Contribution of Small-Scale Fish Farming Subsector to Rural Income Generation in Thulamela Municipality, Limpopo Province, South Africa

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Abstract: The purpose of this study was to investigate the contribution of small-scale fish farming subsector to rural income generation in Thulamela Municipality in Limpopo Province, South Africa. The study applied a qualitative method to collect data from individual respondents using the semi-structured interview involving 15 small-scale fish farmers. The findings from the study revealed that in terms of gender, more men were participating in the fish farming sector than women. Seventy-three percent of the total participants were men as compared to 27 percent of women participating in fish farming. In terms of age, a large proportion of farmers were men and women within the age range of 41-50 years and above 50 years who participated more actively in fish farming than other age groups. The results revealed some challenges and constraints characterised by theft of fish by community members, fish-eating birds or predators, poor access to funding, expensive fish feed, unavailability of fish feed, shortage of land, lack of proper infrastructure, and insufficient water supply during the drought period. As part of recommendations, some interventions should be developed to address the constraints and challenges revealed in the study. Small-scale fish farmers should be assisted to have access to proper infrastructure, boreholes to supplement available water during the dry season, fish feed, the agricultural market, land and other resources for fish farming.

Keywords: Aquaculture, Fish farming, Income, Rural areas, Small-scale

1. Introduction

Fish may become an important commodity for income generation, food security and livelihood improvements of the rural population. Britz (2015) indicate that most small-scale fishers are poor, but their livelihood strategies are diverse, ranging from a primary livelihood of last resort, to being part of a commercial accumulation strategy. According to Britz (2015), small-scale fishing for livelihood purposes is widespread and growing in rural areas, with 77% of inland water bodies surveyed generating significant daily income covering family living costs. Sawada (2012:11) maintains that income generation activities targeting the poorest people could reduce rural poverty through new non-farm business entries and expansion of existing businesses in poverty-stricken areas. According to Britz, Hara, Weyl, Tapela & Rouhani (2015:1) in Africa the fishing sector is dominated by small-scale fisheries and provides income for over 10 million people engaged in fish production, processing and trade. According to Munguti & Ogello (2014:4) Tilapia contribute the bulk of the fish, yielding about 3,400 tons (69.9%), followed by Catfish at 1,047 tons (21%), Common Carp at 373 tons, and Trout at 51 tons.

Limpopo is one of the landlocked provinces within South Africa with its inhabitants having no access to marine fishing activities. Britz (2015) suggests that the development of inland fisheries policy needs to be realised in order to promote small-scale fish farming practices to enhance rural income generation. Britz (2015) expatiates that the fish farming subsector has the potential to become a sustainable endeavour towards the remarkable contribution to improve rural livelihoods through income generation. "The most pressing problem in Limpopo and many other predominantly rural provinces in the developing world is poverty" (Musyoki, 2012:3). According to Hossain (2012:36), the problem is that hungry people are trapped in severe poverty where they lack the money to buy enough food to nourish themselves. Chitiga-Mabugu *et al*. (2013:3) indicate that poor rural communities often experience lack of income opportunities. Sawada (2012:11) maintains that income

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generation activities targeting the poorest people could reduce rural poverty through new non-farm business entries. According to Lehane (2013:3), fish farming presents an opportunity to diversify income and protect against market fluctuations in the prices of agricultural products. Bostock, McAndrew, Richards, Jaucey, Telfer, Lorenzen, Little, Ross, Handisyde, Gatward & Corner (2010:2898) indicate that fresh-water fish farming is dominated by the three fish species, namely tilapia, catfish and carp that benefit poor rural inhabitants. The study has three objectives to answer the research questions which were (a) to determine the contribution of small-scale fish farming for income generation in Thulamela Municipality in Limpopo Province, (b) to determine the fish species that contribute to income generation, (c) to make recommendations on how small-scale fish farming can contribute to income generation in Thulamela Municipality in Limpopo Province.

2. Literature Review

2.1 Global Perspective

According to Rabo, Zarmai, Jwanya and Dikwahal (2014:21), more than 120 million people throughout the world are estimated to depend on fish for all or part of their income. FAO (2014:45) concurs with the statement by Rabo *et al.* (2014) that millions of people around the world find a source of income and livelihood in the fisheries and aquaculture sector. Sowman (2006:60) affirms the statement by Rabo *et al.* (2014) which shows that small-scale fish farming is the main income generator to improve the livelihoods of millions of people in Asia, Africa and Latin America. In support of this statement, Bondad-Reantaso and Prein (2009:3) point out that small-scale fish farming improves rural livelihoods and provides income opportunities to enhance the quality of life of rural poor communities. The statements above by different scholars confirm the contributions made by small-scale fish farming income generation to improve livelihoods particularly in rural areas. This indicates that in most of the developing countries, small-scale fish farming is considered as a direct contributor to the development of the local economy to provide people with income and employment opportunities. According to Asif *et al*. (2015:290), aquaculture is a significant socio-economic activity, especially for rural communities, contributing to livelihoods, food security and poverty reduction through such mechanisms as income generation, employment and diversified farming practices. Bostock, McAndrew, Richards, Jauncey, Telfer, Lorenzen, Little, Ross, Handisyde, Gatward & Corner (2010:2897) emphasise that global fish farming has grown dramatically over the past 50 years to around 52.5 million tonnes in 2008 worth US$98.5 billion and accounting for around 50 per cent of the world's fish food supply. This indicates that small-scale fish farming plays a very significant role towards the building up of the world economy to uplift human livelihoods. The development and promotion of fish farming practices contribute positively towards generating income for the poor marginalised rural communities and as well support local and national economies.

According to FAO (2014:36), fish farming is another option which has proved to be successful for some famers in Siaya in Kenya to increase their sources of income and food security, diversifying their near subsistence livelihoods. The argument by Flores and Filho (2014:333) shows that several studies globally have demonstrated the feasibility of fish farming in generating income and nutritional quality of food. The statement by FAO (2014:1) also affirms that poor farmers in parts of Asia farm fish where it is traditional practice which they consume or sell to generate income. This is owed to the fact that selling fish for generating income is a very common practice at the level of small-scale farmers to improve livelihoods. This is self-evident that in many countries of the world, small-scale fish farming has potential and does exist to provide income to improve the lives

2.2 Continental Perspective

Solomon (2015:1) shows that catfish production indeed serves as a source of income in Nigeria by reducing the rate of unemployment in the country and increasing the country's Gross Domestic Product. Phiri *et al*. (2013:171) confirm that fish in Malawi acts as a source of income for the people, generating local revenue of about MK2.6 billion (US$24 million) annually, and contributes about 4% to the GDP. According to Mathew (2013:50), small-scale fisheries contribute significantly to foreign exchange revenue in many developing countries. A significant number of them depend on small-scale fisheries as a source of full-time, seasonal, part-time, or occasional income (Béné *et al*., 2010:934). It is also seen as a valuable provider of employment, cash income and foreign exchange, with developing countries contributing over 90% of the total global production.

According to Musuka and Musonda (2013:299), smallholder aquaculture in Zambia contributes significantly

to household food security through provision of cheap fish as food, nutrition (protein), income, diversification of rural livelihood and employment generation, thus stimulating the rural economy. This confirms the contributions made by the subsector which justifies that fish can be one of the major commodities to address the diverse issues within the rural poor communities in the developing countries. Solgaard and Yang (2011:1008) indicate that people belonging to higher income households are usually willing to pay extra money to buy farmed fish. This kind of contribution will really boost the small-scale fish farming sector to increase its income. Musuka and Musonda (2013:301) further highlighted the importance of families in adopting small-holder aquaculture to improve rural households' income to be able to pay school fees for their children with the disposable income from small-scale fish farming. Therefore, small-scale fish farming improves rural livelihoods by generating income that can provide cash for other household requirements. Jwatya (2010:10) indicated that aquaculture is often considered a source of animal protein for household consumption, with a high potential for cash income generation. Fisheries management in Ethiopia has made a great contribution to the economy because it provides employment, food and income, making it possible to evaluate over-exploitation of the fisheries (Janko, 2014:465). Furthermore, Oluwemimo and Damilola (2013:2) signified the fact that fish farming in Nigeria has the potential to help expand the resource base for food production and reduce the pressure on conventional sources of fish which are harvested faster than they can be regenerated. These resources can in future generate significant employment and enhance the socio-economic status of the farmer to generate foreign exchange.

Jimoh and Mohammed (2015:148) confirm the importance of small-scale fish farming to the world at large and the role it plays in improving various countries' economies. Animashaun, Fakayode and Ayinde (2015:72) point out that aquaculture and farm-raised catfish have been identified as a growing source of income for farmers in Nigeria. This shows how the small-scale fish farming in Nigeria became very popular and important for the local people so much so that it generated millions in revenue, particularly at the farm level. According to Sanusi and Mohammed (2014:298), the contribution of the sub-sector to GDP at 2010 current factor cost rose from N350 billion to N473 billion in 2014. Asa and Solomon (2015:1) show that catfish production indeed serves as a source of income in Nigeria by reducing the rate of unemployment in the country and increasing the country's Gross Domestic Product. This has further been confirmed by Ugwumba and Chuckwuji (2010:105) that in Nigeria, the small-scale fish farming is profitable so much that the sector achieved the mean gross margin of N734, 850.39, mean net farm income of N712, 659.89 and net return on investment of 0.61 percent. Grema, Geidam and Egevu (2011:226) affirm that fish farming alone has the potential to supply the national requirement for fish and produce excesses for export generation to earn foreign exchange.

Maina, Okaba, Mwangi and Waringa (2014:113) show that fish farming in Kenya was a preferred enterprise to diversify sources of income and improve the nutritional content of local diets. According to Ogundari and Ojo (2008:43), the Oyo area in Nigeria has 120 fish farms with high potential for generating income and investment in aquaculture farms to ensure sustainable income generation.

According to Nagoli, Chiwaula and Chaweza (2013:14), aquaculture in Malawi contributes at least 10% of aquaculture households' income. Phiri, Dzanja, Kakota and Hara (2013:171) confirm that fish in Malawi acts as a source of income for the people, generating beach price local revenue of about MK2.6 billion (US$24 million) annually, and contributes about 4% to the GDP. Furthermore, Nagoli, Valeta and Kapute (2013:15) proved that in Malawi fish production in small-scale fish ponds not integrated with agriculture was found to be about 800kg/ha/yr while in integrated aquaculture-agriculture farms, it yielded over 1800kg/ha/yr. In simple terms, this means that Malawi is doing more on small-scale integrated aquaculture-agriculture than it is in fish farming alone without integrating with crops. According to Nagoli, Valeta and Kapute (2013:17), small-scale fishers mainly produce for their own consumption and for local markets, as such most of them remain poor and vulnerable to food insecurity. The importance of small-scale fish farming manifests itself in most of the African countries including Nigeria, Kenya, and Malawi for its significant role in sustaining rural livelihoods and alleviating poverty.

2.3 South African Perspective

Agbebi (2011:456) indicates that fish farming also generates income for all categories of people involved in it and alleviates poverty in the state by contributing to the national income. The Department of Agriculture, Forestry and Fisheries in South Africa (2010) indicate that the most suitable areas for the

production of freshwater fish species are in provinces such as Limpopo, Mpumalanga Lowveld and Northern KwaZulu–Natal. This is so because of the suitable climate and resources that prevail in these regions. Jwatya (2010:10) emphasises that even if the small-scale fish farming in South Africa is immature, it has immense potential in enhancing the country's economy with a high potential for cash income generation. Hara and Backeberg (2014:277) noted that in Africa, it is estimated that the fishing sector provides income for over 10 million people and contributes to the food security of over 200 million people. According to Béné, Hersoug and Allison (2010:326), many people see fish farming as an entry point for poverty reduction through its role in generating revenue, creating employment, and its contribution to food security and the Millennium Development Goals.

According to Ellender, Weyl and Winker (2009:681), fish farming does not only provide food security opportunities but also contributes to income generation. For rural poor and food-insecure communities, small-scale aquaculture has the potential for contributing towards improved food security, income and livelihoods (Isaacs & Hara, 2015:7). Okwuokenye and Ikoyo-Eweto, (2016:2) support the above statement that the importance of fishes produced locally cannot be over emphasized because they generate income for the farmers, thus helping to reduce the poverty levels of the people. The fisheries sector provides food security in a number of developing countries through the nutritional benefits of fish and income generation for those in the fishing sector. Nkomo (2015:20) maintains that food security has been stabilised both through catching fish for direct consumption and selling them for income.

Essentially, fish farming in South Africa has a dual purpose, with one being of providing food to the needy and the other being that of providing income for the families to buy household requirements.

3. Research Methodology

A qualitative research methodology has been employed using a semi-structured interview guide to collect information through interview process.

3.1 Study Area

According to Stats SA (2016) Thulamela Municipality has population of 657 982. The study was carried out in various rural villages among others Lwamondo, Dopeni, Phiphidi, Shanzha, Mandala, Mapate, Khalavha and Makwarela in Thulamela Municipality, Vhembe District. According to Maponya & Mpandeli (2015:1), climate conditions in Vhembe District are subtropical with mild, moist winter and wet warm summers and such kind of climate conditions are very much conducive for fish farming.

3.2 Sampling

Purposive sampling method was used to collect homogeneous data from individual small-scale fish farmers with same characteristics in various

Figure 1: Geographic Area of Thulamela Municipality

Source: The local government Handbook of South Africa, 2018

Table 1: Age of Farmers

Age Range of Respondents	Number of Respondents	Percentages
18-30 years	0	0%
30-40 years	3	20%
41-50 years	7	47%
50+ years	5	33%
Total	15	100%

Source: Authors

Table 2: Gender of Farmers

Gender	Number of Participants	Percentage
Males	11	73%
Females	4	27%
Total	15	100%

Source: Authors

villages within the study area in the Thulamela Municipality. Dudovskiy (2016) views purposive sampling as a judgemental, selective or subjective sampling technique in which the researcher relies on his or her own judgement when choosing members of the target population to participate in the study. Crossman (2016) defines purposive sampling as non-probability procedure that is selected based on characteristics of a particular population in relation to the objective of the study. The study took a sample size of fifteen individual small-scale fish farmers from the total research population of thirty farmers who operate within the Thulamela Municipality. A sample population of fifteen small-scale fish farmers was purposively selected and interviewed to collect primary data from the respondents.

4. Data Collection

The primary data were collected through semi-structured interview and captured with the aid of a tape recorder. Data collection process was done through the local Agricultural Extension officer who organised the chosen farmers to be available for data collection. Individual respondents were visited at their place of operation to capture data using videos and tape recorders. A number of questions were developed to allow the respondents to answer accordingly.

5. Findings and Discussions

The findings and the discussions of the results are hereunder presented. The study intended to answer the research questions which were (a) to determine the contribution of small-scale fish farming for income generation in Thulamela Municipality in Limpopo Province, (b) to determine the fish species that contribute to income generation, (c) to make recommendations on how small-scale fish farming can contribute to income generation in Thulamela Municipality in Limpopo Province

5.1 Age of Farmers

Table 1 depicts demographic figures on the age group of the fifteen research respondents. Of the 15 respondents, zero (0%) or no respondent was there within the age range of 18 to 30 years. Only three (20%) respondents were within the age range of 30 to 40 years. There were seven (47%) respondents within the age range of 41 to 50 years whereas five (33%) were above 50 years of age.

5.2 Gender of Farmers

Table 2 depicts the results on the investigation with regard to gender. Of the 15 research respondents, eleven 11 were males and 4 were females. In terms of percentages, males were 73% whereas females were 27% from the total number of fifteen respondents. Jentoft, Chuenpagdee, Barragan-Paladines and Franz (2017:749) pointed out that gender differences in access to general education can impact the roles that women and men play in small-scale fisheries such that in Greenland, women attain higher levels of general education, while men are more likely to take vocational education training in fishing and hunting.

Table 3: How Small-Scale Fish Farming was Established in Thulamela Municipality

Respondent No	How Small-Scale Fish Farming was Established
1	I started with one pond and some fingerlings I bought from a certain fish farmer
2	I got inspired by respondent number 1 and started fish farming together with cash crops
3	I inherited from my father
4	I was inspired by fish farmers using aqua-dams and built 5 fish ponds
5	I have built one big pond for irrigation and later turned it for fish farming
6	I caught fingerlings from the river and put them in a pond and they multiplied
7	I started fish farming with 11 men and 11 women as a co-operative
8	I have built the fish pond and stocked some fingerlings
9	I built one pond, bought 100 fingerlings and stocked them in a pond and they multiplied
10	I have built one pond and stocked the fish
11	I have built some ponds and bought fingerlings from existing fish farmers
12	I have built small ponds and stocked fingerlings
13	I started with one pond
14	I have built two fish ponds and stocked them with fingerlings
15	I started with one fish pond

Source: Authors

Table 4: Impact of Fish Farming on Communities

Respondent No	Impact of Fish Farming on the Communities
1	The business is creating jobs for community members
2	I hired temporary workers who gain income
3	Community members get jobs
4	Communities will get fresh fish from my business
5	Community members get fresh fish from my business especially young men
6	Community members come and learn about fish farming
7	The business hires some temporary workers to assist with work
8	The community gets fresh fish from my business
9	My business is providing the local community with white meat
10	Community members get food
11	It has improved the lives of people because they come here when they need fish
12	People get fresh fish
13	Communities come and observe fish while others buy the fish
14	People dig ponds and get paid
15	It supplies communities with fish

Source: Authors

Eleven (73%) respondents indicated that they started with the digging of fish ponds on their own and stocked some fingerlings. Two (13%) respondents indicated that they were inspired by visiting some existing fish farmers operating within their areas whereas one (7%) respondent inherited the fish farming activities from his/her father. Another (7%) respondent showed that the business started as a cooperative with men and women working together. See Table 3.

According to the study respondents, the impacts of fish farming on the local communities are shown on Table 4. In responding, nine (60%) of the respondents indicated that community members get fresh fish as food from fish farming. Five (33%) respondents showed that community members got employment opportunities from the business of fish farming. One (7%) respondent indicated that community members acquired more valuable information about fish production.

5.3 Opportunities Created by Fish Farming in Thulamela Municipality

Four (27%) respondents indicated that fish farming could create job opportunities whereas four (27%) respondents showed that fish farming could create businesses. Three (20%) respondents indicated that

Table 5: Opportunities Created by Fish Farming

Respondent No	Opportunities Created by Fish Farming
1	Fish farming will become a learning area for school children
2	Fish farming will create employment opportunities
3	It will create job opportunities
4	It creates opportunities by providing communities with fresh fish
5	It will create job opportunities for jobless people if we practise it in a large scale
6	It will create income opportunities
7	Fish farming creates job opportunities for the people to have work
8	It can generate income
9	It can create jobs
10	It will provide fresh fish to the local people
11	People come and get fish very easily
12	It will provide fresh fish
13	To sell fish to the people
14	To hire more people for jobs
15	It will create job opportunities and business that supplies retailers with fish

Source: Authors

Table 6: Opportunities Associated with Fish Farming

Respondent No	Opportunities Associated with Fish Farming
1	It will add value to the people's lives
2	It will promote fish farming
3	They bring income to operate fish farming as business
4	It will promote fish farming
5	The more fish farmers have more ponds, more people will have more jobs
6	Generation of income will make fish farming to reduce poverty
7	It will make fish farming to increase the world economy
8	Fish farming will reduce malnutrition
9	Fish farming will reduce malnutrition
10	It will promote fish farming
11	To promote fish farming
12	They will make fish farming to generate income
13	Fish farming to develop further
14	To increase fish farming
15	To make fish farming to increase the economy

Source: Authors

fish farming could generate income. Another three (20%) respondents indicated that it could create opportunities such as a food supplier whereas one (6%) respondent indicated that fish farming could serve as a centre for school children to learn science. See Table 5.

5.4 Opportunities Associated with Fish Farming

Four (27%) respondents indicated that the above opportunities would promote fish farming. Three (20%) respondents indicated that they would make fish farming to generate income whereas two (13%) respondents also indicated that they would make fish farming to contribute to improve the local economy. Two (13%) respondents indicated that these opportunities would enable fish farming to address malnutrition. Two (13%) respondents indicated that these opportunities would help fish farming to add value to the lives of the ordinary people whereas two (13%) respondents also indicated that the opportunities would increase fish farming activities. See Table 6.

5.5 Good Aspects Related to Fish Farming

Five (33%) respondents indicated that the good aspects related to fish farming were that it generates income which improves the people's livelihoods. Three (20%) respondents showed that when community

Table 7: Good Aspects Related to Fish Farming

Respondent No	Good Aspects Related to Fish Farming
1	Fish farming generates income, creates jobs for local people, serve as a food base and as a business
2	Whenever I sell some fish I will have income
3	Fish farming serves as a business to generate income and it motivates people to live a healthy life by eating fish
4	Watching fish relieves community members from stress as they become happy
5	It provides food
6	Fish farming promotes water conservation and prevents fish extinction
7	People will be financially stable which will improve their health and livelihoods
8	Fish is good for people's health
9	Good health and good development of people's brains
10	Fish farming always keeps the ponds clean
11	My friends come and see fish and they go back home happy
12	Fish farming improved our lives because when we sell fish we get income
13	I developed very well in fish farming since I worked with the extension officer
14	To save water through fish farming
15	The change is that I'm able to provide people with food

Source: Authors

Table 8: Fish Species

Respondent No	Types of Fish Species Reared	Respondent No	Types of Fish Species Reared
1	I rear Tilapia and Catfish	9	I rear Tilapia and Catfish
2	I rear Tilapia	10	I rear Tilapia and Catfish
3	I rear Tilapia	11	I rear Tilapia and Catfish
4	I rear Tilapia	12	I rear Tilapia and Catfish
5	I rear Tilapia	13	I rear Tilapia
6	I rear Tilapia	14	I rear Tilapia and Catfish
7	I rear Tilapia	15	I rear Tilapia
8	I rear Tilapia		

Source: Authors

Table 9: Reasons for Keeping the Fish Species

Respondent No	Reasons for Farming Specific Fish Species
1	Tilapia is good for this province and can tolerate harsh conditions
2	The fish can tolerate the harsh conditions in our area
3	Tilapia can tolerate harsh conditions
4	I rear tilapia because they resist some diseases
5	It is available locally in rivers and dams
6	They can live in harsh conditions
7	It can live in local conditions and tolerate harsh conditions
8	They are locally available
9	Tilapia species make good production and resist cold and other aspects that can destroy fish farming
10	Tilapia species perform well in the local environment
11	They are suitable for the local environment
12	People prefer this type of fish
13	Most people prefer tilapia
14	Because these are the species I had access to
15	I realised that most people prefer tilapia

Source: Authors

Table 10: Dominating Fish Species

Name of Fish Species	Percentage of Fish Species in Domination
Tilapia	70%
Catfish	21%
Common Carp	8%
Trout	1%
Total	100%

Source: Authors

Table 11: Challenges in Fish Farming

Respondent No	Challenges Experienced by Farmers	Respondent No	Challenges Experienced by Farmers
1	Theft	9	Shortage of land or space
2	Fish-eating birds and predators	10	Fish-eating birds
3	No proper infrastructure (fish ponds)	11	Fish-eating birds
4	Unavailability of fish feed	12	Fish-eating birds
5	Fish-eating birds	13	Shortage of feed
6	Insufficient water during drought	14	Theft
7	Insufficient water during drought	15	Fish-eating birds
8	Fish-eating birds		

Source: Authors

members watch the fish in the ponds, they get relieved of stress and become happy. Three (20%) respondents indicated that fish farming promotes water conservation since people usually conserve water to perform fish farming activities. Two (13%) respondents indicated that eating fish promotes good health to the community members and brings change towards healthy lives. Two (13%) respondents indicated that fish farming generates food for the communities. See Table 7 on the previous page.

5.6 Types of Fish Species Reared

Nine (60%) respondents indicated that they kept only Tilapia fish species whereas six (40%) respondents said that they reared both Tilapia and Catfish fish species. See Table 8 on the previous page.

5.7 Reasons for Farming with Fish Species

According to Hlophe (2015:10), tilapia fish species and catfish are commonly known in most African countries for improving rural livelihoods. Three (20%) respondents indicated that most of the people in the community preferred tilapia whereas two (13%) respondents indicated that the species performed well in the local environment. Two (13%) respondents indicated that they kept tilapia because it can be resistant to diseases, cold and other aspects that can destroy fish farming. Two (13%) respondents indicated that they kept tilapia because the species were locally available for fish farming. One (7%) respondent indicated that the fish species was the only one he had access to. See Table 9 on the previous page.

According to Gomna & Rana (2007:152), a large number of aquatic species were consumed, and few species dominated consumption with Tilapia being the most important in Africa. See Table 10 above for dominating fish species.

5.9 Challenges Experienced by Farmers

Nine (60%) respondents indicated that fish-eating birds were their current challenge in fish farming that destroyed a greater portion of their production. Three (20%) respondents indicated drought as another challenge in fish farming. Two (13%) of the respondents highlighted theft as a challenge whereas one (7%) indicated the unavailability of fish feed as a challenge. See Table 11 above.

5.10 Constraints that Hinder the Development of Fish Farming

Furthermore, the results shown in Table 12 on the following page reveal constraints including lack of proper infrastructure, water scarcity and other impediments that hinder fish farming initiatives. Six (40%) of the

Table 12: Constraints

Respondent No	Constraints in Fish Farming	Respondent No	Constraints in Fish Farming
1	Lack of proper infrastructure	9	Delay in issuing of water use licences
2	Lack of proper infrastructure	10	Water scarcity
3	Lack of proper infrastructure	11	Water scarcity
4	Lack of proper infrastructure	12	Theft and water scarcity
5	Water scarcity	13	Shortage of feed
6	Water scarcity	14	Water scarcity
7	Non- availability of fingerlings supply	15	No Constraints
8	Water scarcity		

Source: Authors

Table 13: Interventions to Address Constraints

Respondent No	Interventions to Address Fish Farming Constraints
1	Construction of strong fences to prevent theft
2	Government and farmers to promote fish farming
3	Drill boreholes to address water shortage
4	Drill boreholes
5	Drill boreholes and create a market for products
6	Drill boreholes to address water shortage
7	Drill boreholes to address water shortage
8	Drill boreholes to address water shortage
9	Water laws on issuing of operating licences should be relaxed and provide more land available for fish farming
10	Drill boreholes to address water shortage
11	Drill boreholes for more water
12	Construction of fencing to prevent theft
13	Drill boreholes for more water
14	Drill boreholes
15	Provide quality feed and cover the ponds with nets

Source: Authors

respondents indicated water scarcity as a constraint that hindered the development of fish farming. Four (25%) of the respondents indicated lack of proper infrastructure especially fish ponds as a constraint that also hindered the development of fish farming whereas one (7%) respondent mentioned the delay in the issuing of water use licences as a hindrance.

One (7%) respondent indicated theft as a problem that could hinder the development of fish farming. Another (7%) respondent indicated non-availability of fingerlings as a constraint whereas another (7%) indicated that shortage of fish feed hindered the development of fish farming.

Ten (66%) respondents indicated that drilling of boreholes to add more water for fish farming can be an intervention to address the constraint in fish farming. Two (13%) respondents indicated that the construction of strong fences may address the issue of theft whereas one (7%) respondent mentioned that government and farmers should promote small-scale fish farming. One (7%) respondent indicated that water use laws needed to be revised so that delays in the issuing of operating licences be addressed in favour of fish farming. Another (7%) respondent indicated that there was no constraint in the development of fish farming, because he has sufficient resources such as water and infrastructure to operate on. See Tables 12 and 13 above.

5.11 Solutions to the Current Challenges on Fish Farming

The respondents in Table 14 on the following page suggest some solutions to address the current challenges on fish farming. Twelve (80%) respondents indicated that the provision of sufficient water through drilling of boreholes would provide solutions to their current challenges. Two (13%) respondents indicated that construction of strong fences around fish ponds would prevent theft whereas one (7%)

Table 14: Solutions to Current Challenges

Respondent No	Solutions to Current Challenges
1	Construction of strong fences will prevent theft
2	Providing water through boreholes will assist farmers
3	If farmers can have access to funding to drill boreholes to address water shortage
4	Strong fences will prevent theft
5	Sufficient water will improve fish farming and maximise production
6	Boreholes will supply more water for fish farming
7	Sufficient water through boreholes will enhance fish farming
8	Sufficient water will enhance fish farming
9	Issuing of water licences in time will promote fish farming
10	If boreholes can be drilled during drought then my fish ponds will always be full of water
11	Boreholes will provide sufficient water
12	Boreholes will provide sufficient water
13	Government officials should provide guidance
14	Harvested water can be stored and used to fill the ponds during drought
15	Protect ponds with nets

Source: Authors

of respondents said that the availability of fish feed would promote fish farming for the market.

6. Recommendations

These recommendations are based on the outcomes of the study:

- Fish farmers should be assisted to construct proper infrastructure facilities including fish ponds.
- Private and public sectors should provide assistance in constructing strong infrastructure to minimise fish theft.
- Alternative reliable water sources should be established and be secured.
- The government should allocate available state land to successful fish farmers to expand their activities.
- Fish farmers should be empowered to produce their own local high-quality feed.
- The government together with farmers should promote local feed mills and hatcheries to produce feed and fingerlings.
- Fish farmers should be encouraged to join fish farming forums in order to improve communication among each other.
- The Department of Agriculture through its farmer support branch should assist farmers in adapting to a farmer to farmer support system.
- Fish farmers' forums should consistently facilitate publishing of the results of good performing fish farming projects in the local media in order to attract funding.
- Women and youth need to be encouraged to participate more actively in fish farming.

7. Conclusion

In view of the contributions of the fifteen (15) participants interviewed in this study, the availability of infrastructure and financial resources are some of the major determinants which guarantee the success of the subsector. Mufudza (2015:60) points out that the government is supposed to take the income generating projects as a strategy to fight unemployment both in urban and rural areas. Jacobi (2013:90) indicates that the main support needed in all groups is usually financial support in order to improve and sustain fish farming projects.

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