	917
Muchinga	3	52	111	0	0	0	0	0	0	166
Northern	0	521	4	0	0	0	17	0	0	542
North Western	191	104	9	7	0	0	0	0	0	311
Southern	0	14	5	38,330	0	20	0	0	0	38,369
Western	40	5	0	0	0	0	0	2	0	47
Zambia	676	724	811	39,486	2	23	17	18	0	41,757

6.7 Number of Production Cycles per Year for Households

The majority (73.3%) of fish farming facilities under households were used for one (1) production cycle followed by those that never harvested their facilities (21.1%). Eastern Province recorded the highest percentage of facilities that had two (2) production cycles at 11.0% (See Table 6.7).

TABLE 6.7: PERCENTAGE DISTRIBUTION OF NUMBER OF PRODUCTION CYCLES BY HOUSEHOLDS BY PROVINCE

Province	Total facilities	Percentage distribution of the number of harvests per facility					
	Number	Percent	0 cycle	1 cycle	2 cycles	3 cycles	4 cycles
Central	1,171	100.0	22.7	69.1	7.3	0.9	0.0
Copperbelt	4,019	100.0	23.3	69.7	7.0	0.0	0.0
Eastern	1,495	100.0	37.3	50.3	11.0	1.5	0.0
Luapula	8,629	100.0	12.7	84.7	2.5	0.1	0.0
Lusaka	1,376	100.0	4.3	85.1	10.6	0.0	0.0
Muchinga	5,295	100.0	25.7	69.8	4.1	0.4	0.0
Northern	14,234	100.0	24.3	71.9	3.6	0.2	0.0
Northwestern	3,862	100.0	16.7	71.4	9.9	1.8	0.3
Southern	749	100.0	23.0	67.8	9.2	0.0	0.0
Western	753	100.0	28.3	61.0	9.4	0.9	0.4
Zambia	41,583	100.0	21.1	73.3	5.1	0.4	0.0

6.8. Fish Stocking Density for Households and Establishments

Table 6.8 shows the average stocking density (number of fish per meter square or meter cubic) for households and establishments. Under households, the national average fish stocking density for cages was 43.1 per meter square and 4.1 per meter square for ponds. Meanwhile, establishments reported a fish stocking density of 90.6 per meter cubic and 7.9 per square meter for cages and ponds, respectively.

Among provinces, Northwestern recorded the highest fish stocking density for cages by households at 76.1 per meter cubic and Western was highest under ponds at 8.0 per square meter. The highest fish stocking density for cages under establishments was recorded in Southern Province (228.0 per meter cubic) and Lusaka was highest under ponds at 9.5 per meter square.

TABLE 6.8: AVERAGE FISH STOCKING DENSITY FOR HOUSEHOLDS AND ESTABLISHMENTS

Province	Households		Establishments	
	Cages (number of fish/m3)	Ponds (number of fish/m2)	Cages (number of fish/m3)	Ponds (number of fish/m2)
Central	10	4.7	24.4	7.3
Copperbelt	-	3.3	31.6	9.5
Eastern	-	3.8	-	4.7
Luapula	-	3.2	81	3.4
Lusaka	-	3.9	-	9.5
Muchinga	-	3.8	68.1	8.1
Northern	-	1.1	43.6	3.2
North Western	76.1	4.4	179.2	8
Southern	-	4.9	228	7.5
Western	-	8	69.1	7
Zambia	43.1	4.1	90.6	7.9

6.9 Average Fish Yields for Households and Establishments

The national average fish yield for cages under households was 18.6 kg/m3/year and 7.0 tonnes/ha/year from ponds. Under establishments, fish yield for cages was 46.6 kg/m3/year while ponds recorded 15.0 tonnes/ha/year



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Cage fish farming under households was only reported in Northwestern and Central Provinces with the earlier reporting the highest yields at 20.3 kg/m³/year. Meanwhile, the highest yield from ponds was recorded in Northern Province at 12.5 tonnes/ha/year followed by Southern (10.2) and the lowest was Luapula at 3.4.

Under establishments, Southern Province reported the highest fish yields from cages at 68.7 kg/m³/year followed by Luapula and Copperbelt at 47.4 and 23.3, respectively. Copperbelt Province recorded the highest fish yields from ponds at 24.9 tonnes/ha/year followed by Southern Province (18.6) and Western (15.5) [See Table 6.9].

TABLE 6.9: AVERAGE FISH YIELDS FOR HOUSEHOLDS AND ESTABLISHMENTS

Province	Households		Establishments	
	Cages (kg/m ³ /year)	Ponds (tonnes/ha/year)	Cages (kg/m ³ /year)	Ponds (tonnes/ha/year)
Central	17	8.1	6.5	5.8
Copperbelt	-	8.4	23.3	24.9
Eastern	-	6.2	-	-
Luapula	-	3.4	47.4	2
Lusaka	-	6.5		11
Muchinga	-	6.7	9.3	1.5
Northern	-	12.5	2	2.8
North Western	20.3	3.8	-	8
Southern		10.2	68.7	18.6
Western	-	4.5	1	15.5
Zambia	18.6	7	46.6	15

CHAPTER 7: FINGERLING PRODUCTION

This chapter covers information on fingerling production by households and establishments between 1st January and 31st December, 2022. Specifically, the number of breeding facilities managed by households, number of fingerlings produced and sold by households and establishments, type of fingerlings produced by households, and the number of establishments producing fingerlings in the country are discussed in this chapter.

7.1 Number of Fish Breeding Facilities Managed by Households and Establishments by Province

Table 7.1 shows that the total number of fish breeding facilities managed by both households and establishments countrywide was 1,781. Under households, Northern Province recorded the highest percentage at 45.6%, followed by Muchinga at 16.6% while the lowest was Western Province (0.4%). Similarly, at the establishment level, Northern Province had the highest percentage at 21.4% while Eastern Province had the lowest percentage at 2.9%.

TABLE 7.1: DISTRIBUTION OF FISH BREEDING FACILITIES MANAGED BY HOUSEHOLDS AND PROVINCE

Province	Managed by households		Managed by establishments		Total	
	Number	Percent	Number	Percent	Number	Percent
Central	21	1.3	12	11.7	33	1.9
Copperbelt	47	2.8	18	17.5	65	3.6
Eastern	129	7.7	3	2.9	132	7.4
Luapula	251	15	6	5.8	257	14.4
Lusaka	44	2.6	8	7.8	52	2.9
Muchinga	279	16.6	10	9.7	289	16.2
Northern	765	45.6	22	21.4	787	44.2
Northwestern	108	6.4	11	10.7	119	6.7
Southern	27	1.6	9	8.7	36	2
Western	7	0.4	4	3.9	11	0.6
Zambia	1,678	100	103	100	1,781	100

7.2 Fingerling Production by Species

A total of 228,119,775 fingerlings were produced by both households and establishments. The households produced a total of 4,647,527 fingerlings of which Three-spotted tilapia accounted for the highest number, representing 69.6% of the total while Tanganyika bream accounted for the lowest number, representing 0.1%. Other species (mixed species/crossbreeds) accounted for 13.2% (See Table 7.2).

Under establishments, a total of 223,472,248 fingerlings were produced. Nile tilapia accounted for the highest number of fingerlings produced at 91.1% followed by Green-headed tilapia (4.0%) while Common Carp fish accounted for the lowest percentage at 0.01%.


TABLE 7.2: DISTRIBUTION OF FINGERLINGS BY SPECIES

Type of Species	Households		Establishments		Total	
	Number	Percent	Number	Percent	Number	Percent
Three-spotted tilapia	3,233,824	69.6	7,523,516	3.4	10,757,340	4.7
Green-headed tilapia	340,748	7.3	9,000,059	4	9,340,807	4.1
Red-breasted tilapia	350,408	7.5	749,298	0.3	1,099,706	0.5
Nile tilapia	61,735	1.3	203,604,441	91.1	203,666,176	89.3
Common Carp fish	29,480	0.6	12,500	0.01	41,980	0
Catfish	14,942	0.3	890,934	0.4	905,876	0.4
Tanganyika Bream	4,657	0.1	1,691,500	0.8	1,696,157	0.7
Other (Mixed Species/Cross-breeds)	611,732	13.2	-	-	611,732	0.3
Zambia	4,647,527	100	223,472,248	100	228,119,775	100

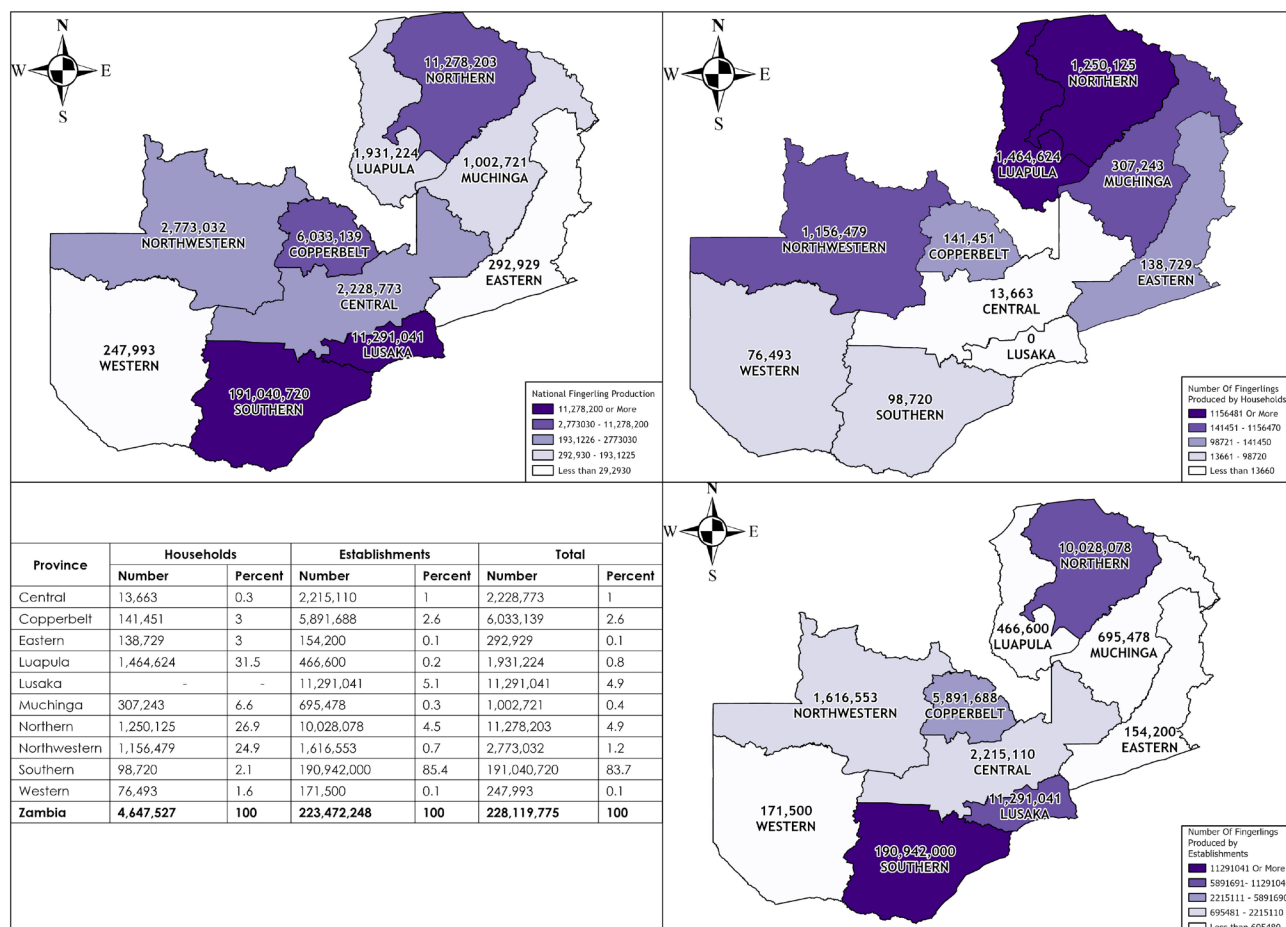
7.3 Fingerling Production by Province

Overall, Southern Province recorded the highest number of fingerlings produced by both households and establishments representing 83.7% of the total. Eastern and Western provinces accounted for the lowest with 0.1% each.

TABLE 7.3: DISTRIBUTION OF FINGERLINGS PRODUCED BY PROVINCE

Province	Households		Establishments		Total	
	Number	Percent	Number	Percent	Number	Percent
Central	13,663	0.3	2,215,110	1	2,228,773	1
Copperbelt	141,451	3	5,891,688	2.6	6,033,139	2.6
Eastern	138,729	3	154,200	0.1	292,929	0.1
Luapula	1,464,624	31.5	466,600	0.2	1,931,224	0.8
Lusaka	-	-	11,291,041	5.1	11,291,041	4.9
Muchinga	307,243	6.6	695,478	0.3	1,002,721	0.4
Northern	1,250,125	26.9	10,028,078	4.5	11,278,203	4.9
Northwestern	1,156,479	24.9	1,616,553	0.7	2,773,032	1.2
Southern	98,720	2.1	190,942,000	85.4	191,040,720	83.7
Western	76,493	1.6	171,500	0.1	247,993	0.1
Zambia	4,647,527	100	223,472,248	100	228,119,775	100

FIGURE 7.1: DISTRIBUTION OF FINGERLINGS PRODUCED BY PROVINCE



7.4 Type of Fingerlings Produced by Households

Table 7.4 shows the distribution of type of fingerlings produced by households. Of the total 4,647,527 fingerlings produced countrywide, 4,405,255 were of mixed sex and 242,272 were sex reversed.

Luapula Province produced the highest number of sex-reversed fingerlings accounting for 63.1% while Copperbelt Province produced the lowest number accounting for 0.6% of the total.

For mixed sex fingerlings, Luapula Province still produced the highest number accounting for 29.8% and Central Province produced the lowest number accounting for 0.1% of the total.



TABLE 7.4: DISTRIBUTION OF TYPE OF FINGERLINGS PRODUCED BY HOUSEHOLDS BY PROVINCE

Province	Type of fingerlings produced by households				Total	
	Sex reversed		Mixed sex			
	Number	Percent	Number	Percent	Number	Percent
Central	9,626	4.0	4,037	0.1	13,663	0.3
Copperbelt	1,406	0.6	140,045	3.2	141,451	3.0
Eastern	5,365	2.2	133,364	3.0	138,729	3.0
Luapula	152,757	63.1	1,311,867	29.8	1,464,624	31.5
Lusaka	-	-	-	-	-	-
Muchinga	6,443	2.7	300,801	6.8	307,243	6.6
Northern	31,950	13.2	1,218,174	27.7	1,250,125	26.9
Northwestern	23,415	9.7	1,133,065	25.7	1,156,479	24.9
Southern	-	-	98,720	2.2	98,720	2.1
Western	11,310	4.7	65,183	1.5	76,493	1.6
Zambia	242,272	100.0	4,405,255	100.0	4,647,527	100.0

7.5 Number of Fingerlings Produced and Sold by Households and Establishments

Table 7.5 shows that of the total 228,119,775 fingerlings produced countrywide by both households and establishments, 17,815,325 were sold. Under households, 1,621,386 fingerlings were sold from the total of 4,647,527 produced. Luapula Province accounted for the highest number of fingerlings sold representing 52.9%, while Eastern Province accounted for the lowest at 1.3%.

A total of 223,472,248 fingerlings were produced by establishments, out of which 16,193,939 were sold. Among provinces, Copperbelt reported the highest percentage of fingerlings sold representing 28.9% while Eastern (0.1%) was the lowest.

TABLE 7.5: DISTRIBUTION OF FINGERLINGS PRODUCED AND SOLD BY PROVINCE

Province	Fingerling Production and Sales		
	Households		
	Number of fingerlings produced	Number of fingerlings sold	Percent
Central	13,663	-	-
Copperbelt	141,451	-	-
Eastern	138,729	20,966	1.3
Luapula	1,464,624	857,464	52.9
Lusaka	-	-	-
Muchinga	307,243	138,547	8.5
Northern	1,250,125	304,318	18.8
Northwestern	1,156,479	199,986	12.3
Southern	98,720	72,664	4.5
Western	76,493	27,441	1.7
Zambia	4,647,527	1,621,386	100



Province	Establishments		
	Number of fingerlings produced	Number of fingerlings sold	Percent
Central	2,215,110	1,695,110	10.5
Copperbelt	5,891,688	4,673,968	28.9
Eastern	154,200	14,000	0.1
Luapula	466,600	178,100	1.1
Lusaka	11,291,041	3,182,950	19.7
Muchinga	695,478	396,770	2.5
Northern	10,028,078	2,032,763	12.6
Northwestern	1,616,553	1,291,053	8
Southern	190,942,000	2,568,975	15.9
Western	171,500	160,250	1
Zambia	223,472,248	16,193,939	100
Province	Total		
	Number of fingerlings produced	Number of fingerlings sold	Percent
Central	2,228,773	1,695,110	9.5
Copperbelt	6,033,139	4,673,968	26.2
Eastern	292,929	34,966	0.2
Luapula	1,931,224	1,035,564	5.8
Lusaka	11,291,041	3,182,950	17.9
Muchinga	1,002,721	535,317	3
Northern	11,278,203	2,337,081	13.1
Northwestern	2,773,032	1,491,039	8.4
Southern	191,040,720	2,641,639	14.8
Western	247,993	187,691	1.1
Zambia	228,119,775	17,815,325	100



CHAPTER 8: FISH FEED PRODUCTION

This chapter gives a summary of fish feed production status in Zambia between 1st January 2022 and 31st December, 2022. It includes the number of establishments involved in fish feed production, the quantities and types of fish feed produced, sources of protein ingredients and distribution of fish feeds in the country.

8.1 Number of Establishments Producing Fish Feed

A total of 44 establishments were recorded to have been involved in fish feed production categorized as commercial complete (feed produced by an established feed manufacturing company with ingredients that are well-balanced and labelled) and non-commercial (on-farm formulated). Northern Province had the highest number of feed-producing establishments (13) while Luapula was the least with only one (1). Out of the total of 44 fish-feed producing establishments, nine (9) were producing commercial complete feeds and 35 produced non-commercial on-farm feeds. Among provinces, Lusaka had the highest number of commercial complete fish feed producers four (4) (See Table 8.1).

TABLE 8.1: NUMBER OF ESTABLISHMENTS PRODUCING FISH FEED BY PROVINCE

Province	Establishments producing fish feed		
	Total	Commercial complete	Non-commercial (On-farm produced)
	Number	Number	Number
Central	3	0	3
Copperbelt	3	0	3
Eastern	7	0	7
Luapula	1	1	0
Lusaka	4	4	1
Muchinga	5	1	4
Northern	13	0	12
North-western	2	1	1
Southern	2	2	0
Western	4	0	4
Zambia	44	9	35

8.2 Quantity of Fish Feed produced by Establishments

A total of 86,368.99 metric tons of different types of fish feeds were produced by the 44 establishments from January to December 2022. Southern Province recorded the highest production of 70,000 metric tons accounting for 81.05% of the total feed produced while Muchinga recorded the least quantity of 1.95 metric tons accounting for 0.02%. Much of the feed produced was commercial complete (85,240 metric tons) at 98.70% of the total feed produced while non-commercial on-farm formulated feed was 1,127.83 metric tons at 1.30 % of the total fish feed produced (see Table 8.2 and Figure 8.1).

TABLE 8.2: QUANTITY OF FISH FEED PRODUCED BY ESTABLISHMENTS AND PROVINCE

Province	Quantity (in metric tons) of feed produced by establishments					
	Total		Commercial complete		Non-commercial (On-farm produced)	
	Quantity	Percent	Quantity	Percent	Quantity	Percent
Central	72.55	0.08	0	0	72.55	6.43
Copperbelt	8.2	0.009	0	0	8.2	0.73
Eastern	4.8	0.006	0	0	4.8	0.43
Luapula	2	0.002	2	0.002	0	0
Lusaka	15,218.00	17.62	15,218.00	17.85	0	0
Muchinga	1.95	0.002	0	0	1.95	0.17
Northern	1,029.49	1.19	0	0	1,029.49	91.28
North western	20.15	0.02	20	0.02	0.15	0.01
Southern	70,000.00	81.05	70,000.00	82.12	0	0
Western	11.85	0.01	0	0	11.85	1.05
Zambia	86,368.99	100	85,240.00	100	1,128.99	100

FIGURE 8.1: QUANTITY OF FISH FEED PRODUCED BY PROVINCE

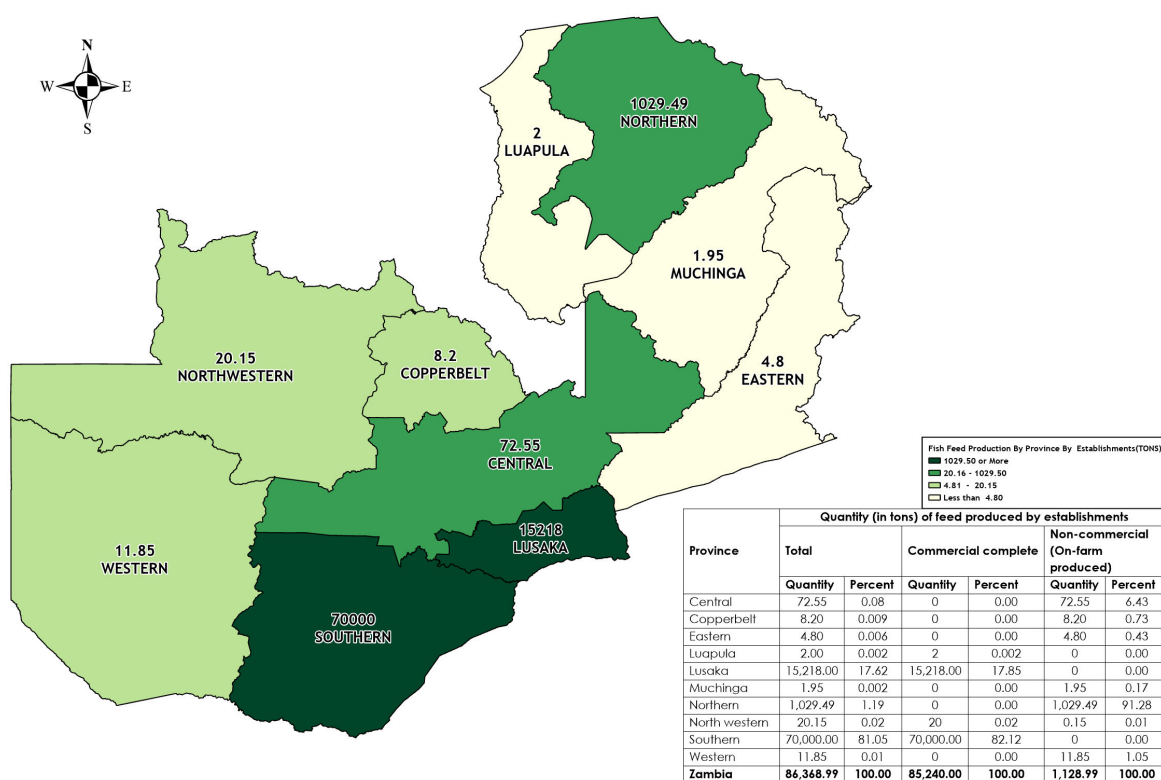
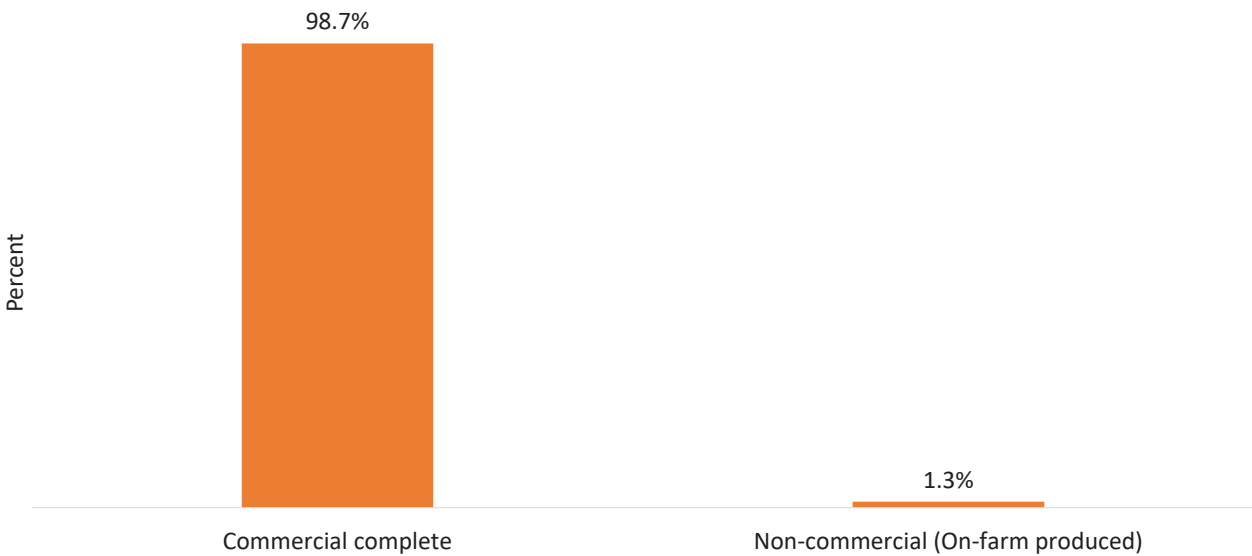




FIGURE 8.2: PERCENTAGE OF FEED PRODUCED BY TYPE



8.3 Main types of Protein-source ingredients used in Fish Feed

Among the protein-source ingredients used in fish feed formulation, Soya beans was the most commonly used (28 establishments). Moringa and insects such as termites were among the other protein-sources reported by 12 commercial feed producing establishments.

TABLE 8.3: QUANTITY OF FISH FEED PRODUCED BY ESTABLISHMENTS AND PROVINCE

Province	Quantity (in tons) of feed produced by establishments					
	Total		Commercial complete		Non-commercial (On-farm produced)	
	Quantity	Percent	Quantity	Percent	Quantity	Percent
Central	72.55	0.08	0	0	72.55	6.43
Copperbelt	8.2	0.009	0	0	8.2	0.73
Eastern	4.8	0.006	0	0	4.8	0.43
Luapula	2	0.002	2	0.002	0	0
Lusaka	15,218.00	17.62	15,218.00	17.85	0	0
Muchinga	1.95	0.002	0	0	1.95	0.17
Northern	1,029.49	1.19	0	0	1,029.49	91.28
North western	20.15	0.02	20	0.02	0.15	0.01
Southern	70,000.00	81.05	70,000.00	82.12	0	0
Western	11.85	0.01	0	0	11.85	1.05
Zambia	86,368.99	100	85,240.00	100	1,128.99	100

8.4 Establishments that used imported or locally sourced Protein Ingredients

The main source of protein ingredients used to make feed by establishments (23) was locally sourced soya beans as compared to imported (5). In terms of imported sources of protein ingredients, the highest number of establishments (8) used fish meal. Blood meal was the only ingredient that was not locally sourced while the other ingredients were both locally sourced and imported (See Table 8.4).

TABLE 8.4: SOURCES OF DIFFERENT INGREDIENTS USED BY ESTABLISHMENTS

Ingredient	Establishments using ingredients	Locally sourced	Imported
	Total	Number	Number
Fish meal	21	13	8
Soya beans	28	23	5
Sunflower	21	19	2
Blood meal	3	0	3
Other ingredients	12	9	3



CHAPTER 9: FISH MARKETING

This chapter highlights the information on households and establishments that reported to have engaged in fish marketing from 1st January to 31st December 2022. The cost of fish farming inputs, fingerlings and fish produced, their prices, and marketing aspects are discussed under this chapter.

9.1 Distribution of Fish Sales at Household by Province

Table 9.1 shows that out of the total 19,697 households, 7,619 (38.7%) sold their fish. Among the provinces, Western reported the highest percentage at 53.2% followed by Muchinga and Central at 48.1% and 46.1% respectively. The lowest was Lusaka at 11.7%.

TABLE 9.1: PERCENTAGE DISTRIBUTION OF HOUSEHOLDS THAT SOLD THEIR FISH BY PROVINCE

Province	Total Households	Households that reported to have sold their fish	
	Number	Number	Percent
Central	692	319	46.1
Copperbelt	2,501	1,028	41.1
Eastern	936	400	42.7
Luapula	2,716	855	31.5
Lusaka	996	117	11.7
Muchinga	3,075	1480	48.1
Northern	5,690	2,271	39.9
North-western	1,875	596	31.8
Southern	515	179	34.8
Western	701	373	53.2
Zambia	19,697	7,619	38.7

9.2 Place of Fish Sales by Households

Figure 9.1 shows places where fish was sold. The majority of households sold their fish on-farm (49.7%) followed by those that sold within their districts but not on their farms at 47.3%. Households that sold their fish outside their district were lowest at 3.0%.

FIGURE 9.1: PERCENTAGE DISTRIBUTION OF HOUSEHOLDS BY PLACES OF FISH SALES

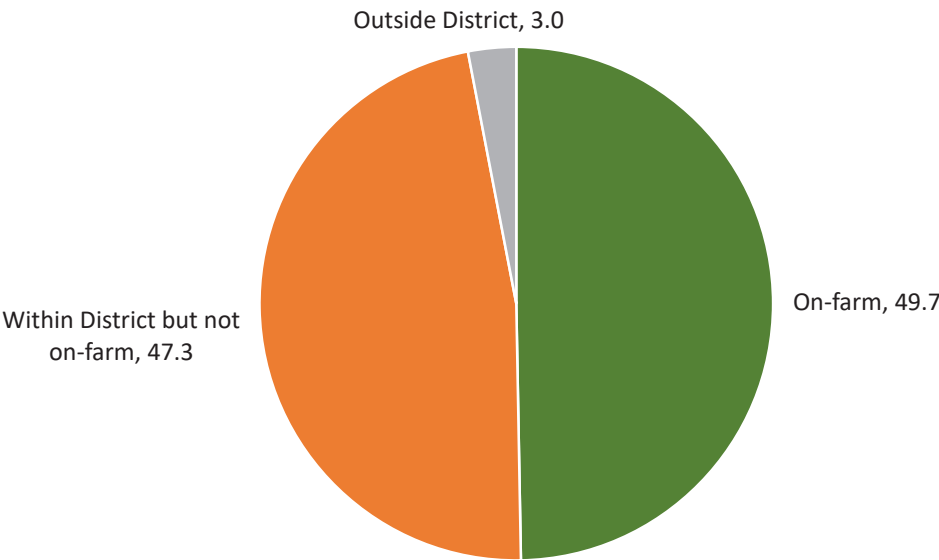


Table 9.2 shows that among provinces, Northern (57.4%) had the highest percentage of households that sold their fish on-farm followed by Northwestern with 56.4% while Muchinga had the lowest with 35.9%.

In terms of households that sold their fish within the district but not on-farm, Eastern Province reported the highest percentage at 60.4% followed Muchinga (60.0%) while Lusaka was lowest at 30.4%. Meanwhile, Lusaka (23.2%) recorded the highest percentage of households that sold fish outside their districts.

TABLE 9.2: PERCENTAGE DISTRIBUTION OF HOUSEHOLDS BY PLACES OF FISH SALES BY PROVINCE

Province	Percentage distribution of households by places where they			Total
	sold fish			
	On-farm	Within District but not on-farm	Outside District	
	Percent	Percent	Percent	
Central	51	46.8	2.2	100
Copperbelt	53.4	44.4	2.2	100
Eastern	39.6	60.4	0	100
Luapula	45.2	52.1	2.6	100
Lusaka	46.5	30.4	23.2	100
Muchinga	35.9	60	4	100
Northern	57.4	42.1	0.4	100
North-western	56.4	43	0.6	100
Southern	50	39.7	10.3	100
Western	54.8	44.4	0.8	100
Zambia	49.7	47.3	3	100

9.3 Average Fish Price by Households and Establishments

The national average price of fish per kilogram was K45.60 and K49.39 for households and establishments respectively. Among provinces, North-western recorded the highest price per kilogram at both household and establishment at K53.08 and K57.34, respectively. Northern recorded the lowest average price of K38.9 per kilogram at household level and Southern was the lowest at establishment (K45.75) (See Table 9.3).

TABLE 9.3: HOUSEHOLD AND ESTABLISHMENT AVERAGE FISH PRICE PER KILOGRAM BY PROVINCE

Province	Price per kilogram (Kwacha)	
	Household	Establishment
Central	43.20	47.10
Copperbelt	49.01	48.42
Eastern	43.22	-
Luapula	41.71	55.01
Lusaka	44.67	47.27
Muchinga	53.02	56.68
Northern	38.86	57.21
North-western	53.08	57.34
Southern	44.14	45.75
Western	45.14	50.64
Zambia	45.60	49.39



9.4 Value of Fish Sales by Households

Table 9.4 shows the value of fish sales at household level by province. A total value of K239,439,275.28 was realized from the sale of 5,250,861.30 kilograms of fish at an average price of K45.60. Among provinces, Copperbelt recorded the highest amount (K68,943,602.05), followed by Lusaka with K42,112,646.97 while the least was Western Province (K5,428,369.38).

TABLE 9.4: VALUE OF FISH SOLD BY HOUSEHOLDS BY PROVINCE

Province	Price/ Kg	Quantity Sold (Kgs)	Value (Kwacha)
Central	43.20	283,713.20	12,256,410.24
Copperbelt	49.01	1,406,725.20	68,943,602.05
Eastern	43.22	175,665.90	7,592,280.20
Luapula	41.71	337,612.10	14,081,800.69
Lusaka	44.67	942,750.10	42,112,646.97
Muchinga	53.02	195,173.20	10,348,083.06
Northern	38.86	887,255.30	34,478,740.96
North-western	53.08	621,441.30	32,986,104.20
Southern	44.14	280,268.90	12,371,069.25
Western	45.14	120,256.30	5,428,369.38
Zambia	45.60	5,250,861.30	239,439,275.28

9.5 Major Buyers of Fish from Households

Table 9.5 shows that out of the total households that reported to have sold fish, 76.2% sold to individuals for consumption followed by traders (19.1%) while the lowest were institutions at 1.9%.

TABLE 9.5: PERCENTAGE DISTRIBUTION OF HOUSEHOLDS BY MAJOR FISH BUYERS BY PROVINCE

Province	Who did the household mainly sell the fish to?				
	Traders	Institutions	Hotels and restaurants	Individuals (for final consumption)	Total
Central	34.1	10.5	2.2	53.3	100.0
Copperbelt	36.6	0.0	0.0	63.4	100.0
Eastern	11.3	0.0	5.2	83.5	100.0
Luapula	18.9	0.0	3.5	77.6	100.0
Lusaka	41.2	3.5	1.8	53.5	100.0
Muchinga	4.5	3.5	5.1	86.9	100.0
Northern	21.5	1.1	0.4	77.0	100.0
Northwestern	1.2	5.4	6.6	86.8	100.0
Southern	24.9	4.5	4.5	66.0	100.0
Western	25.6	1.9	3.6	68.9	100.0
Zambia	19.1	1.9	2.8	76.2	100.0

9.6 Fingerling Production and Value of Sales by Households

Table 9.6 shows that out of the total 4,647,527 fingerlings produced by households, 1,621,386 were sold at the average price of K1.1per fingerling. The value of sales for the 1,621,386 fingerlings sold by households was K1,783,524.85.

At provincial level, Luapula recorded the highest sales with K1,326,276.74 followed by Northern and Muchinga at K372,690.73 and K178,161.00, respectively. There were no households that reported to have produced and sold fingerlings in Lusaka province while Central and Copperbelt provinces produced fingerlings but did not report sales.

TABLE 9.6: FINGERLING PRODUCTION AND SALES BY HOUSEHOLD BY PROVINCE

Province	Household Production	Fingerlings sold	Average price/ fingerling (Kwacha)	Total (Kwacha)
Central	13,663		0.0	
Copperbelt	141,451		0.0	
Eastern	138,729	20,966	1.0	20,944.57
Luapula	1,464,624	857,464	1.5	1,326,276.74
Lusaka	-		-	-
Muchinga	307,243	138,547	1.3	178,160.97
Northern	1,250,125	304,318	1.2	372,690.73
North-western	1,156,479	199,986	0.6	116,498.91
Southern	98,720	72,664	1.0	72,767.04
Western	76,493	27,441	1.0	27,440.64
Zambia	4,647,527	1,621,386	1.1	1,783,524.85

9.7 Fingerling Production and Value of Sales by Establishments

Table 9.7 shows that out of the total 223,472,248 fingerlings produced by establishments, 16,193,939 were sold at the average price of K1.1 per fingerling yielding a value of K17,812,821.90.

Among provinces, Southern produced the highest number of fingerlings 190,942,000 out of which 2,568,975 were sold while Eastern produced the lowest at 154,200 of which 14,000 were sold.

At national level, Copperbelt contributed the highest number of fingerlings sold (4,673,968) followed by Lusaka (3,182,950) and Southern (2,568,975), respectively.

TABLE 9.7: FINGERLING PRODUCTION AND SALES BY ESTABLISHMENTS BY PROVINCE

Province	Number of fingerlings produced	Fingerlings sold	Average price/ fingerling (Kwacha)	Total (Kwacha)
Central	2,215,110	1,695,110	1.1	1,864,110.00
Copperbelt	5,891,688	4,673,968	1.1	5,141,364.80
Eastern	154,200	14,000	1.1	15,400.00
Luapula	466,600	178,100	1.1	195,910.00
Lusaka	11,291,041	3,182,950	1.1	3,501,245.00
Muchinga	695,478	396,770	1.1	436,447.00
Northern	10,028,078	2,032,763	1.1	2,236,039.30
North-western	1,616,553	1,291,053	1.1	1,420,158.30
Southern	190,942,000	2,568,975	1.1	2,825,872.50
Western	171,500	160,250	1.1	176,275.00
Zambia	223,472,248	16,193,939	1.1	17,812,821.90

9.8 Cost of Major Fish Farming Inputs

The average price per fingerling was K1.10 countrywide. The average cost of fertilizer was the highest at K660.20 per 50kg bag while commercial feed was at K551.0 (See Table 9.8).

TABLE 9.8: AVERAGE COST OF MAJOR FISH FARMING INPUTS

Type of Input	Price/fingerling (Kwacha)	Average unit cost /50kg (Kwacha)
Fingerling	1.1	
Commercial Feed		551.0
Own made feed (ingredients)		338.3
Fertilizer		660.2
Lime		108.1
Compost / manure		21.6



CHAPTER 10: BIOSECURITY MEASURES, FISH DISEASE AND CLIMATE SMART AQUACULTURE

This chapter highlights the information on biosecurity practices, challenges, diseases, level of awareness and implementation of biosecurity measures in fish farming between 1st January to 31st December, 2022 for both households and establishments. Biosecurity measures are essential for preventing and controlling the spread of diseases in fish farming.

It is worth noting that establishments that were involved in feed production but not fish production were also included in the analysis under this chapter.

10.1 Proportion of Households and Establishments Practicing Biosecurity Measures

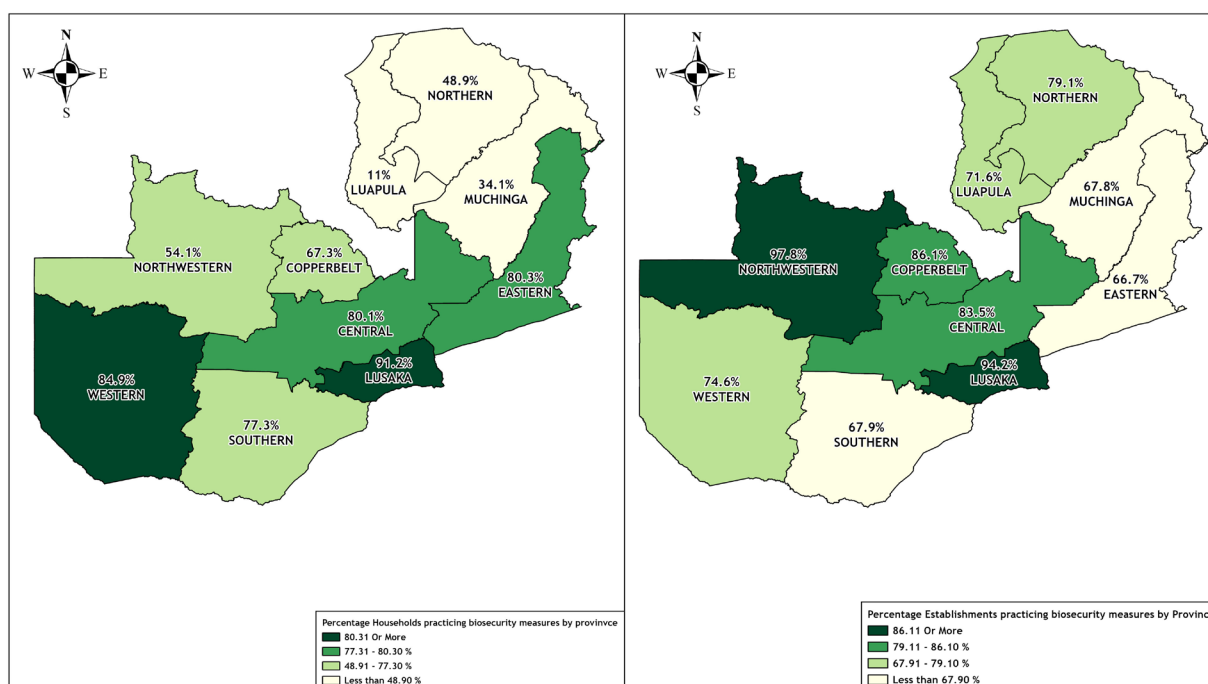
Table 10.1 and Figure 10.1 show that of a total 19,697 households, 10,035 (50.9%) practiced biosecurity measures. At the provincial level, Lusaka (91.2%) had more households that adopted biosecurity practices, followed by Western (84.9%) while Luapula had the lowest at 11.0%.

As for establishments, out of a total of 1,674 establishments, 1,388 (82.9%) practiced biosecurity. At the provincial level, North-western (97.8%) had more establishments that adopted biosecurity practices, followed by Lusaka (94.2%) while Eastern reported the lowest at 66.7%.

TABLE 10.1: PERCENTAGE DISTRIBUTION OF HOUSEHOLDS AND ESTABLISHMENTS PRACTICING BIOSECURITY MEASURES BY PROVINCE

Province	Total households	Households practicing biosecurity measures		Total Establishments	Establishments practicing biosecurity measures	
		Number	Percent		Number	Percent
Central	692	554	80.1	127	106	83.5
Copperbelt	2,501	1,683	67.3	546	470	86.1
Eastern	936	752	80.3	90	60	66.7
Luapula	2,716	300	11.0	81	58	71.6
Lusaka	996	908	91.2	346	326	94.2
Muchinga	3,075	1,050	34.1	87	59	67.8
Northern	5,690	2,780	48.9	172	136	79.1
North-western	1,875	1015	54.1	46	45	97.8
Southern	515	398	77.3	109	74	67.9
Western	701	595	84.9	71	53	74.6
Zambia	19,697	10,035	50.9	1,674	1,388	82.9

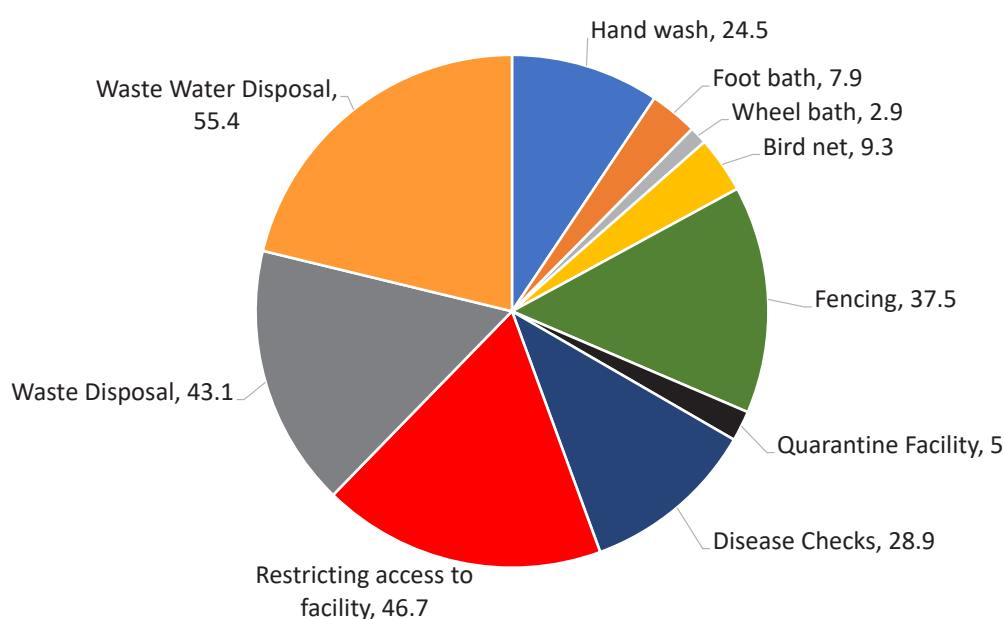
FIGURE 10.1: PERCENTAGE DISTRIBUTION OF HOUSEHOLDS AND ESTABLISHMENTS PRACTICING BIOSECURITY MEASURES BY PROVINCE



10.2 Types of Biosecurity Measures Practiced by Households and Establishments

Figure 10.2 shows the most common forms of biosecurity measures practiced by households. These included wastewater disposal (55.4%), restricted access to the facility (46.7%), waste disposal (43.1%) and fencing (37.5%).

FIGURE 10.2: PERCENTAGE DISTRIBUTION OF BIOSECURITY MEASURES PRACTICED BY HOUSEHOLDS

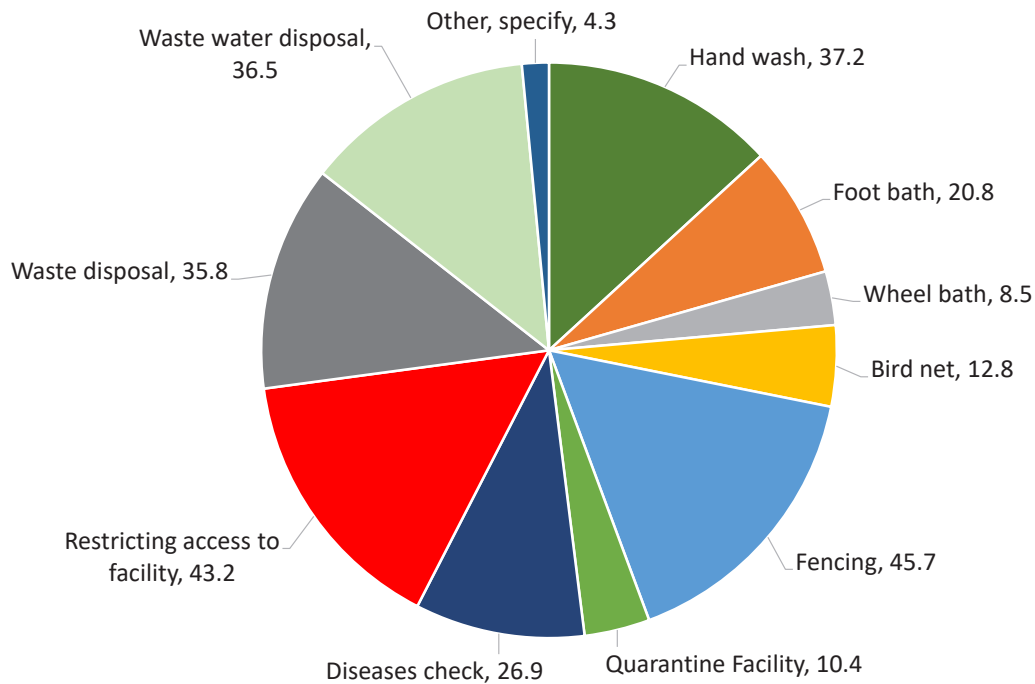




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Figure 10.3 shows the most common forms of biosecurity measures practiced by establishments. These included fencing (45.7%), restricting access to facility (43.2%), hand wash (37.2%) and waste water disposal (36.5%).

FIGURE 10.3: PERCENTAGE DISTRIBUTION OF BIOSECURITY MEASURES PRACTICED BY ESTABLISHMENTS



10.3 Reasons for Households and Establishments not Practicing Biosecurity Measures

Table 10.2 shows the distribution of households by reasons for not practicing biosecurity measures. Among provinces, Northern (30.1%) reported most households that did not have biosecurity measures followed by Luapula (25.0%) and Muchinga (21.0%). Further, 3.3% of households reported not practicing biosecurity measures because they were not in production during the reference period.

TABLE 10.2: PERCENTAGE DISTRIBUTION OF HOUSEHOLDS BY REASONS FOR NOT PRACTICING BIOSECURITY MEASURES

Province	Total households that did not practice biosecurity measures		Reasons for not practicing biosecurity measures				
			Lack of training	Lack of awareness	Inadequate resources	Do not know	Not in production
	Number	Percent	Percent	Percent	Percent	Percent	Percent
Central	138	1.4	0.0	15.9	38.4	46.4	0.0
Copperbelt	818	8.5	5.7	22.7	34.4	11.5	25.7
Eastern	184	1.9	27.2	32.1	32.1	8.7	0.0
Luapula	2,415	25.0	19.8	29.6	40.0	9.6	1.0
Lusaka	88	0.9	0.0	33.0	67.0	0.0	0.0
Muchinga	2,025	21.0	6.9	41.5	40.4	10.2	1.1
Northern	2,910	30.1	28.8	51.3	13.9	5.6	0.3
Northwestern	860	8.9	22.8	34.1	31.7	9.2	2.3
Southern	117	1.2	23.1	35.0	6.0	12.0	23.1
Western	105	1.1	2.9	25.7	61.9	2.9	6.7
Zambia	9,662	100	18.4	38.3	30.9	9.0	3.3

Table 10.3 shows the distribution of establishments by reasons for not practicing biosecurity measures. Among provinces, Copperbelt (49.5%) reported most establishments that did not have biosecurity measures followed by Northern and Muchinga who both reported 9.3%.

TABLE 10.3: PERCENTAGE DISTRIBUTION OF ESTABLISHMENTS BY REASONS FOR NOT PRACTICING BIOSECURITY MEASURES

Province	Total Number of establishments not practicing biosecurity measures		Reasons not practicing biosecurity measures				
			lack of training	lack of awareness	inadequate resources	do not know	other specify
	Number	Percent	Number	Number	Number	Number	Number
Central	9	6.4	0	4	1	0	0
Copperbelt	70	49.5	21	0	2	22	23
Eastern	6	4.3	0	0	1	0	0
Luapula	12	8.3	0	2	0	7	0
Lusaka	11	8.1	0	10	1	0	0
Muchinga	13	9.3	2	2	5	2	0
Northern	13	9.3	0	4	6	1	0
North Western	1	0.7	0	0	0	0	1
Southern	4	2.8	0	0	3	0	0
Western	2	1.4	0	0	0	0	0
Zambia	140	100	23	22	19	32	24

Figure 10.4 shows percentage distribution of reasons households did not practice biosecurity measures. The majority of households reported lack of awareness (38.3%) followed by inadequate resources (30.9%) and lack of training (18.4%) as their main reasons for not practicing biosecurity measures.

FIGURE 10.4: PERCENTAGE DISTRIBUTION OF REASONS HOUSEHOLDS DID NOT PRACTICE BIOSECURITY MEASURES

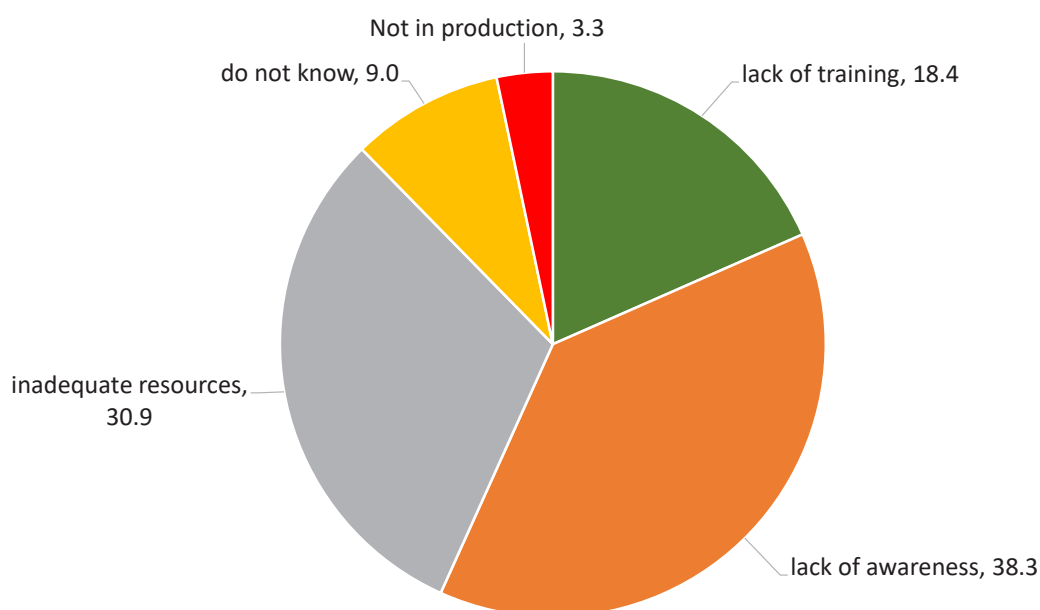
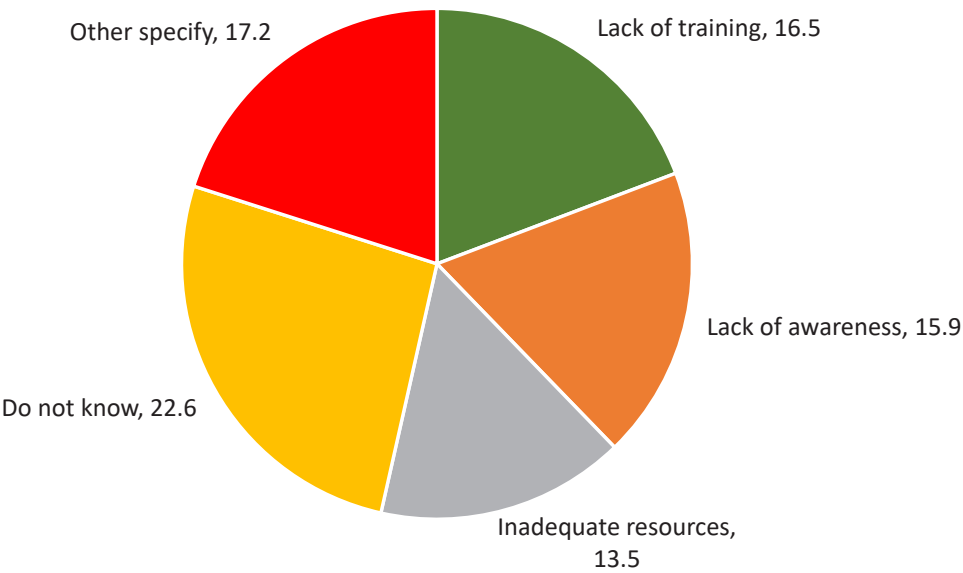




Figure 10.5 shows percentage distribution of reasons establishments did not practice biosecurity measures. The majority of establishments reported do not know (22.6%) followed by others specify (17.2%) and lack of training (16.5%).

FIGURE 10.5: PERCENTAGE DISTRIBUTION OF REASONS ESTABLISHMENTS DID NOT PRACTICE BIOSECURITY MEASURES



10.4 Households and Establishments that observed signs of Fish Disease

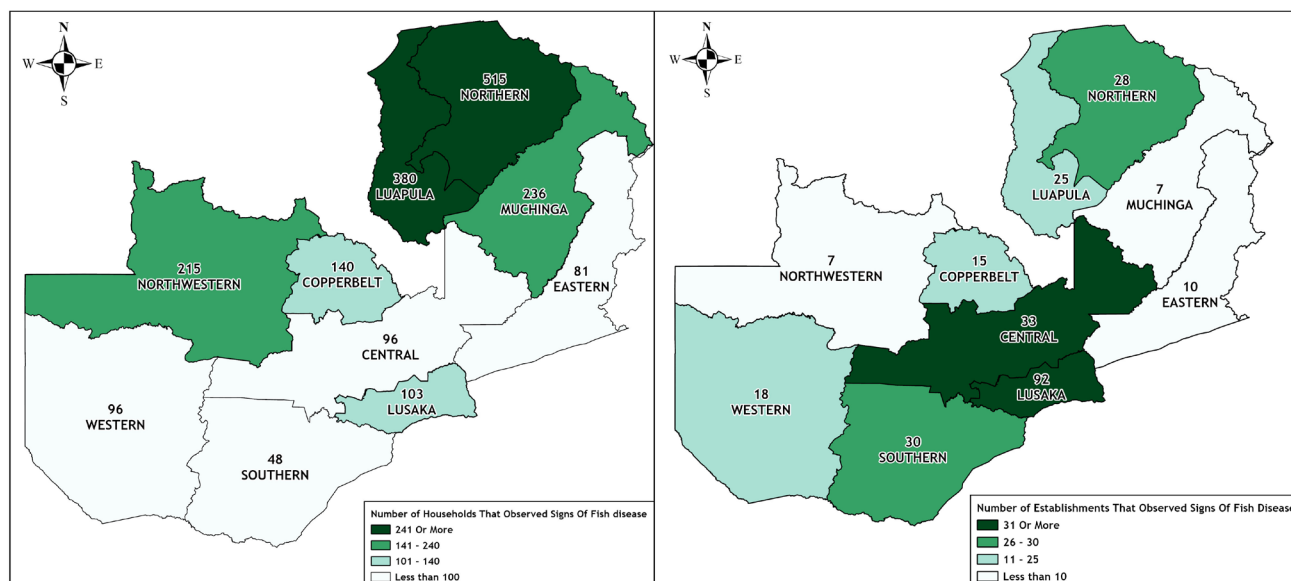
Table 10.4 shows the distribution of households and establishments that reported observing signs of fish disease. Out of the 10,035 households that reported practicing biosecurity, 1,910 (19.0%) observed signs of fish disease. Among the households at the provincial level, Northern (27.0%) reported the highest followed by Luapula (19.9%).

Out of the 1,674 establishments that reported practicing biosecurity, 265 (15.8%) observed signs of fish disease. Among the establishments, Lusaka (34.7%) reported the highest followed by Central (12.5%) with North-western being the lowest at 2.6%.

TABLE 10.4: DISTRIBUTION OF HOUSEHOLDS AND ESTABLISHMENTS THAT OBSERVED SIGNS OF FISH DISEASE

Province	Households		Establishments	
	Number	Percent	Number	Percent
Central	96	5.0	33	12.5
Copperbelt	140	7.4	15	5.7
Eastern	81	4.2	10	3.8
Luapula	380	19.9	25	9.4
Lusaka	103	5.4	92	34.7
Muchinga	236	12.4	7	2.6
Northern	515	27.0	28	10.6
Northwestern	215	11.3	7	2.6
Southern	48	2.5	30	11.3
Western	96	5.0	18	6.8
Zambia	1,910	100.0	265	100.0

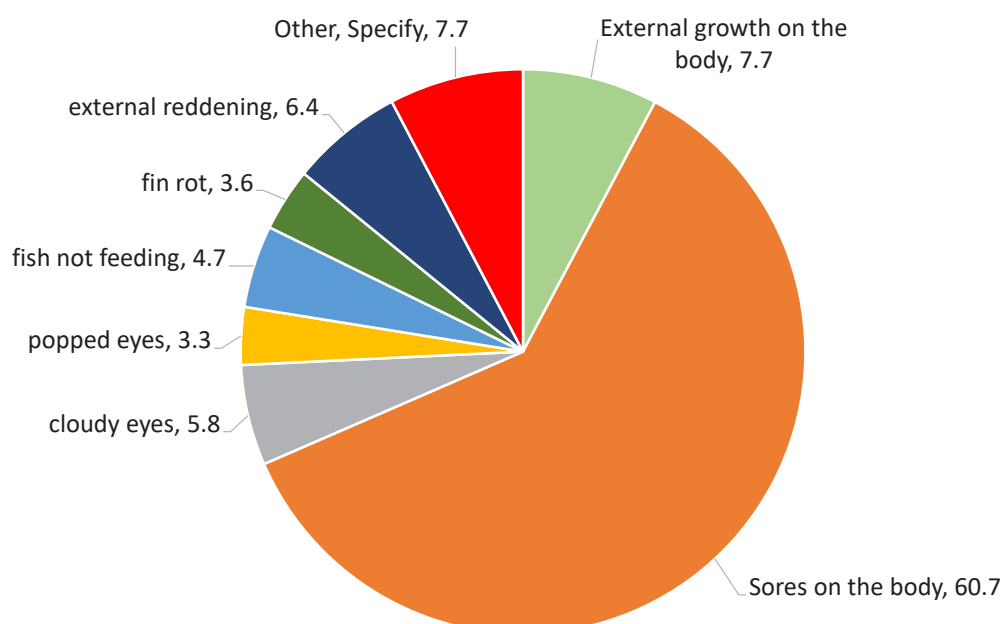
FIGURE 10.6: DISTRIBUTION OF HOUSEHOLDS AND ESTABLISHMENTS THAT OBSERVED SIGNS OF FISH DISEASE



10.5 Major signs of Fish Disease observed by Households

Figure 10.7 shows the percentage distribution of major signs of fish disease observed by households. The most observed signs of fish diseases were sores on the body reported by 60.7% households.

FIGURE 10.7: PERCENTAGE DISTRIBUTION OF MAJOR SIGNS OF FISH DISEASE OBSERVED BY HOUSEHOLDS

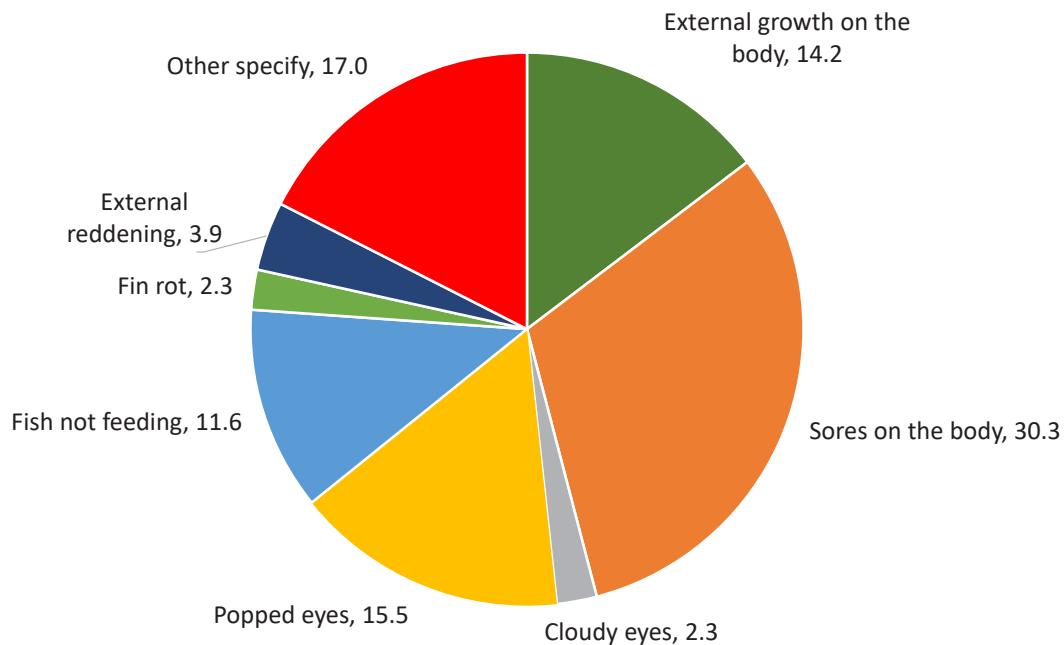




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Figure 10.8 shows the percentage distribution of major signs of fish disease observed by establishments. The most observed signs of fish diseases were sores on the body reported 30.3% establishments.

FIGURE 10.8: PERCENTAGE DISTRIBUTION OF MAJOR SIGNS OF FISH DISEASE OBSERVED BY ESTABLISHMENTS



10.6 Households and Establishments that did not report Suspected Disease to relevant Authority

Table 10.5 shows that the main reasons households did not report to authority were due to lack of awareness (37.6%), and distance to relevant authority (36.3%). At provincial level, Northern (31.3%) reported the highest number of households that did not report cases of suspected fish disease followed by Luapula (20.0%) and Muchinga (13.8%).

TABLE 10.5: DISTRIBUTION OF HOUSEHOLDS THAT DID NOT REPORT SUSPECTED DISEASE TO RELEVANT AUTHORITY

Province	Households that did not report suspected disease to a relevant authority		Reasons for not reporting to the relevant authority				
			Lack of feedback	Lack of awareness	Distance to the relevant authority	I treat the fish myself	Other specify
	Number	Percent	Number	Number	Number	Number	Number
Central	21	1.8	0.0	50.0	50.0	0.0	0.0
Copperbelt	140	12.0	0.0	17.0	49.6	33.3	0.0
Eastern	45	3.9	0.0	36.4	15.9	15.9	31.8
Luapula	233	20.0	7.8	50.2	29.0	2.6	10.4
Lusaka	59	5.1	0.0	25.4	25.4	49.2	0.0
Muchinga	161	13.8	6.8	53.1	33.3	6.8	0.0
Northern	365	31.3	0.0	61.0	28.0	11.0	0.0
Northwestern	98	8.4	0.0	20.4	69.4	10.2	0.0
Southern	21	1.8	0.0	33.3	33.3	33.3	0.0
Western	24	2.1	0.0	29.2	29.2	12.5	29.2
Zambia	1,166	100.0	1.5	37.6	36.3	17.5	7.1

10.7 Authority where Households and Establishments reported observed Signs of Disease

Figure 10.9 shows that the majority of the households reported to the Department of Fisheries (74.3%), while the rest were distributed among the Agriculture (8.3%), Livestock Services (2.3%) and Department of Veterinary Services (1.6%). The 13.5% of households who responded to "others specify" reported either to fellow farmers, fish farming private companies or WorldFish.

FIGURE 10.9: PERCENTAGE DISTRIBUTION OF AUTHORITY WHERE HOUSEHOLDS REPORTED OBSERVED SIGNS OF DISEASE

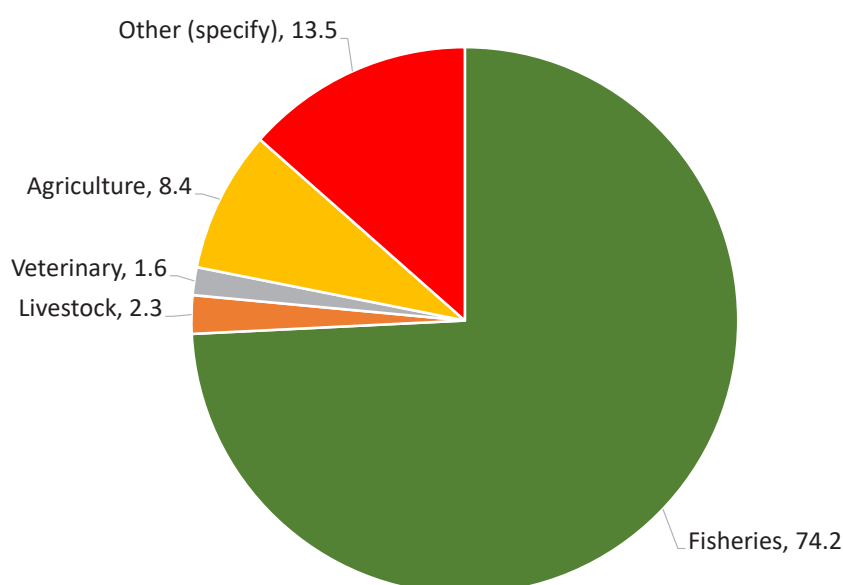
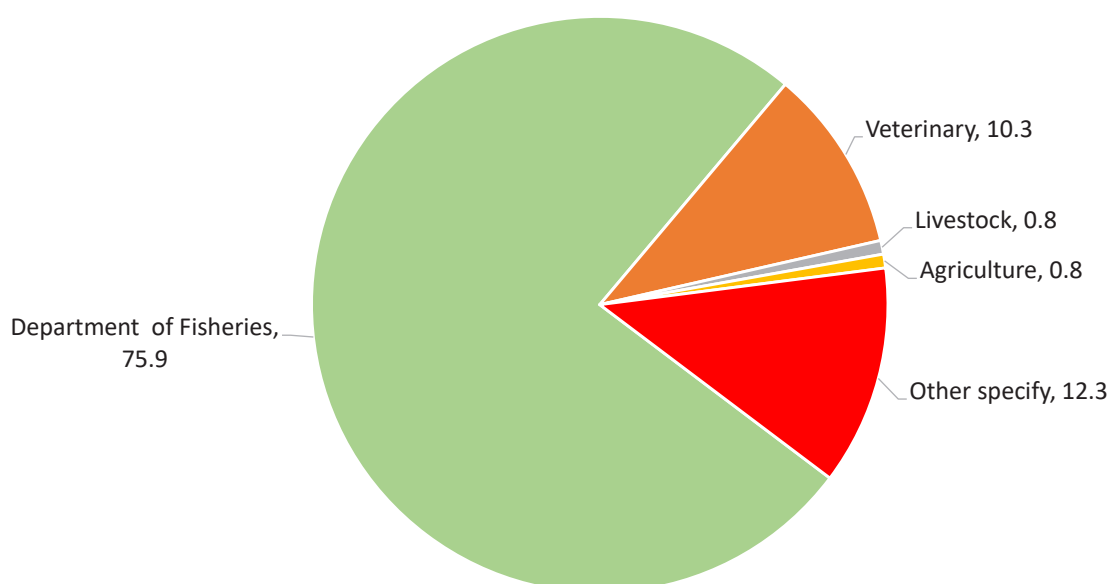


Figure 10.10 shows that 75.9% of establishments reported to the DoF followed by "others specify" at 12.3% and DVS at 10.3%.

FIGURE 10.10: PERCENTAGE DISTRIBUTION OF AUTHORITY WHERE ESTABLISHMENTS REPORTED OBSERVED SIGNS OF DISEASE BY PROVINCE





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Table 10.6 shows the distribution of households and establishments that reported suspected disease to the relevant authorities. Out of the 1,910 households that observed signs of fish disease on their farms, 744 (38.9%) households notified the relevant authorities. Among the provinces, Northern (20.2%) reported more cases to the relevant authorities followed by Luapula (19.8%).

Out of the 265 establishments that observed signs of fish disease, 130 (49.1%) establishments notified the relevant authorities. Among the establishments at the provincial level, Luapula (19.2%) reported more cases followed by Lusaka (16.9%).

TABLE 10.6: DISTRIBUTION OF HOUSEHOLDS AND ESTABLISHMENTS THAT REPORTED SUSPECTED DISEASE TO RELEVANT AUTHORITY

Province	Households that reported suspected disease to the relevant authority		Establishment that reported suspected disease to the relevant authority	
	Number	Percent	Number	Percent
Central	75	10.0	21	16.2
Copperbelt	0	0.0	10	7.7
Eastern	36	4.8	5	3.8
Luapula	147	19.8	25	19.2
Lusaka	44	5.9	22	16.9
Muchinga	75	10.1	3	2.3
Northern	150	20.2	14	10.8
Northwestern	117	15.8	2	1.5
Southern	27	3.7	19	14.6
Western	72	9.7	9	6.9
Zambia	744	100.0	130	100.0

10.8 Households and Establishments that attempted to treat the suspected Diseased Fish by Province

Table 10.7 shows the number of households and establishments that attempted to treat the suspected diseased fish. Among the households at the provincial level, the highest percentage of treatment attempts was in Northern (21.4%), followed by Luapula (15.4%) and Muchinga (14.3%). Among the establishments at the provincial level, the most treatment attempts were in Lusaka (40.7%), followed by Southern and Central, both with 11.4%.

TABLE 10.7: DISTRIBUTION OF HOUSEHOLDS AND ESTABLISHMENTS THAT ATTEMPTED TO TREAT SUSPECTED DISEASED FISH BY PROVINCE

Province	Households that attempted to treat suspected diseased fish		Establishment that attempted to treat the suspected diseased fish	
	Number	Percent	Number	Percent
Central	43	5.7	25	11.4
Copperbelt	47	6.2	10	4.6
Eastern	7	1.0	3	1.4
Luapula	116	15.4	21	9.5
Lusaka	73	9.7	89	40.7
Muchinga	107	14.3	6	2.7
Northern	161	21.4	21	9.6
Northwestern	127	16.8	5	2.3
Southern	34	4.6	25	11.4
Western	38	5.0	14	6.4
Zambia	754	100.0	219	100.0

10.9 Methods used to Treat suspected Fish Diseases

Out of the 1,910 households that observed signs of fish disease at their farms, 754 (39%) attempted to treat their fish with various methods. The most common method was the application of salt to water in the facility (60.3%), followed by changing water (18.5%), and antibiotics use at 6.2%. (See Figure 10.11).

FIGURE 10.11: PERCENTAGE DISTRIBUTION OF TREATMENT METHODS APPLIED BY HOUSEHOLDS

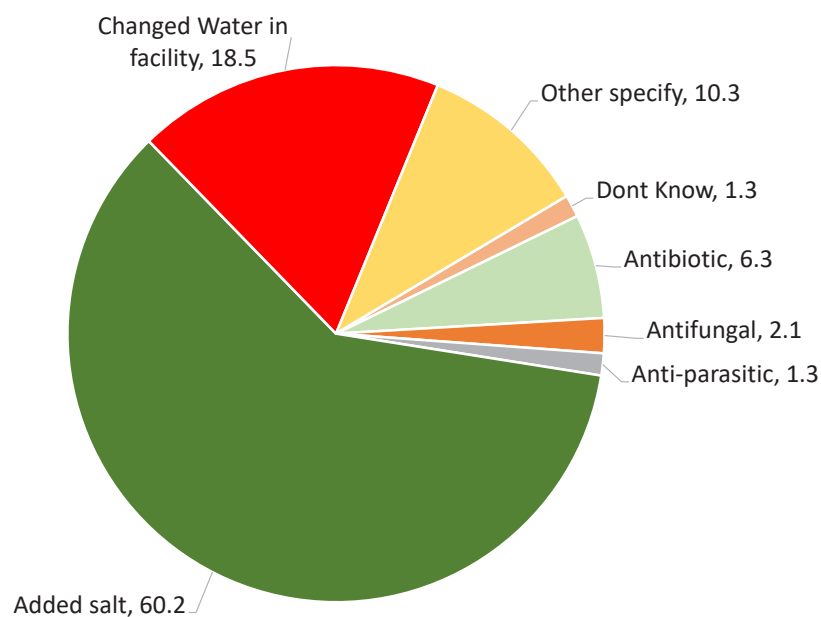
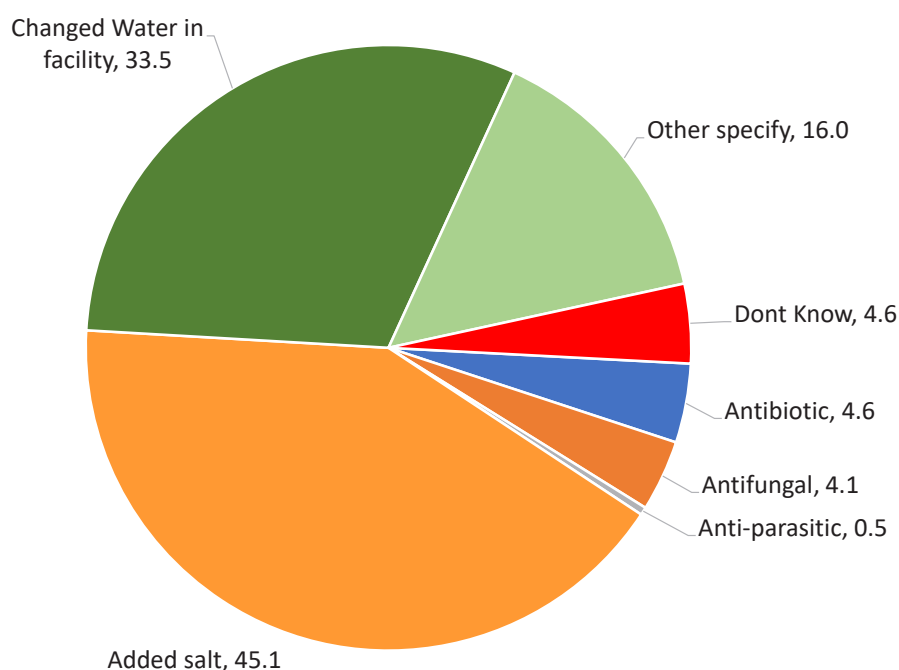


Figure 10.12 shows that out of the 265 establishments that observed signs of fish disease, 219 (82.6%) attempted to treat fish with various methods. The most common method was salt (45.1%) followed by changing of water in the facility (33.5%) and others (16.0%).

FIGURE 10.12: PERCENTAGE DISTRIBUTION OF TREATMENT METHODS APPLIED BY ESTABLISHMENTS





CHAPTER 11: ACCESS TO LOANS, CREDIT AND GRANTS

This chapter presents information on the number of households and establishments that accessed loans, credits and grants between 1st January and 31st December, 2022. It highlights the sources, total and average loan amounts accessed by both households and establishments.

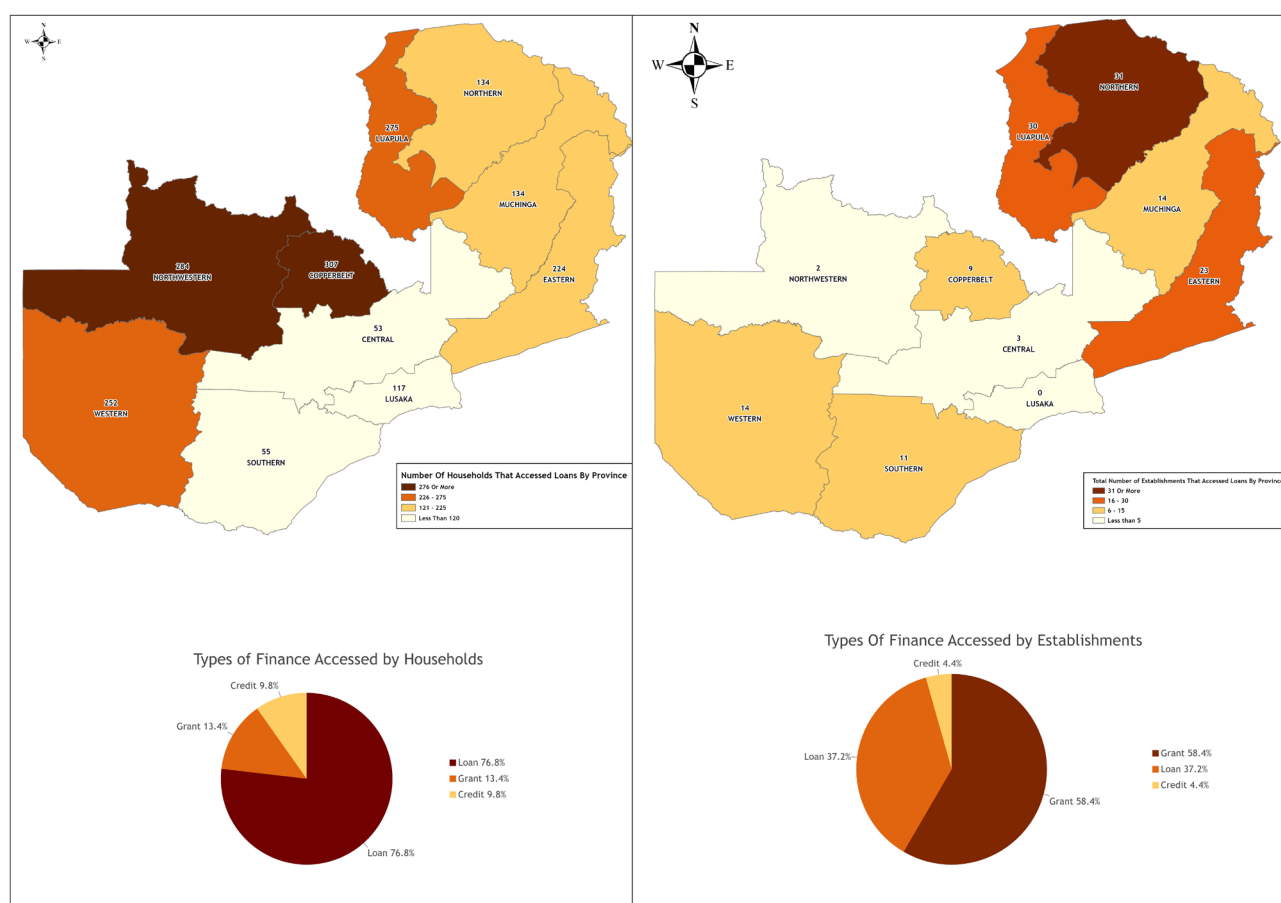
11.1. Number of Households and Establishments that accessed Loans, Credit and Grants

Table 11.1 and Figure 11.1 show the total number of households and establishments that accessed loans, credit and grants. A total of 1,835 households and 137 establishments accessed loans, credit and grants. North-western had the highest number of households accessing loans with 284 while Southern Province had the lowest with 34. Northern Province had the highest number of households that accessed the credits with 53. Eastern (127) recorded the highest number of households that accessed grants.

At the establishment level, Northern Province recorded the highest number (18) of establishments that accessed loans, while Luapula Province had the highest number (23) of establishments that accessed grants.

TABLE 11.1: NUMBER OF HOUSEHOLDS AND ESTABLISHMENTS THAT ACCESSED LOANS, CREDIT AND GRANTS BY PROVINCE

Province	Number of Households	Number of Establishments						
	Total	Loan	Credit	Grant	Total	Loan	Credit	Grant
Central	53	53	0	0	3	2	0	1
Copperbelt	307	257	50	0	9	8	0	1
Eastern	224	72	25	127	23	6	0	17
Luapula	275	220	21	34	30	5	2	23
Lusaka	117	117	0	0	0	0	0	0
Muchinga	134	110	14	10	14	1	0	13
Northern	134	81	53	0	31	18	1	12
North-western	284	284	0	0	2	1	0	1
Southern	55	34	0	21	11	9	0	2
Western	252	182	17	53	14	1	3	10
Zambia	1,835	1,410	180	245	137	51	6	80



Source of Finance	Number of Households			Number of Establishment		
	Loan	Credit	Grants	Loan	Credit	Grants
Government-run program	1,183	14	191	37	1	58
Commercial bank	34	29	0	6	0	0
Bank farmers/ union/cooperative	13	0	0	4	0	3
Microcredit/Community credit scheme	101	32	0	0	1	0
NGOs/ Faith-Based/ Church	43	3	38	3	0	19
Friends	16	82	16	1	4	0
Kaloba	20	20	0	0	0	0
Zambia	1,410	180	245	51	6	80



11.3. Loans, Credit and Grants Households Sourced

Table 11.3 shows the average value of loans, credit and grants by each source of finance obtained by the fish farming households. The government-run programme provided the highest average loan, credit and grant amounts at K105,899.04, K76,667.56, and K35,197.27, respectively.

Non-Governmental organizations (NGOs)/Faith-Based/ Church provided the second-highest average amounts for loans (K43,292.45), credit (K50,000) and grants (K19,024.39).

TABLE 11.3: AVERAGE AMOUNT OF LOANS, CREDIT AND GRANTS OBTAINED BY HOUSEHOLDS

Source of Finance	Loan		Credit		Grant	
	Number of households	Average amount obtained by households (Kwacha)	Number of households	Average amount obtained by households (Kwacha)	Number of households	Average amount obtained by households (Kwacha)
Government-run program	1,183	105,899.04	15	76,667.56	191	35,197.27
Commercial bank	34	21,797.93	30	13,956.48	0	-
Farmers union/ cooperative	13	2,115.27	0	-	0	-
Microcredit/ Community credit scheme	101	14,875.22	33	22,922.34	0	-
NGO/Faith-Based/ Church	43	43,292.46	3	50,000.00	38	19,024.39
Friends	16	7,781.36	85	2,437.87	14	1,147.39
Kaloba	20	11,757.07	20	1,009.45	0	-
Zambia	1,410	29,645.48	186	27,832.28	243	18,456.35

11.4 Average Value of Loans, Credit, and Grants the Establishments obtained by Source of Finance

Table 11.4 shows the average value of loans, credit, and grants by each source of finance obtained by fish farming establishments. The commercial banks provided the highest average amount of loans at K24, 280,000, and government-run programs provided the highest average amount with credit and grants at K250,000 and K402,542, respectively.

The NGOs, faith-based organizations, and churches were the second highest source of finance for both loans and grants under establishments at K97,567 and K236,268, respectively.

TABLE 11.4 AVERAGE AMOUNT OF CREDIT/LOANS/GRANT OBTAINED BY ESTABLISHMENTS

Source of Finance	Loan		Credit		Grants	
	Number of establishments	Average amount obtained by establishments (Kwacha)	Number of establishments	Average amount obtained by establishments (Kwacha)	Number of establishments	Average amount obtained by establishments (Kwacha)
Government-run program	37	5,493,418	1	250,000	58	402,542
Commercial bank	6	24,280,000	0	-	0	-
Farmers' union or cooperative	4	147,500	0	-	3	83,500
Microcredit institution/ community credit scheme	0	-	1	10,000	0	-
NGO / faith-based organization/ church	3	97,567	0	-	19	236,268
Friend/relative	1	25,000	2	5,500	0	-
Zambia	51	6,008,697	4	88,500	80	240,770

11.5 Type of Collateral/Guarantee used by Households and Establishments

Table 11.5 shows the type of collateral or guarantee used by households and establishments in acquiring their financing for fish farming. A total of 96 households acquired collateral or guarantee-based loans out of which the majority (32) used land title and 23 out of 45 used motor vehicles to obtain credit. Under establishments, land title (4) out of 8 was used to obtain loans as collateral or guarantee.

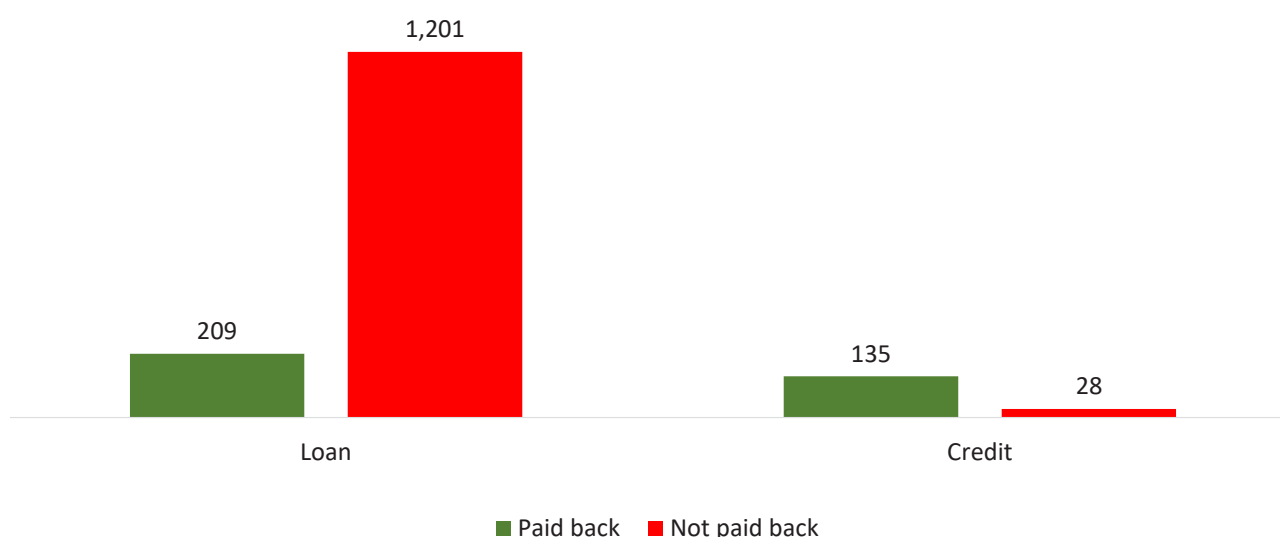
TABLE 11.5 NUMBER OF HOUSEHOLDS AND ESTABLISHMENTS BY TYPE OF COLLATERAL/GUARANTEE

Type of collateral/guarantee	Households		Establishments	
	Loan	Credit	Loan	Credit
Land title	32	12	4	0
Farm implements/ equipment	7	10	2	0
Vehicle	-	23	-	0
House	30	-	2	0
Animals	27	-	-	0
Total	96	45	8	0

11.6 Number of households that paid back the Loans and Credits

Figure 11.2 shows the number of households that paid back the loans and credit and those that did not. From the total 1,410 households that obtained loans, 209 paid back while 1,201 that did not. On the other hand, the number of households that paid back the credit was 135 compared to 28 that did not.

FIGURE 11.2: DISTRIBUTION OF HOUSEHOLDS' LOANS AND CREDIT REPAYMENT STATUS

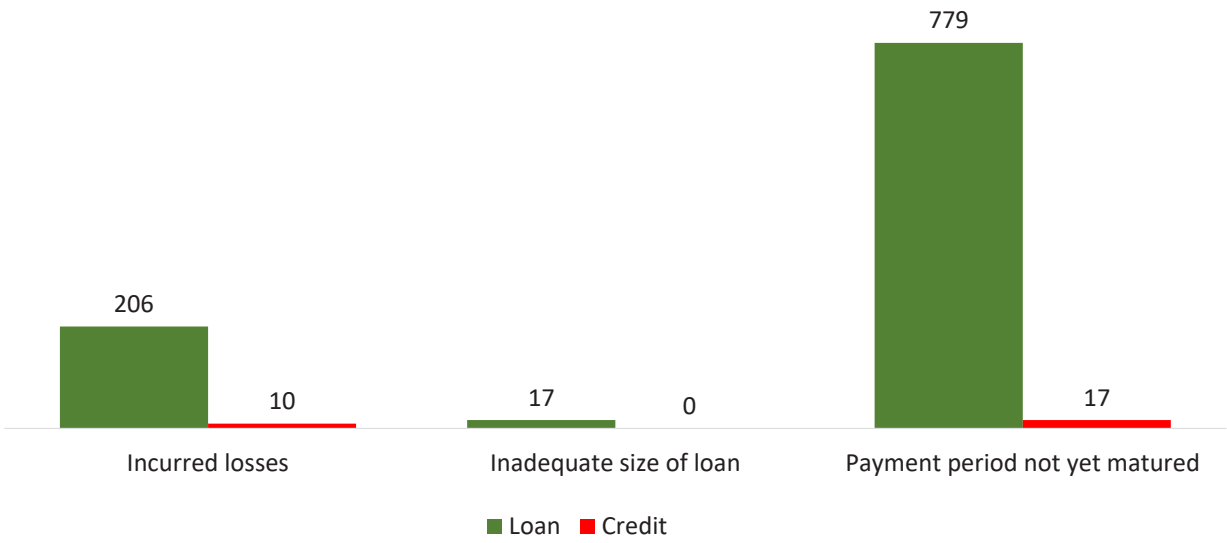


11.7 Reasons for Households not paying back Loans/Credit

Figure 11.3 shows the reason for not paying back the loans/credit. A total of 779 and 17 households reported that they did not pay back the loans and credit respectively, because they were within the repayment period. In addition, 206 households that obtained loans and 10 that acquired credit incurred losses.



FIGURE11.3 DISTRIBUTION OF THE HOUSEHOLDS REPORTED MAJOR REASONS FOR FAILING TO PAY BACK THE LOAN/ CREDIT



CHAPTER 12: FISH FARMING EMPLOYMENT

This chapter presents a summary of employees engaged by fish farming households and establishments segregated by sex, province, type of employment and fish farming activities as at 31st December 2022. The main fish farming activities highlighted in this section include facility construction, table-size fish production, fingerling production, harvesting, processing, marketing, administration, transportation, and security.

12.1 Number of Employees engaged by Fish Farming Households and Establishments

Table 10.1 and Figure 10.1 show that a total of 58,906 were employed in the aquaculture subsector. The majority were contributed by households (44,848 employees) and the remaining 14,058 by the establishments.

Under households, Luapula Province recorded the highest number of paid employees at 2,759, followed by Northern Province with 2,565, while Southern Province had the lowest number of paid employees at 144. In terms of unpaid employees, Northern Province ranked the highest with 10,013, followed by Luapula Province with 5,449 and Southern Province had the lowest at 877.

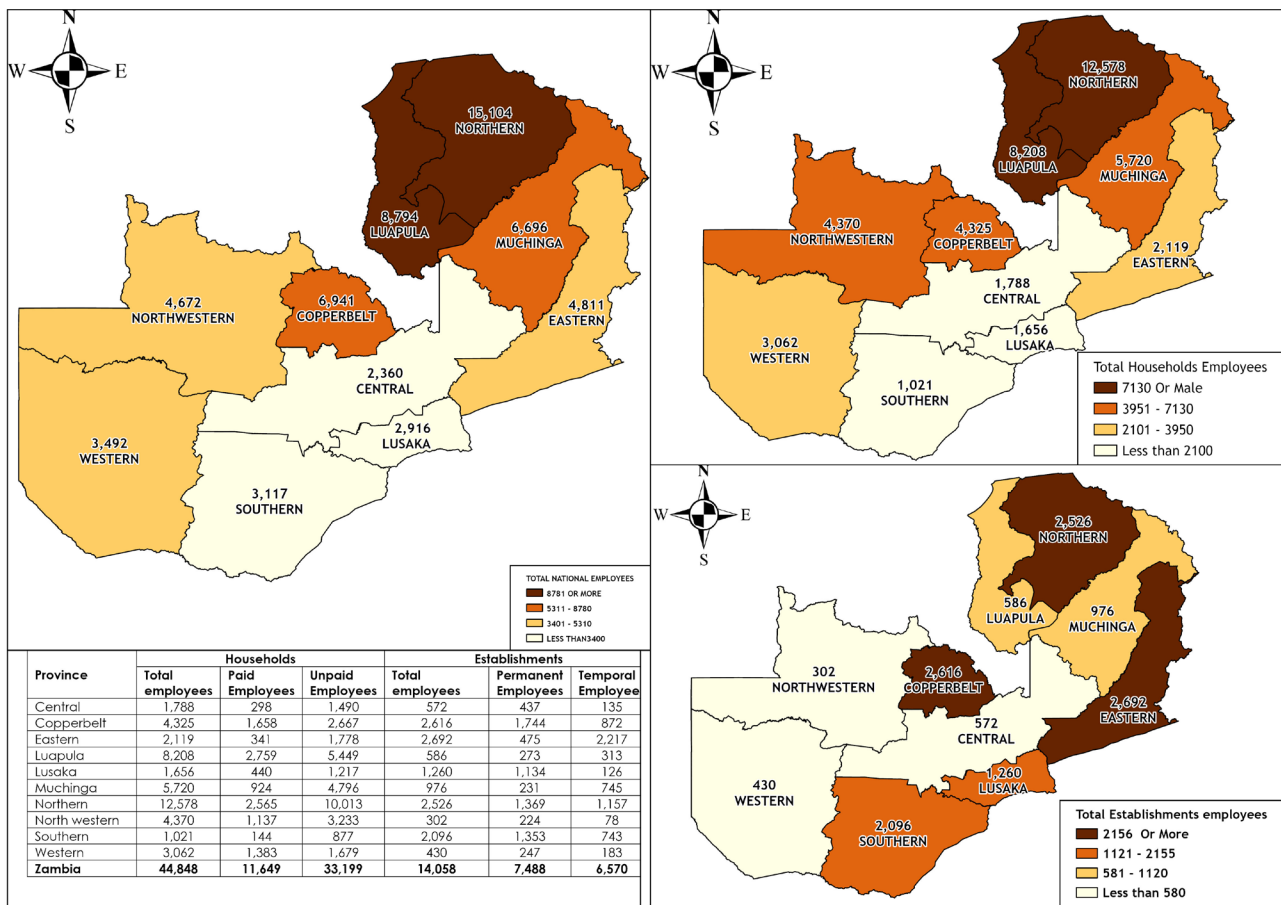
As for establishments, Copperbelt Province had the highest number of permanent employees seconded by Northern Province with 1,369, while North-western Province recorded the lowest number of permanent employees at 224. For temporal employees, Eastern Province had the highest number at 2,217 followed by Northern Province with 1,157, and North-Western Province was the lowest at 78.

TABLE 12.1 DISTRIBUTION OF EMPLOYEES ENGAGED BY FISH FARMING HOUSEHOLDS AND ESTABLISHMENTS BY TYPE OF EMPLOYMENT BY PROVINCE

Province	Households			Establishments			Total
	Total employees	Paid Employees	Unpaid Employees	Total employees	Permanent Employees	Temporal Employees	
Central	1,788	298	1,490	572	437	135	2,360
Copperbelt	4,325	1,658	2,667	2,616	1,744	872	6,941
Eastern	2,119	341	1,778	2,692	475	2,217	4,811
Luapula	8,208	2,759	5,449	586	273	313	8,794
Lusaka	1,656	440	1,217	1,260	1,134	126	2,916
Muchinga	5,720	924	4,796	976	231	745	6,696
Northern	12,578	2,565	10,013	2,526	1,369	1,157	15,104
North western	4,370	1,137	3,233	302	224	78	4,672
Southern	1,021	144	877	2,096	1,353	743	3,117
Western	3,062	1,383	1,679	430	247	183	3,492
Zambia	44,848	11,649	33,199	14,058	7,488	6,570	58,906



FIGURE 10.1 DISTRIBUTION OF EMPLOYEES ENGAGED BY FISH FARMING HOUSEHOLDS AND ESTABLISHMENTS BY TYPE OF EMPLOYMENT BY PROVINCE



10.2 Employees engaged by Fish Farming Households and Establishments by Sex and Fish Farming Activity

Table 10.2 shows the number of employees engaged by fish farming households and establishments to undertake various fish farming activities as at 31st December 2022 across the country. At the household level, facility construction had the highest number for both male and female paid employees, recording 19,566 for males and 1,501 for females. Similarly, table-size fish production had the highest number for both male and female unpaid employees at 17,202 and 10,793, respectively.

At the establishment level, for permanent employees, the highest number of male employees was in administration, transportation, and security, at 784. On the other hand, facility construction had the highest number of female permanent employees at 454. In the case of temporary employees, facility construction had the highest number for both males and females at 1,319 and 549, respectively.

TABLE 12.2 DISTRIBUTION OF EMPLOYEES BY FISH FARMING ACTIVITY AND GENDER

Fish farming activity	Total workers engaged	Households					Establishments				
		Number of paid Employees		Number of unpaid Employees		Total employees House-holds	Number of permanent Employees		Number of temporal Employees		Total employees
		Male	Female	Male	Female		Male	Female	Male	Female	Establish-ments
Facility Construction	41,819	19,566	1,501	12,858	4,973	38,898	1,828	577	2,184	684	5,274
Table size fish Pro-duction	37,556	6,551	941	17,202	10,793	35,488	1,657	332	772	482	3,244
Fingerling Production	7,078	930	108	3,609	1,827	6,474	392	139	204	39	774
Harvesting	32,823	7,613	1,418	14,080	7,845	30,956	417	187	840	423	1,867
Processing	5,669	685	88	2,331	2,046	5,150	190	118	129	98	535
Marketing	14,947	1,836	556	6,912	4,958	14,263	367	170	190	117	844
Transportation, Securi-ty, Administration	25,224	5,682	1,364	10,361	6,432	23,839	3,110	624	1,264	262	5,259



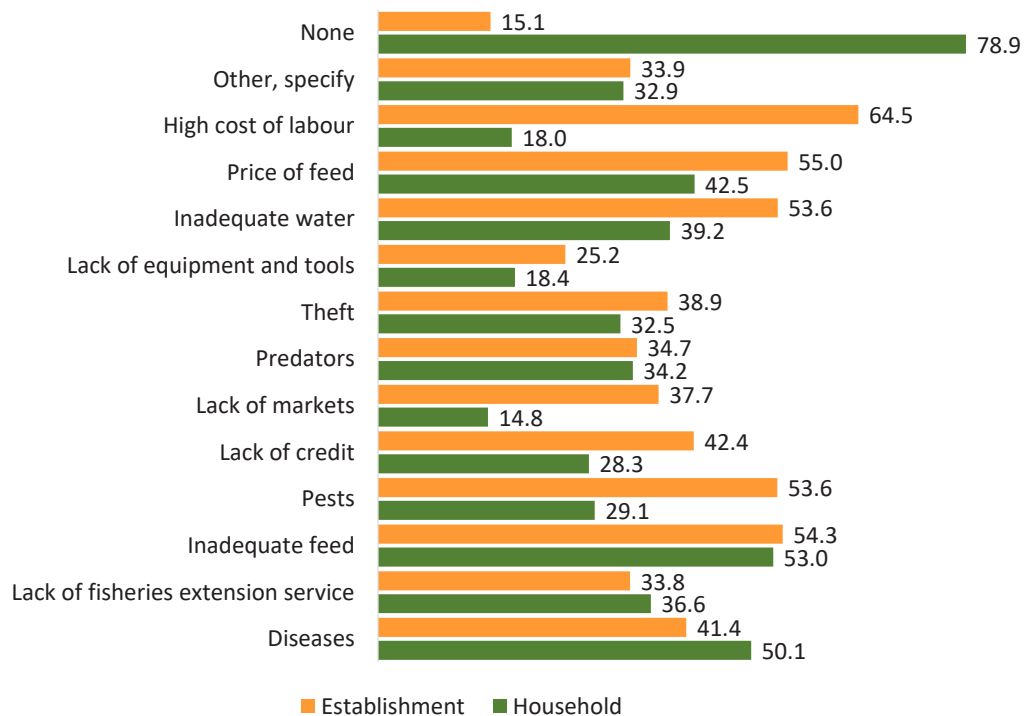
CHAPTER 13: CHALLENGES IN FISH PRODUCTION

This chapter highlights the challenges faced by households and establishments involved in fish farming between 1st January and 31st December, 2022. The challenges are reported by the most severe, moderate, and less severe categories.

13.1 Major challenges faced by Households and Establishments in Fish Farming

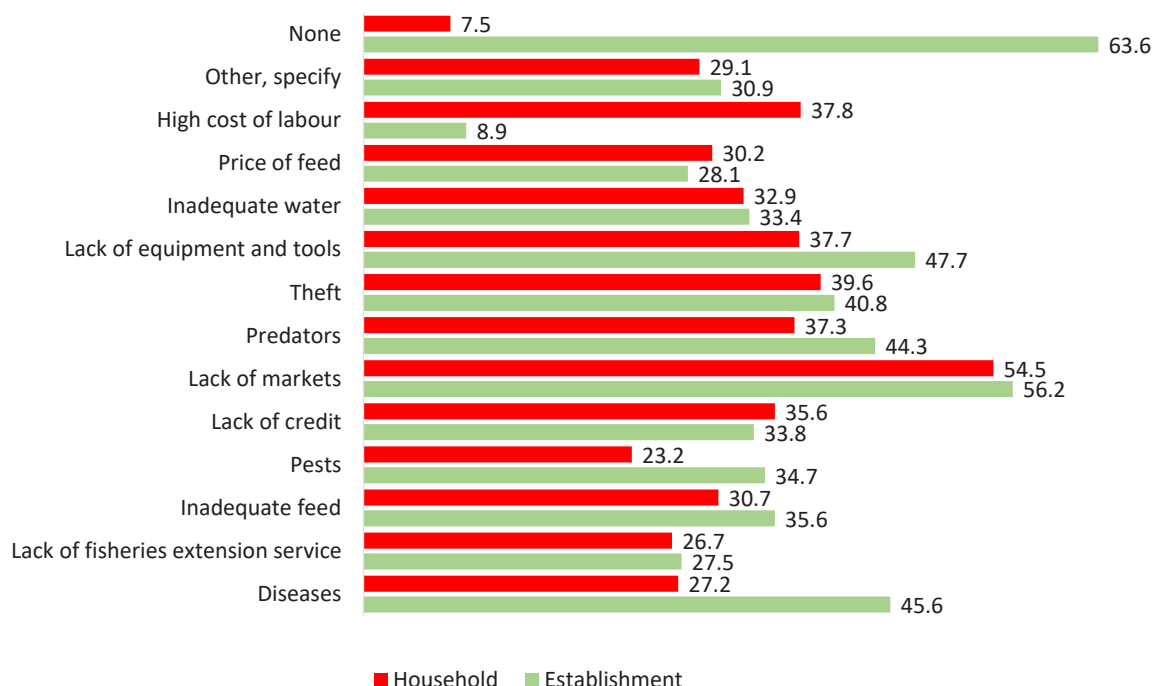
Figure 13.1 shows the major challenges faced by households and establishments in fish farming under the most severe category. At the household level, inadequate feed (53.0%) was the major challenge followed by diseases (50.1%) and the price of feed at 42.5%. Under establishments, the high cost of labour (64.5%) was the major challenge followed by price of feed (55.0%) and inadequate feed at 54.3%.

FIGURE 13.1: MOST SEVERE CHALLENGES FACED BY HOUSEHOLDS AND ESTABLISHMENTS IN FISH FARMING



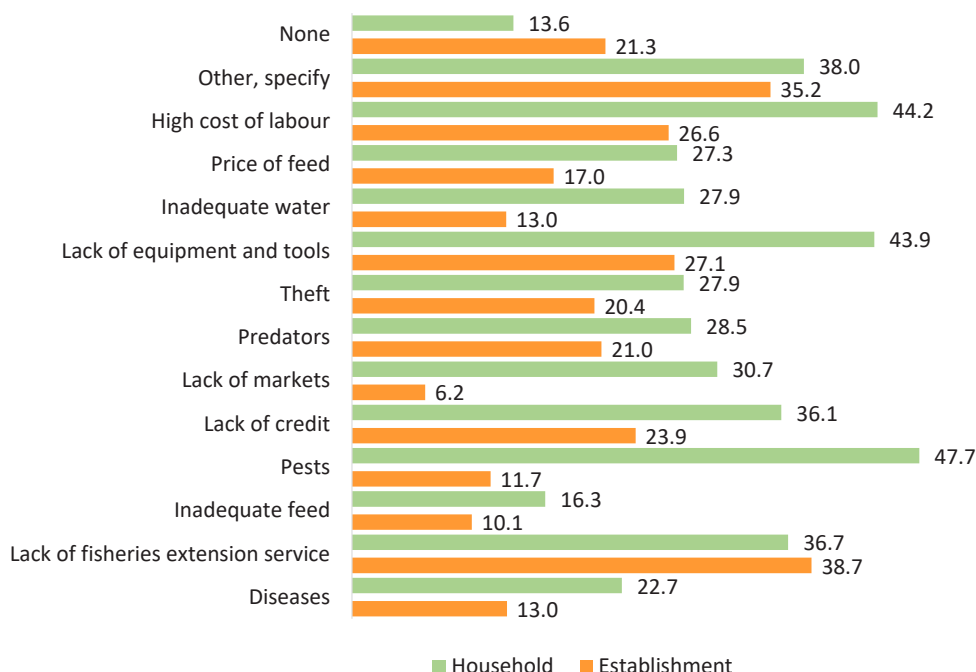
In the moderate-severe category, lack of markets (54.5%) was the major challenge faced by households involved in fish farming followed by theft (39.6%) and lack of equipment and tools at 37.7%. At establishment level, lack of markets (56.2%) was the major challenge faced by establishments involved in fish farming followed by lack of equipment and tools (47.7%) and diseases at 45.6% (See Figure 13.2).

FIGURE 13.2: MODERATE-SEVERE CHALLENGES FACED BY HOUSEHOLDS AND ESTABLISHMENTS IN FISH FARMING



In the less-severe category, Pests (47.7%) was the major challenge faced by households involved in fish farming followed by high cost of labour (44.2%) and lack of equipment and tools at 43.9%. At the establishment level, lack of fisheries extension service (38.7%) was the major challenge faced by establishments involved in fish farming followed by lack of equipment and tools (27.1%) and high cost of labour at 26.6% (See Figure 13.3).

FIGURE 13.3: LESS-SEVERE CHALLENGES FACED BY HOUSEHOLDS AND ESTABLISHMENTS IN FISH FARMING





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