Business & Social Science
IJRBS

Research in Business & Social Science

IJRBS VOL 12 NO 3 (2023) ISSN: 2147-4478

Available online at www.ssbfnet.com
Journal homepage: https://www.ssbfnet.com/ojs/index.php/ijrbs

Impact of training and development on the quality of fish produced: Evidence from fish farmers in Odogbolu, Ogun State, Nigeria

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ARTICLEINFO

Article history:

Received 12 February 2023
Received in rev. form 11 April 2023
Accepted 24 April 2023

Keywords:

Educational Level, Fish Farming, Aquaculture, Training and Development, Fish Marketability, Feed Quality.

JEL Classification:
O18

ABSTRACT

Training and development have emerged as important construct within entrepreneurial literature over the past two decades. This study proves how training and development can effectively advance fish farming productivity in Odogbolu Metropolis. The impact of fishermen's educational level on fish profitability was examined. The influence of feed quality on fish performance was also demonstrated. The assessment of fish weight/size as a determinant of fish marketability in the study area was also researched. The study's objectives were underscored through the lens of constructivism and human capital theories. A purposive sampling technique was adopted to determine one hundred and twenty-one sample sizes. A quantitative approach was employed, and three hypotheses were presented and tested by applying regression techniques using SPSS software. The study found a significant association between fish farmers' educational level and profitability. Feed quality showed a significant association with fish performance, and a significant association was also found between fish weight/size and fish marketability. The study proves that fish farmers should educate themselves through training and development programs on quality fish production regarding fish weight/size, fish performance, and fish marketability. Government and stakeholders must proactively encourage adult education among fish farmers to expose them to the benefits of fish farming activities in the study area..

Introduction

The fishing occupation is a prehistoric practice dating back at least 40,000 years (Barker et al., 2002). The fishing practice are rooted in the supply of food for human survival and over time grew commercially into a global industry based on demand and supply (Boyd et al. 2020). In developed economies, fish farming is predominantly mechanized (Hamilton et al. 2014). To the contrary, fish farming in developing nations is primarily for subsistence farming among small businesses (Hamilton et al., 2014). Fishing activity practices take place on and off land, that is, in seashores, islands and fresh waters. The major fishing operations of the world take place in the seawaters of the Pacific and Atlantic shores, and within the mild latitudes of northern hemisphere (Desforges et al. 2014). While fishing activities in Indian Ocean is estimated at approximately 4 percent of the global annual total fish generation, the Pacific and Atlantic Oceans accounts for a total of 40 percent, with Aquaculture fishing estimated at 15 percent (Food and Agriculture Organisation, 2018). According to the Food and Agriculture Organisation (FAO) (2018), fish has been a key component of the world's nutrition throughout the centuries. The advent of powerful machines and improved equipment as a result of advanced technology led to increased fishing activities over the past ten decades (Wuyep & Rampedi, 2018). Consequently, there has been a worldwide decrease in fish stocks due to over-fishing, and this brought to a halt the increase in fish hunting over the past two decades (Bavington, 2010). Therefore, it has become an imperative to increase fish production through on land fish farming, known as aquaculture methods (Turcios & Papenbrock, 2014).

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https://doi.org/10.20525/ijrbs.v12i3.2468

Aquaculture is one of the fastest growing food production sector accountings for about 50% fish food production (Rath, 2018). Aquaculture is the husbandry of aquatic food organism. "Aquaculture includes all aspects of production of aquatic organisms in captivity comprising either some or all stages of their life cycle, their live foods and the resultant markable products in the habit of fresh, brackish and sea water" (Rath, 2018, p.2). Other researchers define aquaculture as the farming of aquatic animals including fish, molluscs, crustaceans and aquatic plants (Tacon, 2020; Lucas, Southgate & Tucker, 2019; Muñoz, Bueno, Agüera & Fernández-Alba, 2010). It has been referred to as the art, science and business of culturing fish, crustaceans, bivalves and pearls and other aquatic animals (Tunde, Kuton Oladipo & Olasunkanmi, 2015). Aquaculture is well practiced in the first world countries such as Canada, Florida, United States of America (USA) (Love, Fry, Cabello, Good & Lunestad, 2020) and other fast-growth countries like China, Indonesia, Singapore, Malaysia (Prabu, Rajagopalsamy, Ahilan, Jeevagav & Renuhadevi, 2019), as well as developing countries such as Nigeria, making aquaculture accessible to both rural and urban communities (Wuyep & Rampedi, 2018). The FAO (2019) documented that China, India, Vietnam, Indonesia and Thailand are the topmost producers of aquaculture worldwide. China, with one-fifth of the world's population, records two-thirds of the world's aquaculture production (FAO, 2004). However, in the 1950s, aquaculture begun in Sub-Saharan Africa with the motives of enhancing nutrition in local communities, earning of extra income, broadening of agricultural activities to minimize the danger of crop failures and generation of job opportunities in rural areas (Hecht, 2006). In the area of fish farming capability, the African continent accounts for 43 percent of having tilapia farming capabilities, African catfish and carp (Ridler & Hishamunda, 2001). Despite the increasing growth of aquaculture in many areas of the world with fish farming potentials, there is little or no growth in Sub-Saharan Africa. In spite of concerted initiatives to promote the growth of aquaculture since the 1950s, proceeds on aquaculture investments is yet to be realized by government and international aquaculture organisations (FAO, 2004) with less than 5 percent of the viable space being utilized (Kaspersky, 2004).

According to Thompson and Mafimisebi (2014), in Nigeria the fishing industry is made up of three major sub-sectors, that is, the artisanal, trade or industrial and aquaculture sector. The awareness on the economic importance of aquaculture to the country's Gross Domestic Product (GDP) continued to increase (Adewuyi et al., 2010). This stems from the need to meet the increasing demand for fish consumption for local and export markets (Adewuyi et al., 2010). The commonly cultured fish species include "*Tilapia spp, Heterobranchus bodorsalis, Clarias gariepinus, Mugie spp, Chrysichthys nigrodigitatus, Heterotis niloticus, Ophiocephalus obscure, Cyprinus carpio and Megalo spp"* (Adewuyi et al., 2010, p. 179). Fish aquaculture is done in enclosures such as artificial ponds, vats, and tanks (Adewuyi et al., 2010). The aquaculture sub-sector contributes between 0.5% and 1% to Nigeria's domestic fish production (Awoyemi & Ajiboye, 2011; Adewuyi et al., 2010). As a result of rapid increase in the world's population growth, there is a rise in the demand for animal protein (which is higher in quality than plant protein) (Wuyep & Rampedi, 2018; Awoyemi & Ajiboye, 2011; Adewuyi et al., 2010). The normal protein consumption in Nigeria is estimated at 19.38g/output/ day is poor and far lower than the FAO protein requirement of 65g/ output/day (Awoyemi & Ajiboye, 2011; Adewuyi et al., 2010). While fish farming started more than four decades ago, aquaculture is yet to make meaningful contribution to domestic fish production in Nigeria (Awoyemi & Ajiboye, 2011; Adewuyi et al., 2010). The aquaculture industry is estimated to create 30000 jobs every year and generate a revenue of US$160 million annually (Adewuyi et al., 2010).

Fish production has been known to contribute 55% to the protein intake in Nigeria (Awoyemi & Ajiboye, 2011; Adewuyi et al., 2010). However, the consumption rate of fish is greater than local production where consumption expenditure account for about 35% for animal protein in 2015, and about 10% of food consumption expenditure by the average Nigerian (Liverpool-Tasie, Sanou, Reardon & Belton, 2021). Despite the increase in consumption of other sources of protein from animals such as livestock and poultry industries, the problem of protein deficiency still persists (Awoyemi & Ajiboye, 2011; Liverpool-Tasie et al., 2021). The protein deficiency in diet is related to the inability of fish farming industry to supply the required quantity of fish (Awoyemi & Ajiboye, 2011). Yet, fish consumption is known as the best source of animal protein that is rich in amino acid (Wuyep &Rampedi, 2018). The situation gave rise to poor health condition due to insufficient food nutrients, low productivity and poor living standard, and low contribution of fishery industry's input to the country's GDP (Awoyemi & Ajiboye, 2011: Wuyen & Rampedi, 2018). The industry now contributes only 2% of the GDP with an estimate of about 0.2% of the total global fish production (Awoyemi & Ajiboye, 2011; Olapade & Adeokun, 2005). Being the most populous country in Africa, Nigeria is one of the largest importers of fish with a per capita consumption of 7.52kg and a total consumption of 1.2 million metric tons with imports amounting to about 2/3 of the total consumption rate. This indicates the huge shortfall in fish supply in Nigeria (Olapade & Adeokun, 2005: Ozigbo, Anyadike, Adegbite & Kolawole, 2014). Based on the above discussion, this study aims to establish the influence of training and development on quality of fish produced by fish farmers in Odogbolu Local Government Area. Specifically, the study aims to access the impact of educational level of fishermen on fish profitability, influence of feed quality on fish performance, and the effect of fish weight/size on fish marketability.

To this end, the following objectives were presented:

i. To examine if the educational level of fish farmers had significant impact on the profitability of fish in the study area.
ii. To establish if quality of feed had significant influence on fish performance in the study area.
iii. To demonstrate if there was a significant association between fish weight/size and fish marketability in the study area.

This study will be of benefit to fish farming entrepreneurs, government agencies, academics, private and public sectors. More specifically, the study provides useful insight and information to fish farming entrepreneurs to understand the effect and importance of training to ensure an efficient and effective business management operation towards increasing profitability. It allows fish farming

entrepreneurs to examine various training exercises before investing in a business venture. Fish farmers can utilize the knowledge to examine various social economic characteristics affecting fish farming productivity.

The paper starts with an introduction section, followed by the literature review, empirical review and hypotheses development. The next section illustrated the theoretical paradigms that underpinned the study, which is followed by the research methods, and discussion of findings. The study concluded with the research implications and conclusion.

Literature Review

Fish Farming in Nigeria

There are different types of fish breeds in Nigeria which are sea trout, cyprinids, pangas catfish, freshwater fishes, silver sea bream, common carp, catla, greasy grouper, bighead carp, Nile tilapia, grass carp (Emmanuel, Chinenye, Oluwatobi & Peter, 2014). However, the catfish species (*clarias* spp. and *Heterobranchus* spp.) are the most cultured species due to their toughness, general acceptability and high market value in Nigeria (Adeleke, Robertson-Andersson, Moodley & Taylor, 2020; Emmanuel et al., 2014). These species are usually reared to marketable size within a period of 4-9 months, depending on the adopted production method (Adewumi, 2015). The success story of fish in Nigeria is hinged on catfish production, which accounts for over 80% of aquaculture production in Nigeria (Adeleke et al., 2020; Anetekhai, 2010). According to the Federal Department of Fisheries (2008), cited in Wuyep and Rampedi (2018), 40% of animal protein consumed in Nigeria is derived from fish. While over 800,000 metric tons of fish is produced annually in Nigeria, yet 600,000 metric tons must be imported annually to respond to the high demand for protein in the country (Arene, 2002). These statistics suggest that fish production in Nigeria is not sufficient to satisfy local demands for protein. Therefore, fish production still lacks adequate attention from the government, particularly in the local communities.

Categories of Aquaculture

Within intensive and extensive aquaculture methods, various types of fish farms are used.

Figure 1: Cage system designs; *Source:* FAO (2011, p, 11)

Cage systems were the first method used in aquaculture, which involved the use of cages that are placed in lakes, rivers, ponds and oceans that contain the fish (Moe, Fredheim, & Hopperstad, 2010). This approach is generally known as the offshore farming. Fish are preserved in cage-like structures and are “artificially fed” and harvested at the saleable period. Over time the fish farming cage approach underwent numerous technological transformations, particularly in the areas of reducing diseases and environmental challenges (Njiru, Aura & Okechi, 2019). However, the primary challenge of the cage approach is the loss of fish due to the large number of fish population (Njiru et al., 2019). Other major types of fish farm system are pond (earthen or lined), and tanks (concrete and plastics) (Obwanga, Soma, Ingasia Ayuya, Rurangwa, Wonderen, Beekman, & Kilelu, 2020). Pond culture mainly uses earthen system for extensive or semi-extensive aquaculture, while tanks culture may be either concrete or plastic structures with a designed continuous water flow outlet (Ngwili, 2014). It should be noted that pond and tank systems are the most common production systems in Africa (Obwanga et al., 2020). This is due to the fact that pond and tank systems are the most affordable and manageable for small-scale farmers in Africa. Besides, previous research study affirmed that there is potential poverty impacts of small-scale pond and cage aquaculture in Ghana (Kassam & Dorward, 2017). In addition, the adoption of earthen ponds and concrete tanks for fish culture have been demonstrated to generate increase profitability and employment opportunities in Nigeria (Olaoye, Ashley-Dejo, Fakoya, Ikeweinwe, Alegbeleye, Ashaolu, & Adelaja, 2013).

Empirical Review and Hypotheses Development

Level of Education and Fish Profitability

Empirical investigations on the impact of training and development on fish productivity is well documented. Dickson, Nasr-Allah, Kenawy and Kruijssen's (2016) study on pond-based tilapia monoculture and tilapia-mullet polyculture farmers in Egypt revealed that best management practice training had significant impact on farm profitability. The study by Adewuyi *et al*., (2010) on the analysis of productivity of fish farming in Ogun State, Nigeria indicated that majority (68%) of the fish farmers had formal (tertiary) education and funded their fish production through private savings. Further, evidence from the study revealed that an average total cost of ₦394 380,00 was invested per annum by fish farmers, while gross returns of ₦715 030.30 was generated with a gross margin of ₦574 314,00 and an annual income of ₦320 650,00 (Adewuyi et al., 2010). The degree of return on investment of 0.55 indicated that for every one naira invested in fish production by farmers, a return of ₦1.55 and a profit of ₦0.55 was achieved (Adewuyi et al., 2010). In a study conducted by Oluwemimo and Damilola (2012) on socioeconomic determinants of sustainable fish farming in Nigeria, the authors found that 66% of the fish farmers had tertiary education, which contributed to the technical understanding of fish farming requirements and use of innovative techniques of fish management. The authors further reported that a net revenue of ₦318,640.75 was realised from an investment of ₦619,442.55, with a gross margin of ₦457,327.95 in fish farming (Oluwemimo & Damilola, 2012). In addition, the study further revealed a cost ratio of 1.5 indicating that for every ₦100 investment, additional ₦50 is yielded by the enterprise (Oluwemimo & Damilola, 2012). Tunde et al. (2015) also reported that the majority (52%) of fish farmers in Sarki area of Oyo State in Nigeria had tertiary education which contributed to the increase in fish farming productivity. It is in this regard that Ibok, Ele, Anita-Obong, Okon and Udoh (2013) argued that fish farming is a highly technical business that requires learned farmers. Therefore, this study assesses the impact of educational level of fish farmers on fish profitability.

Quality of Feed and Fish Performance

Previous studies have proven the impact of fish feed quality on fish performance (Opiyo, Githukia, Munguti, & Charo-Karisa, 2014; Rawski, Mazurkiwicz, Kierończyz & Józefiak, 2020). Opiyo et al. (2014) empirically investigated growth performance of Nile tilapia, with commercial and on-farm made fish feed in Kenya. The authors revealed that fish fed with commercial feed grew largest than the others. The authors argued that quality of feed has significant impact on fish performance. Rawski et al. (2020) explored the use of Black Soldier Fly Full-Fat Lavae as alternative to fish meal and fish oil in Siberia. The authors indicated that growth of experimental fish and feed utilization parameters were improved. The authors further maintained that Black Soldier Fly Full-Fat Lavae as fish diet is suitable fish nutrient for fish performance. In addition, in Denmark, Lund, Dalsgaard, Rasmussen, Holm, and Jokumsen, (2011) examined the replacement of fish meal with varieties of organic plant proteins in organic trout feed for fish performance. The authors found that it is advisable to substitute fish feed by 47% organic plant protein concentrates without compromising trout performance. On the contrary, Norambuena, Hermon, Skrzypczyk, Emery, Sharon, Beard, and Turchini (2015) investigated the inclusion of Algae in fish feed for the performance of Juvenile Atlantic Salmon in Australia. The authors revealed that inclusion of Algae components (Verdemin and Rosamin) at level of 2.5 and 5.0% did not have any positive, nor negative significant effect in Atlantic Salmon growth and feed efficiency. Research investigation on the quality of fish feed for fish performance, within the context of training and development in Nigeria is scarce. This study examines the influence of feed quality on the performance of fish.

Fish Weight/Size and Fish Marketability

Furthermore, the determinant for the weight and size of fish has been attributed to selection of programme in breeding of fish (Cohen et al. 2017; Fleming et al. 2002). For example, Cohen et al. (2017) demonstrated the use of Estradiol in the feminization of eels in aquaculture, which led to the increase in the size of eels for the purpose of marketability. The adoption of artificial selection by Flemming, et al. (2002) found a significant link between artificial selection and domesticated fish than their wild counterpart. The selected programme led to an increase in growth rate and marketability of fish (Flemming et al., 2002). Through a genetic improvement of cold-water fish species, Gjedrem (2000) empirical investigation revealed that a 10 – 15% increase in growth rate of cold-water fish led to increase in production and improvement in consumption of fish by consumers. Many previous studies have also indicated the essential need to increase fish growth or size to meet increasing demands for fish (Henry et al., 2015; Mozanzadeh et al., 2016). It is instructive to note that local fish farmers in Africa, particularly in Nigeria still require training programmes in the area of selection methods of rearing fish for the purpose of improving fish growth. One of the motivations of this study is to investigate if weight/size of fish is a determinant of fish marketability in Nigeria.

Theoretical Review

Constructivism Worldview

The constructivism learning philosophical view suggests that knowledge and skills can be enhanced in numerous ways without necessarily depending on a particular ideal solution (Kumar, 2011; Kusuma et al., 2021). Constructivists believe that knowledge is the outcome of construction in an individual (Kusuma et al., 2021). Constructivism is associated with scientific methods as it advocates for a comprehensible participatory approach of human development in relation to education and training (Kumar, 2011: Fernando & Marika, 2017). Constructivists are of the view that skills development in a particular context must ensure that the acquisition of knowledge is well-defined, demonstrated, and understood (Fernando & Marika, 2017). Constructivism assumption suggests that individuals and groups are allowed to identify gaps and weaknesses in performance in a particular area of competence (Kumar, 2011). Therefore, knowledge is actively constructed by the learner, and the acquisition of knowledge must be socially and

culturally rooted (Fernando & Makari, 2017). This implies that training programmes for fish farmers should be informed by the background, environment, and the preferred species of fish.

Human Capital Theory

The development of the Human Capital Theory (HTC) can be traced to the works of Mincer (1958, 1962), Schultz (1960), Becker (1962) and Ben-Porath, (1967). The proponents of this theory opinioned that education and training are regarded as an investment for the future which justifies the current action (Becker, 1962). Initially, Human Capital Theory was based on neo-classical theories of labor markets, education and economic growth (Schultz, 1960). It fails to acknowledge the fact that workers are productive resources and attempts to find out whether highly trained staff are more productive than other workers (Tan, 2014). Garcia (2005) asserted that lack of equitable pay increases for employees due to increased performance after gaining specific skills, will result in low motivation in terms of financing their own training expenses. Small businesses are likely to invest in training, as they will derive nearly all the earnings from the increased output attained by the newly acquired skills (Robson, Akuetteh, Westhead, & Wright, 2012).

Education and training have been used globally to sustain the concept of human capital. For instance, Adom and Asare-Yeboa (2016) investigated the level of education, area of education, business and training and work experience as tools of human capital. The authors found that business performance is enhanced by individuals' level of intellectual capability. Robinson et al. (2012) examined the interlink between human capital components, such as prior business experience, with export opportunity intensity. The authors revealed that high export intensity was found among entrepreneurs with prior business experience. Therefore, the significant interlink between education and the theory of human capital better underscores the impact of educational level of fish farmers on fish profitability, performance and marketability in Odogbolu local government of Nigeria.

Viewed from the local government perspective, the assumption of human capital development implies that local fish farmers can get training support from the local government on productivity and sustainability of fish farming. This is important because the training support will benefit the fish farmers and the community, as increase in fish productivity and sustainability will help reduce the current fish shortage within the community (Adewuyi *et al*., 2010), and positively contribute to the economy.

Research Methods

The research was conducted as a quantitative study, using primary data gathered from selected fish farmers and fish farm employees. A case study research design was adopted to comprehend the influence of training and development on profitability of fish farmers using Odogbolu local government area of Ogun state. The application of quantitative questionnaires was helpful in the determination of the impact of educational level of fish farmers, fish feed quality and size/weight of fish on profitability, fish performance and marketability of fish respectively.

The population for this study included all fish farm owners and fish farm employees from five fish farming communities in Odogbolu Metropolis, which are Eriwe Fish Garm, Oluadepe Farm, IDIPR Fish Farm village, Elegbeji Fish Farm and Fortune Farm village. It should be noted that fish farming is the most predominant occupation of these communities after crop farming. Using purposive sampling technique, a sample of one hundred and twenty-one (121) fish farmers and fish farm employees were selected for the study from a target population of three hundred and fourteen (314). Research participants were purposively selected with the aim of identifying active fish farmers and farm employees who could provide the required and adequate information to achieve the research objectives. These fish farmers were the major suppliers of fish to many local governments in Ogun State.

A questionnaire survey was used to collect quantitative data. The questionnaire comprised two sections. The first section was made up of the demographic information of research participants, which includes the sex, age group, academic qualification, work designation and total work experience in years. The second section of the questionnaire included questions relating to research problems. The five-point Likert-scale was applied to measure the range of positive and negative activities, that is, Strongly Disagree = 1, Disagree = 2, Undecided = 3, Agree = 4, and Strongly Agree =5. The research questions were designed from literature review and were further modified after the pilot study. A reliability value of 0.72 was achieved, which is higher than the acceptable threshold of 0.7 (Wilson, 2014).

The outcome of the demographic characteristics of participants were presented in Table 1 below.

Table 1: The Socio-Characteristics of Fish Farmers

Gender	**Frequency**	**Percentage**
Male	81	66.9
Female	40	33.1
Total	121	100
Age		
20-30	30	24.6
31-40	39	32.3
41-50	40	33.1
51-60	7	6.2
61-70	5	3.8
Total	121	100
Educational level		
Primary school certificate	7	5.6
Secondary school certificate	39	31.9
BSc degree	63	52.4
MSc degree	12	10.1
PhD. Degree	-	-
Total	121	100
Farming system		
Small scale	94	77.4
Semi-extensive	21	17.5
Extensive	6	5.1
Total	121	100
Farming method		
Cage system	-	-
Irrigation/ditch pond system	95	78.8
Tank/ concrete	26	21.2
Total	121	100
Fish cultured		
Clarias	109	89.7
Tilapia	12	10.3
Total	121	100

The results from Table 1 above shows that male fish farmers and employees accounted for about 66.9% of the sample compared to their female counterparts who represented 33.1%. This shows the dominance of males in fish production in the area of study. Generally, 90% of the participants were found to be in the active age of 20 – 50 years. A considerable amount (31.9%) of the participants had Senior School Certificate (SSCE) education, while the majority (52.4%) had BSc degree. The descriptive composition also shows that most of the participants (77.4%) adopted small scale farming operations. This finding supports previous evidence that small scale fish farming is the most widely used in Africa (Kassam & Dorward, 2017; Olaoye et al., 2013). In addition, the result of the type of farming method shows that the majority (78.8%) of the fish farmers adopt irrigation/ditch pond system. This result also affirmed the finding of Obwanga et al. (2020), that pond and tank system is prevalent among fish farmers in Africa. Findings from Table above also shows that the most utilised kind of fingerlings by the fish farmers were Clarias (89.7%), which is a specie of catfish, and Tilapia (10.3%). This is not surprising as previous studies have indicated that catfish is the most cultured fish in Nigeria (Emmanuel et al., 2014; Adeleke et al., 2020)

Test of Hypotheses

Regression analysis was adopted to measure the extent of impact of the independent variables (educational level of farmers, fish feed quality, and fish weight/size) on the dependent variables (fish profitability, fish performance, and fish marketability). Appropriate clarification and analysis were employed to explain the test of hypotheses.

The first hypothesis was presented to examine the impact of fish farmers' educational level on the profitability of fish business in the study area. The first hypothesis states thus:

$H0_1$: Educational level of fish farmers has no significant impact on fish profitability.

Ha_1: Educational level of fish farmers has a significant impact on fish profitability.

Table 2: Validation of Hypothesis One

Variable	B	Beta	T	P-value	R^2	F	Df	P-value
Constant	1.911		4.519	.000				
Educational level	.404	.343	3.987	.000	.118	15.899	1;120	.000[b]

Note: a. Predictor: Educational level. b. Dependent variable: Fish farming profitability

Table 2 above reveals the results from the regression analysis, which indicated that the extent to which the variance in fish farming profitability can be explained by educational level is 11.8% i.e. (R square = 0.118). On the aggregate, the value of Fcal 15.899 is at 0.001 significance level. The constructs coefficient shows the simple model that expresses how educational level affects fish farming profitability. Therefore, fish farming profitability = 1.911+ 0.404 educational level. This implies that for every 100% change in fish farming profitability, educational level contributed 40.4%. This research evidence implies that educational level of fish farmers affects fish farming profitability. Thus, the decision would be to reject the null hypothesis (H_0), and accept the alternative hypothesis (H_1), i.e., there is significant impact of educational level of fish farmers on fish farming profitability.

Hypothesis 2

The second hypothesis was formulated to determine if fish feed significantly influences fish performance in the study area. Hypothesis 2 states that:

$H0_2$: There is no significant association between quality of fish feed and fish performance in the study area.

Ha_2: There is a significant association between quality of fish feed and fish performance in the study area.

Table 3: Validation of Hypothesis Two

Variable	B	Beta	T	P-value	R^2	F	Df	P-value
Constant	1.712		4.522	.000				
Fish feed	.508	.843	5.312	.000	.518	17.428	1;120	.000[b]

Note: a. Predictor: Fish feed. b. Dependent variable: Fish performance

Table 3 above shows that the quality of feed was able to explain 51.8% variation in the fish performance (R^2 = 0.51.8), which significantly predicted the dependent variable. Fcal 17.428 is found to be at 0.001 significant level. Therefore, fish performance = 1.712 + 0.508 quality of fish feed. This suggests that for every 100% change in fish performance, quality of fish feed contributed 50.8%. This research finding indicated that quality of fish feed has significant impact on fish performance in the study area. Therefore, the null hypothesis (H_{02}), is rejected and the alternative hypothesis (H_2), is accepted.

Hypothesis 3

$H0_3$: There is no significant association between fish weight/size and fish marketability in the study area.

Ha_3: There is a significant association between fish weight/size and fish marketability in the study area.

Table 4: Validation of Hypothesis Three

Variable	B	Beta	T	P-value	R^2	F	Df	P-value
Constant	2.129		6.569	.000				
Fish weight/size	.416	.379	4.469	.000	.144	19.974	1;120	.000[b]

Note: a. Predictor: Fish weight/size. b. Dependent variable: Fish marketability

Table 4 above reveals the outcome of the regression model. It depicted the extent to which variance in fish weight/size can be explained by fish marketability output is 14.4 % i.e. (R square = 0.144). The Fcal is 19.974 at 0.001 significance level and 0.99% confidence level. Table 4 above also shows the simple model that expresses how fish weight/size affects fish marketability. Therefore, Fish Marketability = 2.129 + 0.416 Fish weight/size. This implies that, for every 100% change in, fish marketability, fish weight/size contributed 41.6%. This finding means that fish weight/size has significant influence on fish marketability. Thus, the null hypothesis ($H0_2$) is rejected, and the alternative hypothesis (Ha_2) is accepted, i.e. there is significant relationship between fish weight/size and fish marketability.

Discussion

This study examines the effectiveness of workforce training and development on fish farming profitability of small businesses in Odogbolu local government area, Ogun state. Constructivism and the human capital theory were applied to justify the study findings. The result of the regression analysis revealed that there is significant association between educational level and of fish farmers and quality of fish produced (11.8%, Fcal (1,911) = 15.899, $p < 0.001$. This finding concurs with the research study conducted by Fapohunda (2005) on profitability of homestead fish farming in Nigeria. The study indicated that the educational status of the farmers had positive and significant impact on the revenue of the fish farming enterprise. Another related study conducted by Obayelu, Arowolo, Ibrahim, and Oderinde (2016) on socioeconomic determinants of profitability of fresh fish marketing in Ogun State, Nigeria revealed that profits from fresh fish was significantly determined by education. The significant link between education and profitability in fish farming further buttresses the assumption of the human capital theory. In relation to the human capital theory, investment of 0.404 in education and training of the fish farmers will yield an equal increase of 1.911 in fish profitability or income for the farmers. Besides, increase in human capital development has been identified to increase productivity and income (Schultz, 1960; Becker, 1962; Tan, 2014).

The study demonstrated that quality of feed has significant impact on fish performance (51.8%, Fcal (1.712) = 17.428, $p < 0.001$. This outcome supports the study conducted by Opiyo et al. (2014). The authors found that fish fed with commercial feed grew largest than the others. The authors argued that quality of feed has significant impact on fish performance. A sufficient empirical bank of data exists on the impact of quality of feed on fish performance (Rawski et al., 2020; Lund et al., 2011).

A significant association was also found between fish weight/size and fish marketability (14.4 %, Fcal (1,119) = 19.974, $p < 0.001$. The significant impact of fish size on fish marketability may be attributed to fish farming methods adopted by the local fish farmers. As shown in Table 1 above, 78.8% of the local fish farmers adopted irrigation and ditch pond systems, which led to a significant impact on the growth of fish. This outcome is related to the study conducted by Jha and Barat (2005) on growth, survival rate and number of marketable fish. The authors found an increase in the number of marketable fish above a set size of 4g after 90 days of culture of fish. This implies that a positive significant association exists between size/weight of fish and fish marketability as shown in this study. The finding also supports the experimental report of Zheng, Liang, Yao, Wang & Chang (2013) on the effect of size-fractionated fish protein hydrolysate on fish growth. The authors argued that fish hydrolysate contains some molecular weight compounds that contributed to the growth and performance of fish. These suggest that weight/size of fish is determined by specific fish farming methods and diet, which in turn enhance fish marketability. Therefore, there is need to expose fish farmers in Odogbolu Local Government to various feeding formula and fish farming systems that can improve fish weight/size for quality and marketability of fish. Findings from the demographic analysis show that 78.8% of the fish farmers adopt irrigation and ditch pond system. Many studies have identified various fish farming systems that can better enhance the weight and growth of fish for improve marketability (Henry et al., 2015; Mozanzadeh et al., 2016).

The first alternative hypothesis indicates that the educational level of fish farmers has a significant impact on the quality of fish produced in the study area. Hence, the hypothesis is accepted. The second hypothesis stated that quality of feed has significant influence on fish performance, and the hypothesis is accepted. The third alternative hypothesis stated that there is a significant association between fish weight/size and fish marketability in the study area. Therefore, the alternative hypothesis is accepted. These findings further indicate that the acquisition of education and training on methods of fish farming, feeding formula, treatments and use of modern technology will enhance quality of fish and its marketability.

Conclusions

On the basis of the empirical evidence, it could be concluded that involvement in fish farmers training programmes and development have direct relationship with fish farming profitability in Odogbolu local government area of Ogun state Nigeria. This is as a result of the fact that the fish farmers were also substantially involved in the newly introduced fish farming methods that led to high productivity in the fish farming sector. The study established that adequate training and development of fishermen will aid high quality of fish produce in the study area. It is evident that expenditure on training and development can be viewed as resourceful human capital strategy to sustain suitable professionalism presently and in years ahead. Specifically, the analyses revealed that majority of the participants in the study area believed that the uniqueness of farm produce is due to the human capital status of the fishermen. Further, the quality of feed indicated a significant improvement in fish performance. Finally, the study also concluded that fish weight/size will always determine fish marketability.

To be a successful fish farmer in Nigeria that is producing locally with high-rate profitability, there is need to engage in relevant training programmes on quality production of fish in terms of cost effectiveness, quality of feeds and rearing systems. It is essential for fish farmers to understand feeding formula, treatments, use of modern technology and market management as it affects fish production. Therefore, fish farmers must possess the ability to adapt to change and utilisation of modern farming methods and feed formular in fish farming. Farmers are advice to educate themselves through training and development programmes duly design for this purpose, and government should encourage adult education so as to expose them to the benefits embedded in fish farming activities in the research environment.

Fish farmers should see education and fish farming technology as important indices that will enhance their level of exposures and improve their production process with the opportunity to compete favourably in the fish farming market either locally or globally. Government needs to inject funds into adult education and create more awareness of the need to adopt advanced technologies in fish production. The outcome of the research study will be beneficial to agricultural policymakers, government and non-government agencies whose focus is on rural poverty alleviation.

Acknowledgement

Author Contributions: Conceptualization, Methodology, Data Collection, Formal Analysis, Writing—Original Draft Preparation, Writing—Review And Editing with equal contribution. All authors have read and agreed to the published the final version of the manuscript.
Institutional Review Board Statement: Ethical review and approval were waived for this study, due to that the research does not deal with vulnerable groups or sensitive issues. Informed consent was obtained from all the participants in this study, and confidentiality of the participants were treated according to POPIA guidelines.
Data Availability Statement: The data are not publicly available due to privacy of the organisation.
Conflicts of Interest: The authors declare no conflict of interest.

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