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Research Article

Current and future prospects of commercial fish farming in Zambia

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Abstract. According to the survey conducted, there were 15 land based commercial fish farms in Lusaka, Copperbelt and Northern provinces and 10 cage culture operators, mainly based on Lake Kariba. Fish production per hectare ranged between 13 and 18 tonnes while total production was estimated to be approximately 4971.37 metric tons. The weight of fish at harvest from ponds and tanks ranged from 250g to 350g per piece while under cage culture, where fish were regularly fed with floating pellets, ranged from 400 to 450g. Fish stocking density by most farmers was 30,000 fingerlings per hectare and between 12,000 and 15,000 for cage culture. Those who operated fish hatcheries employed a technology that manipulated genetic materials of Oreochromis andersonii and O. niloticus, resulting in production of all-male tilapia, simply referred to as "super males". Environmental considerations remained a great challenge to the development of both land based commercial fish farms and cage culture on Lake Kariba. Higher fees were charged to do environmental impact assessment (EIA) studies before commencement of operation.

Key Words: current, future, prospects, commercial, fish farming, Zambia.

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Introduction

Zambia's rich endowment of water in form of rivers, lakes and swamps provides the foundations for supporting significant economic growth and development (Mudenda 2006; Musumali *et al* 2009). These natural resources are ideally suited to aquaculture production (ACF/FSRP 2009). Aquaculture development programs have the potential to create new jobs, improve food security among poor households, remove variability in terms of household income flow, and increase farm level efficiency and sustainability (Kaliba *et al* 2007).

The potential for aquaculture that has been ascertained for commercial pond fish farming development exceeds 38,000 hectares in all provinces of Zambia (NADP 2010). Commercial fish farming is a principal economic activity that is focussed on making money (profit) by actively participating in the market through the sale of all kinds of fish products and other related farm produce. Commercial fish farming is usually very large, intensive and involves large investment. It is market oriented and may include processing for export (ACF/FSRP 2009). In Zambia, it is operated at two levels: land based (i.e. use of ponds and tanks with and without recirculatory system) and cage aquaculture. These practices involve higher stocking densities of mono-sex species, reliance on feed and oxygen supplementation in some cases.

Materials and methods

A survey was conducted between December 2010 and April 2011 to assess current and future prospects of commercial fish farming in Zambia using semi-structured questionnaires (see the Annex 1) that were administered personally to respondents (i.e. commercial fish farmers, fish seed producers and fisheries officers). Data collection included the following: aquaculture production statistics; fish feed/seed availability as well as institutional and regulatory policy frame work supporting aquaculture development. Other relevant information was obtained from the Department of Fisheries (DoF) headquarters and provincial fisheries offices. Field data analyses were done using Statistical Package for Social Sciences (SPSS 12.0) while Microsoft Excel was used to prepare graphs and tables.

Results

It was established that fish production per hectare ranged between 13 and 18 tonnes while total production from land based commercial fish farming was estimated to be approximately 4,453.21 metric tons in 2010 (Figure 1), with 51% production being recorded in the Copperbelt Province (Figure 2) while Lusaka and Southern recorded 34% and 11%, respectively.

On the other hand, fish production from cage culture was estimated to be approximately 518.16 metric tons in 2010 compared to 387 metric tons recorded in 2009 (Figure 3).

Fish cultivation was centered on Nile Tilapia (*Oreochromis niloticus* (Linnaeus, 1758)), *O. andersonii* (Castelnau, 1861), *O. macrochir* (Boulenger, 1912) and *Tilapia rendalli* (Boulenger, 1897) (Figure 4).

The government was promoting aquaculture as a business in higher potential zones where specific aquaculture production systems were to be marched with available resources (Figure 5).

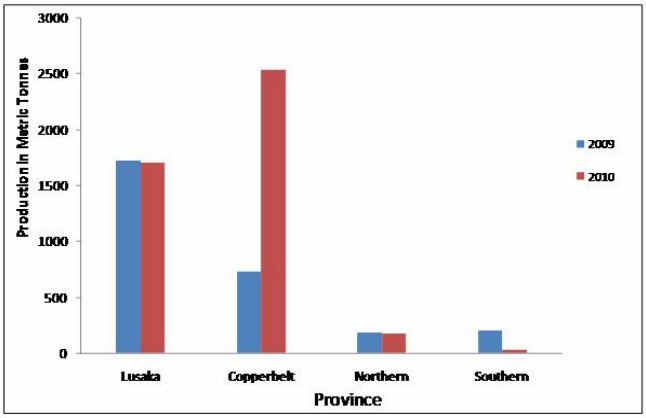

Figure 1. Fish production from land-based commercial farmers

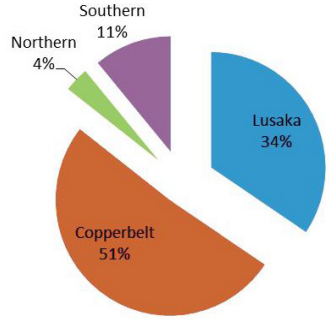

Figure 2. Fish production from commercial fish culture

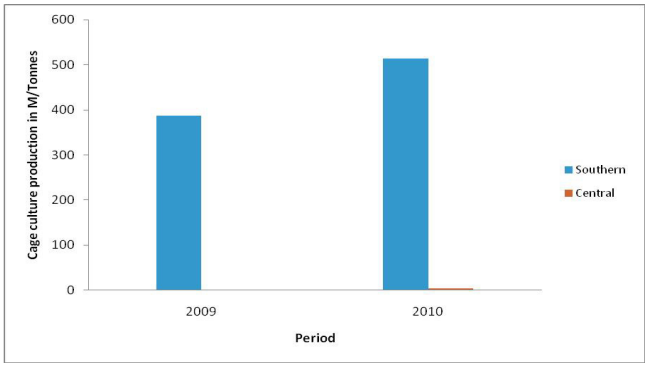

Figure 3. Fish production from cage culture

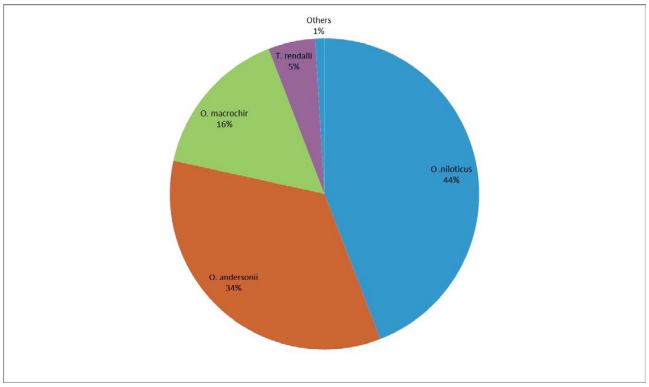

Figure 4. Percentage distribution of cultured fish species

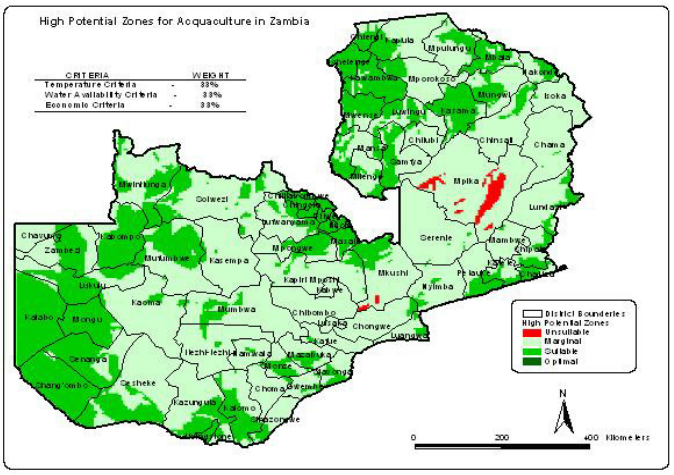

Figure 5. Map showing higher potential zones for aquaculture in Zambia (Source: NADP 2010)

Discussion

Findings of this study agree with a report by FAO (2004b) and ACF/FSRP (2009) that observed the concentration of land based commercial fish farmers in areas around Lusaka, Copperbelt and Northern provinces where ideal conditions for such business existed. However, during the survey, only 15 such farmers were recorded, compared to earlier reports by FAO (2004) and Mudenda (2006), which indicated that there were at least between 20 and 24 commercial fish farmers in Zambia. It was observed that the substantial decline in number of commercial operators over the years may have been attributed to:

- poor performance of the country's economy as well as lack of incentives from government to promote investment and growth of this sector;
- fragmented support to aquaculture by both the government and private sector to ensure growth, which has contributed to its poor development;
- higher operation costs; inability of the individual fish farmers to access investment loans from financial institutions due to lack of collateral; lending institutions normally prefer to lend to the agriculture sectors, which they are more knowledgeable of;
- the sector previously operating without an enabling policy and legal framework needed to promote its sustainable growth;
- lack of quality affordable feed/inadequate hatcheries that produce quality fish seed leading to high fish yields; fish farmers also found it difficult to meet costs of feed, fingerlings and tools as a result of indirect expenses arising from transport and communication costs;
- so much red tape in registering a fish farming company;
- inability of potential farmers to raise funds to hire consultants to conduct environmental impact assessment (EIA).

The entry into the sector of five new investors (Savanna and Eureka farms in Lusaka, Revendel Tilapia Enterprises in Luanshya, Aqua and St. Patrick fish farm in Kafue) showed an increase in investment, implying that fish production from aquaculture could be increased 10-fold, contributing significantly to national food security, important domestic provider of much needed high-quality animal protein and other essential nutrients (generally at affordable prices to the poorer segments of

the community) and/or a provider of employment opportunities and cash income (Tacon 2001; DoF 2010).

In Zambia, cage culture, a specialized type of fish farming was practiced at commercial level by hospitality business owners, the majority of whom were also Kapenta fishers on Lake Kariba. The introduction of cage culture on Kariba holds a great potential for growth of aquaculture in Zambia. The practice has the potential of producing large quantities of fish for export and domestic markets (FAO 2004a). Cage fish farmers have continued expanding with new cages introduced in Mkushi (Central Province) and expansion in both cage numbers and fish production on Lake Kariba. Observations by FAO (2004) revealed that for cage culture in Africa to succeed, five key constraints of seeds, feed, finance, skills/information and marketing have to be addressed comprehensively.

During the study, 10 cage culture operators (with 42 active cages out of a total number of 51) were recorded, most of which were concentrated in Siavonga and Sinazongwe districts on Lake Kariba with few found elsewhere. However, an earlier report by Maguswi (2003) observed that there were 4 commercial enterprises practicing cage aquaculture on Lake Kariba. They each used 44 cages 6 m x 6 m x 6 m (216 m^3) and 10 pens to grow Nile tilapia bream (*O. niloticus*) and used commercial feeds such as pellets. Stocking density was around 20 kg/m^3, while average production was 3.5 tonnes per cage measuring 216 m^3. But Blow & Leonard (2007) indicated the existence of only three small cage farms in Zambia operating on Lake Kariba in the Siavonga area that were established in the 1990s and whose production was not more than 10 tonnes per annum of whole fish. The authors reported that all three farms had 30 square cages of around 40 m3, with wooden walkways. Production nets were nylon and made in Zimbabwe or imported from abroad. No predator nets were used. The authors further reported that the three cage sites were located in shallow (<5 m deep) inshore areas and were close enough to land to have walkways out to the sites. Juveniles were transferred to the cages from pond sites, where they were on-grown to market size of around 350 g.

Fish stocking density by most commercial farmers was 30,000 fingerlings per hectare, which was equivalent to 3 fish per m^2. Mudenda (2006) reported that the recommended stocking density for breams was 2.5 fingerlings per square metre of pond. Cage farmers stocked between 12,000 and 15,000 mono sex or sex reversed Nile Tilapia fingerlings meant to improve yield. The average pond size was about half a hectare (5000 m^2), although some farms had ponds below that size.

The study concurred also with FAO (2005) who reported that the concentration of fish cultivation was centered on *O. niloticus*, *O. andersonii*, *O. macrochir* and *T. rendalli* to some extent. These contributed about 99% of production while other fish species such as carp (*Cyprinus carpio* Linnaeus, 1758) and the red swamp crayfish (*Procambarus clarkii* (Girard, 1852)) contributed only 1%. Nile Tilapia was the most favoured species because of its relatively faster growth, and flexible feeding habits in crowded conditions, particularly in cages. Not until such a time when the conclusion of evaluation of substituting it with a suitable native species *O. niloticus* will remain the main species for cage aquaculture. Some farms operated fish hatcheries in which they employed a technology that manipulated genetic materials of *O. andersonii* and *O. niloticus*, resulting in production of all-male tilapia, simply referred to as "super males", which avoids the common inconvenience resulting from premature pond fish reproduction, a problem that most farmers were grappling with.

Most land-based fish farmers used both on-farm feed and complete diets (either extruded or floating pellets) to feed their fish either by broadcasting or through the use of feed rings twice or more per day. Zambia has at least 2 to 3 commercial fish feed producers. The price of aqua feed supplied by Tiger Animal Feed and National Milling Corporation (NMC) ranged between $15.63 and $20.83 per fifty (50) kg bag. However, according to Machena & Moehl (2001) feed remains one of the most prominent barriers to expanded aquaculture production, especially medium- and large-scale production. Unless affordable feed costs can be maintained, farm-raised products cannot compete with those coming from capture fisheries, unless there is significant value added through the production of luxury items.

The weight of fish at harvest for ponds and tanks was from 250g to 350g per piece while under cage culture where fish were regularly fed with floating pellets, the weight at harvest ranged from 400g to 450g. The fish after harvest was transported to the market (wholesalers and retailers) using refrigerated trucks, where they were sold whole/round and in some cases processed as fillets between $2.30 and $3.13 per kg.

The study also revealed an increase in number of fish farm employees by 10%. Mudenda (2006) reported that commercial fish farmers employed over 310 workers of which 69 were full time and the rest were indirect workers. To date only 15% of employees at commercial fish farms were on permanent basis while 85% were contractual workers. It was also observed that the majority of the workforce employed on permanent basis, showed commitment and motivation in discharging their duties compared to those who were indirectly employed. The study further agrees with Mudenda (2006) on the aspect of most, if not all the workers in commercial aquacultures being functionally literate, although less than 1% of commercial fish farm workers had received specialist training in aquaculture at any level.

Environmental considerations remained a great challenge to development of both land based commercial fish farms and cage culture on Lake Kariba. The Zambia Environmental Management Agency (ZEMA) (formally Environmental Council of Zambia) was cited as the major hindrance to establishment of new fish farms. Higher fees were charged by ZEMA for carrying out environmental briefs or environmental impact assessment (EIA) studies before commencement of operation. The concerned farmer was required by law to hire consultants (whose costs were not less than $5,000) to conduct an EIA, an exercise perceived to be expensive. If ZEMA determined that a project was likely to have a significant impact on the environment, it may require the preparation of an environmental impact assessment (EIA). In addition, EIAs are obligatory for all projects specified in the Second Schedule, including all projects located in or near environmental sensitive areas such as areas supporting populations of rare and endangered species or major water catchment areas.

From this study the authors further learnt that conducting an environmental project brief was far much cheaper than EIA. For example, Zambia National Service (ZNS) owned seventeen

hectares Chanyanya farm, only prepared an environmental brief as opposed to conducting an EIA before commencing operations. A project brief is a report on preliminary conditions of possible impacts of a project on the environment and constitutes the first phase of the EIA process. A project brief is required for all projects listed in the First Schedule to the Regulations, including fish farms with a production of 100 tonnes or more per year. A project brief was also required for the introduction of alien species of flora and fauna into the local ecosystem.

Other concerns raised by stakeholders included issues in which they urged government to provide an enabling environment in terms of regulations and legal support that promoted the commercialization of aquaculture to ensure availability of credit facilities, good quality fish seed and affordable feed. According to FAO (2004) the challenge to government and regional organisations was to identify bottlenecks to development and make short and effective interventions where necessary. As for Zambia, a good national policy was lacking to promote sustainable aquaculture development from the time of its inception in the early fifties except for one that supported only the fisheries from natural waters, lakes, rivers and swamps. The aquaculture sector operated without an enabling policy and legal framework that caused it to lag behind in terms of development compared with other agriculture activities such as crops and livestock production that received yearly incentives (farmer input support programme and free animal vaccines) from the central government. FAO (2005) further reported that a policy and regulatory framework which addressed issues of resource allocation, cumulative environment impact, and input as well as product quality was also needed for this sector to grow.

A need therefore, arose for the amendment of the Fisheries Act, Cap 200 of 1974, the country's major piece of legislation governing the fisheries sector by parliament that did not contain any substantive provisions relating to aquaculture (Mutuna 2009). The Fisheries Act was amended in 2007 to help strengthen provisions for the development of the sector. Some of the provisions in the amended Act describe the license procedure to engage in and set up an aquaculture facility and address issues such as the protection of the aquatic environment, fish movement and fish disease (i.e. Zambia had a liberal policy with respect to translocation and introductions, provided they were closely monitored with strict measures to prevent escapes into the natural waters), environmental impact assessments and genetically modified organisms. The legal framework as contained in the Fisheries Act concerning regulation and control fish escapees from fish farms, cages, fish pens or any other aquaculture facility into the natural fisheries will be followed. The same legal frameworks will apply for regulating the introduction and use of exotic fish species and use of genetically improved fish species in aquaculture. The amended legislation also provides for a definition of aquaculture, the preparation of aquaculture development plan, the declaration of aquaculture development areas and establishment of a Technical Aquaculture Committee (FAO 2005)

In order to address the ambiguity of aquaculture objectives, the Department of Fisheries embarked on the preparation of a National Aquaculture Development Strategy (NADS) in 2004 with the support of Food and Agriculture Organization (FAO) of the United Nations to refocus development and management of aquaculture so as to commit government to remove obstacles to aquaculture development. NADS was based on four fundamental principles:

- to promote aquaculture development as a business (profit) in higher potential zones (HPZs) where specific aquaculture production systems were to be marched with available resources (Figure 5);
- stakeholders were expected to contribute to development where they had a comparative advantage;
- aquaculture was considered a profitable venture;
- producers required having a say in the management of the sector, with clearly outlined roles and responsibilities.

The strategy's final goal was to have a healthy and dynamic aquaculture sector in Zambia. It acknowledged 9 key priority areas for growth of aquaculture: (1) suitable production systems, (2) availability and cost of inputs (feed, seed capital), (3) extension or outreach (4) research and technological innovation, (5) education and training, (6) marketing, (7) producer organisation, (8) regulations and control, and (9) monitoring and evaluation (NADP 2010).

Conclusion

The conclusion that can be drawn from this study is that environmental considerations have remained a great challenge to the development of commercial fish farming in Zambia. However, the current trends indicate that investment in the sector was being recorded in the country although the growth of aquaculture was perceived to be relatively slow. Fish farming had great potential for reducing poverty in the country by increasing fish production for food security and income generation amongst households, thereby contributing directly to the achievement of the Millennium Development Goals (MDGs). Through coordinated support to the sector it was possible for fish farming to grow to unprecedented levels.

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Annex 1

Current and future prospects of commercial fish farming in Zambia

(1) DATE: _____/_____/ _____

(2) NAME OF OPERATOR: _____

(3) DESIGNATION (OPTION): _____

(4) TYPE OF AQUACULTURE:_____ (A) LAND BASED (B) CAGE CULTURE

(5) LOCATION OF FARM/CAGES:_____

(6) HOW LONG HAVE YOU BEEN IN OPERATION?:_____ (A) BELOW 6 MONTHS (B) 6 MONTHS TO 1 YEAR (C) 2-5 (D) 6- 10 YEARS (E) >10 YEARS

(7) HOW DID YOU FINANCE THE BUSINESS? (A) USED OWN RESOURCES (B) BANK LOAN (C) GRANT AID (D) OTHER(S)/SPECIFY: _____

(8) DID YOU DO AN ENVIRONMENTAL IMPACT ASSESSMENT (EIA) BEFORE COMMENCEMENT OF OPERATION? _____ (A) YES (B) NO

(9) IF YES, WHO DID IT? _____ (A) SELF (B) CONSULTANT (C) OTHERS

(10) WHAT WAS THE COST OF EIA? _____ (A) BELOW $1000 (B) $1200-3000 (C) $3100-5900 (D) ABOVE $6000

(11) IF ANSWER IS NO TO QUESTION 6, WHAT DID YOU DO? _____ (A) NOTHING (B) ENVIRONMENTAL BRIEF (C) OTHERS/SPECIFY: _____

(12) WHAT FISH SPECIES DO YOU CULTURE? _____ (A) RED BREASTED BREAM (B) THREE SPOTTED BREAM (C) NILE TILAPIA (D) AFRICAN CATFISH (E) OTHERS _____

(13) WHAT IS THE SOURCE OF YOUR FINGERLINGS? _____ (A) BREED OWN JUVENILES (B) BUY FROM LOCAL SEED PRODUCERS (C) IMPORT FROM OTHER COUNTRIES (D) OTHER(S)/SPECIFY _____

(14) WHY IS THIS SPECIES MOST PREFERRED _____ (A) FAST GROWTH (B) IMPROVED GENETIC MATERIAL (C) MARKET DEMAND (D) OTHER(S) SPECIFY: _____

(15) DO YOU EXPERIENCE ANY FISH DISEASES? _____ (1) YES (2) NO

(16) IF ANSWER IS YES TO QUESTION ABOVE, WHAT TYPE OF INFECTIONS HAVE YOU EXPERIENCED? _____ (A) FUNGAL (B) BACTERIAL (C) ECTOPARASITES (D) ENDOPARASITES (E) OTHER(S)/SPECIFY _____

(17) WHAT DO YOU DO WITH THE INFECTED FISH? _____ (A) NOTHING (B) REMOVE AND THROWN AWAY (C) QUARINTINE THEM (D) APPLY TREATMENT TO SICK FISH (E) OTHER(S)/SPECIFY: _____

(18) WHO SUPPLIES FEED FOR YOUR FISH? _____ (A) OWN FEED PRODUCTION (B) TIGER ANIMAL FEED (C) NATIONAL MILLING CORPORATION (D) OTHER(S)/ SPECIFY _____

(19) WHAT IS THE PRICE OF FEED/50KG? _____ (A) BELOW $10 (B) $10-14 (C) $15-19 (D) ABOVE $20

(20) HOW DO YOU FEED THE FISH _____ (A) BROADCASTING (B) USE FISH FEEDERS (C) OTHERS SPECIFY: _____

(21) HOW OFTEN DO YOU FEED YOUR FISH PER DAY? _____ (A) ONCE (B) TWICE (C) MORE THAN TWICE

(22) WHAT QUALITY STANDARDS HAVE YOU PUT IN PLACE TO ENSURE FEED WASTAGE IS KEPT TO MINIMUM? _____ (A) NOTHING (B) USE OF FISH EXTRUDED DIETS (C) USE OF FLOATING FEED (D) OTHER(S)/ SPECIFY _____

STATUS OF AQUACULTURE OPERATION:

(A) LAND BASED

(1) WHAT IS YOUR FARM SIZE? _____ (A) BELOW A HA (B)1-5HA (C) 6-10HA (D) 11-19HA (E) >20HA

(2) WHAT IS THE TOTAL VALUE OF YOUR FARM? _____
(A) BELOW $10000 (B) $15000-25000 (C) $26000-50000 (D) >$50000

(3) NUMBER AND SIZES OF AQUACULTURE FACILITIES

_____

(4)WHO CONSTRUCTED THE FACILITIES AT FARM? _____ (A) SELF (B) HIRED CONSTUCTORS (C) OTHER(S) SPECIFY _____

(5) WHAT WAS THE CONSTRUCTION COST/FACILITY? _____

(6) FISH STOCKING DENSITY/M^2 _____

(7) FISH FARM PRODUCTION CYCLE:_____ (A) 4-6 MONTHS (B) 7-9 MONTHS (C) 12 MONTHS (D) MORE THAN 12 MONTHS

(8) PRODUCTION/FACILITY/UNIT TIME: _____

(9)TOTAL FARM OUTPUT: _____TONS/YEAR

(B) CAGE PRACTICE

No.	CAGE			STOCKING DENSITY (KG/M^3)	NUMBER STOCKED	NAME(S) OF SPECIES STOCKED	PRODUCTION/CAGE/ UNIT TIME
	Type	Size	Number				
1							
2							
3							
4							
5							

CAGE TYPE: (1) PLASTIC CIRCLE CAGES (2) SQUARE CAGES (3) WOODEN CAGES

(1) WHERE ARE THE CAGES LOCATED? (A) INSHORE (B) OFFSHORE (C) OTHERS (SPECIFY**):**_____

(2) HAVE YOU EXPERIENCED FISH ESCAPE? _____ (A) YES (B) NO

(3) IF YES EXPLAIN WHAT CAUSED THE ESCAPE _____

(4) DO YOU USE PREDATOR NETS AROUND YOUR CAGES? _____ (A) YES (B) NO

(5) IF NO WHAT MEASURES HAVE YOU PUT IN PLACE TO PREVENT FUTURE ESCAPE OF FISH? _____

(6) WHAT IS YOUR FISH MARKET SIZE? _____ (A) 200-249G (B) 250-299G (C) 300-349G (D) ABOVE 350G

(7) WHERE DO YOU SALE YOUR FISH AFTER HARVEST? _____ (A) LOCALLY (B) SURROUNDING TOWNS WITHIN THE PROVINCE (C) LUSAKA (D) OTHER(S)/SPECIFY: _____

(8) HOW DO YOU SALE YOUR FISH? _____ (A) WHOLE/ROUND/GUTTED FISH (B) FRESH FILLETS (C) SUPER-CHILLED FILLETS (D) FROZEN FILLETS (6) SMOKE DRIED

(9) TO WHO DO YOU SALE YOUR FISH (A) WHOLESALE RS (B) RETAILERS (C) BOTH
(D) OTHER(S)/SPECIFY_____

(10) AT WHAT PRICE DO YOU SALE YOUR FISH/KG _____ (A) $1- 2 (B) $2.5- 3 (C) $3.5-4 (D) ABOVE $4.5

(11) HOW DO YOU TRANSPORT YOUR FISH TO THE MARKET? _____ (A) ICED SACKS/SEALED BOXES IN OPEN VANS (B) REFRIGERATED TRUCKS (C) OTHER(S)/SPECIFY: _____

(12) DO YOU HAVE FISH PROCESSING FACILITIES? _____ (A) YES (B) NO

(13) IF ANSWER IS YES WHAT TYPE IF ANY? _____ (A) COLD ROOMS (B) DRY SMOKING KILNS (C) OTHER(S)/ SPECIFY: _____
(14) HOW DO YOU RATE YOUR PRODUCTION COST? _____ (A) BELOW $1/KG (B) $1-$3/KG (C) ABOVE $4/KG

(15) NO. OF EMPLOYEES: _____ (A) 1-5 (B) 6-14 (C) 15-29 (D) ABOVE 30

(16) WHAT IS THEIR CONDITION OF SERVICE? _____ (A) PERMANENT (B) CONTACT (C) CASUAL (D) OTHER(S)/SPECIFY _____

(17) WHAT PERCENTAGE OF EMPLOYEES ARE WOMEN? _____ (A) BELOW 15%
(B) 16-29% (C) 30-49% (D) ABOVE 50%

(18) WHAT JOBS DO THEY DO? _____ (A) NET MENDING (B) FISH PROCESSING (C) HATCHERY OPERATIONS
(D) OTHER(S)/SPECIFY: _____

OTHER REGULATORY FRAMEWORKS AND LEGAL ISSUES

(1) HOW DO YOU RATE POLICIES AND LEGAL FRAME WORKS _____ (A) DOES NOT EXIST (B) VERY POOR
(C) POOR (D) GOOD) (E) VERY GOOD (F) EXCELLENT

(2) DO YOU HAVE ANY DESIGNATED ZONES FOR AQUACULTURE OPERATIONS? _____ (A) YES AND (B)
NO (C) IF NO, STATE HOW THIS COULD BE DONE: _____

(3) HAVE YOU ATTENDED ANY FISH FARMING TRAINING? _____ (A) YES (B) NO

(4) IF ANSWER TO QUESTION ABOVE IS YES, STATE TYPE OF COURSE AND ITS DURATION: _____

(5) WHERE DID YOU TRAIN: _____

(6) WHAT DO YOU THINK ARE THE MAIN REASONS FOR THE GROWTH OF THE INDUSTRY?

	YES/NO	RANK
FAVOURABLE FISH PRICE		
POSSIBILITY OF MAKING MONEY		
GOVERNMENT PROMOTION		
AVAILABILITY OF CREDIT		
AVAILABILITY OF FISH FEED		
AVAILABILITY OF FISH SEED		
OTHERS SPECIFY		

RANK = (1) VERY POOR (2) POOR (3) FAIR (4) GOOD (5) VERY GOOD

(7) WHAT DO YOU THINK ARE THE MAIN CONSTRAINTS FOR THE GROWTH OF THE INDUSTRY?

	YES/NO	RANK
SHORTAGE OF FISH SEED		
LACK OF CREDIT FACILITIES		
COST OF CREDIT		
LACK OF MARKETS		
GOVERNMENT REGULATIONS		
GOVERNMENT TAXATION		
LACK OF TECHNOLOGICAL KNOWLEDGE		
LACK OF SKILLED LABOUR		
OTHERS SPECIFY		

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