INTRODUCTION: Agricultural diversification in Zambia by the smallholder farmers has for a long time been limited due to the policies which have prioritized maize production relative to 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 of the farm enterprises that has taken center stage in recent years in the country’s development agenda is the aquaculture production. This subsector has been recognized as a means to promote youth employment, improve rural smallholder household income and can contribute to the nutritional security of the households. This is evidenced by the tremendous positive trajectory of aquaculture production from 12,988Mt in 2012 to 32,888Mt in 2017 (DOF 2018).

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 compared to the consumption demand of 185,000Mt per annum. 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.
Although, 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, at the national level, Zambia faces a huge deficit in meeting the growing demand for fish especially from urban consumers and total fish demand is estimated at 185,000Mt per annum (AfDB 2016). At the current production levels (DOF 2017 estimates) about 37% of the national fish requirement is met through imports from various countries.\footnote{With Namibia providing 89.61\% of the imported fish into Zambia.}

The current government policies for aquaculture have put emphasis on promoting commercialization of aquaculture and this seems to 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 fish supply (DOF 2017). While there have been policy pronouncements to develop the small-scale aquaculture as means for creating youth employment and poverty reduction through income generation, there still remains a number of challenges faced by the small-scale fish farmers that need to be addressed to improve productivity and increase their contribution in meeting the present/future demands of fish.

Lack of technical skills in fish farming, non-availability of fish farming inputs (feed and fingerlings), 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. This study focused on identifying ways that can enhance small and medium-scale farmers’ participation in aquaculture production. Specifically, the study identified factors relating to production, marketing, and institutional constraints that needs to be addressed to improve production from the small and medium scale farmers.

**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. In addition, five focus group discussions (FGDs) were conducted with fish farmers in five districts. 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. For more details on the data description and methods see Namonje-Kapembwa, and Mofya-Mukuka (2018).

**FINDINGS:** The following key findings emerged from this study.

Firstly, the aquaculture production by most small-scale farmers in the rural areas is characterized by “low input-low output” management system. The factors that attribute to this kind of management system include the high cost of feed, non-availability of quality fingerlings, as well as limited knowledge and skills in aquaculture production. For small-scale farmers to improve their productivity, access to affordable quality fish-feed is critical. The cost of feed, however, in most parts of the country is very high and is not readily available in a number of districts. Till now almost all the micro-ingredients such as fishmeal, premixes, and vitamins are still being imported which keeps the price of feed relatively high in Zambia (Genschick et al., 2017). This has resulted in some farmers using wrong feed such as leftover kitchen food while others resort to using single ingredient feed which tends to compromise the growth of fish to a desired size and weight. Further, quality fingerlings are not available in some districts and hence farmers have to travel to other districts to access fingerlings. This contributes to the high cost of producing fish by the small-scale farmers especially those in remote areas.

Secondly, there is weak institutional support to aquaculture in terms of extension service delivery which is rarely available to the small-scale farmers. A number of small-scale fish farmers mostly use the basic knowledge of fish farming which they acquire from fellow farmers. Lack of technical and management skills has also contributed to low productivity among the small-scale fish farmers. The weak support is also reflected in the low staffing levels at district offices as well as inadequate funding to the fisheries department for operations.

Thirdly, aquaculture production is capital intensive especially for the initial investments and access to financing for small-scale farmers is very limited. A few farmers have benefited from the government and donor funding initiatives such as the Citizen Economic Empowerment Fund, however, the proportion of these farmers is marginal compared to the potential of the sector’s growth. Lack of sensitization and skills in proposal development among the small-scale farmers also contributes to limiting the access to these funds. Also, majority of the farmers who access the funds are those in urban areas as opposed to those in remote places. Hence the need to find ways of ensuring that farmers in remote areas access funding to support their fish farming business.

Fourth, there is limited infrastructure necessary for fish farming to progress among the small-scale farmers. Facilities such as cold storage, road networks especially feeder roads are necessary for the development of small-scale aquaculture in Zambia. Government investment in public goods (such as roads, rural electrification) is critical if the country is to attract the private sector investment along the fish value chain in various districts. A number of opportunities for the private sector exist in the fish value chain such as setting up of fish feed milling plants and supply of quality fingerlings in various districts but this will require the necessary public goods to be put in place. The small-scale farmers in Zambia for a long time have been dependent on state-run hatcheries and extension services for inputs which have not resulted in sustained growth hence the need for private sector involvement in the provision of certain inputs services to address the supply the gap.

**CONCLUSION AND RECOMMENDATIONS:**

While the large-scale aquaculture production in Zambia has significantly increased in the recent years contributing a large proportion of farmed fish in the country, the small and medium scale production, which constitute numerous farmers, contributes less than 20% of the total fish from aquaculture. The study has highlighted various challenges faced by the small and medium farmers and recommends the following:

**Production Constraints:**

- Build capacity of small-scale fish farmers in aquaculture production and best management practices
- Create an enabling environment for private sector input providers including agro-dealers
to supply fish feed and seed in various districts

- Train farmers in on-farm feed formulation that are cost-effective
- Sensitize small-scale farmers to utilize the e-voucher for aquaculture production
- Build capacity of fisheries staff at various levels, (district, provincial and national)
- Promote community-based aquaculture projects to benefit from economies of scale when dealing with inputs and marketing.
- Private commercial fish firms to establish out-grower schemes to address the input supply challenges of the small-scale farmers
- Investment in hammer mills for fish feed production.

Marketing Constraints

- Improve access to credit to enhance investment in fish farming by small-scale farmers
- Promote public-private partnership in the investment of solar energy facilities in rural areas
- Prioritize public investments such as roads and rural electrification in high aquaculture farming areas to attract the private sector in such areas.

Institutional Constraints

- Government to allocate more funding to the department of fisheries to improve its operations especially fish hatcheries in various districts. Establish centers for fingerling production in remote areas.
- Create a dedicated fish-farming research and development program to establish production technology for high priority species to enhance production and productivity, particularly for the small and medium scale farmers.
- Build capacity and visibility for the fisheries department by training new and current staff in aquaculture production
- Sensitize farmers on ways of accessing funds for aquaculture production from CEEC fund and form the aquaculture development fund
- Increased staffing and funding to the public extension system to effectively train the fish farmers
- Increase funding for operations and research to aquaculture department.

REFERENCES


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