Enhancing the Participation of Smallholder Farmers in Aquaculture Value Chain in Zambia

by

Thelma Namonje-Kapembwa and Rhoda Mofya-Mukuka

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Indaba Agricultural Policy Research Institute (IAPRI)
Lusaka, Zambia
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Namonje-Kapembwa and Mofya-Mukuka are Research Associate and Senior Research fellow respectively with Indaba Agricultural Policy Research Institute.
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Comments and questions should be directed to:

The Executive Director
Indaba Agricultural Policy Research Institute
26A Middleway, Kabulonga
Lusaka
Telephone: +260 211 261194; 0977771079/81
Telefax +260 211 261199
Email: chance.kabaghe@iapri.org.zm or info@iapri.org.zm
EXECUTIVE SUMMARY

In the recent year, aquaculture has taken center stage in the country’s development agenda and it is recognized as a means to promote youth employment, improve rural smallholder household income and food security and reduce the high levels of malnutrition\(^1\) that the country is currently facing. Unlike past policies, which promoted public investment in aquaculture, current policy emphasis is on promoting commercialization of aquaculture. Government’s role is to create a conducive environment for private sector participation. Current policies have successfully promoted large-scale investment in aquaculture who now account for 80% of the country’s total production from aquaculture, however, production from the small-scale farmers is still very low. Small-scale fish farmers have continued to face a number of constraints and remain largely dependent on government and international development programs. The lack of technical skills in fish farming, non-availability of fish farming inputs, high investment costs, poor road infrastructure especially feeder roads and limited provision of extension services seem to be the major limiting factors to the expansion of fish farming by small-scale farmers in most parts of the country.

Behind this backdrop, this study examined how smallholder participation in aquaculture production can be enhanced in light of the commercialization policy emphasis. Specifically, the study looked at production, marketing and institutional constraints that hinder small- and medium-scale farmers’ entry into aquaculture.

The study applied qualitative research methods involving in-depth interviews with key informants from the Department of Fisheries in selected districts as well as fish farmers in those districts. The qualitative data collected was supplemented with quantitative data from the Department of Fisheries, Central Statistics Office (CSO) and Indaba Agricultural Policy Research Institute (IAPRI). The key informant interviews were conducted in Copperbelt and Lusaka Provinces. In Copperbelt the following districts were selected, Ndola, Kalulushi and Luanshya while for Lusaka Province, Kafue and Chongwe Districts were selected.

The study highlights the following key findings;

1. Small-scale aquaculture farmers face several production constraints including high cost of fish-feed and seed (fingerlings), non-availability of quality fingerlings in a number of districts, limited supply of water, limited knowledge of and management skills for fish farming.
2. The constraints relating to marketing include non-availability of cold storage facilities, limited availability of transport especially in the rural areas, and inconsistency in fish supply due to high cost of production.
3. A number of institutional constraints also limit small-scale aquaculture development including limited access to extension services, limited access to credit to finance their aquaculture business, and low staffing level and limited funding to the Department of Fisheries, thereby, contributing to low productivity of smallholder aquaculture farmers.

To address the above constraints, the following actions are recommended to enhance the participation of smallholder farmers in aquaculture value chain:

\(^{1}\) Stunting at 40%, underweight 15% and wasting 6% (DHS, 2015)
1. Continuously building capacity of small-scale fish farmers in aquaculture production and best management practices through improved extension delivery systems and learning on-farm feed formulation techniques.

2. Create an environment where private sector input providers, such as community agro-dealers, can supply fish feed and seed in various districts.

3. Improve access to credit to facilitate investment in fish farming by small-scale farmers.

4. Support development of aquaculture cooperatives for aggregation of their output to ensure consistency in supply.

5. Government to allocate more funding and increase the number of officers in the Department of Fisheries to improve its operations at district level. Specifically include fish hatcheries in various districts and extension delivery.

6. Encourage private commercial fish firms to establish out-grower schemes to address the input supply challenges of the small-scale farmers.

7. Capacitate fish-farming research institutions to establish production technologies for high priority species to enhance production and productivity, particularly for the small- and medium-scale farmers.
## CONTENTS

ACKNOWLEDGMENTS ....................................................................................................... iii
EXECUTIVE SUMMARY ..................................................................................................... v
LIST OF TABLES ................................................................................................................. viii
LIST OF FIGURES ............................................................................................................... viii
ACRONYMS ....................................................................................................................... viii
1. INTRODUCTION .............................................................................................................. 1
2. THE STATUS OF THE AQUACULTURE SUBSECTOR IN ZAMBIA ......................... 3
3. DATA AND METHODS .................................................................................................... 5
4. STUDY FINDINGS .......................................................................................................... 6
   4.1 Status of Aquaculture Production by Small-Scale Fish Farmers ....................... 6
   4.2 Constraints in Fish Farming .................................................................................. 6
      4.2.1 Production Constraints .............................................................................. 7
      4.2.2 Marketing .................................................................................................... 9
      4.2.3 Institution Constraints ................................................................................ 9
5. OPTIONS FOR ENHANCING SMALL-SCALE PARTICIPATION IN AQUACULTURE .... 11
   5.1 Recommendations ................................................................................................. 11
   5.2 Conclusion .............................................................................................................. 12
REFERENCES ..................................................................................................................... 13
LIST OF TABLES

<table>
<thead>
<tr>
<th>TABLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1. Issues in Small-Scale Aquaculture and Suggested Recommendations</td>
<td>11</td>
</tr>
</tbody>
</table>

LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Annual Fish Production from Capture and Aquaculture</td>
<td>3</td>
</tr>
<tr>
<td>2. Annual Fish Imports and Exports (2010-2017)</td>
<td>4</td>
</tr>
<tr>
<td>3. Smallholder Fish Pond Production in Luanshya District in the Copperbelt Province</td>
<td>8</td>
</tr>
</tbody>
</table>

ACRONYMS

AfDB  African Development Bank
CEEC  Citizen Economic Empowerment Commission
CSO   Central Statistics Office
DOF   Department of Fisheries
FAO   Food and Agriculture Organization
GRZ   Government of Republic of Zambia
IAPRI Indaba Agricultural Policy Research Institute
MT    Metric tons
ZAEDP Zambia Aquaculture Enterprise Development Project
1. INTRODUCTION

Fish supply in Zambia is largely dependent on capture fishery, which contributes nearly 70% of the country’s total production. However, fish catches have been declining in all the water bodies in the country and yet demand for fish has been increasing due to increased human population. The need for enhancing aquaculture production was realized several decades ago when a World Bank study (at the request of the government) pointed out an increasing gap between supply and demand (World Bank 1978). The report had estimated that in 1985 the supply of fish from natural waters would be approximately 61,000Mt while the projected demand would be 86,000Mt. The supply gap was therefore estimated at 25,000Mt. To address this gap, the World Bank study recommended aquaculture as critical means of fish production and suggested exploring, through pilot projects, the technical, financial, and economic viability of fish culture in Zambia. Following this report, the Government initiated efforts to promote aquaculture production, which involved the setting up of large-scale model commercial fish farms in different parts of the country. However, inefficiencies in the operation of these farms coupled with limited Government resources and inadequacy of support activities such as extension service and training, the industry virtually collapsed (FAO 1978).

In the last five years, aquaculture has once again taken center stage in the country’s development agenda and is recognized as a means to promote youth employment, improve rural smallholder household income and food security and reduce the high levels of malnutrition in Zambia. This is evidenced by the tremendous positive trajectory of aquaculture production from 12,988Mt in 2012 to 32,888Mt in 2017 (DOF 2018). On 30th September 2016, in his address to the national assembly, the President of the Republic of Zambia, Mr. Edgar Chagwa Lungu, emphasized that “The agriculture sector, fisheries, and livestock will be the main focus around which other sectors will be developed in an integrated manner under the seventh national development plan. Agriculture will, therefore, be the major priority of our economic diversification agenda.” Following the pronouncement, the President, in October 2017, launched a 5-year Zambia Aquaculture Enterprise Development Project (ZAEDP) aimed at advancing the aquaculture sub-sector as a viable and inclusive business opportunity funded by the African Development Bank (AfDB) and grant from the Government of Republic of Zambia (GRZ). The project is expected to benefit about 12,000 fish farmers and entrepreneurs comprising of 50% women and youth in the high potential aquaculture areas (Lusaka Times of Zambia 2017). The main component of ZAEDP is the aquaculture development fund with the aim of addressing smallholder farmers’ constraints in accessing finance.

Unlike past policies which promoted public investment in aquaculture, current policy emphasis is on promoting commercialization of aquaculture, therefore, centered on Government creating a conducive environment for private sector participation. To a large extent, these policies have yielded positive results such that Zambia is now ranked the sixth largest producer of farmed fish in Africa (Genschick et al. 2017). While the policies have successfully promoted large-scale investments which now contributes nearly 80% of the country’s total aquaculture fish supply, small-scale sector production remains low (Kaminski et al. 2017). It is estimated that the 21,429 small-scale farmers engaged in fish farming in Zambia contribute only 11% to total farmed fish supply (DOF 2017). The growth of the small-scale aquaculture sector is affected by several challenges and remains largely supported by national and international development programs (Genschick et al. 2017). In a study conducted by the DOF in 2016, found inadequate finances, high feed costs and poor quality fingerlings, and predation including theft as major impediments to the growth of smallholder aquaculture in Zambia (DOF 2016). The lack of technical skills in fish farming, non-
availability of fish farming inputs, high investment costs, poor road infrastructure especially feeder roads and provision of extension services seem to be the major limiting factors to the expansion of fish farming by small-scale farmers in most parts of the country. It has also been observed that management and production system by most small-scale fish farmers is characterized by ‘low input – low output’ with little or no routine management (Mwango et al. 2016).

To this effect, this study examined how small- and medium-scale participation in aquaculture production can be enhanced. Specifically, the study analyses the technical factors, institutional framework and market constraints that hinder small- and medium-scale fish farmers’ entry into aquaculture and limits the sector to the emergent and larger farmers or the elites in society. Of particular interest, the study identifies policies that address the constraints and business/marketing models that promote effective linkages between the smallholder farmers and other private sector players in aquaculture. Following the need to diversify the agricultural sector, this study provides some empirical evidence on ways of improving small- and medium-scale farmers’ participation in aquaculture production in order to diversify their production and also build other sources of income that are not seasonal.

The rest of the paper is organized as follows; section 2 presents a review of aquaculture production in Zambia and section 3 highlights the data sources and methods used for this study. Section 4 brings out the constraints faced by the fish farmers. Finally, section 5 provides some options for enhancing smallholder participation in aquaculture production in Zambia and conclusion.
Agricultural diversification in Zambia by the smallholder farmers has for a long time been limited due to the policies which have mostly focused on maize production rather than any other farm enterprise. Though the country is largely endowed with various resources that can help rural poor households improve their food and nutrition security among others, the maize-centric policies have often siphoned the limited resources allocated to the sector thereby undermining Zambia’s potential to diversify the agriculture sector. One sub-sector that has the potential for improving household nutritional security and contribute to rural employment is the aquaculture production. Currently, the domestic demand for fish has continued to rise with the rapid increase in human population estimated at 3% annually (CSO 2016) coupled with the changes in the consumption patterns.

Studies have also shown that fish is an important source of animal protein among the poor households in Zambia. For instance, using 24-hours recall questions on household consumption of the Rural Agricultural Livelihood Survey, show that 40% of the households reported having consumed fish (Chapoto and Zulu-Mbata 2015). Similarly, a study on fish consumption in urban Lusaka show that the 24-hours and 7-day recall results indicate that fish is consumed frequently among poor households in Lusaka with 31.9% households having consumed fish in the last 24-hours and 81% indicated they had done so at least once during the seven days prior to the survey (Genschick et al. 2018). These findings underline the significant role that fish plays in the household dietary diversity and its impact on household nutritional security (Mofya-Mukuka and Kabisa 2017).

However, despite Zambia having many water bodies and conducive climatic condition for aquaculture production, the country’s total fish production from aquaculture and catches from capture fisheries is just over 100,000Mt. In 2017, total fish production was estimated to be at 120,963Mt of which 32,888Mt was from aquaculture production representing 27% of the total fish production in Zambia (DOF 2018). Figure 1 shows the annual fish production from aquaculture and capture, though the trend shows an increase in the quantity produced, aquaculture production in Zambia is still in its infancy stage hence the need for increased efforts in fish farming. Further, the Department of Fisheries (DOF) attributes the increase in aquaculture production to a rise in the number of small- to medium-scale fish farmers (ponds and cage fish farmers) (DOF 2018).

Figure 1. Annual Fish Production from Capture and Aquaculture

Source: Department of Fisheries (2018).
At national level, Zambia faces a huge deficit in meeting the growing demand for fish, especially from urban consumers. According to the African Development Bank, Zambia’s fish demand is estimated at 185,000 Mt per annum (AfDB 2016) and based on the 2017 total fish production, about 37% of the national fish requirement is met through imports from various countries. Figure 2 shows the annual fish imports and exports for the past 8 yrs. Fish imports have continued to rise to meet the huge deficit from the domestic production with the exception of 2017 which showed a slight reduction of 5.8%. Further, between 2015 and 2017, the quantity of fish imported almost equal the domestic production from both Capture fishery and Aquaculture. However, despite the huge quantities of fish that is imported, it has been reported that over 80% of that fish is informally re-exported to countries like Congo DR and Malawi (DOF 2018). The fish exports shown in figure 2 are those that are formally reported by the CSO but as already indicated a huge percentage of the fish exports are done informally. The continued increase in fish imports and exports shows that there is a huge demand for fish both locally and to other neighboring countries presenting an opportunity for fish farmers in Zambia.

Figure 2. Annual Fish Imports and Exports (2010-2017)

Source: Department of Fisheries (2018).

2 With Namibia providing 87.6% in 2017 of the imported fish into Zambia
3. DATA AND METHODS

The study applied qualitative research methods involving in-depth interviews with key informants from the Department of Fisheries in the various districts and fish farmers using interview guides. The key informant interviews included seven staff members from the Department of Fisheries in various districts and four fish farmers from each district visited. In addition, five focus group discussions (FGDs) were conducted with the fish farmers in five districts and thirty farmers participated in the FGDs of which twenty-three were male and seven were female farmers. The qualitative data collected was supplemented with quantitative data from the Department of Fisheries, Central Statistics Office (CSO) and IAPRI’s aquaculture data collected from 100 farmers in the same districts. The key informant interviews were conducted in Copperbelt and Lusaka Provinces. In Copperbelt the following districts were selected, Ndola, Kalulushi, Kitwe and Luanshya while for Lusaka Province, Kafue and Chongwe Districts were selected. The choice of the districts was based on the activeness of the fish farmers recorded in the farmer registers kept by the district fisheries officers. The farmers were purposively selected by the extension officers as some of the farmers have abandoned fish farming business hence only active members were selected.

The findings from the qualitative interviews and the quantitative data were synthesized and complemented by a review of relevant literature on aquaculture production. Other data sources include policy documents such as the Second National Agricultural Policy (SNAP), the National Aquaculture Development plan for 2015 to 2020, the National Agriculture Investment Plan (NAIP) for period 2014 to 2018, annual reports from the Department of Fisheries desk as well as interviews with key private stakeholders in aquaculture production.
4. STUDY FINDINGS

4.1 Status of Aquaculture Production by Small-Scale Fish Farmers

Aquaculture in Zambia has continued to show a steady growth in terms of the quantities produced and the number of fish farmers that are joining the industry. Ponds and Cages are the two major fish farming systems that have been adopted in Zambia with the latter mostly been used by the commercial fish farmers who account for 70% of the fish produced through fish farming (DOF 2018; Kaminski et al. 2017). For the past three years, there has been a significant increase in the number of small-scale fish farmers and this has been attributed to the availability of credit from the Citizen Economic Empowerment Commission (CEEC) which has been supporting fish farming (DOF 2017). This finding supports the study by the Department of Fisheries that found that lack of financial capacity as one of the major constraints to aquaculture production (Mwango et al. 2016). However, despite the increase in the number of small-scale fish farmers, their total contribution towards aquaculture production in Zambia is still very low hence the need to find ways of improving their productivity. Small-scale fish farmers mostly use ponds for fish farming and are dotted throughout the country with Northern, Northwestern, Eastern, and Copperbelt Provinces having the majority farmers.

From the districts surveyed on the Copperbelt Province, most of the small-scale farmers engaged in fish farming are doing it as a part-time activity with approximately 45% doing it as a business. However, fish farming by small-scale farmers is characterized by low production due to poor management, high stocking rates, and low input use. Further, most small-scale farmers use earthen ponds with one or more species stocked and fertilizers consist mostly of poultry, animal manures and compost and the occasional use of supplementary feeds. This has often led to low productivity, fluctuations in production as some farmers tend to abandon production and some are seasonal producers. In terms of participation, the majority of the fish farmers are over the age of 40 years, who are mostly retirees and are now taking up fish farming (Namonje-Kapembwa and Samboko 2017). Youth participation is still very low in most of the provinces in Zambia and for those that are engaged in fish farming, the majority are working in groups after accessing funds through organizations like CEEC (DOF 2017; Mwango et al. 2016; Namonje-Kapembwa and Samboko 2017). It was also observed that farmers with other sources of income such as wage employment or own businesses besides fish farming were more likely to manage their fish farming activities better than those without other sources of income.

4.2 Constraints in Fish Farming

Small-scale aquaculture has received considerable attention in many countries over the years as it is viewed as a means of alleviating rural poverty and improving food security (Belton 2013). While there is a widespread desire to show that the development of small-scale aquaculture can play a role in poverty reduction, through the production of fish-food and income, there still remains a number of challenges faced by the small-scale fish farmers that need to be addressed to improve productivity and meeting the present/future demands for fish. In this study, we categorize the challenges into three groups; production, marketing, and institutional.
4.2.1 Production Constraints

In terms of production, the constraints faced by the small-scale fish farmers include; inadequate supply of quality seed, lack of affordable quality feed, inadequate technical advice/information, water challenges and lack of finances. Access to quality fingerlings is key to improving the productivity of small-scale fish farmers. In some districts, farmers have no access to fingerlings hence they travel to other districts to source for fish seed thereby adding to the cost of doing fish farming. Establishing or expanding breeding centers in various districts with the potential for aquaculture will promote efficient use of resources and lower production costs. The other challenge affecting aquaculture production is the non-availability of affordable quality fish feed. A number of studies have shown that the growth of the small-scale aquaculture production is often limited by the inadequate use of quality feed and limited knowledge base on the use of farm-made feeds (Issa et al. 2014; Mwanja and Nyandat 2013; Namonje-Kapembwa and Samboko 2017).

The cost of fish feed is generally high, making it difficult for small-scale fish farmers to invest in quality feed that can improve the productivity of their fish farms. Further, the supply of fish feed is limited in many districts and is mostly found in Lusaka and parts of the Copperbelt Province, making it difficult for farmers in distance areas to access the much-needed ingredient in fish farming. The non-availability of feed locally in a number of districts has resulted in the use of wrong feed such as leftover food while others resort to using single ingredient feed, which tends to compromise the growth of the fish to an optimum size and weight. The study by Mwango et al. (2016) shows that farmers who used commercial feed had a significantly higher productivity compared to those that used single ingredients. The low-input management has often resulted in low production and productivity among the small-scale fish farmers. Both the SNAP and NAIP have indicated that the development of fish seed and fish feed are key components in improving aquaculture production and productivity (GRZ 2016; MAL 2013) however, the implementation of these plans has been very slow. If the aquaculture sector is to grow, there is need to engage agro-dealers in the supply of feed to various districts for farmers to access; there is also a need to build the capacity of the small-scale fish farmers to develop farm-made feeds and utilize the resources available more efficiently.

A 46-year-old fish farmer in Kalulushi said:

“The cost of fish feed is very high it’s almost 5 times that of chicken feed and finances are the main problem that we face as farmers. I have tried to apply for CEEC funding but with no success. All this I have done here at the farm is with my limited resources. Accessing a loan will definitely help improve my fish farming business as the market for fish is readily available”.

The other challenge that clearly stands out among some of the small-scale fish farmers visited is their inadequate knowledge and technical skills required in fish farming. Based on the aquaculture survey conducted by the IAPRI in 2017 with a sample of 100 fish farmers, most of the farmers indicated that they only received training once in fish farming and rarely had access to extension officers from the fisheries department who could address some of their management and technical concerns in fish farming (Namonje-Kapembwa and Samboko 2017). The lack of management and technical skills needed in fish farming is evident in their production levels, stocking levels, and the water quality of their ponds. From a general perspective, small-scale fish farmers need access to appropriate knowledge and skills for breeding, pond management, feeding, fertilization, harvesting, post-harvest handling, and marketing. However, the extension support service in Zambia is rather inadequate due to lack of incentives, resources, and logistics support. As a result, there are few extension agents
accessible to small-scale fish farmers to share the appropriate information and skills needed for them to adopt the good management practices. The low staffing rate of aquaculture extension officers coupled with non-availability of transport in most of the districts has contributed to the poor performance of the extension service in Zambia, in particular for fisheries and livestock (Chijoka 2017). The other challenge is unstable access to water for ponds and cages. Water is the lifeline of aquaculture production and without a stable supply of fresh water, it becomes difficult to sustain a meaningful fish farming business venture. Fish survives only in good quality water and require an abundant supply of water for obtaining food and oxygen. If the quality of water is according to the production requirement it becomes easier for fish to gain maximum weight and size (Muddassir et al. 2016). Lack of stable access to water is widespread in some districts; this has led to the drying up of ponds and consequently the abandonment of a fish farming business by some small-scale farmers.

The pictures below show the emerging small-scale aquaculture farms in Luanshya District on the Copperbelt Province.

**Figure 3. Smallholder Fish Pond Production in Luanshya District in the Copperbelt Province**

Source: Pictures captured during field work.
4.2.2 Marketing

Marketing of fresh fish by small-scale fish farmers is largely informal, targeting individual households and local community markets. Though the demand for farmed fish is high in most urban areas in Zambia, fish supply from small-scale fish farmers is still a long way from meeting the current demand.

As such much of the fish consumed by the urban population is mostly from commercial fish farms such as Capital Fisheries, Lake Harvest and Yalelo. With regard to marketing of farmed fish, the challenges faced by small-scale fish farmers, as highlighted by the key informants and fish farmers include:

Supply Inconsistency: Fish supply by most small-scale farmers is not consistent and, as such, establishing market linkages with local food stores becomes a challenge. On average small-scale fish farmers own two to three ponds with a production cycle of six months depending on management (Namonje-Kapembwa and Samboko 2017). For a small-scale farmer to have a consistent supply of fish (monthly supply) he/she needs to have at least six ponds and they have to stock up every month. This, however, may be difficult for most small-scale fish farmers to make such a huge investment due to the prevailing high cost of inputs and limited access to financing. The small-scale farmers should also time their production to take advantage of the fish bans when fish supply is very scarce in most parts of the country.

Lack of Transport and Cold Storage Facilities: Majority of the fish farmers depend on local public transport to transport their fish to well-established markets where they can fetch good prices. This, however, becomes a challenge for some farmers in areas with limited availability of public transport. The other challenge is lack of cold storage facilities, especially among the small-scale fishers in remote areas. Due to the nature of fresh produce like fish, refrigeration facilities are essential in this sector. However, most of the rural areas are not connected to electricity, hence small-scale farmers incur significant post-harvest losses, which has a negative impact on the incomes (Shula and Mofya-Mukuka 2015). To avoid the post-harvest losses and the challenge of transporting fish to well-established markets, fish farmers resort to selling their fish within the local communities, thereby fetching lower prices for their fish. The baseline survey report for fish farming in Copperbelt and Northwestern Province also showed that the main market outlet for fish sold by small-scale farmers was the farm gate followed by local market (Mwango et al. 2016). Another study found similar findings that 64% of the small-scale farmers sell their fish at the pond site (Genschick et al. 2017). It should be noted that none of the small-scale farmers supplied fish to any supermarkets or institutions; this highlights the importance of local informal markets for small-scale sector.

4.2.3 Institution Constraints

A good fisheries institutional framework is critical for the growth of the sector. The smallholder fish farmers in Zambia face a number of institutional challenges which include the following:

Inadequate Extension Services: Unlike the crops and livestock extension systems, the fisheries extension services in Zambia remain limited. While the establishment of the Department of Fisheries under the Ministry of Fisheries and Livestock provides for a position of district fisheries officer, however, these positions are not yet filled in some districts. Even in the districts where the fisheries officer is there, funding for operations is inadequate and a vehicle is not available. In general, the country has adequate academically qualified experts
but most lack experience in the field. For large scale producers, extension is accessed on a one on one basis, which most small-scale farmers cannot afford.

**Poor Access to Financing:** Aquaculture is capital consuming, which requires resources ranging from high level of investment in facilities and equipment to adequate working capital for further investment. However, most smallholders do not have access to finance and if available, it is at an unaffordable rate. A few farmers have benefited from the various government and donor funding initiatives such as the Citizen Economic Empowerment Fund and the Aquaculture Development Fund. However, the proportion of these farmers is marginal compared to the potential of the sector’s growth. The limitations to accessing these funds are a lack of sensitization and lack of skills in proposal development among the small-scale farmers. For example, farmers on the Copperbelt expressed ignorance on the availability of funding under the Aquaculture Development Project. Mostly farmers in and around Lusaka were aware of the fund.

**Regulatory Framework:** Under the Fisheries Act of 2011, the government introduced regulations to assess the environmental impact of any fish farm. It also regulates the quality of production and the type of fish being produced. However, there are no regulations on the importation of fish in the country, including standards on the quality of fish produced in those countries. It is estimated that local fish supply only meets 70% of what is consumed with the rest coming from outside the country. Given the high production costs, most small-scale farmers are not able to compete on price with the imported fish which is much cheaper.

**Limited Visibility of Aquaculture in the Ministry:** A previous study had identified the limited visibility of the aquaculture section within the Department of Fisheries (See Shula and Mofya-Mukuka 2015). The authors proposed upgrading the section to a department such that there would be two distinct departments (aquaculture and capture fish) under the Ministry of Livestock and Fisheries.
5. OPTIONS FOR ENHANCING SMALL-SCALE PARTICIPATION IN AQUACULTURE

5.1 Recommendations

Based on the study findings both from the field visits and review of various literature on small-scale aquaculture in Zambia and in other countries in Africa, table 1 highlights some of the recommendations and action points that can help enhance the participation of smallholder farmers in aquaculture production.

Table 1. Issues in Small-Scale Aquaculture and Suggested Recommendations

<table>
<thead>
<tr>
<th>Issues</th>
<th>Institutional Strengthening and Organization</th>
<th>Investments and Operations</th>
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<tbody>
<tr>
<td><strong>Production</strong></td>
<td>• Build capacity of small-scale fish farmers in aquaculture production and best management practices.</td>
<td>• Government provide additional funding in the Department of Fisheries to improve its operations, especially fish hatcheries in various districts. Establish centers for fingerling production in remote areas.</td>
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<tr>
<td>• Low productivity</td>
<td>• Create an enabling environment for private sector input providers including agro-dealers to supply fish feed and seed in various districts.</td>
<td>• Promote community-based aquaculture projects to benefit from economies of scale when dealing with inputs and marketing.</td>
</tr>
<tr>
<td>• High cost of feed and fingerlings</td>
<td>• Train farmers in on-farm feed formulation that are cost-effective.</td>
<td>• Private commercial fish firms to establish out-grower schemes to address the input supply challenges of the small-scale farmers</td>
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<td>• Non-availability of quality fingerlings</td>
<td>• Sensitize small-scale farmers to utilize the e-voucher for aquaculture production.</td>
<td>• Investment in hammer mills for fish feed production</td>
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<td>• Shortage of experts in areas of production and fish diseases</td>
<td>• Build capacity of fisheries staff at various levels, (district, provincial, and national).</td>
<td>• Prioritize public investments such as roads and rural electrification in high aquaculture farming areas to attract the private sector in such areas.</td>
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<tr>
<td><strong>Marketing</strong></td>
<td></td>
<td>• Create a dedicated fish-farming research and development program to establish production technology for high priority species and to enhance production and productivity, particularly for the small- and medium-scale farmers.</td>
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<td>• Limited availability of transport and cold storage facilities</td>
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<td></td>
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<tr>
<td>• Supply Inconsistency</td>
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</table>


5.2 Conclusion

This paper aimed at assessing the factors that can enhance small-scale participation in aquaculture production. To achieve this objective, the study utilized primary qualitative data from fish farmers and key informants from relevant stakeholders in the aquaculture value chain, as well as secondary data sources from various sources. From the findings, we can conclude that small-scale aquaculture production in Zambia is still in its infancy stage, largely due to a number of limiting factors, which can be categorized into three; production, marketing, and institutional constraints. While large-scale production has shown a positive response to the government’s commercialization policy approach to promoting aquaculture, small scale production has lagged behind. The critical challenges facing the small-scale farmers as observed in this study are low productivity and slow-moving expansion of aquaculture. This is mainly due to the high cost of fish feed, non-availability of quality seed (fingerlings), and limited knowledge and skills in aquaculture production. At the institutional level, the main challenges are limited access to public extension services, limited funding and staffing levels in the department of fisheries, and limited to no access to credit—all of which hampers the progress of aquaculture production among the small-scale farmers. Addressing the stated challenges has potential to improve the aquaculture sector in Zambia and contribute to achieving agriculture diversification among the smallholder farmers, thereby, improving nutritional security at household level.
REFERENCES


