FISH LANDING PRICE AND SUBJECTIVE WELLBEING SATISFACTION OF ARTISANAL FISHERS: A CASE OF SELECTED LANDING SITES AROUND LAKE VICTORIA, TANZANIA

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By

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EXTENDED ABSTRACT

The fishery sector contributes enormously to the development of different economies worldwide and specifically to the people engaged in fishing business. However, causations of fish landing prices and their contribution to the individual satisfaction known as subjective wellbeing of fishers remain unknown. The current study assessed the determinants of fish landing prices for subjective wellbeing of artisanal fishers around Lake Victoria, Tanzania. The study specifically, (i) examined the determination of fish landing price around Lake Victoria; (ii) examined the effects of fish attributes on the landing price; and, (iii) analysed the effects of fish landing price on the subjective wellbeing of artisanal fishers. The study was conducted in Mwanza region and the cross-sectional research design was employed. Purposive sampling was used to select two Districts, Sengerema and Buchosa. A total of six landing sites were selected purposely because of being active in the landing activities and the sale of landed fish. Proportionate sampling followed by simple random sampling procedure was used to select 300 respondents from landing sites. Quantitative and qualitative data were collected using a questionnaire, focus group discussion, and a checklist for key informant interview. The collected data were analysed using descriptive and inferential statistics. The descriptive statistics were used to identify methods of fish price determination. The results showed that, the most preferred methods in some of the landing sites were formal negotiations with processors (8%), consultation with other traders (73%), informal negotiations with buyers (78.3) and Beach Management Unit (BMU) (21%). Hedonic price function was employed to examine factors influencing landing price. Hours spent from fishing location in the lake to onshore landing sites showed a negative influence on landing price; information on market price and experiences of fishers showed a positive influence on landing price and were found to be statistically significant ($P<0.05$). The log-linear multiple regression model was employed to examine the effects of fish attributes on the landing price. The results showed that fish freshness for fish landed at the island, the quantity landed at onshore island market, preserved fish as well as fish size, weight, and freshness at mainland landing ground were statistically significant attributes ($P<0.05$). The ordered logistic regression was employed to make inferences with respect to effects of fish landing price on the subjective wellbeing of fishers. The results showed that fish landing price was statistically significant ($P<0.05$). This study concluded that there are established ways of determining fish

prices around Lake Victoria, and these are influenced by monopolistic behaviour of middlemen during price setting. Also, this study concluded that, subjective wellbeing of fishers is influenced by the fish landing price. It is recommended that, the Ministry of Agriculture Livestock and Fisheries should facilitate the dissemination of market price information for a minimum selling price per fish quality standards, improving artisanal fishers' capability on pricing negotiation via BMU. Artisanal fishers are recommended to use improved preservation methods to maintain fish quality, and use of efficient fishing vessels that reduce transportation time. Further, policies and actions recommended on fish price should be set in accordance with the quality of fish attributes through collective agreement between artisanal fishers and buyers. Furthermore, artisanal fishers can come together and form co-operatives for collective purchasing of fishery equipment that can accommodate reasonable sizes of landing fish. They should participate in contractual agreements that allow setting up of minimum fish landing price as a means of capability increase in determining landing price and improvement of subjective wellbeing satisfaction of artisanal fishers.

DECLARATION AND COPYRIGHT

I, Damian Sambuo, hereby declare to the Senate of Moshi Co-operative University that the publishable manuscripts that make this thesis is my original work done within the period of registration and that it has never been submitted and will not be submitted for a degree award in any other institution for a similar or any other academic award.

Signature _____**Date**_____

CERTIFICATION

The undersigned certify that he has read and hereby recommend for acceptance by the Moshi Co-operative University a Thesis titled "Fish Landing Price and Subjective Wellbeing Satisfaction of Artisanal Fishers: A Case of Selected Landing Sites Around Lake Victoria, Tanzania" in fulfillment of the requirement for the award of a degree of Doctor of Philosophy of Moshi Co-operative University.

Dr. Kitala C. T. Malamsha
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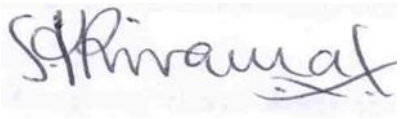
Date



26th May 2021

Dr. Stephen.L. Kirama
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Date

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DEDICATION

I dedicate this work to my Mother, Ernesta Isaack Malya, who took care of me and laid the foundation of my education to the completion of my doctoral studies.

I also dedicate this work to my lovely family, Furahini (Wife), Blessing (Daughter), Godbless (Son), and Alphabless (Son) for their love, caring and utmost patient when I was away and cheering me up when things were not working as planned. You are always awesome and great to me.

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ASDP	:	Agriculture Sector Development Programme
BMU	:	Beach Management Unit
BOT	:	Bank of Tanzania
DC	:	District Commissioner
DED	:	District Executive Director
FAO	:	Food and Agricultural Organization
FGD	:	Focus Group Discussion
GDP	:	Gross Domestic Product
GLMM	:	Generalised Linear Mixed Model
KII	:	Key Informant Interview
MoCU	:	Moshi Co-operative University
NBS	:	National Bureau of Statistics
OLS	:	Ordinary Least Square
PhD	:	Doctor of Philosophy
PTT	:	Price Transmission Theory
RAS	:	Regional Administrative Secretary
RC	:	Random Coefficient
SDT	:	Self-Determination Theory
SWB	:	Subjective Wellbeing
SSI	:	SWB Satisfaction Index
TAFIRI	:	Tanzania Fishery Research Institute
TZS	:	Tanzania Shillings
UN	:	United Nations
URT	:	United Republic of Tanzania
US$	:	United States Dollar
VIF	:	Variance Inflating Factor
WEMWBS	:	Warwick-Edinburgh mental well-being scale

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Worldwide, causation of fish prices variation has been a challenge over the years. Different studies including Gobillon *et al*. (2017), Hammarlund (2015), Lee (2014), McConnell and Strand (2000) employed various approaches in assessing different factors causing variation of fish market prices. These previous studies were across other countries, limited to specific species and were inconclusive with respect to factors that influenced the determination of fish landing price for the selected fish species around Lake Victoria, Tanzania. There are around 34 000 fish species worldwide living in fresh and salty waters. Traded fish for human consumption are recognized and valued through features and quality or characteristics known as fish attributes (FishBase, 2018; Maciel *et al*., 2013).

According to studies (e.g. Gobillon *et al*., 2017; Hammarlund, 2015; Lee, 2014; McConnell and Strand, 2000), fish landing price is a price of fish valued and/or varied based on factors such as fish size, freshness of fish, fat content, days spent under storage, type of fishing vessels, grades, distance and location to offshore island, and onshore mainland landing centres. As for species-specific distinction, Gobillon (2017) looked at Sole and Monkfish species; Hammarlund (2015) looked at Baltic cod; and Lee (2014) focused on Atlantic cod. These studies however focused on industrial fishing and on agents selling fish in auction markets ignoring artisanal fishing.

According to Kambewa (2007), artisanal fishers are individuals who have fishing and trading experience ranging from two to over 40 years. Therefore, empirical information on how landing price is determined with respect to available fish species by artisanal fishers around Lake Victoria remains unknown. Other factors that influence the determination of landing fish prices include appearance, quantities available, the number of buyers, sellers and management facilities (Janssen *et al*., 2001). Because the price of a specific product is determined by its internal and external factors, as well as observed and unobserved attributes (Nguyen, 2011), some studies focused on quality based attributes in determining fish prices (Lee 2014; Roheim *at al*., 2007). Given the foregoing observation, there is no empirical information on the relevance of the mentioned factors, attributes or similar factors in

determining landing prices of fish found around Lake Victoria, Tanzania. This is because fishery activities around Lake Victoria, Tanzania differ from activities in other countries, as the lake is endowed with such species as Nile Perch, Nile Tilapia and Sardines (locally known as "*dagaa*") and that fishing is mainly conducted by artisanal fishers. Another difference is that Nile Perch and Nile Tilapia are traded locally while some are exported to the European Union Markets (FAO, 2003). Therefore, the mentioned factors or similar factors and attributes in industrial fisheries are assumed not to apply in artisanal fisheries around the Lake Victoria, Tanzania, which is the study focus.

This study was designed to fill this knowledge gap by determining the methods, which are used to set fish landing price and to analyse factors influencing fish landing price around Lake Victoria, Tanzania. With regard to factors and fish attributes, which were not addressed by previous studies, this study uncovered how the market price information, preserved fish and fish weights can influence fish landing price.

Determination of fish landing price is also associated with uncertainties that cause difficulties in having proper methods to determine fish landing price (URT, 2014; Kambewa, 2007), and thus preventing, artisanal fishers from getting paid better prices. Artisanal fishers are fishers whose fishing is primarily for local consumption and thus use relatively small amounts of capital (FAO, 2014). A large part of their catch is for local markets at landing sites, which are influenced by uncertainties (Hoof and Kraan, 2017). According to Kambewa (2007), uncertainties are attributed to persistent challenges such as, unequal fisher-buyer price negotiations skills, criteria used to set volume of catch and types and availability of buyers. These uncertainties have an insecure significant relationship with the satisfaction of fishers in life, termed as wellbeing. Thus, the ways landing price is determined remains unclear and the subjective wellbeing (individual satisfaction) of fishers remains illusive (Bergman, 2012; Phillips and Subasinghe, 2010; Monson, 2009; Janssen *et al.*, 2001).

Many methods are used to determine commodity price to reduce these uncertainties. However, methods such as cost-based pricing, customer-value based pricing

(demand-based pricing), competitive-based pricing and psychological pricing (Nagle and Müller, 2017; Ingenbleek *et al*., 2013; Johansson *et al*., 2012; and Hinterhuber, 2008) are useful in industrial fishing but are rarely documented in determining landing price in artisanal fishing due to inadequate access of input factors to influence harvesting of fish among artisanal fishers around Lake Victoria, Tanzania. The factors such as limited access to production facilities, idiosyncratic preferences, lack of improved skills, poor access to fishery assets and poor access to latest technology are input factors cause uncertainties in determining fish landing price hence influencing subjective wellbeing of artisanal fishers (Hou and Westbrook, 2014; Britton, 2013; Luomba, 2013; Bergman, 2012; Phillips and Subasinghe, 2010).

Schuurhuizen *et al.* (2006), argue further that Lake Victoria fish landing sites are dominated by many agents of the processing industries. The domination is set through agent-market systems whereby fishing activities by artisanal fishers depends on outsourced loans from agents to enable them (fishers) accessing fishing gear and vessels such as nets (gillnets, trawl), hooks, lines, canoes and boats. This in turn reduces artisanal fishers' power during price negotiations and subjective wellbeing satisfaction. Therefore, this study explored methods used by artisanal fishers to determine fish landing price around Lake Victoria, Tanzania.

However, according to the Easterlin Paradox (Easterlin, 2001 and Easterlin, 1974), accurate determinants of subjective wellbeing remain inconclusive. Subjective wellbeing (SWB) is the evaluations of the order of individual needs or level of satisfaction when needs are met (Dimoso, 2009). The evaluation of needs satisfaction is based on individual perceptions by cognitive judgments of their life emotions and moods they experience on a given phenomenon (Conceição and Bandura, 2008; Kahneman and Krueger, 2006). The needs are in terms of materials (for example income, facilities, and other resources), relation with others, autonomy, health, and feeling about quality life (Britton, 2013; Hallerod, 2013). Therefore, meeting the best landing price is need of a quality life experience and feelings requirement for the subjective wellbeing satisfaction that remains as a need among fishers. Other factors which form part of autonomy, material and quality life needs that contribute to SWB satisfaction, and which need to be taken on board as identified by Cummins (2014) and Janssen *et al*. (2001) include the association of price determinations, income, and

attributes of goods during trading by a buyer. Therefore, in this respect, this study assumed that artisanal fishers obtain other benefits such as income-earning, acquisition of assets, and other social aspects that could improve their SWB satisfaction during fish trading.

In another study, Dolan and Metcalfe (2012) identify three broad measures of SWB which are the evaluation of individual life satisfaction, experiences which measure pleasurable or feelings and eudemonic which measure psychological needs such as autonomy, control and/or connectedness. In this study, subjective wellbeing is defined as the evaluation of benefits including experience in determining fish landing price acquired by a fisher as a need in attaining maximum satisfaction in the fishing sector. Using Dolan and Metcalfe (2012) three broad measures, Subjective wellbeing in this study is measured by ranking artisanal fishers' life in accordance with the order of their satisfaction in fishing activities, experiences in the determination of fish price as well as their views about autonomy in determining fish landing price. Therefore, it is important to assess the manner fish-landing price is determined and its effects on the subjective wellbeing of artisanal fishers around Lake Victoria, Tanzania.

Apart from individual benefits, there are also national and global benefits of subjective wellbeing the fishing sector provides, therefore motivates undertaken of this study. These benefits include economic development of different countries through provision of employment opportunities, food and increased returns on resource use (Luomba, 2013). Global statistics show that Africa's fishing production was 10.4 million tonnes and US$ 164.1 billion of the world value of fishery output in 2018. More than 3.3 billion people in the world had almost 20 percent of their average per capita intake of animal protein (FAO, 2020). In Tanzania, the fishing sector contributed about 2.5 percent of the real GDP (BOT, 2017), and employed more than 4 million people countrywide. Around Lake Victoria alone, 104 000 people are directly employed and about 500 000 are indirectly employed in fishing business (Luomba, 2013; URT, 2010; FAO, 2003). Despite of Tanzania is surrounded by several Lakes and Indian Ocean to enhance fishery activities, economic comparative analysis with other African counties and the rest of global countries is not the scope of this study. This study is focused at individual level on

benefits of artisanal fishers. Following the substantial contribution of the fishing industry to the economy, the Tanzanian Government facilitated the construction of storage facilities at the landing sites. This was done through installation of ice plants, refrigeration cold storages for fish, provision of vehicles and rehabilitation of fish market places at 20 landing sites surrounding Lake Victoria to enhance the market and fish value (URT, 2014). According to Hou and Westbrook (2014), the market enables fishers to identify, communicate, and maintain contact with buyers usually at the agreeable price, thus obtaining income from selling fishes and therefore achieving their subjective wellbeing. Besides the construction of marketing centres, the government has also made some effort of ensuring sustainability of the fishery market in areas around Lake Victoria including establishing of fish labelling (Roangead, 2013).

Despite the importance of fishery sector and efforts made by the Government of Tanzania in investing in the sector, there is a missing evidence on literature regarding methods used to set the fish-landing price, factors as well as fish attributes influencing landing price of fishes around Lake Victoria, Tanzania. Therefore, this study aimed at filling this knowledge gap by investigating the methods of determining the landing price. The study also investigates fish attributes including, preserved fish and weighted fish measure as attributes, which were not covered in the previous studies. Moreover, this study focused on the relationship between landing price and subjective wellbeing with reference to the Easterlin Paradox (Easterlin, 2001; 1974).

1.2 Problem Statement

Despite that many efforts of determining fish landing price at landing sites have been made to improve wellbeing of fishers around Lake Victoria, the determination of fish landing price has remained unclear. There have not been seen any studies that directly assess methods, factors and attributes in determining landing price around Lake Victoria, Tanzania and the subjective wellbeing of fishers remained unknown disregard majority are said to be poor (NBS, 2019; Chandrashekar, 2014; Luomba, 2013). Moreover, issues on availability of buyers, the volume of catches required, size of fishes, fishing vessels, price information and availability of different fish species that affect volume of specie specific to be landed, remained a challenge to

meet buyers/agents demands. Fish species have different quality attributes for trading and exporting which could be useful opportunities to influence fish landing prices, but the influence of fish attributes to fish landing price also remained unclear (Luomba, 2013; Kambewa, 2007). The fish landing price remained unattractive to fishers and its effects on the subjective wellbeing are rarely known. For example, the Nile perch landing price in 2003 ranged between TZS 3 000 and 4 000 per kg, while consumers paid between TZS 7 000 and 11 000 per kg (Henson and Mitullah, 2003).

Moreover, after removing all overhead costs, Sardines generated an average monthly income of TZS 67 643 and TZS 79 645 for paddled and motorized boats owner's respectively. On the other hand, traders earned an average monthly income of TZS 480 348, indicating a huge income disparity between traders and fishers (Luomba and Onyango, 2012). With regard to landed market size, Lee (2014) found that fishers received prices that were approximately US$ 0.20 per kg, which was equivalent to TZS 450, lower than the price of the same fish when sold in the next largest market by retailers. Therefore, this study uncovers the dispersed income, used in this study as material needs causing variation of subjective wellbeing satisfaction levels as influenced by landing price determination.

Other studies outside Lake Victoria also revealed that the causes of low fish price included among others the failure of agents/buyers to transfer the increase in buying prices from processors to fishers, which created asymmetric price information. Other causes included limited access to fishing vessels, lack of improved skills and, inadequate use of improved technology (Luomba, 2013; Kambewa, 2007), variation in fish species and quality attributes, different market size, varying fish size, demographic, and fishery management of system (Gordon and Maurice, 2015; Hammarlund, 2015; Lee, 2014; Roangead, 2013; Bergman, 2012; FAO, 2003; Henson *et al*., 2000). However, low price benefited fish buyers/agents and generated meagre benefits to fishers thus not meeting subjective wellbeing satisfaction among fishers (Gordon and Maurice, 2012; Gupta, 1984). Pollnac and Poggie (2008) argue that, despite the low income earned, artisanal fishers are unable to quit fishing business.

This trend therefore calls for a serious re-think on policy towards fish landing price determination and fishers' satisfaction in fishery occupation. Therefore, the overarching questions in this study include, how do fish attributes influence the determination of fish landing price, and why are fishers are still pursuing fishing activities despite being displeased with the paid landing price? Therefore, the study on which this thesis is based aimed to assess the determination of fish landing price around Lake Victoria, Tanzania.

1.3 Justification for the Study

The study was worth conducted because some previous related research studies have focused on socio-economic, welfare, food security, trading, and export and value chain of fishers in Tanzania. Some of these studies include fishery resources and welfare study in rural Zanzibar by Mkenda (2001); technical efficiency of small-scale fishing households in Tanzanian coastal villages by Sesabo and Tol (2007); the effects of compliance with food safety standards on costs, benefits, and organization of Nile Perch export supply chain in Tanzania by Mpenda (2010). Others are Nile Perch export and welfare around Lake Victoria by Bergman (2012), assessment of socio-economic status of fishers' communities in Lake Victoria in relation to poverty by Luomba (2013), and a baseline study on Nile Perch value chain in Tanzania by Rongead (2013). The reviewed literature from the studies mentioned, informed this study that they did not focus on the effects of the fish-landing price on the subjective wellbeing of artisanal fishers.

Although few of the previous review studies (Gobillon *et al.*, 2017; Hammarlund, 2015; Lee, 2014; McConnell and Strand, 2000) made some generalization that the income of fishers varies at the regional and local levels, they failed to report on the contribution of landing price on the subjective wellbeing of fishers. This is an information knowledge gap, which was set to be filled by the present study. The knowledge is useful in supporting policymakers, researchers, and academicians to make investment decisions in the fishery sector at the local and export fish markets. The identified knowledge gap, therefore, necessitated the undertaking of the study.

Understanding of the effects of fish landing price to the subjective wellbeing of artisanal fishers positioned this study to contribute towards socio-economic development of the marginalized local fishers. This study aligns with policies, programmes, and strategies that aim to develop a sustainable, competitive, and more efficient fisheries and aquaculture industry in Tanzania. Among the policies and programmes are National Fisheries Policy of 2015 (URT, 2015) which stated that the market and storage facilities are crucial in influencing growth of fishery sector; Agriculture Sector Development Programme Phase Two (ASDP II) which necessitate the action areas for research on fisheries (URT, 2016). It was observed that there are untapped potentials in the fisheries sector and that the sector has been dominated by small-scale fishers and fish farmers who normally use traditional technologies. Therefore, through policy and programme interventions on fish price determination, improved fish land price can influence fishers' life satisfaction.

Further, understanding of the effects of landing price on the subjective wellbeing of fishers would indicate the contribution of the fishery sector towards realisation of the national development vision 2025 (URT, 2016). In addition, the study is in line with UN (2016) Sustainable Development Goal Number 14 that targets on providing access of small-scale artisanal fishers to marine resources and market aimed at improving subjective wellbeing of artisanal fishers.

1.4 Objectives of the Study

1.4.1 Main objective

The main objective of the study was to assess the determination of fish landing price around Lake Victoria, Tanzania.

1.4.2 Specific objectives

The specific objectives of the study were:

(i) To examine factors influencing fish landing price determination around Lake Victoria,

(ii) To examine the effects of fish attributes on the landing price, and

(iii) To analyse fish landing price effects on the subjective wellbeing of fishers

1.4.3 Research questions

In order to examine fish landing price determination around Lake Victoria, the following research questions were developed:

(i) How do fishers determine landing price?

(ii) What are the factors affecting fish landing price?

1.5 Hypotheses

The stated relationship between independent and dependent factors from the study objectives based on guiding theories and the underlying assumptions requires statistical hypothesis testing. Therefore, the following null hypotheses were tested:

$H0_1$: Fish attributes do not influence landing price of fish.

$H0_2$: Landing price of fish does not influence the subjective wellbeing of artisanal fishers.

1.6 Theories Underpinning the Study

The study was guided by Price Theory and supported by Price Transmission Theory (PTT), and Utility theory (Odemero, 2013; Nguyen, 2011; Kahneman and Thaler, 2006).

1.6.1 Price theory

The theory of price validates the price for any specific commodity in connection with supply and demand of that commodity. According to this theory, the price of the commodity is obtained at a point that utility-bearing attributes of that commodity is not only valuable to individual buyers' demands but also it complies with the sellers. This is known as the optimal market price (Nguyen, 2011). The foundations of valuation of a commodity for its utility-bearing attributes and prices vary with the change in the number of attributes associated with it; and these dates back to the demonstration of Rosen (1974) and are known as hedonic price theories. Hedonic price model relies on attributes, characteristics or factors that influence commodity valuation, which assumes that consumers' utility is derived directly from the quality attributes in a commodity (Rosen, 1974). Therefore, hedonic pricing techniques are based on a theory of consumer behaviour which suggests that people value a good because they value the attributes of the good rather than the good itself. The model is relevant to this study because landed fish have different attributes (heterogenous

characters) in the market with no common price. Thus, consumers can choose any bundles of attributes they wish to maximize utilities based on their constrained income (McConnell and Strand, 2000; Kristofersson and Rickertsen, 2004).

The importance of the relationship between quantities of attributes and commodity prices was also demonstrated in studies of supply and demand for fish with specific attributes. These studies include Brayden *et al.* (2018), Bronnmann and Hoffmann (2018), and Johnston *et al.* (2001), which focused on the valuation of fish attributes that have value to the consumer by employing the demand theory.

Others studies include Kristofersson and Rickertsen (2004), Brummett (2000), McConnell and Strand (2000), which focused on the supply theory. It is assumed that an increase in the supply of commodity with specific individual attributes affects prices (Kristofersson and Rickertsen, 2004). Moreover, during the supply of fishes, fishers may have control of harvest and the cost of harvesting, but it is important to understand that fish price received by fishers may also be influenced by monopoly, strategic pricing, demand, and supply factors (Gordon and Hussain, 2015).

Furthermore, with the assumptions that the price of fish received by fishers is the optimal price and can change when supply and demand change (Gordon and Hussain, 2015), thus the price theory is a useful guide on the evaluation of the effects of fish attributes on landing prices. This theory contextualizes the determination of landing price as basing on the supply and demand of fish, considering attributes such as species, size, freshness, preserved fish, and weight (Alapan *et al.*, 2016; Gordon and Hussain, 2015; Roheim *et al.*, 2007; Kristofersson and Rickertsen, 2004; McConnell and Strand 2000). Preserved fish undergo through different method of preservation, which include freezing, smoking, and sun drying of fish (Matiya, 2010).

The price of a specific product is determined by its internal and external factors, observed and unobserved attributes (Nguyen, 2011). The Price Theory is criticised on grounds that, the resulting prices to be set would always be arbitrary under true uncertainty (Elsner *et al*., 2014). True price valuation cannot perfectly be determined by considering fish attributes; other factors have to be employed during price

determination. However, the key feature of price theory is the assumption that implicit price is a function of its fundamental attributes (Thrane, 2005).

To understand the impact of attributes on prices for supplying fish within landing sites, it was important to understand how independent variables such as fish species, size, freshness, quantity landed at the market (with category by the location of offshore and onshore landing sites), preserved fish and weight affect landing price as a dependent variable. Thus, the study focused on how freshness, size, species, preserved fish, quantity landed at the market by category, and weighted measures affect landing price. Therefore, in this study, fish price valuation is determined by considering fish attributes and other factors.

1.6.2 Price transmission theory

Price transmission theory governs understanding of change of input price factors in a variety of areas including resource allocation, production technique, pricing adjustments, and quantity produced to fishers as a firm. This theory was put forward by Odemero (2013) in understanding price transmission and households' demand elasticity for frozen fish. Price transmission refers to the effect of prices at one end of the market to the other end of the market. On the other hand, Minot (2009) describes the percentage change in price at one end of the market given a 1 percent change in the price at the other end of the market. Analysis of Price transmission from the producers to the market may be due to a range of factors such as change of market power, subsidy, and policy reform (Aguero, 2007; Meyer and Cramon-Taubadel, 2004).

Price transmission assumes that changes of output prices depend on changes of inputs price flow-in and it is also possible that changes in input prices to be caused by the flow of changes of output prices flow in, for example by demand shifts can be transmitted to input prices (Meyer and Cramon-Taubadel, 2004). Therefore, distance to onshore and offshore markets, storage facilities, weighted scale, and the number of buyers are the price factors examined by the present study that could affect changes in fish landing price. Others include the availability of agents, middlemen, the cost of transporting fish, market price information available in the area, and social

demographic characters of the fishers (Aguero, 2007; Meyer and Cramon-Taubadel, 2004).

Regarding the fishery community, price transmission due to fishery input compensation provided by agents affects the final price given to fishers (Odemero, 2013). On the other hand, the changes in the output prices from processors to agents or middlemen might not affect fish prices paid to artisanal fisher's leading to an Asymmetric price transmission, thus, affecting fisher's subjective wellbeing (Aguero, 2007; Meyer and Cramon-Taubadel, 2004). It is assumed, therefore, changes in input or output factors may lead to a change in fish landing price, and analysis of these factors remains of paramount importance to this study.

Therefore, analysis of price transmission is used to guide understanding of how the change in independent variables such as distance to onshore and offshore markets, storage facilities, weighted scale, and the number of buyers is contributing to changes in fish landing price. Others include the availability of agents, middlemen, the cost of transporting fish, the market price information available in the area, and social demographic characters of the fishers.

The shortcoming of this theory can be the omissions of transaction cost by agents. In other words fish agents may be uncertain and raise prices for fearing of being left with fish that end up to deterioration. Therefore, in this study to reduce the omissions of transaction costs, the government intervention and negotiation between producers and buyers are considered useful in mitigating the lowering of prices on the producer' side. Thus, understanding of changes of input price factors from artisanal-buyer linkage was essential in this study.

1.6.3 Utility theory

Utility theory informed that an individual is participating in an activity as a need of attaining subjective wellbeing satisfaction (Ettema *et al*., 2010). These needs are in terms of material, relational and feelings about quality life that must be met (Britton, 2013; Hallerod, 2013) and therefore become satisfied. Since fishers' subjective wellbeing is indicated by valuations of individual life in a given aspect experienced at a point in time (Reyes-García *et al*., 2016; Kahneman, 2006), the valuations in this

study included fishers' satisfactions on feelings and fishing motivation from the landing price of fishes. This theory is a useful guide for understanding how fishers' needs have to be complemented or otherwise from the landing price of fishes around Lake Victoria, Tanzania.

The theory assumes that there is a continuous hedonic flow of pleasure or pain known as experienced utility or progress benefits (Kahneman and Thaler, 2006). This enhances understanding of the diversity and progression of fishers' life valuations and in this case landing price. Valuation is by focusing on the involvement of fishers in determining fish landing price as it influences subjective wellbeing satisfaction, which is also a cause of obtaining other socioeconomic benefits such as the amount of income from determining landing price, service, social bonds strengthened, and fishing resources (Britton, 2013). Therefore, these socioeconomic benefits also form part of fishers' subjective wellbeing (Daw, 2016; Reyes-García *et al*., 2016).

In supporting the Utility theory, Ryan and Deci (2000) on the Self-Determination Theory (SDT) demonstrate that, autonomy brings satisfaction to individuals hence, the achievement of subjective wellbeing. Then, with this assumption, the focus was on landing price and autonomy in determining landing price by fishers, which is the motivation of pursuing fishing business as their main income generation activity. However, the exercise of market power on the determination of landing price associated with changes on loan arrangements and other fishing resources by monopolistic middlemen leads to losses of welfare/subjective wellbeing among fishers (Gordon and Hussain, 2015; Dimoso, 2009; Meyer and Cramon-Taubadel, 2004).

Despite the monopolistic tendency by middlemen, the capability approach as demonstrated by Sen (1985) is useful in understanding the capabilities of fishers in determining landing price. This is because individuals who are unable to participate in such activities due to monopolistic tendency and other limitations are likely to experience lower levels of wellbeing (Delbosc and Currie, 2011; Currie *et al*., 2010). This approach supports the assumptions that fishers' needs include the capability to acquire fishing facilities, vessels, and other resources that are useful for their

capability to determine landing price thereby attaining subjective wellbeing (King *et al.*, 2014).

One of the criticisms of the Utility theory is that, a reasonable approximation to the behaviour of individuals towards satisfaction under conditions of uncertainty cannot be clearly made (Kahneman and Thaler, 2006). Evaluation, experience and eudemonic measures of subjective wellbeing were employed in this study to overcome the weakness in the theory (Dolan and Metcalfe, 2012). The theory is useful to this study because landing price remains important to all fishers. A change of landing price might affect fishers' happiness. Thus, the theory guided the study on understanding how the landing price as well as demographic and other socioeconomic factors including age, household size, education, personal relation, and marital status contribute to the subjective wellbeing of artisanal fishers around Lake Victoria, Tanzania (Pellerone *et al*., 2016; Dimoso, 2009 and Jackson, 2007).

1.7 Conceptual Framework

As indicted in the study background and theoretical reviews several studies have focused on methods and factors of determining fish price. The fish price paid to fishers is among the factors that ideally contribute to subjective wellbeing of fishers with regard to utility theory. In an attempt to combine these concepts, a conceptual framework (Figure 1) was developed to determine the attainments of subjective wellbeing from fish landing price.

It is conceptualized that from the theoretical and empirical review, the factors causing variations in fish landing price include onshore and offshore distances, the number of buyers in the onshore market and offshore market, storage facilities and market price information. Using price transmission theory, it is explained that the change of these factors from the producers to the market may be due to changes on market power, subsidy, and policy reform. On the other hand, literature reveals that apart from various methods used to determine fish landing price, demographic and socio-economic factors also influence determination of variability in landing price (Britton, 2013; Hallerod, 2013; Bjørnskov, 2008; Kahneman, 2006 and Schuurhuizen *et al.*, 2006).

Moreover, empirical review indicates that fish attributes also influence variability in the landing price (Gobillon *et al.*, 2017; Hammarlund, 2015; Lee, 2014; Roheim *et al.*, 2007; McConnell and Strand, 2000). These attributes demanded by buyers based on bore utilities that varied with prices as explained by price theory. Therefore, causal factors of fish prices were the basis for determining value of fish attributes by fishers and buyers during landing (Lee, 2014). The landing price variation is also the subject of the agent system that is buyers' behaviour of dominating and wilding power on price negotiation as well as government intervention on beach management.

The influence of these numerous factors on the price of fish led to the variation on fish price affecting subjective wellbeing of fishers as indicated in Figure 1 (Purcell, 2016; Reyes-García *et al*., 2016; King, 2014; Ruiz, 2012; Kahneman, 2006). Therefore, to enhance achievement of subjective wellbeing of fishers, it was important to consider improvement of landing price determination based on external factors, landing of quality fish attributes based on internal factors and improvising capacity on demographic and socio-economic factors of artisanal fishers.

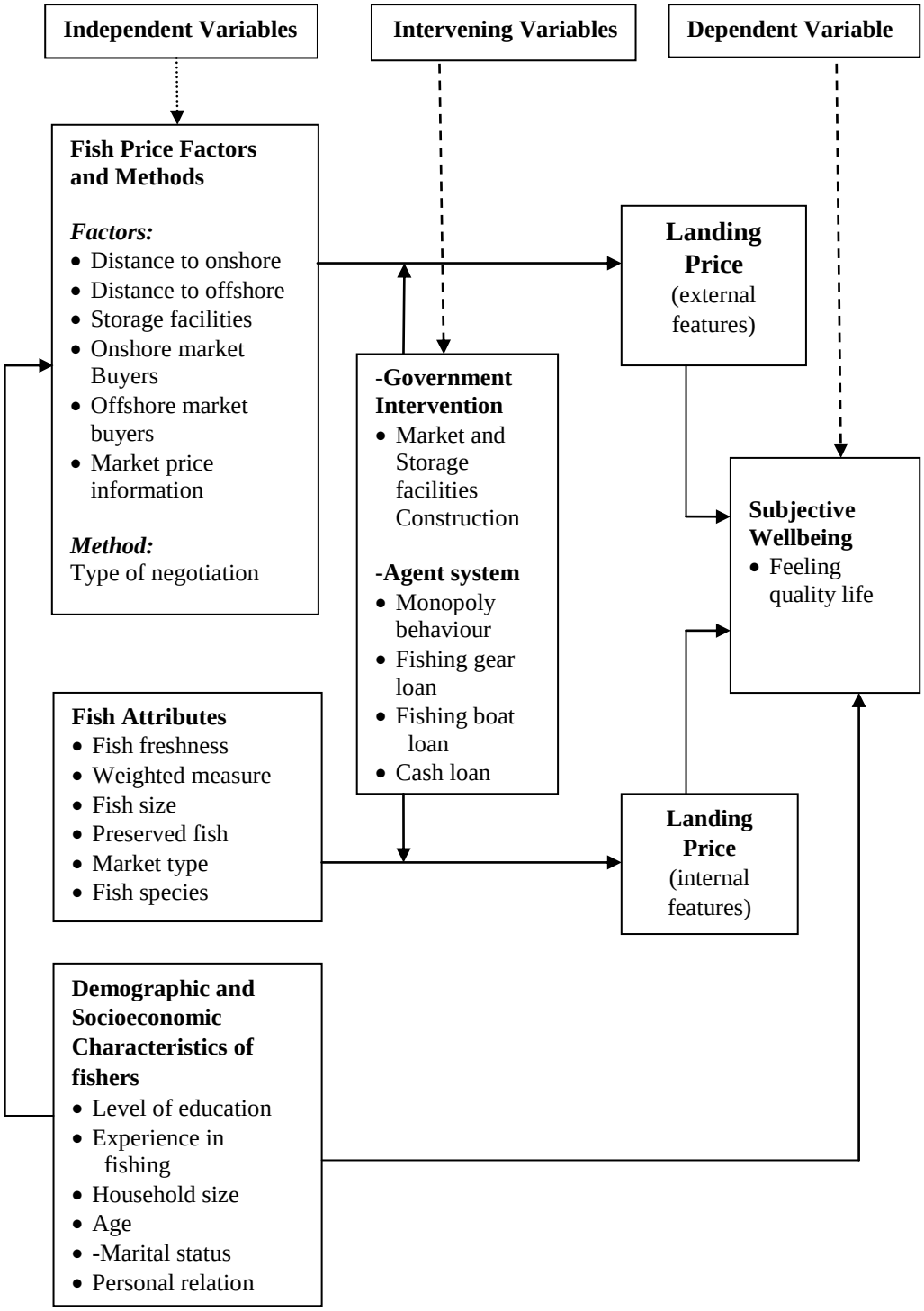

Figure 1 : Conceptual framework for the study

1.8 General Methodology

1.8.1 Description of the study area

The study was conducted around Lake Victoria in Mwanza Region because it is the 'leading fish market stop centre' with seven fish processing industries and therefore surpasses other regions (Kagera, Geita, Simiyu and Mara) surrounding the Lake in fishing, fish landing, trading and exporting of fish (URT, 2017). In addition, Mwanza Region has about 52 942 fishers, but is among the eight poor regions in Tanzania with high poverty rates of 34.6 percent. This is as demonstrated by the existing highest number of poor people including artisanal fishers who live below the poverty line (URT, 2014; NBS, 2019). Two districts within Mwanza Region; Sengerema and Buchosa were purposely selected, based on ranking with a high collection of fish catch and landing sites activeness in the selling of landed fish (URT, 2017). Mwanza Region is located in the southern part of Lake Victoria, about 1 200 – 1 400 metres above the sea level and lies between latitudes $1^0$30' and $3^0$0' South of the Equator and between longitudes $31^0$45' and $34^0$10' East of the Greenwich. The region shares borders with Lake Victoria in the North, Kagera, and Geita Regions to the West, Mara Region to the East, and Shinyanga and Simiyu Regions to the South and Southeastern sides of the region (URT, 2017).

1.8.2 Research philosophy

The research philosophy employed in this study is interpretivist research philosophy that provides guidance on data collection methods, analysis, and recommendations (Saunders *et al*., 2016). Interpretivist paradigm is conceptualized as having a subjectivist epistemology with relativist ontology. Subjectivist epistemology implies a rational belief on qualified standards by individual believer from the surrounding environment. Relativist ontology is the belief that reality is a finite subjective experience and nothing exists outside of our thoughts. In interpretivist, normally knowledge is relative to particular circumstances including historical, time-based, cultural, and subjective. The interpretive paradigm focuses primarily on knowing and describing individual experiences and actions interpreted by individuals as representatives of reality.

During the research process, the researcher made use of the existing empirical studies to construct data collection tools and asked artisanal fishers to identify methods believed to be useful in determine landing price, examined actual fish attributes/factors influencing landing price. Further, this philosophy guided this study on exploring individual's rational beliefs on subjective wellbeing satisfaction levels experienced by artisanal fishers as well as their experiences in the determination of fish landing price.

The scientific approach in this philosophy is based on the assumption that reality from a relativist perspective is not distinguishable from the subjective experience; and that reality is the experiences of the human and human experience is reality (Levers, 2013). Therefore, research methods are embedded in approving or disapproving hypotheses tested from the data collected. Using the same philosophy, the study was guided by the Price Theory and supported by Price Transmission Theory (PTT) and Utility Theory. Theories were used in the formulation of study conceptual framework and in the construction of data collection tools in generating results that contributed to the assumptions held by the guiding theories.

1.8.3 Research design

This study employed a cross-section research design. The design entails collecting, organising, and analysing data from various cases around Lake Victoria at a single point in time. The design was chosen because it is suitable for both qualitative and quantitative data to fit the chosen variables of this study (Saunders *et al*, 2016). Therefore, cross-sectional research design was used in this study because not only the study duration was limited in terms of time, but also it was suitable in examining different variables at the same time (Saunders *et al*, 2016; Bajpai, 2011; Kothari, 2009).

1.8.4 Sampling procedures

To collect pertinent information from respondents, purposive, proportionate, and simple random sampling techniques were utilized. Purposive sampling technique was used to select three active landing sites on landing and selling of fish with non-overlapping trading by artisanal fishers between landing sites in each district. Therefore, six landing sites were included in this study. The selected six landing sites were Busisi, Kijiweni, and Nyakalilo in Sengerema District, and Kanyala,

Itabagumba, and Bulyaheke in Buchosa District. Purposive sampling of the landing sites was assisted by the respective District Fishery Officials. The proportionate sampling technique was used to obtain the respective sample size per landing site, and was later followed by simple random sampling of fishers from each landing site using a lottery approach. Sampling frame were all fishers within the region.

1.8.5 Sample size determination

A sample of 300 fishers was selected (Table, 1), from the 1200 total fishers' population of the two districts (URT, 2014), using a formula by Israel (2013) with 95 percent confidence level and a precision level of $\leq$ 5 percent, which is an acceptable sampling error. Israel (2013) formula is given as $n = N \big/ \left(1 + N\left(e^2\right)\right)$ where N population size, n is the sample size and *e* is the level of precision. From an estimated total population of 1200 fishers from two districts, then $n = 1200 \big/ \left(1 + 1200\left(0.05^2\right)\right) = 300$. To obtain the respective sample size per landing site, sampling frame per landing site was obtained with the assistance from the District Fishery Officers and Ward Executive Officer. Proportionate sampling technique was used with a sampling fractional of n/N = 300/1200 = 0.25 (Table 1). The computation is such that $n = \Sigma n_i$ but $n_i = 0.25 \times N_i$ where by $i = 1,2 \ldots 6$. This study presumed sites as centres where initial buyers, who may also be middlemen, meet fishers offloading fish species from the known sites.

Table 1 : Sample size determination

Landing site	Sampling frame	Sample size
Busisi	$N_1 = 254$	$n_1 = 63$
Kijiweni	$N_2 = 184$	$n_2 = 46$
Nyakalilo	$N_3 = 118$	$n_3 = 30$
Kanyala	$N_4 = 296$	$n_4 = 74$
Itabagumba	$N_5 = 156$	$n_5 = 39$
Bulyaheke	$N_6 = 192$	$n_6 = 48$
Total	**N=1200**	**n=300**

1.8.6 Data collection methods and tools

The data requirements of the study were both primary and secondary source of data. The study was guided by quantitative data. Qualitative data were also collected to enrich the quantitative results of this study as recommended by Wisdom and Creswell (2013). Quantitative data were collected by enumeration of the artisanal fishers to gather information related to socio-demographic characteristics of fishers, landing prices, determination of landing price, fish attributes, SWB satisfaction, and the contribution of other benefits gained to influence satisfaction of fishers' lives.

Questionnaire was used to collect quantitative data, but before its administration, a questionnaire was pre-tested to 15 randomly selected respondents (5% of total respondents) to identify and rectify unfamiliar terms used therein, checking for clarity or ambiguity of questions and duration of interviewing one person. The questionnaire was then improved accordingly before it was used for actual data collection. A study involving 300 respondents was later conducted to fishers selected randomly, using a rectified questionnaire from six landing sites.

During actual data collection, qualitative data were collected using Focus Groups Discussion (FGD) and Key Informant Interviews (KII) to support the results on quantitative data. FGD data saturation or thematic saturation codes (Hennink *et al.*, 2019) examined include methods, factors, and attributes used to determining landing price as well as landing price effects on SWB of artisanal fishers. Data saturation or thematic saturation refers a point when issues begin to be repeated during discussion time when collecting data and additional data collection becomes redundant. To reach meaning saturation, that is, gaining the conceptual depth of the issue identified, six FGDs, one at each landing site consisting of eight artisanal fishers, were conducted.

Key informant interviews (KIIs) were conducted to supplement information collected through FGDs and the questionnaire, particularly on themes, facts, and figures of fish attributes, demographic features of fish species, and landing prices. Key informants were selected using purposive sampling techniques and constituted leaders from fishers, one buyer from Sengerema, one agent from Buchosa, two Beach Management Unit (BMU) leaders, two District Fishery Officers, one representative

from the Tanzania Fisheries Research Institute (TAFIRI) and two Village Executive officials, amounting to 12 key informants.

1.8.7 Data analysis

The study employed quantitative data analysis. During the actual data collection, 289 out of 300 fishers, which is 96 percent response rate, completed the questionnaires, and these were used in the analysis. The remaining incomplete questionnaires were discarded. This was in line with the suggestion by Evans (1991) that a high response rate (> 80%) from a sample is preferable.

For effective understanding and exploration of findings from quantitative data, qualitative data analysis was carried out to give implications from the collected quantitative results using quotations and tabulated transcripts (Wisdom and Creswell, 2013). The analysis of qualitative data followed transcriptions, classification and manual coding of the field KIIs and FGDs transcripts, notes, and recorded audio, images, and text documents. Thereafter common themes from the coded data were identified, compared, and linked with the study objectives. The data were then summarised using key quotations and tabulations from the transcript in order to highlight themes within the findings (Wisdom and Creswell, 2013). Data were analysed using the described procedure and as per study objectives.

The first objective was to examine fish landing price determination around Lake Victoria, specifically understanding the methods used on fish price determination, and factors presumed by fishers to influence landing price. The factors (Table 2) included were distance to onshore landing, onshore market, market price information, transport vessels, education level, seasons, and experience in fishing. Moreover, multiple regression analysis, which followed a modified hedonic model as put forward by Janssen *et al*., (2001), was used to determine the influence of the presumed factors in affecting fish landing price. Therefore, multiple regression analysis was carried out using the following equation (1):

$$PRICEF = \beta_0 + \beta_1 DONSH + \beta_2 ONMARKT + \beta_3 MARKCHAN + \beta_4 EDUH + \beta_5 SES + \beta_6 DISTRAN + \beta_7 TVESSEL + \beta_8 YEXPER + \varepsilon \quad (1)$$

Whereby:

β_0	=	Constant or intercept of the coefficient
ε	=	Error term
$\beta_1 - \beta_8$	=	Regression coefficients

Table 2 : Variable definition and the measurements on factors presumed to affect landing price

Variable Description	Variable Name	Type of Variable	Meaning of Variable	Expected signs
Landing Price	PRICEF	Continuous	Price per kg of a fish in TZS at the on-spot market	+
Hours spent to reach onshore landing centres	DONSH	Continuous	Hours spent from fishing location to reach onshore centers	-
Onshore Market	ONMARKT	Continuous	Number of Buyers at onshore	+
Market Price Information	MARKCHAN	Continuous	Number of contacted buyers to provide market price information	+
Transport distance	DISTRAN	Continuous	Distance from onshore to the market centers (km)	-
Seasons	SES	Dummy	Favourable and unfavourable weather condition measured as dummy variables	+
Transport vessel	TVESSEL	Continuous	The cost of acquired fishing transport vessel in TZS	-
Education	EDUH	Continuous	Years spent in school	+
Experience in fishing	YEXPER	Continuous	Years of experience in fishing	+

The second objective was to examine the effects of fish attributes on landing price; two stages approach of the fundamental theory of hedonic price function was employed (Hammarlund, 2015). The first stage, is the price (p) of a commodity, which is the function of its attributes such that $p = f(x)$ and the second stage is the implicit price of a commodity, that is, how changes in each of commodity attributes will lead to changes in price. Ordinary Least Square (OLS) was used to estimate hedonic regression analysis of landing price on fish attributes. Therefore, the fish attributes extracted and used in this study were freshness, size, species, preserved fish, quantity landed at given market category, and the weight measured.

The variable freshness is one of the attributes correlating with landing price fluctuation (Lee, 2014). In this paper, due to challenges of measuring nautical miles travelled, the freshness of the fish was measured in terms of hours spent to reach either offshore islands or onshore mainland landing sites, termed as "trip duration" (Lee, 2014; Lokina, 2009). Therefore, in the scope of this study, freshness is defined as retained quality taste of the harvested fish from the lake before spoilage to the time it is purchased by the primary buyer. To analyse the relationship between freshness and landing price, it was considered essential to establish a freshness benchmark in artisanal fisheries.

Therefore, during FGD, a consensus was reached that, taking other factors constant, freshness lasts for four hours at ambient temperature; and thereafter the fish start to deteriorate and spoil. The island freshness variable applies to fish sold on the islands, while the mainland freshness variable applies to fish originally sold on the mainland landing sites. Landing sites have different number of buyers, sellers, and seller-buyer relationship that cause variance in fish landed price. Therefore, the quantity of fish landed at different Islands and Mainland markets is included as an attribute variable to account for the catches landed at different landing sites, on offshore landing sites, onshore landing sites, or on the local markets. Table 3 presents a summary of the variables used in the analysis for second objective.

Table 3 : Variable definition and the measurements of fish attribute affecting landing price

Variable Descript	Variable Name	Type of Variable	Meaning of Variable	Expected signs
Landing Price	LP	Continuous	Price per kg of a fish in TZS at the on-spot market	+
Island Freshness	SF	Continuous	Hours spent in a distance trip to reach the island	+
Mainland Freshness	IF	Continuous	Hours spent in a distance trip to reach mainland	-
Quantity landed on Island	QL_i	Dummy	Quantity of fish landed, equals to 1 if catches were landed on Island landing site and 0, otherwise	+
Quantity landed on mainland	QLm	Dummy	Quantity of fish landed, equals to 1 if catches were landed on mainland landing site and 0, otherwise	-
Preserved fish	PF	Dummy	Equal to 1 if fish preserved and 0 otherwise.	+
Fish Size	FZ	Continuous	Fish size is measured as number of fish sold in kg, per artisanal fisher	+
Weighted Measured	WM	Dummy	Equal to 1 if weighted scale results are acceptable and 0 otherwise.	-

Local market places are inland locations near the Lake with easy access for artisanal fisher where additional commodities are sold. Another variable is the preserved fish, which was included to consider the quality of fish in different forms of preservation methods including freezing, smoking, and sun-drying. This variable was constructed to account for fish perishability and its effect on the price that a buyer was willing to pay. In addition, fish size was included to account for various sizes of fish.

Therefore, multiple regression analysis was done using the equation:

$$p_j = \beta_i x_i + \mu \quad (2)$$

where:

x_i is the i^{th} attribute of fish x,

p_j is the price of j^{th} fish per kilogram per artisanal fisher,

β_i are the coefficients of the attributes, and

μ is a random factor influencing the price of the fish.

With the change of fish attributes in the quantities during the supply of the fish, then inverse attributes demand estimation is possible using the following equation:

$$\beta_m = Vq_m + \mu_m \quad (3)$$

where:

β_m is the observed fish price of m^{th} attribute,

V is a coefficient of quantities supplied of different fish attributes,

q_m are quantities supplied of different fish attributes, and

μ_m are unobserved factors influencing the price of the fish attributes

and the two equations (2) and (3) are estimated simultaneously in equation (4) by using a random coefficient model (RC) (Hammarlund, 2015):

$$p_j = \rho x_i + V x_i q_i + x_i \mu_i + \varepsilon_i \quad (4)$$

Where by:

$V_i = \frac{\Delta p_j}{\Delta x_i q_i}$ is the marginal implicit price for any attribute of the fish (Taylor, 2003)

$x_i \mu_i + \varepsilon_i$ is the random part of the estimated model

$\rho x_i + V x_i q_i$ is the interaction part of the fish attributes for catches

Random Coefficient (RC) model was also employed to consider the inverse attributes demand estimations. Therefore, equation (5) is a formed multiple regression equation and was transformed to natural log regression (log-linear model) which is a simpler form used in this study and is more accurate for unobserved influential variables, measurement errors, extracting outlaying data and creating normality among variables (Slade, 2000).

$$\ln LP = \beta_0 + \beta_1 \ln IF + \beta_2 \ln SF + \beta_3 QL + \beta_4 PF + \beta_5 \ln FZ + \beta_6 WM + \varepsilon \quad (5)$$

LP = Landing price per kg of fish in TZS at the on-spot market
β_0 = The estimated constant
β_1-β_6 = Represent parameters of estimated coefficients
ε = Error terms

The third objective was to analyse the effects of fish landing price on the subjective wellbeing (SWB) of fishers. The dependent variable is SWB life satisfaction. With the existing limitations of measuring SWB (Cummins, 2014), SWB satisfaction among respondents was measured using evaluation, experience, and eudemonic measures (Michaelson *et al*., 2012; Dolan and Metcalfe, 2012; Layard, 2010). By using experience measures of SWB (Michaelson *et al*., 2012; Layard, 2010), this study developed SWB Satisfaction Index (SSI) from customized feelings items held by the individual in determining fish landing price. The customized items were selected and modified to capture price effect from the Warwick-Edinburgh Mental Well-being Scale (WEMWBS), which is subjective and psychological focus on the aspect of subjective wellbeing (Tennant *et al*., 2007). The indicators included the feeling useful in determining price, feeling relaxed for landing price, dealing with price problems well and thinking clearly to get better price. The classification of the

scores on the index basing on the computed highest scores ranged from none of the time (0), rarely (1), sometimes (2), often (3), and all the time (4). The choice of this 5-point Likert scales suit interval data approximation, improve quality of data and internal consistency (Pontin *et al*., 2013) and both average of individual scores and total scores were employed.

In this study, evaluation measure was adopted as used by Reyes-García *et al.*, (2016) which considered a typical question **'**taking everything into account, how satisfied are you in this life in a way you have been living your life for the past twelve months?' Then, the result of SWB was measured as 0 = 'Very Dissatisfied', 1 = Dissatisfied', 2 = 'Satisfied'. The period of twelve months was included to capture the inclusions of other cross-sectional data (Dimoso, 2009). Eudemonic measures employed worthiness on a 0-10 scale, where 0 is not at all worthwhile and 10 is worthwhile in life satisfaction.

The researcher then modified the standard question **'**taking everything into account, how satisfied are you with this life for being useful in determining landing price in a way you are living these days for the past twelve months?'. The ordered logistic regression analysis was employed to follow the assumption of independence among the choices of categorical ordered dependent variables. This assumption states that the choice of or membership in one category is not related to the choice or membership in another category (i.e., the dependent variable) (Guerra-Bustamante *et al.*, 2019).

Further, the enforcement of carrying out application of the ordered logistic regression is the result of Shapiro Wilk (S-W) Test which showed a p-value less than 0.05 ($p < 0.05$) for normality test of the dependent variable indicating that, dependent variable data are not normally distributed.

Then the SWB result is as follows:

$$SWB_i = \begin{pmatrix} 0 = Verydissatisfied \\ 1 = Dissatisfied \\ 2 = Satisfied \end{pmatrix} \quad (6)$$

Therefore, the ordered logistic regression model appears as follows:

$$P_i = E\left(SWB = \frac{1}{X_i}\right) = B_0 + \sum_{i=1}^{n} B_i X_i \quad (7)$$

SWB = 0, 1 and 2 which are expressed in equation (6), X_i are vector of independent variables, B_0 is a constant and $B_i, i = 1, 2, ..., n$ are coefficients of the independent variables to be estimated.

$$P_i = E\left(SWB = \frac{1}{X_i}\right) = \frac{1}{1+e^{-\left(B_0+\sum_{i=1}^{n} B_i X_i\right)}} \quad (8)$$

$$P_i = \frac{1}{1+e^{-Z_i}} = \frac{e^{Z_i}}{1+e^{Z_i}} \quad (9)$$

Where

$$Z_i = B_0 + \sum_{i=1}^{n} B_i X_i$$

If P_i is the probability of agreeing, then $(1-P_i)$ is the probability of not agreeing with life satisfaction. Therefore, the odds ratio for this response appears as follows:

$$\frac{P_i}{1-P_i} = e^{Z_i} \quad (10)$$

The odds ratio presents the ratio of the probability that artisanal fisher responds on the level of life satisfaction to the probability that was not the level of satisfaction attained.

Applying natural logarithm in Equation (10) yields Equation (11) as follows:

$$\ln\left(\frac{P_i}{1-P_i}\right) = \ln e^{Z_i} = \ln e^{B_0 + \sum_{i=1}^{n} B_i X_i}$$

The natural logarithm of *e* itself is given as

ln *e* = 1, because $e^1 = e$

$$\ln\left(\frac{P_i}{1-P_i}\right) = \ln e^{Z_i} = B_0 + \sum_{i=1}^{n} B_i X_i \quad (11)$$

Equation (10) is a deterministic Equation; thus, to arrive at stochastic Equation (12), there is a need of taking disturbance term (ε) into consideration as follows;

$$\ln\left(\frac{P_i}{1-P_i}\right) = B_0 + \sum_{i=1}^{n} B_i X_i + \varepsilon \quad (12)$$

Therefore, Equation (12) is the logistic regression model, which shows a natural logarithm in odds ratio that shows the relationship between dependent and independent variables of the model.

Since there were no mechanisms fitted to record landing price among artisanal fishers, then experiences in determining landing price were captured by measuring pleasurable or feelings of artisanal fishers on landing price towards SWB life satisfaction (Dolan and Metcalfe, 2012). The independent variables (X_is) included fish landing price denoted by (Fp) measured as a number of times in a year artisanal fishers were involved in determining landing price, education (E) measured as years spent in school, household size (H) and marital status (M) indicated as:{1 – Married, 0 – Otherwise}. Further, the study also included the variable for personal relations satisfaction (I) measured as {1- All of the time, 0- Otherwise} (Pellerone *et al*., 2016; Dimoso, 2009 and Jackson, 2007) and age squared (A^2). Age was measured as the number of years after birth, and age square was included by taking into consideration that age is U-shaped with life satisfaction as supported by wide-ranging literature (López *et al*., 2013; Di Tella, 2001). Age squares were included to represent non-linear age effects (Dimoso, 2009).

1.8.8 Validity and reliability of the data

Validity measures were employed to ensure appropriateness of the data collection tools, processes, and data analysis (Leung, 2015). The measurement focused on whether the research questions are valid for the intended outcome. The methodology used for answering the study questions is appropriateness, as well as the design for the desired methodology (Saunders *et al.*, 2016). Further, validation was conducted on sampling, data analysis methods, results and conclusions for the sample and context (Leung, 2015).

Reliability of data follows data triangulation to give accurate results in terms of form and context using constant comparison approaches after they have been extracted from the original sources (Leung, 2015; Sounders *et al.*, 2016).

Constant comparison of the data was done by comparing each interpretation and finding with the existing findings as it emerges from the data analysis (Lewis-Beck *et al.*, 2004). The scope and analysis of data included quantitative data analysis triangulated with qualitative data analysis (Leung, 2015).

To ensure data validity and reliability, constant comparison approach by Lewis-Beck *et al*., (2004) was used to ensure all relevant data were captured from the target population. The study employed field-testing of the data collection tools to rectify some unfamiliar terms. Some questions were omitted, and the concepts, which were intended to be captured through the questions, were improved. In the case of the absence of figures, suggested figures and data records by proper experts were used in the sampling frame. The regression model was investigated, and one of the covariances found between two variables was omitted. Before running the regression model, all the variables recorded at the continuous level were checked for normality, and were found to have normal distributions. The variables were also correlated to check multicollinearity, and no variables were found to have r-value equal to or greater than 0.8, which means there was no multicollinearity. Multicollinearity was also tested by computing Variance Inflating Factors (VIFs) and tolerances of independent variables. The Variance Inflating Factor was found to be less than 1.5 and tolerance was greater than 0.1, which is not enough to overly the concerns of the presence of multicollinearity. VIFs greater than 10 and Tolerances less than 0.1 imply that there is multicollinearity (see Landau and Everitt, 2004). In all multiple regression models, no pair of variables had a VIF > 10 or tolerance of < 0.1. Hence, there was no multicollinearity in the analysis.

Heteroscedasticity test was also carried out using Breusch Pagan Test for the multiple regression model and the result was statistically insignificant ($P<0.05$). This imply that there are constant variance of the errors from the model; therefore, the assumption of homoscedasticity was not violated. Cronbach's alpha was used to measure internal consistency, which was found to be 0.813 for SWB life satisfaction.

Hedonic price model and log-linear multiple regression model were estimated using ordinary least squares estimation procedure with at least R^2 of 0.8 and adjusted R^2 of

0.8 in each of the model result, implying that both are providing goodness fit in explaining changes of the effect of independent variables to the dependent variable. Meanwhile, the maximum likelihood estimation procedure was used to estimate the ordered logistic regression analysis. The Wald Chi-square was 167.192, the model with explanatory variables was statistically significant ($P<0.05$) when compared with the null model with no explanatory variables or predictors. That means, at least one of the coefficients in the regression model is concluded not equal to zero. Pseudo R^2 of 0.356 also implies that, the model was capable of measuring accurately the prediction of the changes in the dependent variable.

1.9 Ethical Considerations

To observe research ethical issues, an introductory letter from MoCU to Mwanza Regional Administrative Secretary (RAS) (See Appendix 4) was obtained, and permission for data collection from the Regional Administrative Secretary (RAS)-Mwanza Region (See Appendix 5). Moreover, ethical procedures at district level were followed by presenting the permit to the District Executive Director (DED) of Sengerema and Buchosa District Councils. At councils' level, DEDs communicated with District Fishery Officers, Ward Executive Officers, and Chairpersons of Beach Management Units (BMUs) on permission clearance before pre-testing of the data collection tools and actual data collection.

The research objectives were explained by the researcher to the respondents prior to pre-testing and actual data collection. The respondents were guaranteed freedom of participating in terms of filling the questionnaire, participation in focus group discussions, and the interviews, which were recorded by the researcher. The researcher expects to share the results of this study (in a hard copy) with the Authorities of Sengerema and Buchosa District Councils in order to provide feedback.

1.10 Organization of the Thesis

This thesis is organized in five chapters apart from the preliminary pages and appendices. Chapter one provides the general overview of the study that formed the foundation of the entire thesis covering the background to the study, statement of the problem, justification of the study, research objectives, hypothesis, theory

underpinning the study, conceptual framework, general methodology, ethical consideration and organization of the Thesis.

Chapter two, three, and four present three publishable manuscripts each. The manuscripts were prepared and categorized as per specific research objectives whereby each is having five sections. Section one is introduction, followed by literature review in section two, section three is methods, results and discussion are in section four and section five is conclusion. Summary description of analysis procedures per manuscript for chapter two, three, and four are in section 1.8.7. In contrast with the preceding chapters, chapter five presents a summary of the study findings, conclusions that include theoretical reflections and recommendations of the study basing on the key findings of the study as reflected in the manuscripts.

REFERENCES

Aguero, J.M. (2007). Asymmetric price adjustments and behavior under risk: Evidence from Peruvian agricultural markets. [www.faculty.urc.edu/~jorgea/research/ asymm. pdf] site visited on 14/06/2016.

Alapan, M.P., Arpilleda, E.L., Altizo, K. J., Frias, G.K., & Ravelo, J.D., (2016). Factors affecting the market price of fish in the northern part of Surigao Del Sur, Philippines. *Journal of Environment and Ecology*, 7(2), 34-41. doi: 10.5296/jee.v7i2.10469.

Bajpai, N. (2011). *Business research methods*. Pearson, New Delhi. 762pp.

Bergman, J. (2012). Nile perch export and welfare around Lake Victoria has the boom in exports been positive for welfare. [https://gupea.ub.gu.se/bitstream/2077/29748/1/gupea_2077_29748_1. pdf] site visited on 09/02/2016.

BOT (2017). *Bank of Tanzania annual report 2015/16*. Dar es Salaam.

Bradshaw, T. K. (2007). Theories of poverty and anti-poverty programs in community development. *Community Development*, 38(1), 7-25. doi: 10.1080/15575330709490182.

Brayden, W., Noblet, C., Evans, K., & Rickard, L. (2018). Consumer preferences for seafood attributes of wild-harvested and farm-raised products. *Aquaculture Economics and Management*, 22(3), 362-382. doi:10.1080/13657305.2018.1449270.

Britton, E. (2013). Women as agents of wellbeing in Northern Ireland's fishing households. *Maritimes Studies*, 11(1), 16. doi: 10.1186/2212-9790-11-16.

Bronnmann, J., & Hoffmann, J. (2018). Consumer preferences for farmed and ecolabeled turbot: A north German perspective. *Aquaculture Economics and Management*, 22(3), 342-361. doi: 10.1080/13657305.2 018.1398788.

Brummett, R. (2000). Factors influencing fish prices in Southern Malawi. *Aquaculture,* 186(4), 243–251. doi: 10.1016/S0044-8486(99)00383-X

Chandrashekar, B. (2014). Fishery co-operative societies in India: Problems and prospects. *Global Journal for Research Analysis*, 3(7), 2277-8160. [https://www.worldwidejournals.com/global-journal-for-research-analysis-GJRA/recent_issues_pdf], visited on 16/04/2017.

Conceição, P., & Bandura, R. (2008). Measuring subjective wellbeing: A summary review of the literature. [http://www.undp.org/content/dam/undp/library/corporate/Development%20Studies/subjective_well being_conceicao_bandura.pdf] site visited on 11/01/2018.

Cummins, R.A. (2014). *Encyclopaedia of quality of life and well-being research.* Springer, Dordrecht. 311pp. doi: 10.1007/978-94-007-0753-5.

Currie, G., Richardson, T., Smyth, P., Vella-Brodrick, D., Hine, J., Lucas, K., Stanley, J.R., Morris, J., Kinnear, R., & Stanley, J.K. (2010). Investigating links between transport disadvantage, social exclusion and well-being in Melbourne – Updated results. *Research in Transportation Economics*, 29(1), 287-295. doi: 10.1016/j.retrec.2010.07.036.

Delbosc, A., & Currie, G. (2011). Transport problems that matter–social and psychological links to transport disadvantage. *Journal of Transport Geograph,* 19 (1), 170-178. doi: 10.1016/j.jtrangeo.2010.01.003.

Dimoso, R. (2009). Environmental degradation and intra household welfare: The case of the Tanzanian rural south pare highlands. Thesis for Award of PhD Degree at Wageningen University: The Netherlands.

Dolan, P., & Metcalfe, R. (2012). Measuring subjective wellbeing: Recommendations on measures for use by National Governments. *Journal social policy*, 41(2), 409-427. doi:10.1017/S0047279411000833.

Easterlin, R. A. (1974). Does economic growth improve the human lot? Some empirical evidence. In: David, P. A. & Reder, M. W. (Eds), *Nations and households in economic growth: Essays in honor of Moses Abramovitz*. Academic Press, New York. 89–125.

Easterlin, R. A. (2001). Income and happiness: Towards a unified theory. *The economic Journal*, 111(473), 465-484. doi: 10.1111/1468-0297.00646.

Elsner, W., Heinrich, T., & Schwardt, H. (2014). *The microeconomics of complex economies: Evolutionary, institutional, neoclassical, and complexity perspectives*. Academic Press, USA, 571pp. DOI:10.1080/00213624.2015.1013897.

Ettema, D., Gärling, T., Olsson, L., & Friman, M. (2010). Out-of-home activities, daily travel, and subjective well-being. *Transportation Research Part A: Policy and Practice*, 44(9), 723-732. doi: 10.1016/j.tra.2010.07.005.

FAO (2003). *Report of the expert consultation on International Fish Trade and Food Security*. Casablanca: Morocco. 213pp.

FAO, (2014). *The state of world fisheries and aquaculture: Opportunities and challenges*, FAO: Rome. 243pp.

FAO, (2020). *The state of world fisheries and aquaculture: Sustainability in action*. FAO: Rome. 244pp.

Fishbase. (2018). Retrieved from http://www.fishbase.org/search.php.

Gobillon, L., Wolff, F. & Guillotreau, P. (2017). The effect of buyers and sellers on fish market prices. *European Review of Agricultural Economics*, 44(1), 149-176. doi: 10.1093/erae/jbw006.

Gordon, D. & Hussain, S. (2015). Price determination and demand flexibilities in the ex-vessel market for Tuna in the republic of Maldives. *Journal of Aquaculture Economics and Management*, 19(1), 8-28. doi: 10.1080/13657305.2015.994234.

Guerra-Bustamante, J., León-del-Barco, B., Yuste-Tosina, R., López-Ramos, V. M., & Mendo-Lázaro, S. (2019). Emotional intelligence and psychological well-being in adolescents. *International journal of environmental research and public health*, 16(10), 1720. doi: 10.3390/ijerph16101720.

Hallerod, B. & Selden, D. (2013). The multi-dimensional characteristics of wellbeing: how different aspects of wellbeing interact and do not interact with each other. *Social Indicators Research*, 113(3), 807-825. doi: 10.1007/s11205-012-0115-8.

Hammarlund, C. (2015). The big, the bad, and the average: Hedonic prices and inverse demand for Baltic cod. *Marine Resource Economics*, 30(2), 157-177. doi: 10.1086/679972.

Hennink, M. M., Kaiser, B. N., & Weber, M. B. (2019). What influences saturation? Estimating sample sizes in focus group research. *Qualitative health research*, 29(10), 1483-1496. doi: 10.1177/1049732318821692.

Henson, S., & Mitullah, W. (2003). Nile perch exports from the Kenyan shores of Lake Victoria: Good or bad for local fishing communities? *In Livelihoods and ecosystems: Dealing with complexity in rural development and agricultural.* [https://gupea.ub.gu.se/bitstream/2077/29748/1/gupea_2077_29748_1.pdf] site visited on 09/02/2016.

Henson, S., Brouder, A. & Mitullah, W. (2000). Food safety requirements and food exports from developing countries: The case of fish exports from Kenya to the European Union. *American Journal of Agricultural Economics*, 82(5), 1159-1169. [http://www.jstor.org/stable/1244245] visited on 10/12/2016.

Hinterhuber, A. (2008). Customer value-based pricing strategies: why companies resist. *Journal of business strategy*, 29(4), 41-50. doi: 10.1108/02756660810887079.

Hoof, L. & Kraan. M. (2017). *Scoping mission marine fisheries Tanzania*, Wageningen University: Wageningen. 66pp. doi: 10.18174/404872.

Hou, Z. & Westbrook, D. (2014). The impact of market access on income and inequality in rural China: An IV-Quantile analysis. [https://editorialexpress.com/cgibin/conference/download.cgi?db_name=AMES2014&paper_id=78] site visited on 13/05/2017

Ingenbleek, P. T., Frambach, R. T., & Verhallen, T. M. (2013). Best practices for new product pricing: Impact on market performance and price level under different conditions. *Journal of Product Innovation Management*, 30(3), 560-573. doi: 10.1111/jpim.12008.

Israel, D. G. (2013). Determining sample size. The University of Florida. 5pp.[http://www.gjimt.ac.in/web/wpcontent/uploads/2017/10/2_Glenn-D.-Israel_Determining-Sample-Size.pdf] site visited on 16/08/2016.

Jackson, M.I., & Mare, R.D. (2007). Cross-sectional and longitudinal measurements of neighbourhood experience and their effects on children. *Social Science Research*, 36(2), 590-610. doi: 10.1016/j.ssresearch.2007.02.002.

Janssen, C., Söderberg, B., & Zhou, J. (2001). Robust estimation of hedonic models of price and income for investment property. *Journal of Property Investment & Finance*, 19(4), 342 – 360. doi: 10.1108/EUM0000 000005789.

Johansson, M., Hallberg, N., Hinterhuber, A., Zbaracki, M., & Liozu, S. (2012). Pricing strategies and pricing capabilities. *Journal of Revenue and Pricing Management*, 11(1), 4-11. doi: 10.1057/rpm.2011.42.

Johnston, R.J., Wessells, C.R., Donath, H. & Asche, F. (2001). A contingent choice analysis of ecolabeled seafood: Comparing consumer preferences in the United States and Norway. *Journal of Agricultural and Resource Economics*, 26(1), 20–39. [https://ageconsearch.umn.edu/record/311 57/files/26010020.pdf], visited on 05/12/2017.

Kahneman, D. & Krueger, A.B. (2006). Development in the measurements of subjective wellbeing. *Journal of Economic Perspectives*, 20(1), 3–24. doi: 10.1257/089533006776526030.

Kahneman, D. & Thaler, R. (2006). Anomalies: Utility maximization and experienced utility. *Journal of Economic Perspectives*, 20(1), 221-234. doi: 10.1257/089533006776526076.

Kambewa, E.V. (2007). Balancing the people, profit and planet dimensions in international marketing channels. A study on coordinating mechanisms in the Nile perch channel from Lake Victoria. Thesis for Award of Ph.D. Degree at Wageningen University: The Netherlands.

King, M. F., Renó, V. F., & Novo, E. M. (2014). The concept, dimensions and methods of assessment of human well-being within a socioecological context: A literature review. *Social Indicators Research*, 116(3), 681-698. doi: 10.1007/s11205-013-0320-0.

Kothari, C. R. (2004). *Research methodology methods and techniques*. New Age International Publishers, New Delhi. 401pp.

Kristofersson, D. & Rickertsen, K. (2004). Efficient estimation of hedonic inverse input demand systems. *American Journal of Agricultural Economics*, 86 (4), 1127-1137. doi: 10.1111/j.0002-9092.2004.00658.x.

Landau, S., & Everitt, B. (2004). *A handbook of statistical analyses using SPSS*. Chapman & Hall/CRC Press LLC, Florida. 339pp.

Layard, R. (2010). Measuring subjective well-being. *Science*, 327(5965), 534-535. doi: 10.1126/science.1186315.

Lee, M. (2014). Hedonic pricing of Atlantic cod: Effects of size, freshness, and gear. *Marine Resource Economics*, 29(3), 259-277. doi: 10.1086/677769.

Levers, M. J. (2013). Philosophical paradigms, grounded theory, and perspectives on emergence. *Sage Open*, 3(4). doi: 10.1177/2158244013517243.

Lewis-Beck, M. S., Bryman, A., & Futing Liao, T. (2004). *The SAGE encyclopedia of social science research methods*. Sage Publications, California,. 1528pp.

Luomba, J. & Onyango, P. (2012). Dagaa fishery the unknown wealth of Lake Victoria IIFET 2012 Tanzania Proceedings. Retrieved from https://ir.library.oregonstate.edu/downloads/h128nk07m.

Luomba, J. (2013). An assessment of the socio-economic status of fishers' communities in Lake Victoria, Tanzania in relation to poverty. *International Journal of Research in Fisheries and Aquaculture*, 3(3), 98-102. [https://www.researchgate.net/publication/256477617], visited on 26/07/2016.

Maciel, E.S., Savay-da-Silva, L.K., Vasconcelos, J.S., Sonati, J.G., Galvão, J.A., Leandro De Lima, K.F., & Oetterer, M. (2013). Relationship between the price of fish and its quality attributes: A study within a community at the University of São Paulo, Brazil. *Food Science Technology (Campinas)*, 33(3), 451-456. doi: 10.1590/S0101-20612013005000059.

McConnell, K. & Strand, I. (2000). Hedonic prices for fish: Tuna prices in Hawaii. *American Journal of Agricultural Economics*, 82(1), 133-144. doi: 10.1111/0002-9092.00011.

Meyer, J. & Cramon-Taubadel, S. (2004). Asymmetric price transmission: A survey. *Journal of Agricultural Economics*, 55(3), 581-611. doi: 10. 1111/j.1477-9552.2004.tb00116.x.

Michaelson, J., Mahony, S., & Schifferes, J. (2012). *Measuring wellbeing: A guide for practitioners*. New Economics Foundation, London. 33pp.

Minot, N. (2009). *Transmission of world food price changes to African markets and its effects on household welfare*, International Food Policy Research Institute (IFPRI): Washington, D.C. 53pp.

Mkenda, A. (2001). Fishery resources and welfare in rural Zanzibar. Thesis for Award of Ph.D. Degree at University of Gothenburg: Sweden.

Monson, M. (2009). Valuation using hedonic pricing models. *Cornell Real Estate Review*, 7(1), 62-73. [https://hdl.handle.net/1813/70656], visited on 03/11/2016.

Nagle, T. T., & Müller, G. (2017). *The strategy and tactics of pricing: A guide to growing more profitably* (6th Edition). Routledge, London. 352pp.

NBS (2019). National Bureau of Statistics. Dar es Salaam, Tanzania.

Nguyen, T. (2011). Implicit price of mussel characteristics in the auction market. *Aquaculture International*, 20(4), 605–618. doi: 10.1007/s10499-011-9489-x.

Odemero, F. (2013). Price transmission and households demand elasticity for frozen fish under fuel subsidy reform in Delta State, Nigeria. *International Journal of Food and Agricultural Economics*, 1(1), 119-127. [https://www.foodandagriculturejournal.com/119.pdf], visited on 22/05/2016.

Phillips, M. & Subasinghe, R. (2010). Small-scale Shrimp farmers and global market –Trends, future prospects, and adaptation.[//w.aquaculturealliance.org/advocate], visited on 20/08/2016.

Pontin, E., Schwannauer, M., Tai, S., & Kinderman, P. (2013). A UK validation of a general measure of subjective well-being: the modified BBC subjective well-being scale (BBC-SWB). *Health and Quality of Life Outcomes*, 11(1), 150. doi: 10.1186/1477-7525-11-150.

Reyes-García, V., Babigumira, R., Pyhälä, A., Wunder, S., Zorondo-Rodríguez, F. & Angelsen, A. (2016). Subjective wellbeing and income: empirical patterns in the rural developing world. *Journal of Happiness Studies*, 17(2), 773-791. doi: 10.1007/s10902-014-9608-2.

Roangead (2013). Tanzanian Nile perch value chain baseline study. Burgun Cedric: International Trade and Sustainable Development. [http://www.Roangead.org/IMG/pdf/Roangead_Rapport_Final.pdf], visited on 13/07/2016.

Roheim, C., Gardiner L., & Asche, F. (2007). Value of brands and other attributes: Hedonic of retail frozen fish in the UK. *Marine Resource Economics*, 22 (3), 239-253. doi. 10.1086/mre.22.3.42629557.

Rosen, S. (1974). Hedonic price and implicit market: product differentiation in pure competition. *The Journal of Political Economy*, 82(1), 34-55. [https://www.jstor.org/stable/1830899], visited on 15/01/2016.

Ryan, R. & Deci, E. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychological Association*, 55(1), 68-78. doi: 10.1037110003-066X.55.1.68.

Saunders, M., Lewis, P. & Thornhill, A. (2016). *Research methods for business students* (7th edition). Pearson Education Limited, Harlow. 768pp.

Sen, A. K. (1985). Well-being, agency, and freedom: The Dewey lectures 1984. *Journal of Philosophy*, 2(4), 169-221. doi: 10.2307/2026184.

Sesabo, J. K. & Tol, S.J. (2007). Technical efficiency of small-scale fishing households in Tanzanian coastal villages: an empirical analysis. *African Journal of Aquatic Science*, 32(1), 51-61. doi: 10.2989/AJAS.2007.32.1.8.145.

Slade, B.A. (2000). Office rent determinants during market decline and recovery. *Journal of Real Estate Research*, 20(3), 357-380. doi: 10.1080/10835547.2000.12091041.

Tennant, R., Hiller, L., Fishwick, R., Platt, S., Joseph, S., Weich, S. & Stewart-Brown, S. (2007). The Warwick-Edinburgh mental well-being scale (WEMWBS): development and UK validation. *Health and Quality of life Outcomes*, 5(1), 63. doi: 10.1186/1477-7525-5-63.

Thrane, C. (2005). Hedonic price models and sun-and-beach package tours: The Norwegian case. *Journal of Travel Research*, 43(1), 302-308. doi: 10.1177/0047287504272034.

UN (2016). Sustainable development goals, goal 14: Conserve and sustainably use the oceans, seas and marine resources. [www.un.org/sustainabledevelopment/oceans/], visited on 09/10/2016.

URT (2010). *Fishery sector development program Tanzania*. Government Printer: Dar es Salaam, 37pp.

URT (2014). *Ministry of livestock and fisheries development annual statistics report-2013*. Government Printer: Dar es Salaam, 60pp.

URT (2015). *National fisheries policy of 2015*. Government Printer: Dar es Salaam, 44pp.

URT (2016). *Agricultural sector development program phase two (ASDP II).* Government Programme Document. Government Printer: Dar es Salaam, 204pp.

URT (2017). *Mwanza region investment guide*. Government Printer: Dar es Salaam, 80pp.

Wisdom, J. & Creswell, J.W. (2013). *Mixed methods: Integrating quantitative and qualitative data collection and analysis while studying patient-centered medical models*. AHRQ Publication: Rockville, 5pp.

CHAPTER TWO

2.0 FISH PRICE DETERMINATION AROUND LAKE VICTORIA TANZANIA: ANALYSIS OF FACTORS AFFECTING FISH LANDING PRICE

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2.1 Abstract

Determination of fish landing price is important as it contributes to wellbeing of artisanal fishers around Lake Victoria. Dissemination of relevant mechanism for the determination of landing price is a gap that exists between artisanal fisher, agents (middlemen), processors, and the Government. This paper examined fish price determination, specifically finding out methods of price setting of fish and analysing factors influencing fish landing price. A cross-sectional research design was employed, and a combination of simple random sampling, proportionate sampling and purposive sampling procedures were used to select 300 respondents from two Districts namely Sengerema and Buchosa in Mwanza region. The results of descriptive statistics analysis showed that, landing price was determined using common methods, including formal negotiations with processors, consultation with other traders, informal negotiations with buyers and Beach Management Unit (BMU). The results of hedonic price multiple regression showed that, hours spent from fishing location in the lake to the onshore landing centres, market price information, and experiences of fishers were found to be statistically significant ($P<0.05$) factors influencing landing price. This study concluded that, there were established ways of determining fish price but monopolistic behaviour in price setting among middlemen kept the prices down. It is recommended that, artisanal fishers should use acquired fishing experiences to increase availability of market price information through interaction with buyers or agents. Artisanal fishers should adopt collective negotiations with buyers to obtain modern fishing vessels that are cost effective in travelling distances.

Keywords: Landing price, Artisanal fisher, Pricing methods.

2.2 Introduction

Worldwide, determinants of fish prices have been debatable for years. Different studies including Gobillon*et al.,* (2015), Hammarlund (2015), Lee (2014), McConnell and Strand (2000) employed different approaches to ascertain factors that influence the determination of fish prices. These studies were limited to specific species and have remained inconclusive on similar or the same determinants of fish landing price for other fish species.

Landing price is a price of fish valued based on factors such as fish size, days spent under storage, the type of vessel used, grades and distance to the landing centres before reaching the primary buyers. Other factors that determine the price include the number of buyers, sellers, storage management facilities, and quantities sold. These factors have some effect on the income of artisanal fishers in the sector (Jansen *et al.,* 2001).

In the fishery sector, its importance remains paramount to the economic contribution at individual level to global level thus undertaken by this study. Fishing activities in Lake Victoria have been reported as one of the sources of income contributing to wellbeing of artisanal fishers (Luomba and Onyango, 2012). According to Kambewa (2007), artisanal fishers are individuals who have fishing and trading experience ranging from two to over 40 years. Moreover, In Tanzania, the fishery sector contributes 2.5 percent of the real GDP (BOT, 2017), and employs more than 4 000 000 people in related activities. In Africa, fishery output stood at 10.4 million tonnes out of US$ 164.1 billion world fishery outputs in 2020 (FAO, 2020; Phillips and Subasinghe, 2010; Dyck and Sumaila, 2010).

Following the substantial contribution of the fisheries industry to the economy, the Government of Tanzania facilitated the construction of fish marketing centres, installation of ice plants and refrigeration storage for fish, provision of vehicles and rehabilitation of fish markets at 20 centres surrounding Lake Victoria. These efforts were made to enhance fish market and improve fish prices (URT, 2012). According to Hou (2014), the market enables artisanal fisher to identify, communicate, and maintain contact with buyers at the right price thus attaining better price and

increasing income. Apart from the construction of marketing centres, the government has made sure that markets around Lake Victoria are sustainable by establishing of fish labelling thus enabling artisanal fishers to get better prices at market places (Roangead, 2013). Despite these government efforts, fish selling price is still clouded with uncertainties. According to Kambewa (2007), these uncertainties are attributed to contractual arrangements enforced by agents, price negotiations dominated by buyers, catch volume, and the types of buyers who contribute to the determination of fish market price. These approaches are employed notwithstanding the existence of

standard methods used in setting selling market price, and these include cost-based pricing, customer-value based pricing (demand-based pricing), competitive-based pricing and psychological pricing (Hinterhuber, 2008; Johansson *et al*., 2012; Ingenbleek *et al*., 2013; Nagle and Müller, 2017).

The market price is given as a function of each tangible, intangible and other outside influencing factors. These factors also have significant relation with income (Jansen *et al.*, 2001; Monson, 2009; Phillips and Subasinghe, 2010; Chandrashekar, 2014). Given that, there are various market prices, this paper focuses on the determination of fish landing price around Lake Victoria, Tanzania. Specifically, it finds out fish price determination methods and analyses factors that influence fish landing price around Lake Victoria.

2.2.1 Problem statement

Despite that, fishers collect fish at landing centres, the determination of fish landing price has not yet been researched around Lake Victoria, Tanzania. There is lack of evidence on how the artisanal fisher-buyers relationship and other market features determine landing price in Lake Victoria. The paid landing price appears to be associated with income earned to artisanal fishers, but agent's exploitation of artisanal fisher, imbalance power in price negotiation, limited access to production facilities, and idiosyncratic preferences have not yet been linked with landing price (Luomba and Onyango, 2012; Mpenda, 2010; Kambewa, 2007). Others include lack of improved fishing skills, the use of latest technologies, inadequate access to, and control of assets among artisanal fishers. All these are assumed to be among the challenges that constrain artisanal fishers from attaining best landing prices (Luomba,

2012; Kambewa, 2007). Furthermore, artisanal fishers enter into profitable contractual arrangements, but these arrangements are clouded with uncertainties regarding selling prices, volumes of catch, types of buyers, and loans accessibility (Mpenda, 2010). Moreover, previous studies have shown that landing price is determined by fish quality characters, which may also be exploited by the agent to set the price (Roheim *et al*., 2007; Carroll *et al*., 2001).

Furthermore, the prices were so low that, artisanal fishers contributed only 16 percent of the regional income leading to poor revenue collection in the region (Henson *et al*., 2000). For some of the species such as the Nile Perch, the onshore price paid to artisanal fishers is reported to be between TZS 3 000 and 4 000 per Kilogram (Kg). Meanwhile, consumers are reported to pay between TZS 7 000 to 11 000 per Kg respectively depending on the market destination. Elsewhere, Lee (2014) found that artisanal fishers receive prices that are approximately $ 0.20 per kg, which is equivalent to 450 TZS lower than the price of fish if sold in the next largest market place. Despite disparities on prices due to differences in the capability in value addition among artisanal fishers, artisanal fishers still pursue these fishing activities at landing sites while the actual prices at district market centres are very high and even higher in the cities such as Mwanza, Arusha, and Dar es Salaam. Therefore, methods and determinants of fish landing price around Lake Victoria are missing. This study intended to investigate the determination of fish landing prices around Lake Victoria, Tanzania.

2.2.2 Artisanal fisher-agent market relationship

The small-scale producer's market reveals features of unsatisfactory markets; the study by Taru *et al.* (2010) indicated that these markets have higher concentration of sellers with high-income difference. This was a result of differences in their access to ownership and control of physical marketing facilities as well as funds availability. On the other hand, Lake Victoria fishery market is dominated by middlemen (buyers) but with consideration of their relationship with artisanal fishers, a decrease in input prices is not expected to be transmitted to the final fish prices offered by middlemen to increase profit margin (Meyer, 2004). This is because of the behaviour of the firms or the decisions firms take in their pricing and output policy and other competitive tactics to maximize their profits.

Regarding fish market, studies have shown that persistence of low paid price to artisanal fishers is attributed to mechanisms of determining fish price, inequality in profits share, and disparity in prices. These are influenced by market size, low price given to artisanal fishers, the size of fish, and demographic and fishery management of system (Hammarlund, 2015; Lee, 2014; Roangead, 2013; Bergman, 2012; Gordon

and Maurice, 2012; FAO, 2003 and Mitullah, 2000). The market structure may be defined as features organized within the market formed by a number of buyers, sellers and product differentiation in terms of size, colour, and quality as well as the methods of price determination (Olukosi *et al*., 2005). However, Lee (2014) points out that the price determination of Cod fish was based on buyers' defined categories after sorting, and cod sold to fish dealers or auctions. In addition, Lee (2014) find out that, this price determination was associated with Fish cod volume and value of the vessels used.

Moreover, in considering an increase of prices of artisanal fisher's inputs, which are facilitating quantity and quality of fish catches, middlemen may make use of market power and influence a change in input prices to other buyers and gain a required profit margin than a loss (Meyer, 2004). In this respect, it is assumed that middlemen may help in determining landing price of artisanal fisher by including any increases in input prices to the final payment per catches sold.

Additionally, based on the production theory, increase of artisanal fishers' engagement in fishing, leads to an increase of fish harvest/quantity caught. However, the more fish are landed, may ending up getting lower fish prices at the offshore and onshore landing sites around Lake Victoria. Gordon and Hussain (2015) used the theory of derived demand and realized that the demand curve facing tuna artisanal fishers was downward sloping indicating that, increased effort of harvest more fish would usually be rewarded with lower ex-vessel prices, other things remaining equal. Thus, an increase of the number of artisanal fishers may be one of the factors influencing landing price.

Another relationship is the number of buyers against artisanal fishers as stipulated by the law of diminishing returns. Few buyers are more likely to dominate the market and reduce the landing price. For example, Gordon and Hussain (2015) found that the structure of the tuna market has many small first-hand suppliers of fish selling to only a few processors.

Such a structure empowers the processors with market power that can be used to reduce the first-hand price of fish. However, the adverse effect is that low price benefited fish buyers/agents and leaves fishers with fewer benefits through being paid low price (Gordon and Maurice, 2015). This narrows down the fishery market performance, which is the consideration of the extent to which the interactions of the buyers (middlemen) and artisanal fishers in a market generate results that are consistent with the wellbeing of the artisanal fishers.

2.2.3 Empirical factors associated with landing price

Empirically, Gobillon *et al.,* (2015) found that there are many factors explaining variations in fish price. These factors include fish size, presentation, and quality, seller unobserved effects, buyer unobserved effects and seller-buyer matched effects. Accordingly, Janssen *et al.,* (2001) conclude that a negative relationship exists between age and the price of the property. McConnell and Strand (2000) have shown that fish physical characteristics (burn, fat, fish size, manner of harvesting and handling) influence grading of fish thus determining ex-vessel/landing prices.

Moreover, based on freshness, cold fish caught during the previous four days fetched a price of $ 0.04 per kg equivalent to 90 TZS less than the cold fish caught on a given day and offloaded to the market. Fish transported for at most ten days was sold at low price of $ 0.15 per kg, which is equivalent to 337.5 TZS. Another factor is the management of the fish stock that changes the quantity of attributes as this will also change the prices of fish (Hammarlund, 2015). Based on the mentioned studies report, it is however difficult to conclude the same applies around Lake Victoria, in Mwanza region.

2.2.4 Theory underpinning the study

Following that variation in fish price is explained by many factors, this paper employed the theory of price transmission. The focus is analysis of price transmission

based on change of input price factors in a variety of areas including resource allocation, production techniques, pricing adjustments, and quantity produced as depicted by the mentioned theory. This theory was adopted from the study of price transmission and households' demand elasticity for frozen fish by Odemero (2013).

On the other hand, Minot (2009) describes the percentage change in price at one end of the market given a 1 percent change in the price at the other end of the market. Price transmission from the producers to the market may be due to a range of factors such as change of market power, subsidy, and policy reform (Aguero, 2007; Meyer and Cramon-Taubadel, 2004).

Price transmission assumes that, changes of output prices depend on changes of inputs price flow-in and it is also possible that changes in input prices to be caused by the flow of changes of output prices flow in, for example by demand shifts can be transmitted to input prices (Meyer and Cramon-Taubadel, 2004). Therefore, distance to onshore and offshore markets, storage facilities, and the number of buyers are the price factors examined by the present study that could affects changes of fish landing price. Others include availability of agents, middlemen, the cost of transporting fish, market price information available in the area, and social demographic characters of the fishers (Aguero, 2007; Meyer and Cramon-Taubadel, 2004).

Regarding the fishery community, price transmission due to fishery input compensation provided by agents and market opportunities affect the final price given to fishers (Odemero, 2013). The present study assumed changes of these inputs affects fish price. Therefore, price transmission theory was adopted to guide analysis of price transmission on how a change in independent variables such as distance to onshore and offshore markets, storage facilities, and the number of buyers were contributing to changes in fish landing price. Others include availability of agents, middlemen, the cost of transporting fish, the market price information available in the area, and social demographic characters of the fishers.

This theory falls short on the omissions of transaction cost by agents. The agents are uncertain and fearing decision of raise prices may result of being left with fish that end up rotten. In this case, government intervention and negotiation are considered

useful in mitigating the lowering of prices on the part of the producer, therefore reducing omissions of transaction costs. Thus, understanding of changes of input price factors from artisanal-buyer linkage was essential in this study.

2.3 Methods

2.3.1 Data collection and sampling

The study was conducted around Lake Victoria in Mwanza Region because the area is the 'leading fish market stop centre' around the Lake in Tanzania with seven fish processing industries therefore surpassing other regions (Kagera, Geita, Simiyu and Mara) surrounding the lake in fishing, fish landing, trading, and exporting of fish (URT, 2017). Also, around Lake Victoria, Mwanza Region with a total of about 52,942 fishers is among the eight poor regions in Tanzania with high poverty rates of 34.6 percent indicated by the existing highest number of poor people for rural dwellers including artisanal fishers who are living below the poverty line (URT, 2014; NBS, 2019). Two districts within Mwanza Region, Sengerema, and Buchosa were purposely selected, because of their high collection of fish catch, landing sites, and landed fish selling activeness (URT, 2017).

The data requirements of the study were both primary and secondary source of data. The study was guided by quantitative data. Qualitative data were also collected to enrich the quantitative results of this study as recommended by Wisdom and Creswell (2013). Quantitative data were collected by enumeration of the artisanal fishers to gather information related to socio-demographic characteristics of fishers, landing prices and determination of landing price.

A cross-sectional research design was used. The design entails collection, organisation, and analysing data from various cases around Lake Victoria at a single point in time. The design was chosen because it is suitable for both qualitative and quantitative data as per the variables of this study (Saunders *et al*, 2016). Therefore, cross-sectional research design was used in this study not only because the study duration was limited in terms of time, but also because it intended to examine different variables at the same time (Saunders *et al*, 2016; Bajpai, 2011; Kothari, 2009). A sample of 300 fishers was selected (Table, 1), from the population of 1200

fishers in the two districts (URT, 2014), using a formula by Israel (2013) with 95 percent confidence level and a precision level of ≤ 5 percent, which is an acceptable sampling error. Israel (2013) formula is given as $n = N/\left(1 + N\left(e^2\right)\right)$; Where, n is the sample size, N population size and *e* is the level of precision. From an estimated total population of 1200 fishers from two districts, then $n = 1200/\left(1 + 1200\left(0.05^2\right)\right) = 300$.

In order to collect pertinent information from the respondents, purposive, proportionate, and simple random sampling techniques were employed. Purposive sampling technique was used to select three active landing sites on landing and selling of fish with non-overlapping trading by artisanal fishers between landing sites in each district. Accordingly, six landing sites were included in this study. To obtain the respective sample size per landing site, a proportionate sampling technique was used with a sampling fraction of n/N = 300/1200 = 0.25 (Table, 4). Sampling frame per landing site was obtained with an assistant from the District Fishery Officers and Ward Executive Officers. The computation is such that $n = \Sigma n_i$ but $n_i = 0.25 \times N_i$ where by i = 1,2…6. Simple random sampling was used to select respondents per each landing site using a lottery approach.

Table 4: Sample size determination

Landing site	Sampling frame	Sample size
Busisi	$N_1 = 254$	$n_1 = 63$
Kijiweni	$N_2 = 184$	$n_2 = 46$
Nyakalilo	$N_3 = 118$	$n_3 = 30$
Kanyala	$N_4 = 296$	$n_4 = 74$
Itabagumba	$N_5 = 156$	$n_5 = 39$
Bulyaheke	$N_6 = 192$	$n_6 = 48$
Total	**N=1200**	**n=300**

A questionnaire was used to collect quantitative data; prior to the enumeration, pre-testing of the questionnaire was carried out to 15 randomly selected respondents (5% of total respondents) for the purpose of identifying and rectifying unfamiliar terms used therein, checking the clarity and ambiguity of questions and duration of interviewing one person. The questionnaire was later improved accordingly before using it for the actual data collection. During data collection, 289 out of 300 fishers completed the questionnaire, which was used in the analysis; this was a 96 percent

response rate. This was in line with the suggestion by Evans (1991) that a high response rate (> 80%) from a sample is preferable. The incomplete copies of the questionnaire were discarded. Focus group discussion (FGD) guide was also used to complement findings from the questionnaire. FGD data saturation or thematic saturation codes (Hennink *et al*., 2019) examined include methods and factors used to determining landing price.

Data saturation or thematic saturation refers to a point when issues begin to be repeated during data discussion time. To reach meaning saturation, that is, gaining the conceptual depth of the issue identified, six FGDs, one at each landing site consisting of eight artisanal fishers, were conducted. Moreover, twelve key informant interviews (KII) were held from three purposefully selected leaders from fishers, one buyer from Sengerema District, one agent from Buchosa District, two Beach Management Unit (BMU) leaders, two District Fishery Officers, one representative from the Tanzania Fisheries Research Institute (TAFIRI) and two Village Executive Officials.

2.3.2 Data processing and analysis

In this study, both qualitative and quantitative data were analysed using descriptive and inferential statistics. Sample respondents were profiled using frequency, percentages, and ranges. Descriptive statistics and multiple regression analysis were used to determine and examine factors influencing fish landing price respectively. The analysis of qualitative data followed transcriptions, classification, and manual coding of the field KII and FGD transcripts, notes, and recorded audio and text documents. This was followed by the identification of the common themes from the coded data; and these were compared and linked with the study objectives. These data were then summarized using quotations and tabulations from the transcript in order to highlight themes within the findings (Wisdom and Creswell, 2013).

The analysis of quantitative data follows hedonic price function (Rosen, 1974). Hedonic price model relies on factors that influence commodity valuation, which assumes that consumers' utility is derived directly from the quality attributes in a commodity (Rosen, 1974). Therefore, hedonic pricing techniques are based on a theory of consumer behaviour which suggests that people value a good because they

value the attributes of the good rather than the good itself. The model is relevant to this study because landed fish have different at attributes (heterogenous characters) in the market with no common price, thus consumers can choose any bundle of attributes they wish to maximize utilities (McConnell and Strand, 2000; Kristofersson and Rickertsen, 2004).

Therefore, fundamental theory of hedonic price explains the price (P) of a commodity as a function of its' influencing factors. Thus, for any given commodity, let us consider it factored by a set of j-th influencing factors and are denoted as:

$$P = f(X_j) \tag{1}$$

whereby j = 1, 2,3…. n and X_j is a set of factors possessed by a fish that give its total value and n represents the total number of influencing factors for a fish.

$$P = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + .. + \beta_j X_j \tag{2}$$

Therefore, in examining the determination of fish landing price, the multiple regression analysis was employed followed by a modified hedonic model as put forward by Janssen *et al*. (2001). Multiple regression analysis is a statistical process for estimating the relationship between the dependent variable and two or more independent variables (Kothari, 2009). In this paper, multiple regression analysis was used to examine the effect of the presumed factors on fish landing price, using the following equation:

$$PRICEF = \beta_0 + \beta_1 DONSH + \beta_2 ONMARKT + \beta_3 MARKCHAN + \beta_4 EDUH + \beta_5 SES + \beta_6 DISTRAN + \beta_7 TVESSEL + \beta_8 YEXPER + \varepsilon \tag{3}$$

Where:

β_0 is the constant or intercept of the coefficient

ε is the error term

$\beta_1 - \beta_8$ is the regression coefficients

Table 5: Variable definition and the measurements

Variable Description	Variable Name	Type of Variable	Meaning of Variable
Landing Price	PRICEF	Continuous	Price of a fish at on-spot market
Hours spent to reach onshore landing centres	DONSH	Continuous	Hours spent from fishing location to reach onshore centers
Onshore Market	ONMARKT	Continuous	Number of Buyers at onshore
Market Price Information	MARKCHAN	Continuous	Number of contacted buyers to provide market price information
Transport distance	DISTRAN	Continuous	Distance from onshore to the market centers (km)
Seasons	SES	Dummy	Favorable and unfavorable weather condition measured as dummy variables
Transport vessel	TVESSEL	Continuous	The cost of acquired fishing transport vessel in TZS
Education	EDUH	Continuous	Years spent in school
Experience in fishing	YEXPER	Continuous	Years of experience in fishing

In this paper, landing price was regressed on factors affecting landing fish price, which are specified in Table 5. In doing so, Janssen *et al.*, (2001) estimation techniques were adopted followed a modified hedonic model in the same approach including taking natural logarithms of both sides to transform equation (2) to a linear form as appeared in equation (3), permitting parameter estimation by the standard linear model. Therefore, price depends on variables X_1 to X_j but with different coefficients β to be estimated on the function stated in equation (2).

2.3.3 Reliability and validity

To ensure the reliability that all relevant data were captured from the target population, the study employed a prior data collection exercise; some questions, which were found not applicable, were omitted and questions, which were apparently missing, were added.

Before running the regression model, all the variables recorded at the continuous level were checked for normality, and they were found to have normal distributions. The variables were also correlated to check multicollinearity; there were no variables, which were found to have r-values equal to, or greater than 0.8, which means there was no multicollinearity. Multicollinearity was also checked by computing Variance

Inflating Factors (VIFs) and tolerances of independent variables. The Variance Inflating Factor was found to be less than 1.5 which was not enough to the overly concern of presence of multicollinearity. VIFs greater than 10 and tolerances less than 0.1 imply the presence of multicollinearity; no pair of variables had a VIF > 10 or a tolerance < 0.1(Landau and Everitt, 2004). To ensure consistency, 60 percent of the variables were continuous and their measurements are given in Table 5.

2.4 Results and Discussion

The study presents the qualitative and quantitative findings. The findings include socio-demographic characteristics of the respondents, common methods for determination of the landing price, and factors affecting landing price that resulted from multiple regression analysis.

2.4.1 Socio-demographic characteristics of respondents

The descriptive statistics (Table, 6) showed that, the average age of the artisanal fishers was 27.0 years with a maximum of 44 years and a minimum of 15 years. Only 3.1 percent of respondents were women and 97 percent were men of the sample selected from the respondents who were undertaking fishing activities. Moreover, 91 percent of the respondents pursued fishing as their main income generating activity. With regard to their level of education, it was found that 79 percent of all the artisanal fishers had a maximum of primary education level. The average fishing experience of the artisanal fishers was found to be 14 years.

Table 6: Socio-demographic characteristics of respondents (n = 289)

Variables		**Descriptive Statistics**			
	Sub-Variables	**Mean**	**Percentage**	**Max**	**Min**
Age		27	N/a	44	15
Sex	Male		96.9	N/a	N/a
	Female		3.1	N/a	N/a
Household Size		4	N/a	11	1
Occupation	Fishing		91	3	1
Education	High level		21		
	Primary	3	59		
	Incomplete		13		
	Illiteracy		7		
Experience		14	N/a	21	1

2.4.2 Common methods for determination of the landing price

Artisanal fishers face challenges of landing price because of the delayed payments for the requested landing price. Despite all this, artisanal fishers cannot reject a given selling price since fish are perishable goods. This complicates the question on how the landing price is determined. However, during an interview and focused group discussions with artisanal fishers at landing centres, various methods were reported to have been used to determine landing price (Table 7). These are informal negotiations with fish processors, consultation with other traders at the landing centres, formal negotiations with buyers and setting up of the price by BMU.

Table 7: Methods of determination of landing price (n = 289)

District's Councils	Methods Landing Centre	Formal Negotiation with Processors (%)	Consultation with other Traders (%)	Informal Negotiation with Buyers (%)	BMU setting price (%)
Sengerema	Busisi	0	18.7	78.3	3
	Kanyala	5	56	18	21
	Chifunfu	8	52	14	7
Buchosa	Kijiweni	4	73	22	1
	Itabagumba	6	51	34	9
	Bulyaheke	2	38	49	11

These findings concur with the findings reported by Lee (2014), Kambewa (2007), and Brummett (2000). On the other hand, the findings are in contrast with the findings by Gordon and Hussain (2015) and Odemero (2013). In view of the author of this paper, the prices were reasonably set and those means are reflecting customer-value based pricing approach. These means were not effective because of the monopolist tendency by middlemen who colluded to pay low prices.

According to Table 7, less than 10 percent use a method of formal negotiation with processors in each landing sites. This may be due to low level of education and lack of fishing facilities to supply fish at the quality demanded by processors and thus depending on initial buyers who are middlemen and other traders. A large percentage of artisanal fishers preferred landing price to have been set through consultation with other traders and informal negotiations with buyers.

The two methods involve buyers and traders who are middlemen, agents, and mongers. BMU's were also responsible for setting fish landing price found by this study as shown in Table 7. However, during the course of data collection, most of the BMUs were conducting general elections for BMU leaders as directed by District Commissioners (DC), because of the claims that BMU's leaders are too corrupt to set the landing price of fishes. During a focus group discussion, one member had this to say, which seemed to be a shared opinion:

> *"BMU leaders are thieves, they collude with buyers to set a price which is not a positive incentive, yet they are our relatives, that is why DC called for the re-election"* (FGD at Kanyala landing site, April 2017).

Table 7 shows that over 50 percent of the artisanal fishers at Itabagumba, Kijiweni, Chifunfu, and Kanyala set selling prices through market consultation with traders. At Busisi, which is close to town, the selling price was set through informal negotiations with buyers (78 percent). This indicates that, being very close to the township enables retailers (*Machinga*) to access artisanal fishers easily. Moreover, during an in-depth interview, some of the artisanal fishers reported that, these methods would persist as long as the daily fish price was not known until informed by middlemen or BMU. This finding differ from price setting methods informed by literatures which are cost-based pricing, customer-value based pricing (demand-based pricing), competitive-based pricing and psychological pricing (Ingenbleek *et al*., 2013; Nagle and Müller, 2017; Hinterhuber, 2008; Johansson *et al*., 2012;).

2.4.3 Factors affecting landing price

In the following subsections, multiple linear regression results, which are presented in Table 8, are discussed, particularly the extent to which various factors affect fish landing price.

2.4.3.1 Hours spent to reach onshore landing centres

The coefficient of hours spent from fishing location in the Lake to onshore landing centre showed a negative relationship with landing price and was statistically significant ($P < 0.05$), which implies that, one hour increase of travel decreases the landing price by TZS 3.96. The coefficient was negative in relation to price change implying that more hours are spent on travel to reach onshore landing sites. This therefore contributes to the deterioration of fish freshness.

Table 8: Regression results of factors affecting fish landing price (n = 289)

Variables	Coefficients	Std. Error	t	Sig.	Collinearity Statistics	
					Tolerance (T)	VIF
(Constant)	5645.127	2754.422	2.049	0.042**		
Hours to reach onshore	-3.962	1.872	-2.116	0.035**	0.940	1.064
Distance to the market	1.202	0.734	1.637	0.103	0.818	1.222
Number of buyers at onshore	-2.445	1.380	-1.771	0.776	0.991	1.009
Market price information	1.500	0.0612	2.450	0.0149**	0.849	1.178
Seasons	-0.998	0.837	-1.192	0.234	0.653	1.530
Transport cost per vessel	-0.003	0.009	-.362	0.718	0.969	1.032
Education	5.427	23.4	0.232	0.817	0.867	1.153
Years of Experience	15.8863	5.0026	3.176	0.002**	0.811	1.233

Number of observation (n) =289, $R^2 = 0.9341$, Adjusted $R^2 = 0.8725$, VIF < 10, Tolerance > 0.1, *** Statistically significant at $P < 0.01$, ** Statistically significant at $P < 0.05$.

The present study observed that more hours are spent on travel due to current complication in roads infrastructure, inspections for illegal fishing and inadequate transport vessels. Thus, artisanal fishers are discouraged from reaching other market centres in the mainland due to lack of storage facilities. This trend makes buyers dominate the process as they may have easily obtained fish permits and licences making it difficult for artisanal fishers to take fish to the market centres without losing freshness. This finding is also supported by findings of similar studies including Brummett (2000) and Lee (2014) who found that artisanal fisher's fresh fish fetch higher prices in rural areas markets as opposed to the urban areas markets, because of lacking storage mechanism.

2.4.3.2 Market price information

The study found that artisanal fishers tend to increase fish landing prices when there is more market price information from different fish buying agents who are the first hand buyers. The market price information showed a positive relationship with

landing price and was statistically significant (P<0.05). One unit increase in the counted information received about market price led to an increase of landing price by TZS 1.50. The increase of market price information gives artisanal fishers more powers to negotiate the prevailing price at the time of selling, thereby increasing landing price. This study found out that, stakeholders in the fishery sector are interested in growing of fishing chain business by offering various fish prices on a competitive basis. An increase in the pieces of information about landing prices gives artisanal fishers more powers of negotiating the current price at the time of selling. Artisanal fishers may meet more than one buyer at the time of selling. These findings are supported by findings during focus group discussions, as one of the respondents:

"*.....before we sell to marching guys, we usually make phone calls to two to three other different landing centres so that they can give us current prices of fish....*"
(FGD discussants at Busisi landing centre, 05 April, 2017).

That extract indicates that artisanal fishers use other landing centres to collect price information from buyers as an information channel to set the landing price. Each of the landing centres has one BMU that acts as one of formal channels of market price information. According to Ngigi (2008), market information units are established to collect price information and if capacitated they can lead to the dissemination of relevant market information and thus stabilizing the market structure, conduct, and performance.

2.4.3.3 Artisanal fisher's years of experience

Years of experience of the artisanal fishers showed a positive relationship with landing price and was statistically significant (P<0.05), One-year increase in experience led to an increase of the landing price by TZS 15.88. This implies that, most of the artisanal fishers have a competitive edge of having more experience in fishing; thus, they are able to negotiate landing price and recognize honest buyers. Therefore, when a daily given price is lowered by processors, that lowers the price down-streamed to fishers by agents/middlemen, as fishers are not connected to the upstream channels to communicate their problems with pricing. Thus, agents and middlemen gain more profit leaving artisanal fishers gaining little profits. New artisanal fishers need support of the experienced fishers in negotiating landing price.

2.4.3.4 Distance to the market centres located in mainland from onshore/offshore

The responses from the findings showed that artisanal fishers transported fish to the market place from landing centres at an average distance of 4 km in the mainland. The coefficient (β) was 1.202, but it was not statistically significant, which indicates that distance does not affect landing price at the destination. Similarly, observations from focus group discussions at Chifufu, Kanyala, and Bulyanheke landing centres also indicated insignificant relationship between distance and landing price at the destination as shown by the following extracts:

> "…. *when I'm taking fish to the market, already I know the price which I'm going to be paid by a Machinga*..." (Chifufu, 06 April, 2017).

> "*…regardless of the distance I walk, I can't dictate price for my fish when an agent says that market price is bad, he can't offer me bigger price than I planned. Then, I have no option…*" (Kanyala, 07 April, 2017).

> "*….it is difficult to negotiate price with arrogant buyers; all fishes may get rotten during transferring them. Who will pay me? I better sell at a small price; I will catch other fish tomorrow….*" (Kanyala, 07 April, 2017).

These extracts imply that prior communications are done either formally or informally between artisanal fishers and buyers to determine landing prices. As a result, the distance to the market centres in the mainland was found statistically insignificant to affects fish landing price.

2.4.3.4 Effect of number of buyers on fish landing price

The findings showed that the number of buyers for a given trip had a P-value of 0.776, which was not statistically significant at the 5 percent level of significance, which means that availability of many buyers does not influence the landing price. However, the coefficient had negative relationship with price indicating that artisanal fishers meet buyers or middlemen who offer lower prices at the landing centres despite their numbers. During focus group discussions, some of the artisanal fishers reported that, middlemen and agents colluded to set low landing prices irrespective of their number. Middlemen and agents also took advantage of deficiency of storage

facilities and lack of pricing information among artisanal fishers to keep landing price low. This finding is similar to the findings reported by Gordon (2015) and Kambewa (2007) who noted that, middlemen (agents) collude and force artisanal fishers to lower the prices.

2.5 Conclusions

2.5.1 Conclusions

By examining the determination of fish landing price around Lake Victoria area in Tanzania, it is concluded that, formal negotiations with processors, consultations with other traders and informal negotiations with buyers and BMU are the common methods used to determine landing prices as found by this study. Furthermore, it is concluded that the main factors influencing fish landing price around Lake Victoria are onshore distance trips, experiences of the fishers and market price information.

It is recommended that the Ministry of Livestock and Fisheries should facilitate the dissemination of market price information for a minimum selling price per fish quality standards, reduce hours spent from offshore in the Lake to reach landing sites through provision of technologically advanced fishing vessels. Artisanal fishers should also be trained on price negotiation skills via the BMU leadership around Lake Victoria. This will help the country achieve the targets of the UN Sustainable Development Goal Number 14 on providing access of small-scale artisanal fishers to fishery resources and market.

Fishers should also be assisted with access to market and price information channels by extending communication technology in the form of radio, television, cellular phones and computers for BMU offices around lake zones. Moreover, increasing artisanal fishers' fishing experiences can be accommodated by improving access to efficient fishing facilities and equipment to enhance better-paid fish landing prices. The study also recommends that, informal negotiations on the determination of landing prices should be formalized through fishery policy reforms and regulatory framework to monitor fish market conditions and fish price determination. The price setting could be improved using nation-wide regulations on indicators of landing fish prices taking into account the costs associated with collecting various volumes of fish catches.

2.5.2 Managerial implications

The environment in which artisanal fishers operate has been influenced by players (agents, middlemen, buyers, and machingas); as a result, the behaviour of players has significant consequences in determining landing price, leading to low paid price and inconsistent fishing prices. The landing price could easily be determined if the artisanal fishers decide to set prices as per input costs. This also requires an organised and reliable information system that set a minimal selling price per fish quality standard measures.

In addition, BMUs need to have a clear mechanism of disseminating landing prices information with support from the local authorities linked to a developed market information system. Following consequences in determining landing price, an increase of buyers does not support demand theory because of collusion. Policymakers should restructure methods of determining fish prices and price information policies, and provide skills to artisanal fishers on various selling tactics that achieve specific market results at their landing centres.

The current survey based on artisanal fishers' cognition on landing price and not buyers or other domestic consumers in Sengerema and Buchosa. Thus the results could not be generalized to the entire Lake Victoria, Tanzania. It is recommended future research should be focused on the effect of consumers and processors' choice in relation to landing price.

REFERENCES

Bergman, J. (2012). Nile perch export and welfare around Lake Victoria has the boom in exports been positive for welfare. [https://gupea.ub.gu.se/bitstream/2077/29748/1/gupea_2077_29748_1.pdf] site visited on 09/02/2016.

Brummett, R. (2000). Factors influencing fish prices in Southern Malawi. *Aquaculture,* 186(4), 243–251. doi: 10.1016/S0044-8486(99)00383-X.

Chandrashekar, B. (2014). Fishery co-operative societies in India: Problems and prospects. *Global Journal for Research Analysis*, 3(7), 2277-8160. [https://www.worldwidejournals.com/global-journal-for-research-analysis-GJRA/recent_issues_pdf], visited on 16/04/2017.

FAO (2003). *Report of the expert consultation on International Fish Trade and Food Security*, FAO: Casablanca. 213pp.

FAO (2005). *Increasing the contribution of small-scale fisheries to poverty alleviation and food security*, FAO: Rome. 79pp.

Gobillon, L., Wolff, F. & Guillotreau, P. (2017). The effect of buyers and sellers on fish market prices. *European Review of Agricultural Economics*, 44(1), 149-176. doi: 10.1093/erae/jbw006.

Gordon, D., & Hussain, S. (2015). Price determination and demand flexibilities in the ex-vessel market for Tuna in the Republic of Maldives. *Journal of Aquaculture Economics and Management*, 19(1), 8-28. doi: 10.1080/13657305.2015.994234.

Hammarlund, C. (2015). The big, the bad, and the average: Hedonic prices and inverse demand for Baltic cod. *Marine Resource Economics*. 30(2), 157-177. doi: 10.1086/679972.

Hennink, M. M., Kaiser, B. N., and Weber, M. B. (2019). What influences saturation? Estimating sample sizes in focus group research. *Qualitative health research*, 29(10), 1483-1496. doi: 10.1177/1049732318821692.

Henson, S., Brouder, A & Mitullah, W. (2000). Food safety requirements and food exports from developing countries: The case of fish exports from Kenya to the European Union. *American Journal of Agricultural Economics,* 82(5), 1159-1169. [http://www.jstor.org/stable/1244245], visited on 10/12/2016.

Hinterhuber, A. (2008). Customer value-based pricing strategies: why companies resist. *Journal of business strategy*, 29(4), 41-50. doi: 10.1108/02756660810887079.

Ingenbleek, P. T., Frambach, R. T., & Verhallen, T. M. (2013). Best practices for new product pricing: Impact on market performance and price level under different conditions. *Journal of Product Innovation Management*, 30(3), 560-573. doi: 10.1111/jpim.12008.

Israel, D. G. (2013). Determining sample size. The University of Florida. 5pp. [http://www.gjimt.ac.in/web/wpcontent/uploads/2017/10/2_Glenn-D.-Israel_Determining-Sample-Size.pdf], site visited on 16/08/2016.

Janssen, C., Söderberg, B., & Zhou, J. (2001). Robust estimation of hedonic models of price and income for investment property. *Journal of Property Investment & Finance*, 19(4), 342–360. doi. 10.1108/EUM0000000005789.

Johansson, M., Hallberg, N., Hinterhuber, A., Zbaracki, M., and Liozu, S. (2012). Pricing strategies and pricing capabilities. *Journal of Revenue and Pricing Management,* 11(1), 4-11. doi: 10.1057/rpm.2011.42.

Kambewa, E.V. (2007). Balancing the people, profit and planet dimensions in international marketing channels. A study on coordinating mechanisms in the Nile perch channel from Lake Victoria. Thesis for Award of Ph.D. Degree at Wageningen University: The Netherlands.

Kothari, C. R. (2004). *Research methodology methods and techniques.* New Age International Publishers, New Delhi. 401pp.

Landau, S., & Everitt, B. (2004). *A handbook of statistical analyses using SPSS*. Chapman & Hall/CRC Press LLC, Florida. 339pp.

Lee, M. (2014). Hedonic pricing of Atlantic cod: effects of size, freshness, and gear. *Marine Resource Economics,* 29(3), 259 - 277. doi: 10.1086/677769.

Lokina, R. (2009). Technical efficiency and the role of skipper skill in artisanal Lake Victoria fisheries. *Environment and Development Economics*, 14(4), 497 - 519. doi: 10.1017/S1355770X08004968.

Luomba, J. & Onyango, P. (2012). Dagaa fishery the unknown wealth of Lake Victoria. *IIFET 2012 Tanzania Proceedings*. Held in Kilimanjaro Hotel, Dar es Salaam, Tanzania, July 16th -20th, 2012, 1-13.

McConnell, K. & Strand I. (2000). Hedonic prices for fish: Tuna prices in Hawaii. *American Journal of Agricultural Economics*, 82(1), 133-144. doi: 10.1111/0002-9092.00011.

Meyer, J. & Cramon-Taubadel, S. (2004). Asymmetric price transmission: A survey. *Journal of Agricultural Economics*. 55(3): 581-611. doi.org/10.1111/j.1477-9552.2004.tb00116.x.

Minot, N. (2009). *Transmission of world food price changes to African markets and its effects on household welfare*, International Food Policy Research Institute (IFPRI): Washington, D.C. 53pp.

Monson, M. (2009). Valuation using hedonic pricing models. *Cornell Real Estate Review*, 7(1), 62-73. [https://hdl.handle.net/1813/70656], visited on 03/11/2016.

Mpenda, Z. (2010). Effects of compliance with food safety standards on costs, benefits and organization of Nile Perch export supply chain in Tanzania. Thesis for Award of PhD Degree at Sokoine University of Agriculture: Morogoro, Tanzania. 251pp.

Nagle, T. T., & Müller, G. (2017). *The strategy and tactics of pricing: A guide to growing more profitably* (6th Edition). Routledge, London. 352pp.

NBS (2019). National bureau of statistics. Dar es Salaam, Tanzania.

Ngigi, M. (2008). Structure, conduct and performance of commodity markets in South Sudan: Linkage food security. [http://www.fao.org/ fileadmin/user_upload/sifsia/docs/South_Sudan_SCP_study%20report _1.pdf], visited on 23/12/2017.

Odemero, F. (2013). Price transmission and households demand elasticity for frozen fish under fuel subsidy reform in Delta State, Nigeria. *International Journal of Food and Agricultural Economics*, 1(1), 119-127. [https://www.foodandagriculturejournal.com/119.pdf], visited on 22/05/2016.

Olukosi, J. O., Isitor, S. U. & Ode, M. O (2005). Introduction to agricultural marketing and price: Principles and applications. Living Books Publishers Company, Abuja, 120pp.

Phillips, M. & Subasinghe, R. (2010). Small-scale Shrimp farmers and global market –Trends, future prospects, and adaptation.[//w.aquaculturealliance.org/advocate], visited on 20/08/2016.

Roangead (2013). Tanzanian Nile perch value chain baseline study. Burgun Cedric: International Trade and Sustainable Development. [http://www.Roangead.org/IMG/pdf/Roangead_Rapport_Final.pdf], visited on 13/07/2016.

Roheim, C. A., Gardiner, L., & Asche, F. (2007). Value of brands and other attributes: Hedonic of retail frozen fish in the UK. *Marine Resource Economics*, 22 (3), 239-253. doi. 10.1086/mre.22.3.42629557.

Rosen, S. (1974). Hedonic price and implicit market: Product differentiation in pure competition. *The Journal of Political Economy*, 82(1), 34-55. [https://www.jstor.org/stable/1830899], visited on 15/01/2016.

Saunders, M., Lewis, P. & Thornhill, A. (2016). *Research methods for business students* (7th edition). Pearson Education Limited, Harlow. 768pp.

Taru, B., Jonathan, R., & Lawal, H. (2010). Structural analysis of Paddy markets in southern parts of Taraba State, Nigeria. *Journal of Agriculture and Social* Science, 10, 110-12. [https://www.cabdirect.org/cabdirect/abstract/20103311188], visited on 23/04/2016.

URT (2004). *Tanzania Mini Tiger Plan*. Government Printer: Dar es Salaam, 16pp.

URT (2010). *Fishery sector development program Tanzania*. Government Printer: Dar es Salaam, 37pp.

URT. (2014). *Report on Lake Victoria fishery frame survey results-2014 Tanzania.* Government Printer: Dar es Salaam, 162pp.

URT. (2017). *Mwanza region investment guide*. Government Printer: Dar es Salaam, 80pp.

Wisdom, J. & Creswell, J.W. (2013). *Mixed methods: Integrating quantitative and qualitative data collection and analysis while studying patient-centered medical models*. AHRQ Publication: Rockville, 5pp.

CHAPTER THREE

3.0 EFFECTS OF FISH ATTRIBUTES ON LANDING PRICE AROUND LAKE VICTORIA, TANZANIA

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3.1 Abstract

There are various challenges that affect landing price paid to fishers due to varying attributes of fishes. Despite the potential to the wellbeing of artisanal fishers, the effects of fish attributes on landing price remain undisclosed during the landing of the fish harvest to landing sites. The research on which this paper is based employed a cross-sectional research design whereby data were collected once from a sample size of 289 artisanal fishers to investigate the effects of fish attributes on landing prices around Lake Victoria, Tanzania, for selected fish species. Specifically, this paper examines attributes of fish particularly Nile perch, Tilapia and Sardine fish species at the time of arrival at the landing sites to determine the effects of the attributes on the landing prices of the fishes. The log-linear multiple regression model was employed to examine the effects of fish attributes on landing price. The results showed that freshness at island, quantity landed at onshore island market, preserved fish, size, weight and freshness at mainland landing ground were statistically significant in influencing landing price of fishes ($P<0.05$). The study recommends that Artisanal fishers should improve preservation methods to maintain quality of fish attributes, use modern storage facilities over local canoes storage mechanism to maintain freshness of the fish and employ fishing vessels that catch legally sizable fish. Therefore, artisanal fishers may join and form cooperatives for collective purchasing of fishery equipment that could accommodate reasonable sizes of fishes landed as well as participating in contractual agreements to ensure better agreeable fish landing prices.

Keywords: Fish; fish attributes; price; Lake Victoria

3.2 Introduction

Worldwide, fish remains a source of food and employment in developing countries (Henson *et al*., 2000). There are nearly 34 000 fish species living in fresh and salty waters. Fish traded for consumption are recognized by using features and quality or characteristics known as fish attributes during selling (FishBase, 2018; Maciel *et al*., 2013). Nevertheless, for years, the relationship between fish attributes and fish prices have been viewed differently by scholars at the global level. Various studies, including Gobillon (2017), Hammarlund (2015), Lee (2014), Roheim *et al.* (2007) and McConnell and Strand (2000) provide different views regarding various fish attributes of different fish species and their influence on price. For example,

according to McConnell and Strand (2000) fish species, fat content, and the type of handling are fish attributes that influence price. Roheim *et al.* (2007) cited fish species, brands and package size as influencing factors on pricing.

Other attributes are given by Hammarlund (2015) who listed size and freshness of fish as fish attributes influencing the price of fish. Besides, a study by Lee (2014) found attributes such as fish size, fish freshness, trip duration, storage, and fishing gear of fishers. Gobillon (2017) analysed fish species, fish size, time, sellers, and buyers' effects on price of fish. With distinction to species-specific, a study by Lee (2014) focused on Atlantic cod; Hammarlund (2015) on Baltic cod; and Gobillon (2017) on Sole and Monkfish species. Although these studies were country-specific about determining prices of fish and were limited to different species on specific attributes, fish attributes vary across species. However, there is no empirical information on whether the mentioned fish attributes or similar attributes are relevant for selected fish species around Lake Victoria, Tanzania.

Despite the availability of different species around Lake Victoria, Tanzania, the dominant species caught and sold species are Nile perch, Nile tilapia, and Sardine (URT, 2014 and Matiya, 2010). Accordingly, these species were selected for the study. Therefore, fish attributes of the selected species such as freshness, quantity landed at different market categories, and size of fish were analysed in relation to landing prices at different market levels or categories as depicted by Gobillon (2017), Lee (2014), McConnell and Strand (2000). Landing price is defined as the price of fish received at first-hand by artisanal fishers during landing, and it contributes to the income and wellbeing of artisanal fishers within the fishery sector (Alapan *et al*., 2016; Janssen *et al*., 2001). According to FAO (2014), artisanal fishers are fishers using relatively small amounts of capital whose fishing is primarily for local consumption. A large part of their catch is for local markets at landing sites (Hoof & Kraan, 2017).

Apart from income and wellbeing contribution of the fishery sector to individual artisanal fishers, the sector also contributes about 2.5 percent of the real GDP and employs more than 4 000 000 people in related activities in Tanzania (BOT, 2017; FAO, 2014). Therefore, motivates undertaken of this study. Some studies around

Lake Victoria documented various challenges associated with varying attributes of fish hindering higher landing prices among artisanal fishers. These challenges included the agent's exploitation of fishers, imbalance of negotiation power, limited access to fishing gear, buyers' choices, lack of improvement in fishing skills, handling, use of technology, and inadequate access to and control of storage facilities (Kambewa, 2007; Luomba, 2013).

Following the challenges hindering artisanal fishers from obtaining higher landing prices, the government of Tanzania facilitated the construction of storage and other fishing facilities to preserve fish and enable artisanal fishers obtain higher paid landing prices for preserving fishes (URT, 2014a). In addition, artisanal fishers were looking for profitable contract arrangements in their efforts of acquiring higher landing prices (Mpenda, 2010). Consequently, there were still challenges hindering artisanal fishers to be paid higher prices. These challenges include uncertainty regarding information on landing prices, the volume of the catch, the types of buyers, and loans issued to fishers (Janssen *et al*., 2001; Phillips and Subasinghe, 2010). Moreover, Chandrashekar (2014) argue that artisanal fishers' in cooperatives managed to supply quality fish and have improved wellbeing but did not inform how the quality of fish associated with landing price.

However, little is known to conclude the same or similar effects of fish attributes on landing prices around Lake Victoria in Tanzania. To date, there are few types of literature specific to the study area that have looked at the effects of fish attributes on fish landing prices in Buchosa and Sengerema Districts. Studies by Gobillon (2017); Hammarlund (2015); Lee (2014) and McConnell and Strand (2000) confirm the importance of the attribute variables such as freshness, storage facilities, fat contents, grades, and size in determining prices at different market levels or categories. However, there is limited information on whether the mentioned fish attributes or similar fish attributes persist around Lake Victoria, Tanzania. This paper focuses on the price received by artisanal fishers at landing sites (landing price) across all market categories, which include offshore landing sites, onshore landing sites, and local markets. The objective of the paper is to examine the effects of fish attributes on these landing prices. The study result serve as a basis for strategic recommendations

regarding fish pricing and attributes among artisanal fishers around Lake Victoria, Tanzania.

This paper answers two questions: (i) what are the fish attribute influencing landing price. (ii) How does the change of one attribute affects the landing price of fish? It is hypothesized that there is no significant influence of fish attributes on the landing price.

3.3 Literature Review

3.3.1 Theory underpinning the study

The study on which this paper is based was guided by the Price Theory. The theory validates the price for any specific commodity in connection with supply and demand of that commodity. According to this theory, the price of the commodity is obtained at a point where utility-bearing attributes of that commodity is not only valuable to individual demands, but also it complies with the seller's needs; this is known as the optimal market price. The theory was employed by Nguyen (2011) in his study on demonstrating the relationship between prices of one-day island tours and different attributes associated with them.

The foundation of commodity valuation for their utility-bearing attributes and commodity prices varies with a change in the number of attributes associated with it, and they date back to Rosen's (1974) demonstration known as hedonic price theories. Hedonic price model relies on attributes that influence commodity valuation, which assumes that consumers' utility is derived directly from the quality attributes in a commodity (Rosen, 1974). Hedonic price model relies on attributes that influence commodity valuation, which assumes that consumers' utility is derived directly from the quality attributes in a commodity (Rosen, 1974). Therefore, hedonic pricing techniques are based on a theory of consumer behaviour which suggests that people value a good because they value the attributes of the good rather than the good itself. The model is relevant to this study because landed fish have different at attributes (heterogenous characters) in the market with no common price, thus consumers can choose any bundle of attributes they wish to maximize utilities (McConnell and Strand, 2000; Kristofersson and Rickertsen, 2004).

The importance of the relationship between quantities of attributes and commodity prices was also demonstrated in studies of supply and demand for fish with specific attributes. These studies include Brayden *et al.* (2018), Bronnmann and Hoffmann (2018), and Johnston *et al.* (2001), which focused on the valuation of fish attributes that have value to the consumer by employing the demand theory. Other studies are supply studies such as Kristofersson and Rickertsen (2004), Brummett (2000), McConnell and Strand (2000), which focused on the supply theory.

It is assumed that an increase in the supply of commodity with specific individual attributes affects prices (Kristofersson and Rickertsen, 2004). Moreover, during the supply of fishes, artisanal fishers may have the harvest control and harvesting cost, but it is important to understand that fish price received by artisanal fishers may also be influenced by monopoly, strategic pricing, and demand and supply factors (Leiblein, 2017; Gordon and Hussain, 2015).

Furthermore, with the assumption that the price of fish received by fishers is the optimal price and can change when supply and demand change (Gordon and Hussain, 2015), then the price theory is a useful guide for the evaluation of the effects of fish attributes on landing prices. This theory contextualizes the determination of fish landing price based on the supply and demand of fish, considering attributes such as species, size, freshness, weight and preserved fish from different methods of preservation (Alapan *et al.*, 2016; Gordon and Hussain, 2015; Roheim *et al.*, 2007; Kristofersson and Rickertsen, 2004; McConnell and Strand 2000). The methods of preservation include freezing fresh fish, smoking fish, and sun-drying fish (Matiya, 2010).

The price of a specific product is determined by its internal and external factors and observed and unobserved attributes (Nguyen, 2011). The criticism of Price theory is that, the resulting prices to be set will always be arbitrary under true uncertainty (Elsner *et al.*, 2014). True price valuation cannot perfectly be determined by considering fish attributes; there other factors that need to be employed during price determination. However, the key feature of price theory is the assumption that implicit price is a function of its fundamental attributes (Thrane, 2005). To understand the impact of attributes on prices for supplying fish at landing sites, it was important to understand how independent variables such as fish species, size,

freshness, quantity landed at different market category by the location of offshore and onshore landing sites, preserved fish from different methods of preservation and weights influence landing price as dependent variables. This paper study analysed these variables.

3.3.2 Empirical review

Various studies that have looked at several fish attributes and fish price. These studies include Gobillion (2017), Lee (2014), Hammarlund (2015), and McConnell and Strand (2000). Many of these studies analysed data using a hedonic price function. Employing hedonic price function in relation to fish attributes, Lee (2014) and Hammarlund (2015) found that fish size, freshness, trip duration, storage, and gear type have effects on the ex-vessel price for cod. Other studies that used hedonic price function include McConnell and Strand (2000) and Gobillon (2017) who confirmed the influence of attribute variables such as freshness, package and fish size in determining prices of fish at different market levels. However, these studies indicated the quality attributes which are related to fishery management and resale prices.

Several hedonic studies (e.g. Nguyen, 2011; Mangion, 2005; Carroll, 2001; Slade, 2000) used different functional forms such as linear, semi-log, log-log, quadratic and log-linear in transforming variables of choices when estimating hedonic price functions. Studies by Nguyen (2011) and Mangion (2005) employed cross-sectional data in the analysis of log-linear regression model to examine the relationship between price and different attributes in terms of tourism competitiveness. According to literature (Slade, 2000) the log-linear model is the most preferred specification for analysing hedonic price determinants and perform better than other models. Despite similar hedonic price functions, different species were analysed in studies by Lee (2014) who focused on Atlantic cod, Hammarlund (2015) who focused on Baltic cod, and Gobillon (2017) who focused on Sole and monkfish species. The log-linear form is used in the hedonic price analysis of fish attributes of Nile perch, Nile tilapia, and Sardine fish species, which were selected for the study on which this paper is based.

3.4 Methods

3.4.1 Data source and sampling

The study was conducted in the area around Lake Victoria in Mwanza Region because, it is the 'leading fish market stop centre' with seven fish processing industries therefore surpassing other regions (Kagera, Geita, Simiyu and Mara) surrounding the lake in fishing, fish landing, trading, and exporting of fish (URT, 2017). Also, around Lake Victoria, Mwanza Region with a total of about 52,942 fishers is among the eight poor regions in Tanzania with high poverty rates of 34.6 percent indicated by the existence of the highest number of poor people among rural dwellers including artisanal fishers who are living below the poverty line (URT, 2014; NBS, 2019). Two districts within Mwanza Region, Sengerema, and Buchosa were purposely selected, based on ranking with a high collection of fish catch and landing sites activeness in selling of landed fish (URT, 2017).

The data requirements of the study were both primary and secondary source of data. The study was guided by quantitative data. Qualitative data were also collected to enrich the quantitative results of this study as recommended by Wisdom and Creswell (2013). Quantitative data were collected by enumeration of the artisanal fishers to gather information related to demographic features of fish species, landing prices and fish attributes.

A cross-sectional research design was used. The design entails collection, organisation, and analysing data from various cases around Lake Victoria at a single point in time. The design was chosen because it is also in favour of both qualitative and quantitative data that fit the chosen variables of this study (Saunders *et al*, 2016). Therefore, cross-sectional research design was used in this study not only because the study duration was limited in terms of time, but also to enable the examination of different variables at the same time (Saunders *et al*, 2016; Bajpai, 2011; Kothari, 2009). A sample of 300 fishers was selected (Table, 9), from 1200 total fishers' population of the two districts (URT, 2014); using a formula by Israel (2013) with 95 percent confidence level and a precision level of $\leq$ 5 percent, which is an acceptable sampling error. Israel (2013) formula is given as $n = N/\left(1 + N\left(e^2\right)\right)$, where n is the sample size, N population size, and *e* is the level of precision. From an estimated

total population of 1200 fishers from two districts, then $n = 1200 / \left(1 + 1200\left(0.05^2\right)\right) = 300$.

In order to collect pertinent information from respondents, purposive, proportionate, and simple random sampling techniques were utilized. Purposive sampling technique was used to select three active landing sites on landing and selling of fish with non-overlapping trading by artisanal fishers between landing sites in each district. Therefore, six landing sites were included in this study. To obtain the respective sample size per landing site, a proportionate sampling technique was used with a sampling fraction of n/N = 300/1200 = 0.25 (Table, 9). Sampling frame per landing site was obtained with the assistant from District Fishery Officers and Ward Executive Officers. The computation is such that $n = \Sigma n_i$ but $n_i = 0.25 \times N_i$ where by i = 1,2…6. Simple random sampling was used to select respondents per each landing site using a lottery approach.

Table 9 : Sample size determination

Landing site	Sampling frame	Sample size
Busisi	$N_1 = 254$	$n_1 = 63$
Kijiweni	$N_2 = 184$	$n_2 = 46$
Nyakalilo	$N_3 = 118$	$n_3 = 30$
Kanyala	$N_4 = 296$	$n_4 = 74$
Itabagumba	$N_5 = 156$	$n_5 = 39$
Bulyaheke	$N_6 = 192$	$n_6 = 48$
Total	**N=1200**	**n=300**

A questionnaire was used to collect quantitative data related to fish attributes and fish landing price of the selected species. Before full enumeration, pre-testing of the questionnaire was done by administering it to 15 randomly selected respondents (5% of the total respondents) for the purpose of identifying and rectifying unfamiliar terms used therein, checking the clarity and ambiguity of questions, and checking for the duration of interviewing one person. Then the questionnaire was improved accordingly before it was used for actual data collection. During the actual data collection, out of 300 fishers, 289, which is 96 percent response rate, completed the questionnaire, which were used in the analysis. The remaining incomplete questionnaire copies were discarded. This was in line with the suggestion by Evans (1991) that a high response rate (> 80%) from a sample is preferable.

Focus group discussion (FGD) guide was also used to supplement the questionnaire. FGD data saturation or thematic saturation codes (Hennink *et al.*, 2019) examined are the fish attributes used to determine landing price. Data saturation or thematic saturation refers to a point when issues begin to be repeated during discussion time and when collecting data, and where additional, data collection becomes redundant. To reach meaning saturation, that is, gaining the conceptual depth of the issue identified, six FGDs were conducted, one at each landing site consisting of eight artisanal fishers, with the ability of eliciting information on fish attributes, quality of fish, demographic features of fish species, landing prices, and determination of landing price.

Moreover, twelve key informant interviews (KII) were held from three purposefully selected leaders from fishers, one buyer from Sengerema District, one agent from Buchosa District, two Beach Management Unit (BMU) leaders, two District Fishery Officers, one representative from the Tanzania Fisheries Research Institute (TAFIRI) and two Village Executive Officials. Since different vessels catch more than one species of varying fish sizes, data collected from artisanal fishing were based on subsistence, commercial and quantity marketed for more than one species (Hoof & Kraan, 2017).

3.4.2 Description of variables

Theoretical instruction for choosing the independent variables for the hedonic pricing model is missing (Andersson, 2000); thus, it is difficult to select them. Therefore, the use of questionnaire-based surveys, focused group discussions, key informant interviews, and literature are important in gaining an in-depth understanding of fish attributes. This led to the identification of explanatory variables used in this study. In addition, the selection of variables that were used in this paper was based on consensus among prominent scholars that the variables influence fish price and have marginal price effects. Some of these scholars include Gordon and Maurice (2015), Hammarlund (2015), Lee (2014), Roangead (2013), Bergman (2012) and Mitullah (2003).

The variable freshness is one of the attributes correlating with the fluctuation of landing price (Lee, 2014). This paper, focuses on the challenges of measuring nautical miles travelled, the freshness of the fish, which is measured in terms of hours spent in a distance trips to reach either offshore islands or onshore mainland landing sites, termed as “trip duration” (Lee, 2014; Lokina, 2014). Therefore, in the scope of this study, freshness is defined as retained quality taste of the harvested fish from the lake before spoilage to the time it is purchased by a primary buyer. To analyse the relationship between freshness and landing price, establishment of freshness benchmark among artisanal fisheries was considered essential.

Therefore, during FGD, other factors remaining constant, a consensus was reached that freshness lasts for four hours at ambient temperature, and thereafter the fish starts deteriorating leading to spoilage. The island freshness variable applies to fish sold on islands, while the mainland freshness variable applies to fish originally sold at mainland landing sites. Landing sites have different structures, conduct, and performance that cause variance in fish landed price. The quantity of fish landed at different Islands and Mainland markets is included as an attribute variable to account for the catches landed at different landing sites, that is, offshore landing sites, onshore landing sites, or local markets, during analysis. Table 10 presents the summary of the variables used in this paper.

Local market places are inland locations near the sea with easy access for artisanal fishers where additional commodities are sold. Another variable is the preserved fish included to consider quality of fish in different forms of preservation methods carried out locally. This variable was constructed to account for fish perishability and its effect on the price that a buyer was willing to pay. In addition, fish size was included in accounting for variation of fish sizes.

Table 10 : Variable description and meaning

Variable Description	Variable Name	Type of Variable	Meaning of Variable
Landing Price	LP	Continuous	Price per kg of a fish in TZS at the on-spot market
Island Freshness	SF	Continuous	Hours spent in a distance trip to reach the island
Mainland Freshness	IF	Continuous	Hours spent in a distance trip to reach mainland
Quantity landed on Island	QL_i	Dummy	Quantity of fish landed, equals to 1 if catches were landed on Island landing site and 0, otherwise
Quantity landed on mainland	QLm	Dummy	Quantity of fish landed, equals to 1 if catches were landed on mainland landing site and 0, otherwise
Preserved fish	PF	Dummy	Equal to 1 if fish preserved and 0 otherwise.
Fish Size	FZ	Continuous	Fish size is measured as number of fish sold in kg, per artisanal fisher'
Weighted Measured	WM	Dummy	Equal to 1 if weighted scale results are acceptable and 0 otherwise.

3.4.3 Data analysis

According to (Nguyen, 2011), the fundamental theory of hedonic price looks at the price (p) of a commodity as a function of its attributes (x). Thus, in examining the effects of fish attributes on landing price, two stages approach of the fundamental theory of hedonic price function was employed (Hammarlund, 2015). In the first stage, the price (p) of a commodity is the function of its attributes such that:

$$p = f(x) \tag{1}$$

And the second stage is the implicit price of a commodity, that is, how changes in each of commodity attributes will change in the price. Ordinary Least Square (OLS) was used to estimate hedonic regression analysis of landing price on fish attributes. Therefore, fish attributes extracted and used in this study were freshness, size, species, preserved fish, the quantity landed at given a market category, and the weight measured. Therefore, multiple regression analysis was done using the equation:

$$p_j = \beta_i x_i + \mu \tag{2}$$

Where:

x_i is the i^{th} attribute of fish x,

p_j is the price of j^{th} fish per kilogram, per artisanal fisher,

β_i are the coefficients of the attributes, and

μ is a random factor influencing the price of the fish.

With the change of fish attributes in quantities during the supply of the fish, then inverse attributes demand estimation is possible using the following equation:

$$\beta_m = Vq_m + \mu_m \tag{3}$$

where:

β_m is the observed fish price of m^{th} attribute,

V is a coefficient of quantities supplied of different fish attributes,

q_m are quantities supplied of different fish attributes, and

μ_m are unobserved factors influencing the price of the fish attributes

and the two equations (2) and (3) are estimated simultaneously in equation (4) by using a random coefficient model (RC) (Hammarlund, 2015):

$$p_j = \rho x_i + V x_i q_i + x_i \mu_i + \varepsilon_i \tag{4}$$

Where by:

$V_i = \dfrac{\Delta p_j}{\Delta x_i q_i}$ is the marginal implicit price for any attribute of the fish (Taylor, 2003)

$x_i \mu_i + \varepsilon_i$ is the random part of the estimated model

$\rho x_i + V x_i q_i$ is the interaction part of the fish attributes for the amount of catches

Random Coefficient (RC) model was also employed to consider the inverse attributes demand estimations. Therefore, equation (5) is a formed multiple regression equation and transformed to natural log regression (log-linear model), which is a simpler form used in this study and is more accurate for unobserved influential variables, measurement errors, extracting outlaying data and creating normality among variables (Slade, 2000).

$$\ln LP = \beta_0 + \beta_1 \ln IF + \beta_2 \ln SF + \beta_3 QL + \beta_4 PF + \beta_5 \ln FZ + \beta_6 WM + \varepsilon \tag{5}$$

With reference to price theory, all the three selected fish species are valued differently at the time of selling; hence, each has its own valid landing price. Let us

say LP_{NP_i} is Nile perch price; LP_{NT_i} is the price of Nile tilapia and LP_{SA_i} is the price of sardine; then, hedonic regression analysis at the time of landing price per specie is possible as depicted in equation (6). Each landing price per species is not comparable with another. Therefore, equation (6) is a formed multiple regression equation and transformed to natural log regression (Log-linear model). Therefore, the regressed equation was generated using the operational definitions of variables given in Table 2 as it appears as follows:

$$\ln\begin{cases} LP_{NP_i} \\ LP_{NT_i} = \beta_0 + \beta_1 \ln IF + \beta_2 \ln SF + \beta_3 QL + \beta_4 PF + \beta_5 \ln FZ + \beta_6 WM + \varepsilon \\ LP_{SA_i} \end{cases} \quad (6)$$

The estimated constant, β_0, represents the value of the baseline transaction, while the other βs represent parameters of estimated coefficients and ε is an error terms. Robustic White-Huber standard errors were employed following a White test for heteroscedasticity. The coefficient of each dummy variable was calculated using $D_i = \left(e^{\beta_i} - 1\right)100$. Since a change in the log of a variable is a relative change, 100 is a percentage change (Gujarat, 2003). Therefore, βi approximates the relative change to the landing price for dummy variables. For continuous variables, the estimated coefficient β_i is interpreted as the relative effect on the landing price due to a change in the variable.

It is important to note that OLS may violate constant correlation assumptions for data that were closer and others that were collected far apart during a day. Therefore, the RC model allows joint estimation method of a price attributes function and inverse demand function. It also solves the problem of heteroscedasticity and takes into account the constant correlation among multiple measurements. Finally, model inferential results were triangulated with the analysed contents from focus group discussions and key informant interviews from key issues related to fish attributes and their influence on landing price. Participants' quotes were chosen according to their relevance to the research objective.

3.5 Results and Discussion

3.5.1 Demographic features of selected fish species

The study established demographic features of selected fish species, which are Nile Perch, Nile Tilapia, and Sardines in terms of price of fish species per kilogram, quantity of fish per kilogram and the size in length of fish species landed in centimetres. The descriptive statistics after data analysis show that the average landing price was TZS 3 225 per kilogram for Nile perch, TZS 2 780 per kilogram for Nile tilapia, and TZS 324 per kilogram for sardines. The average quantities of fish catches landed by artisanal fisher were 16 kilogram of Nile perch, 23 kilogram of Nile tilapia, and 18 kilogram of sardines.

Table 11 : Demographic features of selected fish species

		Descriptive Statistics			
Variables	**Sub-Variables**	**Mean**	**Std Deviation**	**Min.**	**Max**
Nile perch	Landing price per kg	3225	553.7	2800	7500
	Quantity in kg per artisanal fisher	16	6	12	34
	Size in centimetres per fish	-	-	30	90
Nile tilapia	Landing price per kg	2780	423.4	2500	6500
	Quantity in kg per artisanal fisher	23	4	21	48
	Size in Centimetre per fish	-	-	13	43
Sardine	Landing price per kg	324	43	300	450
	Quantity in kg per artisanal fisher	18	2.7	15	25
	Size in centimetre per fish	-	-	-	-

Also the largest identified Nile perch fish was found to have a maximum length of 90 centimetres and the largest Nile tilapia fish had a maximum length of 43 centimetres (see Table 11).

3.5.2 Fish attributes influencing landing price

The effect of fish attributes on fish landing price was established by computing fish attributes, which were understood by artisanal fishers to be useful for receiving better landing price. Inferential analysis results were obtained by regressing landing price of each fish species on the independent variables that were selected. The results in Table 12 indicate that about 84 percent of the respondents understood that middlemen and fishmongers preferred the size of fish as one of the criteria to set landing price. This

aligns with the observable existing situation; larger sized-fish species are the ones that are highly valuable and preferred for inter-trade at regional markets.

These findings concur with the assumption that market changes for example in terms of increasingly purchasing of fish with certain attributes, create higher demand, and cause price increase in accordance with the price theory. The findings concur with FAO (2003) observation that smaller fish are sold locally within Mwanza region, leaving other regional markets and retailers in Tanzania to trade mostly with larger species such as Nile Perch and Tilapia.

Table 12 : Fish attributes affecting landing price (n = 289)

Fish Attributes	Per cent		
Criteria	No	Yes	Total
Fish size	15.3	83.7	100
Fish that spent days at onshore	68.9	31.1	100
Fish that spent days at offshore	70.8	29.2	100
Specie differences	33.0	67.0	100
Fish stored for many days before reaching landing centres	64.5	35.5	100
Fish stored in a boat freezer before landing	48.0	52.0	100

The availability of the different nature of specie when landed as reported by 67 percent of artisanal fishers, is one of the attribute preferred by buyers because specie differences gives a wide variance of choices to buyers. The consumers' willingness to pay depends on preferences and choices pertaining to available species and sizes, thus influencing the price of fish. Descriptive statistics indicate further that about 68.9 percent of the respondents argue that fish that spent number of days on onshore do not influence landing prices and 70.8 percent of the respondents argue that the fish that spent number of days on offshore landing sites do not influence landing prices. Days spent in storing fish between harvests and landing lead to fish deterioration, implying that artisanal fishers do not spend more than a day between harvest and landing. This finding concurs with the comments given during focus group discussions that artisanal fishers are not spending more than a day because of inadequacy of fishing storage vessels, which prevent them from reaching deeper waters (FGD, at Itabagumba, April 2017).

Looking at the effects of fish attributes on landing price, three hedonic regression analyses were run, one with the dependent variable of landing price of Nile perch, the

second was with the landing price of Nile tilapia, and the third was with the dependent variable of landing price of sardine. The results are presented in Tables 13, 14, and 15.

Table 13 : Effects of fish attributes on the landing price of Nile perch (n =289)

Variables	OLS Coefficients	OLS Std. Error	OLS P-Value	RC model	RC Std. Error	RC p-value
(Constant)	0.049	0.542	0.928	0.069	0.671	0.918
Island freshness	0.013	0.001	0.000***	0.017	0.006	0.005***
Mainland freshness	-0.065	0.005	0.000**	-0.048	0.022	0.030**
Preserved fish	0.109	0.044	0.014**	0.171	0.064	0.007***
Quantity landed at island	0.047	0.029	0.105	0.066	0.018	0.000***
Quantity landed at mainland	-0.067	0.042	0.120	-0.051	0.023	0.027**
Fish size	0.150	0.047	0.001***	0.173	0.029	0.000***
Weighted Measure	-0.125	0.099	0.213	-0.109	0.09	0.226

Number of observation (n) =289, OLS R-squared = 0.911, RC R-squared 0.893, ***Statistically significant at P < 0.01, **Statistically significant at P < 0.05, * Statistically significant at P < 0.1

The multiple regression analysis results of the landing price of Nile perch are presented in Table 13. The explanatory power of the model is also shown by R^2 range from 0.893 to 0.911, giving a good model fit. This is above 80 percent of the total variation in the dependent variable, which is explained by the explanatory variables. The coefficient(s) results of the OLS and RC models in Table 13 show a similar change of landing price in TZS per kilogram.

The fish attributes for Nile perch: island freshness (P<0.01), preserved fish (P<0.05), quantity landed on island (P<0.01), and the size (P<0.01) of fish significantly and positively affected landing price. Other fish attributes were the mainland freshness (P<0.01) of fish and quantity landed on mainland markets (P<0.05), which significantly, but negatively influenced the landing price (Table 13).

Table 14 reveals the hedonic regression results of fish attributes for Nile tilapia as follows: island freshness (P<0.05), fish size (P<0.05), preserved fish (P<0.05), and offshore islands (P<0.01) positively and significantly affected landing price. Others were mainland freshness (P<0.01) and the quantity landed on mainland (P<0.05) markets, which were found significant but negatively affected landing price. The unit change in each of coefficient also indicates a change of landing price in TZS per kilogram of Nile Tilapia.

Table 14 : Effects of fish attributes on the landing price of Nile tilapia (n = 289)

Variables	OLS Coefficients	OLS Std. Error	OLS p-value	RC model	RC Std. Error	RC p-Value
(Constant)	0.0401	0.3371	0.905	0.046	0.5795	0.936
Island freshness	0.0041	0.0016	0.0109**	0.0035	0.0015	0.0203**
Mainland freshness	-0.0739	0.023	0.0014***	-0.071	0.0105	0.00001***
Preserved fish	0.1001	0.067	0.136	0.141	0.0713	0.0489**
Quantity landed on island	0.0381	0.009	0.000***	0.037	0.0013	0.00001***
Quantity landed on mainland	-0.0759	0.032	0.018**	-0.08	-0.112	0.475
Fish size	0.1411	0.017	0.001***	0.143	-0.106	0.178
Weighted measure	-0.1339	0.053	0.012	-0.138	-0.045	0.0023

Number of observation (n) =289, OLS R-squared 0.894, RC R-squared 0.807, ***Statistically significant at P < 0.01, **Statistically significant at P < 0.05, * Statistically significant at P < 0.1.

The model's explanatory power is also shown for the OLS and RC models, whereby the R^2 ranged from 0.807 to 0.894, giving a good model fit. In summary, Nile tilapia fish attributes were had similar effects as Nile perch fish attributes, although the difference was on the units of change of each coefficient, thus confirming the differences in landing prices of the two species.

Table 15 presents hedonic price regression results of fish attributes for Sardine, indicating that island freshness (P<0.05), weighted measure, onshore mainland market, and mainland freshness were significant (P<0.05) but negatively affected landing price. The model coefficient results of sardine's fish attributes are different from the coefficients of fish attributes of Nile perch and Nile tilapia, which are shown in Tables 13 and 14 respectively. The difference was in the coefficients of fish attribute(s); preserved fish, quantity landed at Island, and fish size were found insignificant in influencing landing price of Sardines, but significant in influencing landing price of Nile perch and Tilapia. The model's level of significance was 5 percent for the OLS and RC models with R^2 ranging from 0.865 to 0.912 respectively, giving a good model fit.

Table 15 : Effects of fish attributes on the landing price of Sardine (n = 289)

Variables	OLS Coefficients	OLS Std. Error	OLS P-Value	RC model	RC Std. Error	RC p-value
(Constant)	0.011	0.495	0.982	0.0195	0.671	0.976
Island freshness	-0.103	0.014	0.000***	-0.019	0.007	0.007***
Mainland freshness	-0.025	0.011	0.024**	0.032	0.016	0.046**
Preserved fish	0.073	0.054	0.177	0.093	0.064	0.147
Quantity landed at island	0.009	0.015	0.548	0.039	0.021	0.064
Quantity landed at mainland	-0.103	0.02	0.000***	-0.081	0.013	0.000***
Fish size	0.112	0.073	0.126	0.133	0.081	0.101
Weighted Measure	-0.147	0.086	0.088	-0.096	0.037	0.009***

Number of observation (n) =289, OLS R-squared 0.912, RC R-squared 0.865, ***Statistically significant at P < 0.01, **Statistically significant at P < 0.05, * Statistically significant at P < 0.1.

Therefore, island freshness of fish was found to increase fish landing price by TZS 0.013 per kg of Nile perch and by TZS 0.0041 per kg of Nile tilapia. This implies that the increase in price was caused by buyers arriving at the island from the mainland to get freshness qualities. This reduced hours that could be spent on distance towards the mainland that could lead to deterioration of freshness of fish and therefore leading to low paid landing price. Moreover, other buyers are communities living around and nearby islands who have a traditional of preferring to consume fresh quality fish; this causes an increase of fresh fish demands at the islands. This was clarified during a FGD that, hours spent transporting fish to the mainland with lack of quality storage facilities put artisanal fishers at risk of fish spoilage, which leads to deterioration of landing price. Sometimes, buyers found at mainland tend to collude for low price settings (FGD, Kanyala Ward, April 2017). It is because of this argument that artisanal fishers expect to be paid more on the islands.

The negative coefficients for sardine fish attributes (island freshness, weighted measure, quantity landed at mainland and mainland freshness) were mainly due to demand driven by buyers' quality preference of sardine that were dried by the sun. During focus group discussions, it was quoted that,

> "…. *if artisanal fishers want to be paid better for Sardine catches, sun drying on the grass is the more preferred preservation method by buyers than is fresh catches during landing. And because sardines can also be dried on the*

sand, unfortunately, most of the artisanal fishers do not have time to wait for the sardines to be dried on the sun …" (FGD, Bulyaheke, 08 April-2017).

In general, availability of dried catches of sardines at islands paired with on-site buyers could positively influence landing prices paid in the first hand to artisanal fishers as opposed to the landed freshness of this species.

Contrary to the island freshness, the mainland freshness of fish was found to demonstrate a decrease of fish landing price to selected species relative to the other fish attributes. This finding concurs with the findings by Matiya (2010), and by implication, artisanal fishers around Lake Victoria have inadequate storage facilities and best preservation techniques; the factors that may have contributed to spoilage of transported fish. This is an indication that artisanal fishers are still having inadequate storage facilities to maintain freshness of fish from the harvesting area to the mainland. Likewise, as the fish grading procedures are built on the freshness quality of fish on the mainland, there is a likelihood that unpreserved fish due to lack of cold storage facilities could be graded low quality during landing and therefore negatively affecting the price during the selling.

Meanwhile preserved fish was found to attract an increase of landing price by TZS 0.109 per kg and TZS 0.0713 per kg for Nile perch and tilapia respectively. These results concur with the findings by Alapan *et al*., (2016). By implication, the results mean that, since fish are perishable, if they are to be sold in good condition they must either be taken to the market within the shortest possible time or preserved. This observation was supported by a comment from a BMU leader who said that, "Most of fishers' canoes have missing storage facilities; that is why, the fishers are likely to be paid low for landed fish which is not well preserved" (Busisi Ward Office, April 2017). They are forced to bear the costs during a contractual arrangement, which also lowers landing prices. Henceforth, if low-cost preservation facilities can be provided with improved technologies, they could reduce spoiling and increase the landing price for fresh fish supplied at the mainland.

With the influence of fish quantity landed in Islands, this study found that fish price increased by TZS 0.047 per kg of Nile perch and by TZS 0.038 per kg of Nile tilapia

when the quality of fish were landed on Island, unless otherwise. Landing price also decreased by TZS 0.051 per kg of Nile perch and by TZS 0.0759 per kg of Nile tilapia, when these quantities landed on the onshore mainland. By implication, trading of fish quantity in various islands is an advantage to artisanal fishers, not only because they are likely to suffer dominance behaviour associated with grading procedures at mainland and in other local markets, but also because fishes are perishable commodities that could lead to a better-paid landing price if sold fresh at nearby landing sites.

Moreover, artisanal fishers who took advanced loans through agreements with buyers have to repay the loans acquired via paid landing price, and other costs incurred by fish vessel sponsors. Therefore, using offshore islands for trading fish as a market base for fishers is better than onshore mainland or local market prices.

Another attribute is fish size, when it increased, it caused an increase of fish price by approximately TZS 0.141 per kg of Nile perch and TZS 0.150 per kg of Nile tilapia, both at offshore islands. As stated by Brummett (2000) and Lokina (2014), the accepted legal-size of fish fetches a better price to fishers. During a KII with a fishers' leader of Itabagumba Ward, different fish species of various sizes were sold/bought at different prices, but most of the fishers focused on large size of fish, which caused earning of higher paid landing price (Itabagumba, April 2017). This indicated that the probability of catching fish of large size could influence landing price at landing sites. This is because buyers are willing to pay for large-sized fish as foretold by the utility theory (Hammarlund, 2015).

Furthermore, the government of Tanzania has set legal parameters of defining the accepted legal size of fish for sale. The parameters include 25 centimetres in length for Nile tilapia and 50 to 85 centimetres for Nile perch (Sengerema Fishery Officer, April 2017). Artisanal fishers who violate these criteria opt to sell their fish catches outside markets and end up with lower paid landing prices. The findings support the assumption of the price theory. That is the supply of harvested fish at legally acceptable sizes results to optimal paid landing price among the buyers than is the case when supplying small fish sizes, given that the demand remains constant.

In view of the author of this paper, fishers have poor negotiation skills on fish landing prices pertaining to fish attributes. As a result, they accept any given landing price even if it is 'low pay,' by always hoping that fishes are plenty to be harvested on the next day. This is one of the reasons why poverty persists among fishers (Luomba, 2013; NBS, 2019). The low income due to low pay can be mitigated by improving market structure, conduct, and performance which seem to be reinforced by imperfect competition (middlemen monopoly) and relatively low investment of the fishery economy by the government as depicted by the structural theory and poverty (Bradshaw, 2007).

3.5.3 Variation of fish landing price caused by the change of fish attribute

The marginal effect results in Table 16 showed that, an increase in the quantities of Nile perch and sardines led to an increase in prices of the freshness of fish at offshore landing sites in the islands, and these were statistically significant ($P<0.05$). The results show that, a positive action taken in preserving fish during an increase of quantities of Nile Perch landed, lead to the probability of an increase of landing price by 0.051 and was statistically significant ($P<0.05$). With respect to sardines, an increase of the quantity landed, led to a probability of a decrease of landing price by 0.054 and was statistically significant ($P<0.1$), when landed at mainland landing sites. This indicates that, despite the extent of changes in fish attributes as shown in Table 15, the changes of fish attributes are paramount to the variation in landing prices.

Table 16: Random coefficient model results of the quantity effect of one attribute on the landing price of fish for other attributes (n = 289)

Attributes	Quantity of Nile Perch	Quantity of Nile Tilapia	Quantity of Sardine
Island Freshness	0.021**	0.192	0.049**
Weighted Measured	-0.157	-0.162	-0.094*
Mainland Freshness	-0.189	-0.036	-0.028
Preserved fish	0.051**	0.028**	1.327
Quantity landed on Island	0.001***	0.0291**	0.000***
Quantity landed on mainland	-0.091	-0.171	-0.054*

***Statistically significant at $P < 0.01$, **Statistically significant at $P < 0.05$, * Statistically significant at $P < 0.1$

The marginal effect of the variable weights measured, and onshore mainland for a fish landing centre were found to have a negative sign but not statistically significant.

This implies that any increase in the quantities of fish landed, leads to a decrease of scales of weighted measure, which tends to a decrease of the probability of the fish price selling.

This result was evident in the FGD where fishers agreed that measurement weighted scale used by buyers, provides wrong weighted results, usually less than the actual amount of catch landed; thus, artisanal fishers ended being paid lower prices (FGD, Kanyala, April 2017). The findings support the assumption of price theory that when supplies of the quantities of fishes exceed the demand, they lower the price of that commodity. Thus, the weighted scales measurement of fish is an essential attribute of fish landing price.

The inferential analysis results in Table 15 were also supported by the descriptive results in Tables 17 and 18. Table 17, indicates that fish species had different prices per scale, measured by an increase in the length and weight. The variation of these fish attributes was also observed to benefit first-hand buyers when as opposed to artisanal fishers who are the primary producers. This affirms that, neither there are common criteria for evaluation of fish attributes nor pricing regulations procedures for attributes specificity for price allocation supervised by the responsible authority.

Table 17 : Variation of fish species in size and respective prices

Type of Specie	Size (cm)	Size (kg)	Landing Price (TZS)	Agents/Middlemen/Retailers selling price (TZS)
Nile Perch	Smaller than 50	Less than 1	3 000	Between 4 000-4 500 per piece
	Greater than 50	Between 1 and 4	Between 4 000 – 4 500	Between 10 000-12 000/Kg
		Greater than 5	Between 6 000 – 7 000	
		Greater than 10	Greater than 7 000	
Nile Tilapia		Greater than 1	Between 5 000-6 200	Between 8 000-10 000/Kg
	Smaller than 50	Less than 1	3 000	Between 4 000-4 500 per piece

Different methods of preserving fish shown in Table 18 are empirically indicated to affect fish landing prices. The findings reveal that one 20-litre bucket of preserved sardines could be purchased at a landing price of between TZS 6 000 - 9 000 in 2016.

Table 18: Fish price by storage mechanism and preservations techniques

Species	Methods of Preserving	Unit of Measurement	Landing Price (TZS)	Agents/Middlemen/Retailers Selling Price (TZS)
Sardine				
	Sun-sand Drying			Not below 7 000
	Wire mesh Drying	1 Bucket of 20lt	Between 6 000 – 9 000	Between 15 000-18 000
	Smoking			Between 15 000-18 000
	Dried but affected with rainfall			Not below 9 000
Nile Perch				
	Smoking	Under 50cm	3 000	Between 4 000 - 4 500
	Freezer	Equal or greater than 50cm	5 000-6 200	Between 10 000-12 000
Nile Tilapia				
	Smoking	Under 50cm	3 000	Between 4 000-4 500
	Freezer	Equal or greater than 50cm	5 000-6 200	Between 10, 000-12 000

Some of the preserving methods, which were listed during focus group discussions, and which were observed at the time of enumerating; include sun drying, smoking, salting, and frying in oil. Frying in oil is done at home for consumption. These methods vary and, as a result, affect the preserved fish and the prices (FGD, Nyakalilo, April 2017).

3.6 Conclusions

Regarding the effects of fish attributes on landing price around Lake Victoria, in Tanzania, it is concluded that freshness at island and mainland, the quantity landed at onshore island market, preserved fish, size and weights are the main fish attributes influencing fish landing price of the selected fish species. These findings are similar with the findings in a study by McConnell and Strand (2000); Lee (2014); Hammarlund (2015) and Gobillon (2017). However, preserved fish and weighted measures were unique fish attributes found to influence fish landing price.

The fish attributes listed above had significant influence on fish landing price of the selected fish species. Therefore, the null hypothesis that there is no significant influence of fish attributes on the landing price was rejected; it is evident that fish attributes influence the landing price. Since fish attributes significantly influence fish landing price, it is recommended that artisanal fishers should promptly sell their fish

at the nearest market place, which reduces preservation cost and risks of fish deterioration. Fishers are also recommended to take seriously each attribute of the fish that influence landing price determination when selling fish.

Furthermore, the marginal effect has shown that the change of one attribute affects the landing price of fish; henceforth, it is paramount to consider the influence of each attribute revealed in this study in strategic interventions of determining for landing price. Therefore, the supplies of fresh well preserved, and large-sized fish is recommended to meet optimal price as per the demand. This requires the provision and availability of fishing vessels as well as an installed storage mechanism. This storage mechanism should be associated with quality preservation techniques, and the establishment of cooperative strategies. This can be done through artisanal fishers coming together and forming cooperatives for collective purchasing of fishing equipment that could accommodate reasonable sizes of fishes caught. In addition, fishers should participate in contractual agreements to ensure that buyers purchase the harvest at better agreeable landing prices. Further studies on factors such as taste, nutritional value, fish processing, grading, branding, packaging, marketing, and other fish species that were out of scope of this study are recommended for better understand the relationship with fish price.

REFERENCES

Alapan, M.P., Arpilleda, E.L., Altizo, K. J., Frias, G.K., & Ravelo, J.D., (2016). Factors affecting the market price of fish in the northern part of Surigao Del Sur, Philippines. *Journal of Environment and Ecology,* 7(2), 34-41. doi: 10.5296/jee.v7i2.10469.

Andersson, D. E. (2000). Hypothesis testing in hedonic price estimation - On the selection of independent variables. *The Annals of Regional Science,* 34, 293-304. doi. 10.1007/s001689900010.

Bergman, J. (2012). Nile perch export and welfare around Lake Victoria has the boom in exports been positive for welfare. [https://gupea.ub.gu.se/bitstream/2077/29748/1/gupea_2077_29748_1.pdf] site visited on 09/02/2016.

BOT (2017). *Bank of Tanzania annual report 2015/16*, BOT secretariat: Dar es Salaam. 262pp.

Brayden, W., Noblet, C.L, Evans, K.S., & Rickard, L. (2018). Consumer preferences for seafood attributes of wild-harvested and farm-raised products. *Aquaculture Economics & Management*, 22(3), 362-382. doi: 10.1080/13657305.2018.1449270.

Bronnmann, J., & Hoffmann, J. (2018). Consumer preferences for farmed and ecolabeled turbot: A north German perspective. *Aquaculture Economics and Management*, 22(3), 342-361. doi: 10.1080/13657 305.2018.1398788.

Brummett, R. (2000). Factors influencing fish prices in Southern Malawi. *Aquaculture,* 186(4), 243–251. doi: 10.1016/S0044-8486(99)00383-X.

Carroll, M.T., Anderson, J. L. & Martinez-Garmendia, J. (2001). Pricing U.S. North Atlantic Bluefin tuna and implications for management. *Agribusiness*, 17(2), 243-253. doi.org/10.1002/agr.1014.

Chandrashekar, B. (2014). Fishery co-operative societies in India: Problems and prospects. *Global Journal for Research Analysis*, 3(7), 2277-8160. [https://www.worldwidejournals.com/global-journal-for-research-analysis-GJRA/recent_issues_pdf], visited on 16/04/2017.

Elsner, W., Heinrich, T., & Schwardt, H. (2014). *The microeconomics of complex economies: Evolutionary, institutional, neoclassical, and complexity*

perspectives. Academic Press, USA, 571pp. DOI. 10.1080/00213624.2015.1013897.

Evans, S. J. (1991). Good surveys guide. *BMJ*, 302(6772), 302–303. doi: 10.1136/*bmj*.302.6772.*302*.

FAO (2003). *Report of the expert consultation on International Fish Trade and Food Security*, FAO: Casablanca. 213pp.

FAO (2014). *The state of world fisheries and aquaculture: Opportunities and challenges*, FAO: Rome. 243pp.

FAO (2020). *The state of world fisheries and aquaculture: Sustainability in action*, FAO: Rome. 244pp.

FishBase (2018). Retrieved from http://www.fishbase.org/search.php.

Gobillon, L., Wolff, F. & Guillotreau, P. (2017). The effect of buyers and sellers on fish market prices. *European Review of Agricultural Economics*, 44(1), 149-176. doi: 10.1093/erae/jbw006.

Gordon, D, & Hussain, S. (2015). Price determination and demand flexibilities in the ex-vessel market for tuna in the Republic of Maldives. *Journal of Aquaculture Economics and Management*, 19(1), 8-28. doi: 10. 1080/13657305.2015.994234.

Gordon, D. V., & Maurice, S. (2015). Vertical and horizontal integration in the Uganda fish supply chain: Measuring for feedback effects to artisanal fisher. *Aquaculture Economics and Management*, 19(1), 29-50. doi: 10.1080/13657305.2015.994235.

Hammarlund, C. (2015). The big, the bad, and the average: hedonic prices and inverse demand for Baltic cod. *Marine Resource Economics*, 30(2), 157-177. doi: 10.1086/679972.

Henson, S., Brouder, A. & Mitullah, W. (2000). Food safety requirements and food exports from developing countries: The case of fish exports from Kenya to the European Union. *American Journal of Agricultural Economics*, 82(5), 1159-1169. [http://www.jstor.org/stable/1244245] visited on 10/12/2016.

Hoof, L. & Kraan. M. (2017). *Scoping mission marine fisheries Tanzania*, Wageningen University: Wageningen. 66pp. doi: 10.18174/404872.

Israel, D. G. (2013). Determining sample size. The University of Florida. 5pp.[http://www.gjimt.ac.in/web/wpcontent/uploads/2017/10/2_Glenn-D.-Israel_Determining-Sample-Size.pdf], site visited on 16/08/2016.

Janssen, C., Söderberg, B., & Zhou, J. (2001). Robust estimation of hedonic models of price and income for investment property. *Journal of Property Investment & Finance*, 19(4), 342-360. doi: 10.1108/EUM0000000005789.

Johnston, R.J., Wessells, C.R., Donath, H. & Asche, F. (2001). A contingent choice analysis of ecolabeled Seafood: Comparing consumer preferences in the United States and Norway. *Journal of Agricultural and Resource Economics*, 26(1), 20 -39. [https://ageconsearch.umn.edu/record/31157/files/26010020.pdf], visited on 05/12/2017.

Kambewa, E.V. (2007). Balancing the people, profit and planet dimensions in international marketing channels. A study on coordinating mechanisms in the Nile perch channel from Lake Victoria. Thesis for Award of Ph.D. Degree at Wageningen University: The Netherlands.

Kothari, C. R. (2004). *Research methodology methods and techniques.* New Age International Publishers, New Delhi. 401pp.

Kristofersson, D. and Rickertsen, K. (2004). Efficient estimation of hedonic inverse input demand systems. *American Journal of Agricultural Economics*, 86 (4), 1127- 1137. doi: 10.1111/j.0002-9092.2004.00658.x.

Lee, M. (2014). Hedonic pricing of Atlantic cod: Effects of size, freshness, and gear. *Marine Resource Economics*, 29(3), 259-277. doi.org/10.1086/677769.

Leiblein, M. J., Chen, J. S., & Posen, H. E. (2017). Resource allocation in strategic factor markets: A realistic real options approach to generating competitive advantage. *Journal of Management*. 43 (8): 2588- 2608. doi.org/10.1177/0149206316683778.

Lokina, R.B. (2014). Fishing business arrangements and sustainability around Lake Victoria fishing. *African Journal of Economic Review*. 2(2): 71-94. [https://www.ajol.info/index.php/ajer/a rticle/view/ 116284], visited on 13/08/2016.

Luomba, J. (2013). An assessment of the socio-economic status of fishers' communities in Lake Victoria, Tanzania in relation to poverty. *International Journal of Research in Fisheries and Aquaculture*, 3(3), 98-102. [https://www.researchgate.net/publication/256477617], visited on 26/07/2016.

Maciel, E.S., Savay-da-Silva, L.K., Vasconcelos, J.S., Sonati, J.G., Galvão, J.A., Leandro De Lima, K.F., & Oetterer, M. (2013). Relationship between the price of fish and its quality attributes: A study within a community at the University of São Paulo, Brazil. *Food Science Technology (Campinas)*, 33(3), 451-456. doi: 10.1590/S0101-20612013005000059.

Mangion, M.L, Durbarry, R. and Sinclair, M.T. (2005). Tourism competitiveness: price and quality. *Tourism Economics*, 11(1), 45-68. doi: 10.5367/0000000053297202.

Matiya, G. (2010). Factors influencing prices of fish in central region of Malawi and its implications on the development of aquaculture. *Journal of Applied Sciences.* 5(8): 1424-1429. doi: 10.3923/jas.2005.1424.1429.

McConnell, K. & Strand, I. (2000). Hedonic prices for fish: Tuna prices in Hawaii. *American Journal of Agricultural Economics*, 82(1), 133-144. doi:10.1111/0002-9092.00011.

Meyer, J. and Cramon-Taubadel, S. (2004). Asymmetric price transmission: a survey. *Journal of Agricultural Economics*. 55(3): 581-611. doi.org/10.1 111/j.1477-9552.2004.tb00116.x.

Mpenda, Z. (2010). Effects of compliance with food safety standards on costs, benefits and organization of Nile Perch export supply chain in Tanzania. Thesis for Award of Ph.D. Degree at Sokoine University of Agriculture: Morogoro, Tanzania, 251pp.

NBS (2019). National bureau of statistics. Dar es Salaam: Tanzania.

Nguyen, T.T., (2011). Implicit price of mussel characteristics in the auction market. *Aquaculture International*, 20(4), 605–618. doi: 10.1007/s10499-011-9489-x.

Phillips, M. & Subasinghe, R. (2010). Small-scale Shrimp farmers and global market –Trends, future prospects, and adaptation.[//w.aquaculturealliance.org/advocate], visited on 20/08/2016.

Roangead (2013). Tanzanian Nile perch value chain baseline study. Burgun Cedric: International Trade and Sustainable Development. [http://www.Roangead.org/IMG/pdf/Roangead_Rapport_Final.pdf], visited on 13/07/2016.

Roheim, C. A., Gardiner L., & Asche, F. (2007). Value of brands and other attributes: of retail frozen fish in the UK. *Marine Resource Economics*, 22(3), 239-253. doi. 10.1086/mre.22.3.42629557.

Rosen, S. (1974). Hedonic prices and implicit markets: Product differentiation in pure competition. *Journal of Political Economy*, 82(1), 34-55. [https://www.jstor.org/stable/1830899], visited on 15/01/2016.

Saunders, M., Lewis, P. & Thornhill, A. (2016). *Research methods for business students* (7th edition). Pearson Education Limited, Harlow. 768pp.

Slade, B.A. (2000). Office rent determinants during market decline and recovery. *Journal of Real Estate Research*, 20(3), 357-380. doi: 10.1080/10835547.2000.12091041.

Thrane, C. (2005). Hedonic price models and sun-and-beach package tours: The Norwegian case. *Journal of Travel Research*, 43(1), 302-308. doi: 10.1177/0047287504272034.

URT (2017). *Mwanza region investment guide*. Government Printer: Dar es Salaam, 80pp.

URT (2014). *Report on lake victoria fishery frame survey results.* Government Printer: Dar es Salaam, 162pp.

CHAPTER FOUR

4.0 ANALYSIS OF FISH LANDING PRICE EFFECT ON SUBJECTIVE WELLBEING OF FISHERS AROUND LAKE VICTORIA, TANZANIA

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4.1 Abstract

Fish landing price variations resulting from their determinants have some influence on fishers' subjective wellbeing. This paper presents the analysis of the effects of fish landing prices on the subjective wellbeing of artisanal fishers around Lake Victoria, Tanzania. A cross-sectional design was used in this study; the analysis was carried out from a sample size of 289 of artisanal fishers. Ordered logistic regression was employed to examine the effects of the landing price on the subjective wellbeing of artisanal fishers. The results showed that fish landing price was found to be statistically significant ($P< 0.05$), influencing satisfaction of subjective wellbeing of artisanal fishers. In order to increase satisfaction of subjective wellbeing among fishers, it is recommended that guiding framework for the involvement of artisanal fishers in determination of the landing price should be designed to provide a means for capability in determining fish landing price hence subjective wellbeing satisfaction. This can be done through a collective agreement between fishers and buyers.

Keywords: Fishers, subjective wellbeing, Tanzania

4.2 Introduction

Globally, determinants of subjective wellbeing (SWB) of artisanal fishers remain inconclusive following various determinants of subjective wellbeing explored by using different approaches (Gillam, 2018; Purcell, 2016; Chandra, 2010). Little is documented on the determinants of subjective wellbeing at individuals' level but these studies did not focus on landing price paid to fishers. Studies including Purcell (2016) and Bjørnskov *et al*., (2008) were limited to some determinants of individual's wellbeing such as age, family experience, income, household size, occupation, health, personal relations, leaving a gap on fish landing price.

Fish landing price is defined as the price of fish valued based on fish size, days spent under storage, the type of vessel, grade, distance and time needed to reach primary buyers, and differences in market categories (Gobillon, 2016; Lee, 2014; McConnell and Strand, 2000). Other factors that determine landing price and quantities sold leading to individual fishers' wellbeing include the number of buyers, sellers, and management facilities (Janssen *et al*., 2001).

While there are various measures of wellbeing categorised to individual(subjective) wellbeing and objective wellbeing, this study focused on individual artisanal fishers. Therefore, subjective wellbeing, is the evaluation of the order of individual needs or level of satisfaction where needs are met (Dimoso, 2009). Objective wellbeing is the assessment of indicators that measure education, physical environment, community, and economy at societal level or national level rather than an individual perspective (Dimoso, 2009). The evaluations of needs satisfaction are based on their individual perceptions by cognitive judgments of their emotions, moods, and experiences (Conceição & Bandura, 2008; Kahneman, 2006). Individual needs including needs of fishers are in terms of materials (for example, income, facilities, and other resources), relation with others, health and feeling about quality life (Britton, 2013; Hallerod, 2013).

According to Kambewa (2007), fishers are individuals who have fishing and trading experience ranging from 2 to over 40 years. Fishery contributes to the fishers' needs of food, employment, and income in developing countries (Henson and Mitullah, 2003), including Tanzania where fishing accounts for 2.5 percent of the real GDP (BOT, 2017), and employs more than 4 000 000 people. Around Lake Victoria alone, 104 000 people are directly employed and about 500 000 more are indirectly employed in the fishery subsector (Luomba, 2013; URT, 2010; FAO, 2003). The mentioned benefits that fishing sector provides affect wellbeing at national and global level, thus motivates undertaken of this study.

Despite the notable contribution of fishing to the wellbeing of individual fishers' and the national at large, accurate determinants of fishers' subjective wellbeing have remained elusive according to Easterlin Paradox. Easterlin, (1974; 2001) argued that satisfaction of subjective wellbeing increase with an increase of average incomes, but only up to a point. Beyond that, happiness does not increase when income increases (Easterlin, 1974; 2001). Therefore, income is not the only factor that contributes to the subjective wellbeing of fishers, the study is further depicted other factors.

A study by Pollnac and Poggie (2008) reveals that despite a decline of income among fishers which could worsen the achievement of subjective wellbeing, occupation satisfaction in fishing prevents fishers from leaving fishing occupation; leaving a

narrow information of the effects of fish landing price on subjective wellbeing achievement among fishers (Pollnac and Poggie, 2008). This contradicts with the findings by Phillips and Subasinghe (2010) who revealed that, the low income earned was caused by 'the way fish prices were determined', associated with dominance behaviour in price setting by middlemen. The dominance behaviour lowering fishers' emotions for the autonomy of determining landing price and therefore affects subjective wellbeing achievements.

As Kambewa (2007) observes, 'the way fish prices are determined' is associated with the uncertainty of selling price, the power of negotiations, catch volume, types of buyers, deficiency of fishing gears, and loans. Therefore, they affect fishers' emotions on life judgment about the attainment of subjective wellbeing (Conceição and Bandura, 2008) due to uncertainty concerning the determination of landing price or fish price to be paid during landing, hence deterioration of fishers' subjective wellbeing. Moreover, Chandrashekar (2014) argues that artisanal fishers' cooperative strategy could improve subjective wellbeing of fishers but did not provide a linkage with landing price.

Despite limitation of factors on the achievement of subjective wellbeing, the government of Tanzania has facilitated construction and availability of fishery facilities to ensure life satisfaction among fishers through receiving better landing prices (URT, 2014). However, some previous studies have confirmed that variation of landing price is caused by variations of fish freshness, quantities, and processed fish at the markets. In this regard, the variation of landing price affects economic incentives that brings fishers into subjective wellbeing variations (Asche, 2015; Lee, 2014). The argument is similar to that by Deaton (2011) who revealed that market shock prices, which affect national wellbeing, also affect individuals' wellbeing.

Various studies (for example Asche, 2015; Phillips and Subasinghe, 2010; Pollnac and Poggie, 2008) observe that fishing remains a risky occupation with low income earned. Furthermore, the way fish landing price is determined remains undisclosed around Lake Victoria, Tanzania. Therefore, meeting the best landing price is a quality life feeling that remains a need among fishers for the subjective wellbeing satisfaction. Cummins (2014) and Janssen *et al*. (2001) see price determinations,

income, and attributes of goods during trading by a buyer as part of autonomy, material, and quality needs that contribute to individual SWB satisfaction. Therefore, in a similar context, this paper assumed that artisanal fishers obtain other benefits such as income earning, assets acquisition, and attainment of other social aspects that could improve their SWB satisfaction during fish trading.

Studies (e.g. Gillam, 2018; Purcell, 2016; Asche, 2015; Britton, 2013; Hallerod, 2013; Bergman, 2012; Phillips and Subasinghe, 2010; Pollnac and Poggie, 2008) focused on other determinants of subjective wellbeing such as age, family experience, income, household size, occupation, health and personal relations leaving fish landing price around Lake Victoria, Tanzania, inconclusive answers. These variables affect subjective wellbeing of fishers as depicted by scholars (e.g. Asche, 2015; Lee, 2014; Deaton, 2011; Phillips and Subasinghe, 2010).

There is little empirical evidence on the relationship between landing price and the achievement of fishers' subjective wellbeing, despite the notable contribution of landing price at least in the study area around Lake Victoria, Tanzania. This paper, therefore, fills this gap and contributes to knowledge that would inform policymakers in addressing fishers' satisfaction on landing price and other associated benefits that contribute to the achievement of fishers' subjective wellbeing. The objective of the paper is to analyse the effects of fish landing price on the subjective wellbeing of fishers around Lake Victoria, Tanzania.

4.3 Literature Review

4.3.1 Theory underpinning the study

The study on which this paper is based was guided by Utility theory (Kahneman and Thaler, 2006). According to Utility theory, an individual participates in an activity as a need of attaining subjective wellbeing satisfaction (Ettema *et al*., 2010). These needs are in terms of material, relational and feelings about quality life that must be met (Britton, 2013; Hallerod, 2013) to make him/her satisfied. Since fishers' subjective wellbeing is indicated by valuations of individual life in a given aspect experienced at a point in time (Reyes-García *et al*., 2016; Kahneman, 2006), the valuations in this study included fishers' satisfactions on feelings and fishing motivation from the landing price of fishes. This theory is a useful guide for understanding how fishers' needs can be complemented or otherwise from landing price of fishes around Lake Victoria, Tanzania.

The theory assumes that there is a continuous hedonic flow of pleasure or pain known as experienced utility or progress benefits (Kahneman, 2006). This enhances understanding of the diversity and progression of fishers' life valuations and in this case landing price. Valuation focuses on the involvement of fishers in determining fish landing price as it influences subjective wellbeing satisfaction, which also is a cause of obtaining other socioeconomic benefits such as the amount of income from determining landing price, service, strengthening of social bonds and fishing resources (Britton, 2013). Therefore, these socioeconomic benefits also form part of fishers' subjective wellbeing (Daw, 2016; Reyes-García *et al*., 2016).

In supporting the Utility theory, Ryan and Deci (2000) using Self-Determination Theory (SDT) demonstrated that the autonomy brings satisfaction to individuals; hence, the achievement of subjective wellbeing. With this assumption, the paper focuses on landing price and autonomy in determining landing price by fishers, which remain individual's needs and motivation of pursuing fishing as the main occupation and income generating activity. However, the exercise of market power on the determination of landing price associated with changes on loan arrangements and other fishing resources by monopolistic middlemen leads to losses among fishers of welfare/subjective wellbeing (Gordon and Hussain, 2015; Dimoso, 2009; Meyer

and Cramon-Taubadel, 2004). Therefore, the capability of fishers in gaining power to determine landing price remains questionable.

Despite the monopolistic tendency by middlemen, the capability approach as demonstrated by Sen (1985) is useful in understanding the capabilities of fishers in determining landing price (Sen, 1985). This is because individuals who are unable to participate in such activities due to monopolistic tendency and other limitations are likely to experience lower levels of wellbeing (Currie *et al*., 2010; Delbosc & Currie, 2011). This approach supports the assumptions that fishers' needs include the capability to acquire fishing facilities, vessels, and other resources that are useful for their capability to determine landing price; hence, the achievement of subjective wellbeing (King *et al.*, 2014).

One of the criticisms of the Utility theory is that, approximation of the behaviour of individuals towards satisfaction under conditions of uncertainty remains unclear (Kahneman and Thaler, 2006). Evaluation, experience and eudemonic measures of subjective wellbeing were employed in the study to overcome the weakness in the theory (Dolan and Metcalfe, 2012). The theory is useful to this study because landing price remains important to all fishers. A change of landing price might affect fishers' happiness. Thus, the theory provided guidance to the study on understanding how the landing price as well as demographic and other socioeconomic factors including age, household size, education, personal relation, and marital status effects subjective wellbeing of artisanal fishers around Lake Victoria, Tanzania (Pellerone *et al*., 2016; Dimoso, 2009 and Jackson, 2007).

Thus, the study focused on understanding how the landing price has an influence on the subjective wellbeing of artisanal fishers around Lake Victoria, Tanzania, with the hypothesis that there is no significant influence on the landing price on the subjective wellbeing of artisanal fishers around Lake Victoria in Tanzania. The paper is organized as follows: Section 1 presents an introduction; Section 2 presents methodology; Section 3 presents the results and discussion thereof; Section 4 contains conclusions and recommendations.

4.3.2 Empirical Review

Several studies including Britton (2013), Hallerod (2013), Bjørnskov (2008) and Kahneman (2006) analysed individual subjective wellbeing determinants such as age, family experience, income, health, and other external determinants including occupation satisfaction, management or values. Other determinants include household size, personal relations, and marital status (Kabote, 2018; Dimoso, 2009; Bjørnskov *et al.*, 2008; Shapiro and Keyes, 2008).

As King (2014) observes, subjective wellbeing measures features of individuals' perceptions of their experiences, the cognitive process of personal judgment, attribution, and time perspective. Therefore, subjective wellbeing is not only a subject to economic wellbeing but also a psychological or sociological explanation that identifies situations that lead to individuals' satisfaction (Borrero, 2013). Using individual experiences from interpersonal comparability approach, studies by Waldron (2010), Dimoso (2009) and Ferrer-I-Carbonell (2005) considered the basis of subjective wellbeing valuation in three response choices: 'Very dissatisfied', 'Dissatisfied' and 'Satisfied' to the question **'**taking everything into account, how satisfied are you in this life in a way you are living these days?'. Meanwhile, a study by Lo Coco *et al*., (2018) used a similar approach, but differed in the scale of response choices ranging from 1 (strongly disagree) to 4 (strongly agree) in measuring subjective wellbeing.

Among the interpersonal comparability on the determinants of subjective wellbeing, is a cross-sectional study by Dimoso (2009) that employed ordered probit model in the subjective wellbeing analysis of life satisfaction of individuals at a household level from environmental conditions, income, occupation, household size, and environmental products. Elsewhere using cross-sectional data, Reyes-García (2016) used an ordered logit model to look at the relationship of the determinants of subjective wellbeing which were absolute income, adaptation, social comparison and found that absolute income affects subjective wellbeing. Ruiz (2012) found that fishing is satisfying as an occupation; yet fishers can be dissatisfied about the level of earnings from selling, due to the mechanism of determining fish price.

Purcell (2016) employed a generalised linear mixed model (GLMM) to analyse sale price of sea cucumbers and other fishers' determinants of subjective wellbeing satisfaction and found that, there is gender disparity in the prices of fishes. Purcell (2016) found that fishers were dissatisfied because they expected a set price for sea cucumbers, but they were sometimes offered lower prices by fewer buyers. On these grounds, the current study employed cross-sectional data in the ordered logistic regression analysis to determine the effects of fish landing price on subjective wellbeing satisfaction of artisanal fishers (Pellerone *et al*., 2016; Dimoso, 2009; Jackson, 2007). The ordered logistic regression analysis was employed because subjective wellbeing (SWB) is a discrete choice of categorical variable that follows the assumption of independence among the choices of categorical ordered dependent variables. This assumption states that the choice of or membership in one category is not related to the choice or membership in another category (the dependent variable) (Guerra-Bustamante *et al*., 2019). Landing price, occupation, age, household size, education, personal relation, and marital status were used as independent variables of the determinants of fishers' subjective wellbeing.

4.4 Methods

4.4.1 Data source and sampling

The study was conducted in the area around Lake Victoria in Mwanza Region because, it is the 'leading fish market stop centre' with seven fish processing industries therefore surpassing other regions (Kagera, Geita, Simiyu and Mara) surrounding the lake in fishing, fish landing, trading and exporting of fish (URT, 2017). Also, around Lake Victoria, Mwanza Region with 52,942 fishers is still among the eight poorest regions in Tanzania with high poverty rates of 34.6 percent indicated by the existing highest number of poor people among the rural dwellers including artisanal fishers who live below the poverty line (URT, 2014; NBS, 2019). Two districts in Mwanza Region; Sengerema and Buchosa were purposely selected, based on ranking with a high collection of fish catch and landing sites activeness in selling of landed fish (URT, 2017).

The data requirements of the study were both primary and secondary source of data. The study was guided by quantitative data. Qualitative data were also collected to enrich the quantitative results of this study as recommended by Wisdom and

Creswell (2013). Quantitative data were collected by enumeration of the artisanal fishers to gather information related to socio-demographic characteristics of fishers, landing prices, SWB satisfaction, and the contribution of other benefits gained to influence satisfaction of fishers' lives.

A cross-sectional research design was used. The design entails collection, organisation, and analysing of data from various cases around Lake Victoria at a single point in time. The design was chosen because it was suitable for the chosen variables of this study (Saunders *et al*, 2016). Therefore, cross-sectional research design was used in this study not only because the study duration was limited in terms of time, but also because the study wanted to examine different variables at the same time (Saunders *et al*, 2016; Bajpai, 2011; Kothari, 2009). A sample of 300 fishers was selected (Table, 1), from the 1200 total fishers' population of the two districts (URT, 2014), using a formula by Israel (2013) with 95 percent confidence level and a precision level of $\leq$ 5 percent, which is an acceptable sampling error. Israel (2013) formula is given as $n = N \Big/ \left(1 + N\left(e^2\right)\right)$ where n is the sample size, N population size, and *e* is the level of precision. From an estimated total population of 1200 fishers from two districts, then $n = 1200 \Big/ \left(1 + 1200\left(0.05^2\right)\right) = 300$.

In order to collect pertinent information from the respondents, purposive, proportionate, and simple random sampling techniques were utilized. Purposive sampling technique was used to select three active landing sites on landing and selling of fish with non-overlapping trading by artisanal fishers between landing sites in each district. Therefore, six landing sites namely Busisi, Kijiweni, and Nyakalilo in Sengerema District, and Kanyala, Itabagumba, and Bulyaheke in Buchosa District were included in this study. To obtain the respective sample size per landing site, a proportionate sampling technique was used with a sampling fraction of n/N = 300/1200 = 0.25 (Table, 19). Sampling frame per landing site was obtained with an assistant from District Fishery Officers and Ward Executive Officers. The computation is such that $n = \Sigma n_i$ but $n_i = 0.25 \times N_i$ where by $i = 1,2 \ldots 6$. Simple random sampling was used to select respondents per each landing site using a lottery approach.

Table 19: Sample size determination

Landing site	Sampling frame	Sample size
Busisi	$N_1 = 254$	$n_1 = 63$
Kijiweni	$N_2 = 184$	$n_2 = 46$
Nyakalilo	$N_3 = 118$	$n_3 = 30$
Kanyala	$N_4 = 296$	$n_4 = 74$
Itabagumba	$N_5 = 156$	$n_5 = 39$
Bulyaheke	$N_6 = 192$	$n_6 = 48$
Total	**N=1200**	**n=300**

A questionnaire was used to collect quantitative data, but before full enumeration, pre-testing of the questionnaire was done by administering it to 15 randomly selected respondents (5% of total respondents) for the purpose of identifying and rectifying unfamiliar terms used therein, checking the clarity and ambiguity of questions and duration of interviewing one person. Then the questionnaire was improved accordingly before it was used for actual data collection. During the actual data collection, 289 out of 300 fishers, which is a 96 percent response rate, completed questionnaire, which was used in the analysis. The remaining incomplete questionnaire copies were discarded. This was in line with the suggestion by Evans (1991) that a high response rate (> 80%) from a sample is preferable.

Focus group discussion (FGD) guide was also used to support the questionnaire. FGD data saturation or thematic saturation codes (Hennink *et al.*, 2019) examined was the landing price determination and individual life satisfaction. Data saturation or thematic saturation refers to a point when issues begin to be repeated during discussion time when collecting data and additional data collection becomes redundant. To reach meaning saturation, that is, gaining the conceptual depth of the issue identified, six FGDs were conducted, one at each landing site consisting of eight artisanal fishers. Moreover, twelve key informant interviews (KII) were held from three purposefully selected leaders from fishers, one buyer from Sengerema District, one agent from Buchosa District, two Beach Management Unit (BMU) leaders, two District Fishery Officers, one representative from the Tanzania Fisheries Research Institute (TAFIRI), and two Village Executive Officials. Quantitative data

were collected using a rectified questionnaire to obtain information related to socio-demographic characteristics of fishers, landing prices, determination of landing price, perceptions on life satisfaction, and the contribution of physical and non-physical materials to fishers' life satisfaction.

4.4.2 Variable descriptions

The dependent variable is SWB life satisfaction. With the existing limitations of measuring SWB (Cummins, 2014), SWB satisfaction among respondents was measured using evaluation, eudemonic and experience measures (Layard, 2010; Dolan and Metcalfe, 2012; Michaelson *et al*., 2012). The approaches are useful to identify economic wellbeing, psychological or sociological situations with explanations that lead to individuals' satisfaction (Borrero, 2013). In this study, evaluation measures considered the question **'**taking everything into account, how satisfied are you in this life in the way you have been living for the past twelve months?' Then, the result of SWB was measured as 0 = 'Very Dissatisfied', 1 = Dissatisfied', 2 = 'Satisfied'. The period of twelve months was included to capture the inclusions of other cross-sectional data (Dimoso, 2009). Eudemonic measures employed worthiness on a 0-10 scale, where 0 is not worthwhile at all, and 10 is completely worthwhile in life satisfaction.

Using experience measures of SWB (Michaelson *et al*., 2012; Layard, 2010), this study developed SWB Satisfaction Index (SSI) from customized feelings items held by individuals in determining fish landing price. The customized items were selected and modified to capture price effect from the Warwick-Edinburgh Mental Well-being Scale (WEMWBS) whose subjective and psychological focus is on the aspect of subjective wellbeing (Tennant *et al*., 2007). The indicators included feeling useful in determining price, feeling relaxed for landing price, dealing with price problems well and thinking clearly to get better price. The classification of the scores on the index basing on the computed highest frequency scores ranged from none of the time (0), rarely (1), some of the time (2), often (3), and all of the time (4). Descriptive statistics used to indicate the highest indicator of experience measures of SWB. The choice of this 5-point Likert scales suit interval data approximation, improve the quality of data and internal consistency (Pontin *et al*., 2013).

With consideration of the fishing experience around Lake Victoria, Tanzania, artisanal fishers had no mechanism of obtaining previously recorded fish landing price trends per unit items of fish species sold. Therefore, landing price in this manuscript was redefined as the number of times that fishers experienced by being involved in determining the landing price. Involvement of artisanal fishers in determine landing price influence SWB satisfaction during their fishing life (Mannino and Faraci, 2017). This approach of experience measures of SWB, as used by Dolan and Metcalfe (2012), was found useful in capturing interpersonal individual perceptions of self-satisfaction and motivation for a paid landing price upon feeling useful in determining fish landing price as depicted by Utility theory (Kahneman and Thaler, 2006).

Therefore, the independent variables included in this study were landing price, age of fishers, household size, education, personal relation, and marital status. Age was measured as the number of years after birth, and age square was included by considering that age is U-shaped relationship, with life satisfaction descending to near middle age and afterwards rising as supported by other studies (e.g. López *et al*., 2013, Di Tella, 2001). Age squares were included to represent non-linear age effects (Dimoso, 2009). Household size represents the number of family members and this is considered to have a relationship with subjective wellbeing (Dimoso, 2009; Kabote, 2018). Personal relation was a dummy variable referring to relation satisfaction with buyers that avail availability of contractual arrangement on fishing vessels and determine landing prices. Personal relation satisfaction was considered to contribute to subjective wellbeing, and varies from group relationship, such as crew, family, and community members (Britton, 2013; Gullo *et al*., 2015). This suggests that fishers' relationship satisfaction with buyers contributes to SWB. Marital status and education level of an individual were also considered to influence SWB (Dimoso, 2009; Bjørnskov, Dreher & Fischer, 2008).

4.4.3 Data analysis

The analysis followed Ordered logistic regression model (Guerra-Bustamante *et al*., 2019; Reyes-García, 2016), which allows for more than two categories of the dependent or outcome variables. The ordered logistic regression analysis was employed because subjective wellbeing (SWB) is a discrete choice of categorical variable that follows the assumption of independence among the choices of

categorical ordered dependent variables. This assumption states that the choice of or membership in one category is not related to the choice or membership in another category (the dependent variable) (Guerra-Bustamante *et al*., 2019). Further, the motivation of carrying out application of ordered logistic regression is the result from Shapiro Wilk Test, which showed a p-value of less than 0.05 ($p < 0.05$) for normality test of the dependent variable. This implies that the dependent variable data are not normally distributed.

In the present study, the dependent variable is the result of SWB standard question, measured as 0 = 'Very Dissatisfied', 1 = 'Dissatisfied', 2 = 'Satisfied,' shown in equation (1).

Then the SWB result is as follows:

$$SWB_i = \begin{pmatrix} 0 = Very\ dissatisfied \\ 1 = Dissatisfied \\ 2 = Satisfied \end{pmatrix} \tag{1}$$

Therefore, the ordered logistic regression model appears as follows:

$$P_i = E\left(SWB = \frac{1}{X_i}\right) = B_0 + \sum_{i=1}^{n} B_i X_i \tag{2}$$

SWB = 0, 1 and 2 which are expressed in equation (6), X_i are vector of independent variables, B_0 is a constant and $B_i, i = 1, 2, ..., n$ are coefficients of the independent variables to be estimated.

$$P_i = E\left(SWB = \frac{1}{X_i}\right) = \frac{1}{1 + e^{-\left(B_0 + \sum_{i=1}^{n} B_i X_i\right)}} \tag{3}$$

$$P_i = \frac{1}{1 + e^{-Z_i}} = \frac{e^{Z_i}}{1 + e^{Z_i}} \tag{4}$$

Where

$$Z_i = B_0 + \sum_{i=1}^{n} B_i X_i$$

If P_i is the probability of agreeing, then $(1 - P_i)$ is the probability of not agreeing with life satisfaction. Therefore, the odds ratio for this response is as follows,

$$\frac{P_i}{1 - P_i} = e^{Z_i} \tag{5}$$

The odds ratio presents the ratio of the probability that artisanal fisher responds on the level of life satisfaction to the probability that was not the level of satisfaction attained.

By applying natural logarithm in Equation (5) results to Equation (6) as follows:

$$\ln\left(\frac{P_i}{1-P_i}\right) = \ln e^{Z_i} = \ln e^{B_0+\sum_{i=1}^{n} B_i X_i}$$

The natural logarithm of *e* itself is given as

ln *e* = 1, because $e^1 = e$

$$\ln\left(\frac{P_i}{1-P_i}\right) = \ln e^{Z_i}$$

$$= B_0 + \sum_{i=1}^{n} B_i X_i \qquad (6)$$

The Equation (6) is deterministic Equation that yields stochastic Equation (7), thus, there is a need of taking disturbance term (ε) into consideration as follows;

$$\ln\left(\frac{P_i}{1-P_i}\right) = B_0 + \sum_{i=1}^{n} B_i X_i + \varepsilon \qquad (7)$$

Therefore, Equation (7) is the logistic regression model showing a natural logarithm in odds ratio that shows the relationship between dependent and independent variables of the model.

Since there were no mechanisms installed to record landing price among artisanal fishers, experiences in determining landing price were captured by measuring pleasurable or feelings of artisanal fishers with landing price on SWB life satisfaction (Dolan and Metcalfe, 2012). The independent variables X_is included fish landing price denoted by (Fp), which is measured as the number of times in a year artisanal fishers are involved in determining landing price, education (E) measured as years spent in school, household size (H) and marital status (M) indicated as:{1 – Married, 0 – Otherwise}. Further, the study also included the variable for personal relations satisfaction (I) measured as {1- All the time, 0- Otherwise} (Pellerone *et al*., 2016; Dimoso, 2009 and Jackson, 2007), Age (A) and age squared (A^2). Cronbach's alpha

was used to measure internal consistency, which was found to be 0.813 for SWB life satisfaction. The econometric relationship is shown in equation (8).

$$\ln\left(\frac{P_i}{1-P_i}\right) = B_0 + B_1 Fp + B_2 E + B_3 H + B_4 M + B_5 I + B_6 A + B_7 A^2 + \varepsilon \qquad (8)$$

On the other hand, qualitative data were analysed using content analysis focusing on key issues related to the significance of fish landing price on individual wellbeing of artisanal fishers. Participants' quotes were chosen according to their relevance to the research objective. The analysis of qualitative data followed transcriptions, classification, and manual coding of the field transcripts of KIIs and FGDs, notes, recorded audios, images, and text documents. This was followed by the identification of the common themes from the coded data, comparison and linking with the study objectives. The data were then summarised using remarkable quotations and tabulations from the transcript in order to highlight themes of the findings (Wisdom and Creswell, 2013).

4.5 Results and Discussion

4.5.1 Socio-demographic characteristics of respondents

The study established socio-demographic characteristics of the respondents in relation to wellbeing achievement in terms of age, sex, household size, marital status, occupation, experience and gross income of the fishers as suggested by Borrero (2013) and Easterlin (1974, 2001). The results in Table 20 show that 91 percent of the respondents were engaged in fishing occupation which was the main source of income. This supports Kahneman's (2006) argument that the fishing occupation provides a high level of self-actualisation or job satisfaction and wellbeing (Pollnac & Poggie, 2008) with the majority of fishers aged 27 years with the average fishing experience of 14 years. This indicates that the majority of fishers start fishing activities as early as at the age of 13 years.

This observation is consistent with the observation made by a BMU leader as a key informant who reported, "…. We found our grandparents working here as fishers, and they imparted to us the same fishing skills, techniques of fish handling and negotiation on the pries of fishes; therefore there are no other alternative skills which can satisfy us more than fishing…' (KII, Nyakalilo Ward, April 2017).

Therefore, happiness in fishing life is part of an outcome of their pricing decisions contributing to the achievements of subjective wellbeing. In addition, among the respondents, 97 percent were men and 46 percent were married. Moreover, the responses indicated that about 79 percent completed primary school education, implying a correlation between levels of education with fishing as a labour-intensive occupation that requires hard skills for life satisfaction.

Table 20 : Socio-demographic characteristics of respondents (n = 289)

Variables		Descriptive Statistics			
	Sub-Variables	Mean	Per cent	Max.	Min.
Age		27		44	15
Sex	Male		96.9		
	Female		3.1		
Household size		4		11	1
Marital status	Married/Single with a partner)	133	46		
	Divorced or separated	66	23		
	Unmarried	75	26		
	Widowed	15	5		
Occupation	Fishing		91	3	1
Education	High school and above		21		
	Complete Primary school		59		
	Incomplete Primary School		13		
	Illiteracy		7		
Experience		14		21	1
Income (TZS)		4500,000		868,000	300,000

There are various benefits gained by fishers in participating in fishing activities that contribute to the achievement of their subjective wellbeing. These include fishing vessels, ownership of the house(s) and other domestic items as indicated in Table 21. These fishing vessels and other items owned by the respondents include fishing gear, hand-line fishing, long-line fishing, trawls, wooden sailboats, canoes, and cooling storages. During focus group discussions at Busisi on how fishers obtain fishing vessels, the following observation was made, “Fishing vessels are very helpful, but some of them are so expensive, and it is difficult for individual fishers to own them, they get these from buyers/agents in an agreement that the cost of the vessel would be deducted from fish sales which are highly influenced by landing prices” (FGD, Busisi, April 2017). Therefore, the landing price is subject to the availability of these vessels to facilitate the landing of fishes that contributes to the satisfaction of individual wellbeing.

Table 21 : Percentage contribution of available resources and facilities to fishers' subjective wellbeing (n = 289)

Physical and Non- Physical Resources	Benefit	(%)	Physical and Non-Physical Resources	Benefit	(%)
Fishing occupation		91	Non-Agricultural Assets	Car	00
				Motorcycle	21
Income from fish species	Nile Perch	24		Livestock	56
	Nile Tilapia	29		Television	07
	Sardine	26		Radio	82
	Other species	07		Bicycle	61
Income from non-fishing		14		Mobile phones	92
Ownership of fishing facilities	Fishing gear	21	Houses	Burnt bricks	56
	Handline	56		Cement blocks	08
	Longline	12		Mud and trees	74
	Trawl	62		Unburnt bricks	21
	Wooden-sail	11		Grass	08
	boats	76		Iron sheets	81
	Canoes	36			
	Cooling Storage				
Agricultural assets	Tractor	4			
	Plough	26			
	Wheelbarrow	12			
	Cart	14			
	Hand hoe	100			

4.5.2 Analysis of fish landing price effects on subjective wellbeing of fishers

The study also revealed subjective wellbeing achievement on fisher landing price using descriptive statistics (Granieri *et al*., 2017) including percentages by considering a number of items. The items include how artisanal fishers were satisfied in terms of feeling useful in determining price, feeling relaxed with the landing price, dealing with price problems better, and thinking carefully of getting better price as suggested by Dolan and Metcalfe (2012). Therefore, the results in Table 22 present fishers' satisfaction feelings about landing price. According to these results, the determined landing price allows fishers to enjoy maximum satisfaction; 52 percent of the respondents felt that it was useful to determine landing price, whereas 21 percent were complacent and satisfied with landing price, and 25 percent dealt with the price problem very well.

Table 22 : Fishers' satisfaction feelings about landing price (n = 289)

Items	None of the time %	Rarely %	Some of the time %	Often %	All the time %	Total (%)
Feeling useful in determining price	6	14	28	31	21	100
Feeling relaxed for landing price	24	24	31	18	3	100
Dealing with price problems well	21	19	35	24	1	100
Thinking carefully to get better price	12	8	24	3	26	100

Descriptive statistics was also used to indicate the highest indicator of experience measures of SWB. Therefore, item 1 (Table 22) on feeling useful in determining landing price scored 94 percent from sample respondents. Thus, it is the highest indicator of experience measures of SWB. The remaining items are below this score; therefore, item 1 was used to form the basis of measures of SWB as dependent variable.

The researcher then modified the standard question **'**taking everything into account, how satisfied are you in this life for being useful in determining landing price in a way you have been living for the past twelve months?' The result of the dependent variable SWB was measured as 0 = 'Very Dissatisfied', 1 = Dissatisfied', 2 = 'Satisfied' (Table 23).

Table 23 : Overall SWB satisfaction level from being useful in determine landing price (n=289)

Satisfaction level	Frequency	Percent
Very Dissatisfied	89	31
Dissatisfied	99	34
Satisfied	101	35
Total	289	100

Table 24 shows the ordered logistic regression of preliminary results on the relationship between independent variables and SWB satisfaction of artisanal fishers. The results show that, landing price had a positive relationship with SWB satisfaction and was statistically significant ($P<0.05$). Personal relation showed a positive relationship with SWB satisfaction and was statistically significant ($P<0.1$). Marital status showed a negative relationship with SWB satisfaction and was statistically significant ($P<0.1$). The variable age showed a negative relationship with SWB satisfaction, meanwhile age squares, household size, and education had a positive

relationship but were not statistically significant. These findings concur with the findings by Cummins (2014), Britton (2013), Janssen *et al*. (2001), and Dimoso (2009) that age of the individuals, relation with others, and association of price determinations have a significant relation with individual SWB satisfaction.

Therefore, the coefficients in Table 24 indicated further that, a one-unit increase of the number of times involved in determining landing price, and the ordered log-odds ratio of being very dissatisfied, dissatisfied, and satisfied for SWB satisfaction levels among artisanal fishers would increase by 0.137 while other variables in the model are held constant.

Table 24 : Effects of fish landing price on subjective wellbeing (n = 289)

Variables	Coefficient	Std. Error	Odds ratio
Landing price	0.137	0.017	0.693**
Age in years	-0.116	0.089	1.143
Age square	0.082	0.034	1.083
Household size	0.721	0.142	2.904
Marital status	-0.176	0.017	1.168*
Education	0.411	0.289	1.157
Personal relation satisfaction	0.171	0.052	1. 312*
Threshold parameters			
/cut 1	2.123	1.625	3.102
/cut 2	7.112	1.803	8.910

Number of observation (n) =289; Log Likelihood ratio: Chi-square (χ^2) = 167.192 ($p < 0.05$), Pseudo R^2 = 0.356, ***Statistically significant at P<0.01, **Statistically significant at P<0.05, *Statistically significant at P<0.1, /cut 1 are the estimate cut points on the latent variable used to differentiate very dissatisfied from dissatisfied and satisfied, /cut 2 are the estimated cut points on the latent variable used to differentiate very dissatisfied and dissatisfied from satisfied individual satisfaction levels of SWB when predictor variable values are evaluated at zero.

The odds ratio in Table 24 shows that, one unit increase of the number of times one is involved in determining landing price, then the odds ratio of artisanal fishers SWB satisfaction for the satisfied level versus the combined very dissatisfied and dissatisfied levels would be 0.693 greater, given that all the other variables in the model are held constant. Additionally, the odds ratio of artisanal fishers having very dissatisfied versus dissatisfied and satisfied levels of SWB would be 0.693 greater. The same interpretation applies to the odds ratio of all other variables in Table 24.

The results of the odds ratio and coefficients for the outcome groups appear to be the same. Thus, the findings concur with the assumption underlying ordered logistic regression that, the relationship between each pair of outcome groups is the same. In other words, the coefficients that describe the relationship between, say, the lowest versus all higher levels of the response variable are the same as those that describe the relationship between the next lowest levels and all higher levels. This is called the proportional odds assumption or the parallel regression assumption, because the relationship between all pairs of groups is the same.

Apart from coefficients and odds ratio that were used to interpret the ordered logistic regression analysis in the present study, the marginal effects were also used. The marginal effects interpretation shows that, a unit change of a particular explanatory variable would result in a decrease or increase in the predicted probability, which is the same as that of marginal effect, given that all other variables in the model are held constant. Table 25 is the result of the marginal effects of the ordered logistic regression analysis.

The marginal effects interpretation for the significant variables in Table 25 is as follows; the number of times artisanal fishers were involved in determining landing price were negative for very dissatisfied SWB level of satisfaction. It is however positive (0.013) and (0.018) for dissatisfied and satisfied respectively and was significant ($P < 0.05$). This implies that one additional unit of number of times by artisanal fisher is involved in determining landing price would increase the probability of increasing SWB satisfaction level from lower to the higher level by 0.013 and 0.018 for dissatisfied and satisfied SWB levels of satisfaction, respectively. Likewise, there would be a probability of artisanal fisher with very dissatisfied SWB level to have their SWB satisfaction reduced by 0.031.

Table 25 : Marginal effects of the Ordered logistic regression model (n = 289)

Variables	Very dissatisfied	Dissatisfied	Satisfied
Landing price	-0.031	0.013	0.018**
Age in years	0.042	-0.023	-0.019
Age square	-0.082	0.051	0.031
Household size	-0.071	0.062	0.009
Marital status	0.103	-0.087	-0.016**
Education	-0.021	0.011	0.010
Personal relation satisfaction	-0.004	0.003	0.001***

Number of observation (n) =289, ***Statistically significant at P < 0.01, **Statistically significant at P < 0.05, *Statistically significant at P < 0.1.

Additionally, there other factors which would increase or decrease the probability of SWB satisfaction among artisanal fishers. Among the factors, include marital status, such that being married decreased the probability of the artisanal fishers of being satisfied and dissatisfied, by 0.016 and 0.087 levels of SWB satisfaction respectively and was statistically significant (P < 0.05). Personal relations with buyers increased the probability the artisanal fishers of being satisfied by 0.001 level of SWB satisfaction and was statistically significant (P < 0.01). Others insignificant factors are household size and education but are positive related with SWB satisfaction. Age showed a negative relationship with satisfied SWB level of satisfaction for artisanal fishers.

Finally, the results from ordered logistic regression analysis imply that, SWB satisfaction of artisanal fishers was influenced by landing price determination. Therefore, artisanal fishers felt satisfied on subjective wellbeing by being frequently involved in determining landing price. Moreover, a similar observation was made during KII with a BMU leader that middlemen's dominance behaviour on fish price determination at landing sites makes them become the first price information receivers. This is because middlemen are linked with major buyers who are fish processing facility owners in Mwanza City (KII, Kanyala, and April 2017). These results concur with findings in studies such as Cummins (2014) and Janssen *et al*. (2001) showed that, a commodity price determination during trading forms part of the autonomy and quality needs that contribute to individual SWB satisfaction.

The results also reveal that, persistence of the multiplicative effect of dominance of landing price determination is caused by monopolistic middlemen around Lake Victoria. Therefore, artisanal fishers were not satisfied with the seldom involvement

in the determination of fish landing price. Similar findings are reported by Deaton (2011) and Chen (1999) who concluded that market price, monetary and oligopoly price discrimination affect wellbeing. These results also concur with Utility theory on the assumption that there is a continuous hedonic flow of pleasure on some needs, including autonomy on the landing price determination by fishers. The results are also in line with Easterlin paradox that landing price is among the factors that influence subjective wellbeing. Therefore, in the fishery sector, the determination of the landing price is paramount to the fishers' life satisfaction.

4.6 Conclusions

The fact that the fishery sector is vital for social, economic, policy and planning, the information generated from landing price and subjective wellbeing of artisanal fishers is instrumental to policymakers. This study found that there is a significant effect of landing price on the subjective wellbeing of fishers around Lake Victoria, Tanzania. The effects are in terms of the number of times artisanal fishers' participate in the determination of landing price as highlighted by Utility theory and Self-Determination Theory. Thus, the null hypothesis that, 'there is no significant influence on the landing price on the subjective wellbeing of artisanal fishers around Lake Victoria in Tanzania' was rejected. It is concluded that landing price has some influence on the subjective wellbeing of fishers around Lake Victoria, Tanzania.

It is recommended that efforts should be made by fishers to increase their frequency of involvement and capability in determining fish landing price in order to minimize negative feelings on landing price given to them (artisanal fishers). Further, fishers are recommended to establish a proper mechanism of determining and negotiating price with buyers as well as strengthening the fishery occupation. This can be done through establishing a collective agreement between fishers and buyers, using fishers' cooperative framework, which is a tool of raising capital for ownership of fishing vessels and acquiring skills on pricing among fishers. This can lead to better landing price and achievement of subjective wellbeing.

REFERENCES

Asche, F., Chen, Y., & Smith, M.D. (2015). Economic incentives to target species and fish size: prices and fine-scale product attributes in Norwegian fisheries. *ICES Journal of Marine Science*, 72, 733–740. doi: 10.1093/icesjms/fsu208.

Bjørnskov, C., Dreher, A. & Fischer, J.A.V. (2008). Cross-country determinants of life satisfaction: exploring different determinants across groups in society. *Social Choice Welfare*, 30(1), 119–173. doi: 10.1007/s00355-007-0225-4.

Borrero, S., Escobar, A. B., Cortés, A. M., & Maya, L. C. (2013). Poor and distressed, but happy: Situational and cultural moderators of the relationship between wealth and happiness. *Estudios Gerenciales*, 29(126), 2-11. doi: 10.1016/S0123-5923(13)70014-7.

Britton, E. (2013). Women as agents of wellbeing in Northern Ireland's fishing households. *Maritimes Studies*, 11(1), 16. doi: 10.1186/2212-9790-11-16.

Chen, Y. (1999). Oligopoly price discrimination and resale price maintenance. *The RAND Journal of Economics*, 30(3), 441-455. Retrieved from https://www.jstor.org/stable/2556057.

Conceição, P., & Bandura, R. (2008). Measuring subjective wellbeing: A summary review of the literature. [http://www.undp.org/content/dam/undp/library/corporate/Development%20Studies/subjective_wellbeing_conceicao_bandura.pdf] site visited on 11/01/2018.

Cummins, R.A. (2014). *Encyclopaedia of quality of life and well-being research.* Springer, Dordrecht. 311pp. doi: 10.1007/978-94-007-0753-5.

Currie, G., Richardson, T., Smyth, P., Vella-Brodrick, D., Hine, J., Lucas, K., Stanley, J.R., Morris, J., Kinnear, R., & Stanley, J.K. (2010). Investigating links between transport disadvantage, social exclusion and well-being in Melbourne - Updated results. *Research in Transportation Economics*, 29(1), 287-295. doi: 10.1016/j.retrec.2010.07.036.

Deaton, A.S. (2011). The financial crisis and the well-being of Americans. *NBER working paper series*. 17128. June 2011. National Bureau of Economic Research, USA. 56pp. doi:10.3386/w17128.

Delbosc, A., & Currie, G. (2011). Transport problems that matter–social and psychological links to transport disadvantage. *Journal of Transport Geograph,* 19(1), 170-178. doi: 10.1016/j.jtrangeo.2010.01.003.

Di Tella, R., R. MacCulloch & J. Oswald (2001). Preferences over inflation and unemployment: evidence from surveys of happiness. *American Economic Review,* 91(1), 335-341. doi:10.1257/aer.91.1.335.

Dimoso, R. (2009). Environmental degradation and intra household welfare: The case of the Tanzanian rural south Pare highlands. Thesis for Award of PhD Degree at Wageningen University: The Netherlands.

Dolan, P. & Metcalfe, R. (2012). Measuring subjective wellbeing: Recommendations on measures for use by national governments. *Journal of social policy*, 41(2), 409-427. doi: 10.1017/S0047279411000833.

Easterlin, R. A. (1974). Does economic growth improve the human lot? Some empirical evidence. In: David, P. A. & Reder, M. W. (Eds), *Nations and households in economic growth: Essays in honor of Moses Abramovitz*. Academic Press, New York, 89–125.

Easterlin, R. A. (2001). Income and happiness: Towards a unified theory. *The economic Journal*, 111(473), 465-484. doi: 10.1111/1468-0297.00646.

Ettema, D., Gärling, T., Olsson, L. E., & Friman, M. (2010). Out-of-home activities, daily travel, and subjective well-being. *Transportation Research Part A: Policy and Practice*, 44(9), 723-732.

Evans, S. J. (1991). Good surveys guide. *BMJ:British Medical Journal*, 302(6772), 302–303. doi: 10.1136/bmj.302.6772.302.

FAO (2003). *Report of the expert consultation on International Fish Trade and Food Security*, FAO: Casablanca. 213pp.

FAO (2014). *The state of world fisheries and aquaculture: Opportunities and challenges*, FAO: Rome. 243pp.

FAO (2020). *The state of world fisheries and aquaculture: Sustainability in action,* FAO: Rome. 244pp.

Ferrer-i-Carbonell, A. (2005). Income and well-being: an empirical analysis of the comparison income effect. *Journal of Public Economics*. 89:997-1019.

Gillam, C. & Charles, A. (2018). Fishers in a Brazilian Shantytown: Relational wellbeing supports recovery from environmental disaster. *Marine Policy*. 89:77-84. https://doi.org/10.1016/j.marpol.2017.12.008.

Gobillon, L., Wolff, F. & Guillotreau, P. (2017). The effect of buyers and sellers on fish market prices. *European Review of Agricultural Economics*, 44(1), 149-176. doi: 10.1093/erae/jbw006

Gordon, D, & Hussain, S. (2015). Price determination and demand flexibilities in the ex-vessel market for Tuna in the republic of Maldives. *Journal of Aquaculture Economics and Management*, 19 (1), 8-28. doi:10.1080/13657305.2015.994234

Granieri, A., La Marca, L., Mannino, G., Giunta, S., Guglielmucci, F., & Schimmenti, A. (2017). The relationship between defence patterns and dsm-5 maladaptive personality domains. *Frontiers in psychology*. 8:1926. doi:10.3389/fpsyg.2017.01926.

Guerra-Bustamante, J., León-del-Barco, B., Yuste-Tosina, R., López-Ramos, V. M., & Mendo-Lázaro, S. (2019). Emotional intelligence and psychological well-being in adolescents. *International journal of environmental research and public health*, 16(10), 1720. doi:10.3390/ijerph16101720.

Gullo. S., Lo Coco. G., Di Fratello. C., Giannone. F., Mannino. G., and Burlingame. G. (2015). Group climate, cohesion, and curative climate: A study on the common factors in the group process and their relation with members' attachment dimensions. *Research in Psychotherapy*, 18, 10-20. doi: 10.7411/RP.2014.023.

Hallerod, B., & Selden, D. (2013). The multi-dimensional characteristics of wellbeing: How different aspects of wellbeing interact and do not interact with each other. *Social Indicators Research*, 113(3), 807-825. doi: 10.1007/s11205-012-0115-8.

Hennink, M. M., Kaiser, B. N., & Weber, M. B. (2019). What influences saturation? Estimating sample sizes in focus group research. *Qualitative health research*, 29(10), 1483-1496. doi: 10.1177/1049732318821692.

Henson, S., & Mitullah, W. (2003). Nile perch exports from the Kenyan shores of Lake Victoria: Good or bad for local fishing communities? *In Livelihoods and ecosystems: Dealing with complexity in rural development and agricultural.* [https://gupea.ub.gu.se/bitstream/2077/29748/1/gupea_2077_29748_1.pdf] site visited on 09/02/2016.

Israel, D. G. (2013). Determining sample size. The University of Florida. 5pp.[http://www.gjimt.ac.in/web/wp-content/uploads/2017/10/2_Glenn-D.-Israel_Determining-Sample-Size.pdf] site visited on 16/08/2016.

Jackson, M.I., & Mare, R.D. (2007). Cross-sectional and longitudinal measurements of neighbourhood experience and their effects on children. *Social Science Research,* 36(2), 590-610. doi: 10.1016/j.ssresearch.2007.02.002.

Janssen, C., Söderberg, B., & Zhou, J. (2001). Robust estimation of hedonic models of price and income for investment property. *Journal of Property Investment & Finance*, 19(4), 342-360. doi. 10.1108/EUM0000000005789.

Kabote, S. J. (2018). Influence of women entrepreneurs' characteristics on personal well-being in Arumeru District in Tanzania. *African Journal of Business Management*, 12(11), 316-328. doi: 10.5897/AJBM2018.8558.

Kahneman, D. & Thaler, R. (2006). Anomalies: Utility maximization and experienced utility. *Journal of Economic Perspectives*, 20(1), 221-234. doi: 10.1257/089533006776526076.

Kambewa, E.V. (2007). Balancing the people, profit and planet dimensions in international marketing channels. A study on coordinating mechanisms in the Nile perch channel from Lake Victoria. Thesis for Award of Ph.D. Degree at Wageningen University: The Netherlands.

King, M. F., Renó, V. F., & Novo, E. M. (2014). The concept, dimensions and methods of assessment of human well-being within a socioecological context: a literature review. *Social Indicators Research*, 116(3), 681-698. doi: 10.1007/s11205-013-0320-0.

Kothari, C. R. (2004). *Research methodology methods and techniques.* New Age International Publishers, New Delhi. 401pp.

Layard, R. (2010). Measuring subjective well-being. *Science*, 327(5965), 534-535. doi: 10.1126/science.1186315.

Lee, M (2014). Hedonic pricing of Atlantic cod: Effects of size, freshness, and gear. *Marine Resource Economics,* 29(3), 259-277. doi: 10.1086/6 77769.

Lo Coco, G., Mannino, G., Salerno, L., Oieni, V., Di Fratello, C., Profita, G., & Gullo, S. (2018). The Italian version of the inventory of interpersonal problems (iip-32): Psychometric properties and factor structure in clinical and non-clinical groups. *Frontiers in Psychology*, 9, 341. doi: 10.3389/fpsyg.2018.00341.

López Ulloa, B.F., Møller, V. & Sousa-Poza, A. (2013). How does subjective well-being evolve with age? A literature review. *Journal of Population Ageing,* 6(3), 227-246. doi: 10.1007/s12062-013-9085-0.

Luomba, J. (2013). An assessment of the socio-economic status of fishers' communities in Lake Victoria, Tanzania in relation to poverty. *International Journal of Research in Fisheries and Aquaculture*, 3(3), 98-102. [https://www.researchgate.net/publication/256477617], visited on 26/07/2016.

Mannino, G., & Faraci, E., (2017). Morphogenesis of work. Application to the psychological well-being and psychosocial health. *RISS-Rivista Internazionale di Scienze Sociali*. 3:315-334. [https://www.torrossa.com/en/resources/an/4229031], visited on 03/04/2018.

McConnell, K. & Strand, I. (2000). Hedonic prices for fish: Tuna prices in Hawaii. *American Journal of Agricultural Economics*, 82(1), 133-144. doi: 10.1111/0002-9092.00011.

Meyer, J. & Cramon-Taubadel, S. (2004). Asymmetric price transmission: A survey. *Journal of Agricultural Economics*, 55(3), 581-611. doi: 10.1111/j.1477-9552.2004.tb00116.x.

Michaelson, J., Mahony, S., & Schifferes, J. (2012). *Measuring wellbeing: A guide for practitioners*. New Economics Foundation, London. 33pp.

NBS (2019). National Bureau of Statistics. Dar es Salaam, Tanzania.

Pellerone, M., Iacolino. C., Mannino. G., Formica. I., & Zabbara. S., (2016). The influence of parenting on maladaptive cognitive schema: A cross-sectional research on a group of adults. *Journal of Psychology Research and Behaviour Management*. doi: 10.2147/PRBM.S117371.

Phillips, M. & Subasinghe, R. (2010). Small-scale Shrimp farmers and global market –Trends, future prospects, and adaptation.[//w.aquaculturealliance.org/advocate], visited on 20/08/2016.

Pollnac, R.B., & Poggie, J.J. (2008). Happiness, well-being and psychocultural adaptation to the stresses associated with marine fishing. *Human Ecology Review*, 15(2), 194-200. [https://www. jstor.org/stable/24707603], visited on 18/07/2017.

Pontin, E., Schwannauer, M., Tai, S., & Kinderman, P. (2013). A UK validation of a general measure of subjective well-being: the modified BBC subjective well-being scale (BBC-SWB). *Health and Quality of Life Outcomes*, 11(1), 150. doi: 10.1186/1477-7525-11-150.

Purcell, S.W., Ngaluafe, P., Aram, K.T. & Lalavanua, W. (2016). Trends in small-scale artisanal fishing of sea cucumbers in Oceania. *Fisheries Research*, 183, 99-110. doi: 10.1016/j.fishres.2016.05.010.

Purcell, S.W., Ngaluafe. P, Foale.S.J., Cocks. N., Cullis. B.R., and Lalavanua, W. (2016). Multiple factors affect socioeconomics and wellbeing of artisanal sea cucumber fishers. *PLoS ONE*, 11(12), doi: 10.1371/journal.pone.0165633.

Reyes-García, V., Babigumira, R., Pyhälä, A., Wunder, S., Zorondo-Rodríguez, F. and Angelsen, A. (2016). Subjective wellbeing and income: Empirical patterns in the rural developing world. *Journal of Happiness Studies*, 17(2), 773-791. doi: 10.1007/s10902-014-9608-2.

Roangead (2013). Tanzanian Nile perch value chain baseline study. Burgun Cedric: International Trade and Sustainable Development. [http://www.Roangead.org/IMG/pdf/Roangead_Rapport_Final.pdf], visited on 13/07/2016.

Ruiz, V. (2012). Job satisfaction among fishers in the Dominican Republic. *Social Indicators Research*, 109(1), 81–94. doi: 10.1007/s11205-012-0057-1.

Ryan, R.M. & Deci, E.L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American*

Psychological Association, 55(1), 68-78. doi: 10.1037110003-066X.55.1.68.

Saunders, M., Lewis, P. & Thornhill, A. (2016). *Research methods for business students* (7th edition). Pearson Education Limited, Harlow. 768pp.

Sen, A. K. (1985). Well-being, agency, and freedom: The Dewey Lectures 1984. *Journal of Philosophy*, 2(4), 169-22. doi: 10.2307/2026184.

Shapiro, A. & Keyes, C. L. M. (2008). Marital status and social well-being: Are the married always better off? *Social Indicators Research*, 88(2), 329–346. doi: 10.1007/s11205-007-9194-3.

Tennant, R., Hiller, L., Fishwick, R., Platt, S., Joseph, S., Weich, S., & Stewart-Brown, S. (2007). The Warwick-Edinburgh mental well-being scale (WEMWBS): development and UK validation. *Health and Quality of life Outcomes*, 5(1), 63. doi: 10.1186/1477-7525-5-63.

URT (2010). *Fishery sector development program Tanzania*. Ministry of Agricultural, Livestock and Fisheries. Government Printer: Dar es Salaam, Tanzania. 45pp.

URT (2014). *Report on Lake Victoria Fishery Frame Survey Results-2014 Tanzania.* Government Printer: Dar es Salaam, 162pp.

URT (2017). *Mwanza Region Investment Guide*. Government Printer: Dar es Salaam, 80pp.

Waldron, S. (2010). Measuring subjective wellbeing in the UK. *Office of National Statistics Working Paper*, South Wale, UK. 70pp.

Wisdom, J. & Creswell, J.W. (2013). *Mixed methods: Integrating quantitative and qualitative data collection and analysis while studying patient-centered medical models*. AHRQ Publication: Rockville, 5pp.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter presents the summary, conclusions, and recommendations of the main study on the assessment of fish landing price and subjective wellbeing of artisanal fishers around Lake Victoria, Tanzania. The results summary, conclusions, and recommendations are presented for each of the specific objectives and in view of the study details presented in chapter two, three, and four of the thesis in the form of publishable manuscripts. In the thesis, Chapter one was on the study background, Chapter two provided results on the examination of fish price determination, followed by effects of fish attributes on landing price in Chapter three and Chapter four presented the findings on the impact of fish landing price on subjective wellbeing of fishers. The summary of the research findings section is then followed by conclusions, theoretical contribution, recommendations and area suggested for further studies in Chapter five.

5.1 Summary of Findings

5.1.1 Fish price determination methods and factors affecting fish landing price

The common methods of determining fish price used by fishers around Lake Victoria were analysed. The findings revealed that over 50 percent of the artisanal fishers at each selected landing sites come to an agreement on selling price through market consultations with traders. In addition, about 78.3 percent of artisanal fishers at Busisi settled their selling price through informal negotiation with buyers. During an in-depth interview, some of the fishers reported that these methods are likely to persist as long as daily fish price depended on information from middlemen or Beach Management Unit (BMU). Therefore, landing price is determined through formal negotiations with processors, consultation with other traders, informal negotiation with buyers, and BMU management teams.

The study also examined factors affecting landing price by using a modified hedonic price function and a fundamental theory of hedonic price that explains the price (p) of a commodity as a function of its features. The finding revealed that hours spent from fishing location in the Lake to onshore landing centre had a negative relationship with landing price and was statistically significant ($P<0.05$). This implies that, one-

hour increase of travel decrease the landing price by TZS 3.96. Moreover, market price information showed a positive relationship with landing price and was statistically significant (P<0.05). One unit increase in the counted information received about market price, increased landing price by TZS 1.50. The increase of market price information provides artisanal fishers with more powers to negotiate the prevailing price at the time of selling, and thereby increasing landing price.

Years of experience of the artisanal fishers showed a positive relationship with landing price and were statistically significant (P<0.05); One-year increase in experience increased the landing price by TZS 15.88. The findings showed that the fish price given to artisanal fishers depends on daily prices given by the processors. The agents offer the price to fishers after receiving information from the processors. When a given daily price is lowered by processors, the effects trickled down-streamed by agents/middlemen to fishers who happened not to be connected with the upstream channels to explain their pricing problems. Thus, agents and middlemen gain more profit and leaving artisanal fishers with meagre incomes.

5.1.2 Effects of fish attributes on landing price

The effect of fish attributes on landing price was examined by computing the log-linear form on hedonic price analysis of fish attributes of Nile perch, Nile tilapia, and Sardine fish species, which were selected for the study on which this thesis is based. With reference to price theory, all the three selected fish species are valued differently during supply and demand; hence, each has its own valid landing price. The focus was on the selected fish attributes namely fish freshness, size of fish, fish species, preserved fish, quantity landed at islands and mainland, and weighted measures. These attributes and optimal prices were identified at any time on a daily basis by both sellers and buyers and where landings occur randomly. Ordinary Least Square (OLS) was used to estimate hedonic regression analysis of optimal landing price on fish attributes whereby Random Coefficient (RC) model was employed.

The study findings showed that freshness of fish at islands, quantity landed at onshore island market, preserved fish, fish size, and freshness of fish at mainland are fish attributes that significantly ($p < 0.05$) affected landing price of Nile perch, Tilapia and Sardines. Moreover, fish species were found to have different prices per

scale, measured based on variation in size. The variation of these fish attributes was also observed to benefit first-hand buyers as opposed to artisanal fishers, who are the primary producers.

5.1.3 The effects of fish landing price on subjective wellbeing of fishers

The analysis of fish landing price on subjective wellbeing was established through ordered logistic regression model. This is because subjective wellbeing is a choice categorical dependent variable with an assumption that the choice of or membership in one category is not related to the choice or membership in another category. The standard question used to measure subjective wellbeing in this study is **'**taking everything into account, how satisfied are you in this life for being useful in determining landing price in a way you been living for the past twelve months? The required response was, 'Very dissatisfied', 'dissatisfied,' or 'satisfied'.

The findings showed that, there is a positive relationship between landing price and SWB satisfaction, which was statistically significant ($P < 0.05$). Personal relation showed a positive relationship with SWB satisfaction and was statistically significant ($P < 0.05$). Marital status showed a negative relationship with SWB satisfaction and was statistically significant ($P < 0.05$). Age shows a negative relationship with SWB satisfaction, while age squares, household size, and education had a positive relationship but were not statistically significant. Therefore, fishers were satisfied with life for increased frequency of involvement in the determination of fish landing price.

Similar observations were made during the KII with a BMU leader that middlemen dominance behaviour on fish price determination at landing sites created an opportunity for them to be the first price information receivers. This is because middlemen are linked with major buyers who own fish processing facilities in Mwanza City (KII, Kanyala, April 2017). The results also reveal that, persistence of the multiplicative effect of dominance on landing price determination is caused by monopolistic tendencies of middlemen around Lake Victoria. Therefore, artisanal fishers were not satisfied with their seldom involvement in the determination of fish landing price.

5.2 Conclusions

5.2.1 Fish price determination methods and factors affecting fish landing price

By examining the fish landing price determination around Lake Victoria area in, Tanzania. This study concluded that there are methods used to determine landing price of fishes. The methods used include verbal agreement between fishers and initial buyers. Artisanal fishers agree with the price offered by machingas, agents, middlemen or relatives. Formal negotiation with processors, consultation with other traders and informal negotiation with buyers and BMU are the methods used to determine landing prices in the study area. It is also concluded that the main factors that influence fish landing price around Lake Victoria are onshore distance trips, experiences of the fishers, and market price information. However, market price information was unique factor influencing fish landing price in the study area.

5.2.2 Effects of fish attributes on landing price

As for the effects of fish attributes on landing price around Lake Victoria, in Tanzania, it is concluded that freshness at island and mainland, quantity landed at onshore island market, preserved fish, size and weights are the main fish attributes influencing fish landing price of the selected fish species. The study also concludes that any change in fish attribute affects fish landing price. These findings are similar with the findings reported by Gobillon (2017); Hammarlund (2015); Lee (2014) and McConnell and Strand (2000). However, preserved fish attribute and weight attribute were unique fish attributes influencing fish landing price in the study area. The study also concludes that any change of fish attribute affects fish landing price.

5.2.3 Fish landing price effects on subjective wellbeing of artisanal fishers

On fish landing price effects on subjective wellbeing of artisanal fishers, it is concluded that landing price has a significant effect on the subjective wellbeing of artisanal fishers around Lake Victoria, Tanzania. The effects are in terms of the number of times artisanal fishers' participate in the determination of landing price. Therefore, frequent involvement of fishers in determining landing price is instrumental in improving life satisfaction among artisan fishers as depicted by Utility theory.

5.3 Theoretical Contribution

The analysis of Price Transmission governs a change of input price factors in a variety of areas including resource allocation, production techniques, price adjustments, and quantity produced by fishers as fishing firms' owners. Analysis of price transmission is built on the assumption that the effect of prices at one end of the market affects the other ends of the market. With regard to this assumption, the findings revealed that fish price given to fishers depends on a daily price given by the processors. The agents offer price to fishers after getting information from the processors. When a daily given price is lowered by processors, that lowered price is trickled down streamed by agents/middlemen to fishers, as they (fishers) are not connected to the up streamed channels to explain their pricing problems. Thus, agents and middlemen make more profits leaving artisanal fishers in abject poverty. A need of justifying this empirical finding requires a further testing of price transmission differences between middlemen and artisanal fishers. However, the stated assumption was found inadequate in explaining fish attributes influencing landing price in the way that it contributed to the determination methods of fish price.

Therefore, the Price theory was incorporated to validate the price for any specific commodity in relation to the supply and demand of that commodity. The Price theory provides the basic assumption that as the market changes by increasingly the purchase of a commodity with certain attributes; they create higher demand and cause an increase of the price. According to this theory, the price of a commodity is obtained at a point where utility bearing attributes of that commodity are not only valuable to individual buyers' demands, but they also comply with the sellers and this is known as the optimal market price. The assumption was consistent with the result observed in current situation. Fish species with larger size are the most valuable and are permitted for inter-trade at regional markets. The assumption elaborates further that when supplies of quantities of commodity exceed demands, the price of that commodity goes down. This assumption holds true in this study in that an increase in the quantities of fish landed, negatively affects the actual weights measured by the scales of weighted measure, which tends to lower the price of fish. The weighted measure scales accelerate lowering of the price through mistrust and buyers' collusion during an increase in quantities of fish landed. It also adds to the customer-

value based pricing approach that informal, formal, and consultations with buyers are the method that supports the price theory for setting optimal market price in fishery.

Utility theory holds that an individual participates in an activity to attain subjective wellbeing satisfaction (Ettema *et al*., 2010), and the order in which individual needs are fulfilled causes continuous hedonic flow of pleasure or progress benefits. This assumption was reflected in the findings that the need of all fishers is to have autonomy in determining landing price. Therefore, the thesis contributed that frequent involvement of fishers in determining landing price, maximizes their utilities and is likely to improve life satisfaction in fishery occupation.

5.4 Contributions to Knowledge

This study contributes knowledge on the current high poverty status of fishers surrounding Lake Victoria, Tanzania, which is caused by the manner in which landing price is determined, and reinforced by middlemen monopoly. This tendency result to fishers being paid low price'.

The study identified methods of determining fish price. The study revealed that artisanal fisher's negotiation with buyers has been a useful method for determining fish price as opposed to other methods such as cost-based pricing, customer-value based pricing (demand-based pricing), competitive-based pricing and psychological pricing. However, there are factors that render price determination ineffective, and these include middlemen monopolistic tendency. Therefore, these factors ought to be addressed to improve landing price and subjective wellbeing of fishers.

Following the existence of informal collusion among buyers, an increase of buyers did not necessarily lead to an increase in fish price as per the demand theory. Therefore, this finding did not support the demand theory because buyers formed a coalition regardless of their numbers. Thus, the study has generated knowledge through informing that, preserved fish and weights are among fish attributes influencing fish landing price. The landing price could be determined easily if the artisanal fishers decide to set a price as per input costs hence regulating the market prices and making some adjustments.

However, there has been little information on the asymmetric price regarding artisanal fishers around Lake Victoria, Tanzania. In this thesis, the degree of fish price asymmetry was not tested but using study empirical findings, artisanal fishers are not satisfied with paid fish landing price and the way of determining landing price. The study has shown that it requires a formed and reliable market price information system to set a minimal selling price per fish quality standard measures. The system would also distribute profits to artisanal fishers using nation-wide regulations on indicators of landing fish prices taking into account the costs associated with realising various volumes of fish catches. Further, it is widely known that there are no clear indicators of subjective wellbeing, and therefore this study contributes to the body of knowledge to the Easterlin paradox that landing price is among the factors found to influence subjective wellbeing.

5.5 Recommendations

The study recommends that the Ministry of Livestock and Fisheries should facilitate availability of market price information for a minimum selling price per landing sites per fish quality standards, providing technological fishing vessels through subsidies that reduce hours spent from offshore to reach landing sites. Pricing negotiation skills via BMU leaders around Lake Victoria should also be provided to artisanal fishers. This would help the country achieve the targets of the UN Sustainable Development Goal Number 14 on providing access to marine resources and market among small-scale artisanal fishers.

Fishers should also be assisted with access to market and fish price information by extending communication technology in the form of radio, television, and cellular phones around lake zones. Moreover, the increasing fishers fishing experiences can be accommodated by improving access to more efficient fishing facilities and equipment to enhance fish landing prices. The study recommends generally that the persistence of informal negotiation on the determination of landing price can be formalized through fishery policy reforms and regulatory framework of monitoring fish market conditions and fish price determination.

Given the findings that, fish attributes, freshness at island and mainland, quantity landed at onshore island market, preserved fish, size and weighted measures are

attributes that have long been shrouded with middlemen and agent dominant behaviour when fishers interacted with final buyers (consumers) on onshore mainland and local markets. It is therefore recommended that artisanal fishers when landed at onshore mainland, should sell their fish promptly at the nearest market place, which would reduce the cost of preservation and risks of fish deterioration. Fishers are also recommended to add value in each attribute of the fish that influence landing price determination when selling fish.

Further, policies and actions recommended for adoption among fishers are provision of fishing gears and storage mechanisms with quality preservation technique which can ensure supplies of fresh preserved large-sized fish for better paid price. Therefore, fishers can come together and form co-operatives for collective purchasing of fishery equipment that can accommodate reasonable sizes of landing fish as well as participating in contractual agreements to ensure that buyers purchase the harvests at reasonably better landing prices.

With regard to the conclusion that landing price has a significant effect on the subjective wellbeing of fishers around Lake Victoria, Tanzania, it is recommended that action should be taken by fishers to increase their frequency of the involvement and capability in determining fish landing price in order to minimize negative feelings on landing prices offered to artisanal fishers. Therefore, artisanal fishers can establish a proper mechanism for price determination and negotiation with buyers as well as for strengthening the fishery sector through establishing a collective agreement between artisanal fishers and buyers. Based on the conclusion and recommendations: this study aligned with Tanzania national fishery policy (2015) on improvement of market information system, improved technology and storage facilities construction.

5.6 Suggestions for further research

This research was conducted in Sengerema and Buchosa Districts and focused on fish price factors and fishers' understanding on subjective wellbeing satisfaction. However, some other factors such as consumers' preference of certain fish species, purchasing power of the processors and export market price may influence demand thus affecting landing price of fish and wellbeing. Future research should focus on

consumers and processors' choices in relation to landing price. Furthermore, a replica study can be carried out to incorporate other factors such as taste, nutritional value, fish processing, grading, branding, packaging, marketing, and other fish species that could affect the wellbeing of consumers.

REFERENCES

Ettema, D., Gärling, T., Olsson, L., & Friman, M. (2010). Out-of-home activities, daily travel, and subjective well-being. *Transportation Research Part A: Policy and Practice*, 44(9), 723-732. doi: 10.1016/j.tra.2010.07.005.

Gobillon, L., Wolff, F. & Guillotreau, P. (2017). The effect of buyers and sellers on fish market prices. *European Review of Agricultural Economics*, 44(1), 149-176. doi: 10.1093/erae/jbw006.

Hammarlund, C. (2015). The big, the bad, and the average: Hedonic prices and inverse demand for Baltic cod. *Marine Resource Economics*, 30(2), 157-177. doi: 10.1086/679972.

Lee, M. (2014). Hedonic pricing of Atlantic cod: Effects of size, freshness, and gear. *Marine Resource Economics*, 29(3), 259-277. doi: 10.1086/677769.

McConnell, K. & Strand, I. (2000). Hedonic prices for fish: Tuna prices in Hawaii. *American Journal of Agricultural Economics*, 82(1), 133-144. doi: 10.1111/0002-9092.00011.

URT (2015). *National fisheries policy of 2015*. Government Printer: Dar es Salaam, 44pp.

APPENDICES

Appendix 1: Household Survey Questionnaire

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SECTON A-1: Ethical Issues

Ethical question	**Yes**	**No**
1. Do you have a question		
2. Do you agree to be interviewed		
3. Is it good to start our conversation now		
4. Is it good to talk in private		
5. Is this a good place to hold interview		
If the answer to question 5 above is 'No' do you have a good place you would like to go		

SECTION A-2: IDENTIFICATION PARTICULARS

1. Region:……
2. District:……
3. Ward:……
4. Village:…….
5. Village chairman:……..…
6. Household Number in the Village Register:……
7. Head of household's name:……..…
8. Household size:……
9. Survey date, month and year:……/……/……

SECTION A-3: HOUSEHOLD MEMBER ROSTER					
1.NAME List household members starting with head of household in number 1.	2. Sex M…1 F….2	3. Age	4. Education Years spent in school….. No school……...1 Some primary…….2 Completed primary……...3 Some secondary….4 Secondary completed……...5 Tertiary …….....6	5.Occupatio Fishing……1 Agricultural…2 Mining……...3 Masonry…....4 Carpenter…...5 Employed Government…6 Private Company…....7	6. Marital Status Married…....1 Separated….2 Divorced…. 3 Never married…….4 Widow(er)…5
1.					
2.					
3.					
4.					
5.					

SECTION A-4: FISHING ACTIVITIES						
1. How many fishers are there in the household ?	2. How many days have they spent fishing A. Last month =……. Days B.Last 12 Months =…… …Days	3. List up to three location with the most preferred during dry season (sdry)and rainy season(sr) 1…… …. 2…… …. 3…… …. 4…… ….	4. Why these locations are important ? *(don't read choices, mark up to 3 answers in ORDER of importance)* 1.Get better price 2.Specific type of fish there 3.Local knowledge of fish locations 4.Relatively low time costs 5. Relatively easy to catch there 6. Relatively low fuel costs 7.Locatio	5. Are you mixing fish species during fishing? Yes…….1 No……..2	6. List at least three species of your preference 1…… 2……. 3…….	7. What were the preference reasons for these fish species? As caution against price failure……1 High market demand…..2 Like mixing…….3 Better market price…….4 Get more money…….5 All of above……...6

			n suited to fishing technology 8.Limitations of boat by Agents 9.Reduce conflict with other boats 10.Minimize risks of theft/danger Other factors_____			

8. Was the fish catch as expected from locations visited? Yes…….1 No……..2	If NO, What were the reasons that it was less than the area visited? Dry season……...…1 Rain Season.....2 Fishers increase……3 Illegal fishing……...…4 Businessman use high tech…….…..5 Diseases & community problems….6 Other…….7

SECTION B-1: DETERMINATION OF FISH PRICE

1a. What type were fished in the last month ……	2. How much quantity caught in the last 12	3. Does the quantity catch per day affect landing price?	4. How much catch was used for selling SPECIE(1,2..3) 1…….Kg 2…….Kg 3…….Kg	5. What was the total value of the sale?	6. What were the methods of selling? -Personal looking for buyers….	7. How many buyers were there in this trip?	8. Is the variation in availability of buyers	9. How do you choose buyers Price they

1b. How much quantity were fished in the last month……. Kg	months? ……K g	1…….Yes 2…….No	equivalent to Tsh.s 1……..… 2……..… 3……..… (today/per month) Ths 1……...… 2……...… 3…… per (12months)	TSH	.1 -Taking the fish to the market….2 -Selling to agents.....3 -Receive electronic mobile order….4 -Other (mention)....5	One ….1 More than One …..2 Others…….3	affect change in price? 1…..YES 2…...NO	offer…….1 Type of specie…...2 Available shorter distance ….3 Contracted by Agent....4

9. Regarding demographic and socio economic, which factors may lead to high fish price during landing at landing centres.

Put 1 if YES, Put 0 if NO

Items	**1 or 0**
Literacy level of artisanal fisher	
Tendency of adopting new technology	
Experience of artisanal fisher in locating and catching	
Age of the artisanal fisher in relation to negotiation skills	
Possess fish boats	
Having different sources of income	

10. Regarding fish species, some fish attributes preferred by buyers receive high prices at landing centres Put 1 if YES, Put 0 if NO	
Items	**1 or 0**
The larger the size of fish in Kg	
Fish days spent at onshore	
Fish days spent at offshore	
Availability of different species	
Fish stored for many days before reach landing centres	
Fish stored in a boat freezer before landed	

11. Regarding agent system and supports in kind or in cash provided to artisanal fisher, this give buyer's power over dominance on fish pricing due to items agreed as listed below. Put 1 if YES, Put 0 if NO	
Items	**1 or 0**
Fishing gear loan	
Fishing boat loans	
Cash loan	
Agents are the owner of the boat and other fishing facilities	
Agents take charges of the artisanal fisher basic needs at islands e.g., food, shelter	

12. Regarding factors for productions, some cost of input factors contributes to determination of the landing price. Put 1 if YES, Put 0 if NO		
Items		**1 or 0**
Distance to onshore, with regard to	i. cost of fuel used	
	ii. km used	
Distance to Offshore, with regard to	i. cost of fuel used	
	ii. km used	
Storage facilities in terms of provision and maintenance cost		

Numbers of artisanal fisher per boat	
The use of weighted scale for a fish with >1Kg and < 1Kg	
Offshore market	
Market price information	
13.What are tradition methods of determine fish price? (Rank by the mostly preferred which contributes to your life achievement) i. ……... ii. ……. iii. ……. iv. ……. v. …….	

SECTION B-2: FACTORS AFFECTING FISH PRICE							
1. Did you sell all catch in the last trip? Yes…1 No….2	2.How do you sell your fish catch Onshore ……...1 Fish market ….2 Agents …..…..3 Households….4 Restaurants…..5 Others …….6	3. What was the (a) total quantity sold? ……Kgs (b)price per Kg? ….TSH	4. What was the total value of the sale? TSH.	5 What was the methods of selling Personally looking for buyers…… …...1 Taking the fish to the market…… ….2 Selling to agents...3 Receive electronic mobile order……..4 Other (mention)....5	6. How many buyers were this trip One…1 More than One…2	7. Do artisanal fisher increase landing price when there are many buyers than few Yes…… ……1 No…… ……..2(Go to ‘c’) (b)Usually price increase from TZS……to …….. (c)If No, why? ……	8. (a)When do you get better paid landing price? Low season ….1 High season …2 (b)Usually price increase by…… TZS

9.(a)Is the price different at offshore and onshore? Yes…… …1 No…… ….2 (b)Difference is TZS…… ……	10. (b)How many market price information received during landing? …… (b)List those channel eg. BMU i…… ……. ii…… ……. iii…… …… iv…… ……	11. How is quality of the fish assessed/determined? Laboratory testing…...1 Physical looking…..2 Days since catch…....3	12. Who does the grading of the fish? Artisanal fisher… …..1 Sponsor …..2 Fishery Board…. ....3 Agreements between buyer and artisanal fisher… …4 Other (specify). ...5	13. What things does the price offered depend ON? Quality… …..1 Quantity… ....2 Buyers' competition....3 Season… ……4 Other …….5	14. (a)Did you transport fish for sale? Yes…. …1 No…. ….2 15: how many hours to the market ……..… Hrs	16. What is the average distance you transported for sale? …..KM

17. How did you transport fish? Boat…….1 Fishing craft……2 Boat Owners pick…….3 Special Freezer…4 Car……..5 Other (Specify)...6	18. Who pays costs of transport? Artisanal fisher…….. ….1 Buyer……. . 2 Cooperative Union…..3 Buyer's agent……..4 Share ratio……...5 Other(specify)….6	19. How much does it cost? TSH. …… ……	20. What are the payment mechanisms? Deducted from sales…… 1 Cash on uploading..... 2 Cash on delivery…….. 3	21. What is the payment principle? Volume……. ....1 Boat……..… ....2 Distance…… ....3 Divide share.....4 Other(Specify)..5

22. Did you encounter any fish loss during the last catch? Yes…….1 No……..2	23. What were the reasons for the loss? Rotting…….……1 Theft…….…2 Sea Wind…….…..3 Fire…….…...4 Weather (Rain, Wind etc.)……....5 Other (Specify)……..…..6	24. Did you preserve fish in storage facility in order to get better price before landing?		25. What was the estimated value of this lost fish? TSH. ……/…../……. Day/Month/<12mths	26. What market factors attracted you keep supplying fish?
		Yes	No		1
		1	0		2
					3
					4
					5

SECTION C-1: FISH ATTRIBUTE AND PRICE					
1. List by ranking all important attributes of a quality fish?		2. How much did you catch in each attributes in the last trip?	3. What was the sales price per kilogram ?	4.What was the total revenue obtained from sales?	5. What was the total cost of operations/fuel and catch?
Specie Type1					
ATTRIBUTE	**RANK**	Eg: Average Size = 200Kg	TSH.	TSH.	TSH.
Specie Type 2					
ATTRIBUTE	**RANK**				
Specie Type 3					
ATTRIBUTE	**RANK**				

SECTION C-2: COST OF INPUT FACTORS OF PRODUCTION AND PRICE			
1. Did you purchase the following fishing tools? Yes…….	2. How much these tools were purchased?	3. How much did you pay for these tools	
		Tool	TSH.

.1 No…….. .2					
Boat		Boat		Boat	
Gillnet		Gillnet		Gillnet	
Fishing gear		Fishing gear		Fishing gear	
Longlines		Longlines		Longlines	
Handlines		Handlines		Handlines	

4. From whom did you purchase/obtain these tools? Fishery Cooperative..1 Agents……..2 Trader……...3 Contractor…4 Other…...…5 Private sellers of local fishing tools……...6	5. How was the tools used? For the intended specific specie fishing…..1 All fish species…... 2	6. Were the tools supplied used during the last fishing period? Yes…1 No….2	7. What type of tools did you use last fishing AS PER QN3 above	8. Did you include the cost of it in set price during landing? 1……YES 2…….NO	9. How much was the cost in total of the used tools per total catch of today ……TSH
			1		
			2		
			3		
			4		

SECTION C-3: PRODUCTION FACTORS ON CREDIT						
1. Did you receive fishing tools on credit? Yes……..1 No……...2		2. Who determines volume and quality of fish? Buyer…….…1 Artisanal fisher…..…….....2 Intermediary…….....3 According to agreement……..…4 Other (specify)……5	3. How many tools did you receive?		4. What is the unit price for the tool?	
			Tool	**Quantity**		**TSH.**
Boat			Boat		Boat	
Gillnet			Gillnet		Gillnet	
Fishing gear			Fishing gear		Fishing gear	
Longlines			Longlines		Longlines	
Handlines			Handlines		Handlines	

5. How much did you pay upfront for these tool?	6. How much did you repay in cash later on for the tool?	7. How did you pay? Direct deductions from Sales……..…1 Payment to group Leaders……..2 Payment direct to Bank……..…3 Pay fish…….4 Other(Specify)...5	8. How much in total did you pay for the tool from the quantity caught? TSH.	9. From whom did you receive these tools on credit? Contractor……1 Agent……...2 Cooperative/ Association.…3 Trader……...4 Fishery Board……5 Other (Specify) 6

TOOL	**TSH**	**TOOL**	**TSH**
Boat		Boat	
Gillnet		Gillnet	
Fishing gear		Fishing gear	
Longlines		Longlines	
Handlines		Handlines	

	This week	Last Month
Boat		
Gillnet		
Fishing gear		
Longlines		
Handlines		

SECTION D: SOURCE OF LABOUR IN FISHING					
				HIRED LABOUR	
1 List household members here	2 During the last month fishing how many hours/days did each household spent		3. total wage paid (tshs/ quantity)	4. Did you hire any fishing labour in the last month? Yes……1 No……. 2	5. Total wage paid to hired labour per catch (tsh / quantity)
	Hours/Day	Days/Week			

6. Does the cost of labour included on your price setting 1……YES 2…..NO	7. Is there any good relation on life achievement in fishing with labour availability 1…..NO 2…..YES

SECTION E: EXTENSION SERVICES			
1. Did you receive any fishery advice in the last season? Yes…….1 GO QN 2 No……..2 GO TO QN 12	2. What type of fishery advice did you receive? Fishing……..…. .1 Marketing…… .2 Sorting……. .3 Grading…… …5 Storage…… ..6 Transport……. .7 All the above……8 Other (specify)…….9	3. Where did you mostly receive the fishery advice from? Government ……..……..……1 Cooperatives…… …..2 Fishery Association……....3 Buyers/Traders…..…… …… 4 Small scale fishery network… ..5 Experienced artisanal fisher……..…… …...6 Relative (s) within family…… .7 Others ……8	4. Did you receive the said fishery advice timely? Yes…… …1 No…… .2

SECTION F: FISHERY CONTRACTUAL ARRANGEMENT AND WELLBEING

1.0 Did you fish as part of contract with agent market system at any time over the last 12 months? ☐

i) Yes…1 Go to Qn…3

ii) No…2 Go Section G.1

1.1 If yes, what are the types of contractual arrangement you enter with the buyers

i)……...

ii)…….….

iii)…….….

iv)…….….

v) Others……...

2. What was the reason for you entering in contract fishing?	3. What was the type of contract you entered?	4. How much quantities are under contract fishing system?	5. What did you agree in advance with the buyer as part of this scheme? Tick as many as possible	6. Would you say that the buyer complied with the original agreement?
Lack of fishing tools. ……....1 Market access...2 Credit access……...3 Extension services……...4 All The above……..5 Other (Specify)…….6	Written… ….1 Verbal….. ….2	Quantity shared per Boat	Fish Sale Price……...…1 Quantity catch up……..…..2 Size of the boat…….….3 Quality of fish……....4 Date of fishing……...…5 Servicing fishing tools (e.g. fuelling, spare change) …..6 Fish distribution ratio…....7 All the above……..8 Other……... …9	Yes……1 No…….2

7. What were the main problems lead a buyer not complying with the contract? Did not buy all fish…….…....1 Delays in payment.…2 Changed price……3 Quality low……4 Other…….…..…….…5	8. Would you say that you complied with the original agreements? Yes…… …1 No……..2	9. What were the main problems that lead you (artisanal fisher) not to comply with the contract? Sold elsewhere……..…..1 Size of boat ……...…2 Scarcity Fish ……..3 Did not meet required Standard…… ……..4 Unequal share distribution…..5 Others…… ……..6	10. How do you handle conflicts in case of contract breach? Negotiations..…1 Mediation……..2 Reconciliation...3 Arbitration……4 Other (specify). 5

11. What are the enforcement mechanisms if the contract is breached? Individual…… …1 Court…… …2 Outside court……3 Artisanal fisher groups…4 Cooperatives… …5	12. Does the enforcement mechanism work? Yes…..1 No…...2	13. Is there any clause in the contract that allows exit or termination? Yes…..1 No…...2	14. What are the criteria for participation in contract fishing arrangement? Group formation…..1 Membership in Cooperative Union...2 Type of Fish ……3 Residence…… ….4 Other…… ……5	15. Do you belong to any fishery group? Yes… .1 No….. 2	16. How do you benefit from the group?	17. What is the group size?

18. How long have you been in the fishery group? One Year…..1 Two Years…2 Three Year…3 Four Years…4	19. What are the organizations/associations dealing with promotion of contract fishing in your area? Private companies (mention them)……..…1 International organizations…….2 Local Government Authority……...3 Individuals……....4 Fishery Buyers…..5 Financial Institutions…...….6 LVFO……....7 Other (specify)…..8	20. What are the roles of the institutions you have mentioned regarding to contract fishing (CF)? Provision of extension services…… ……1 Inputs on Credit……2 Fishery group formation……...3 Contract negotiation skills…… …….4 Market information……..5	21. (a)Are you willing to continu with CF? Yes…….1 No……..2 (b) If No…2 Give reasons 1…… 2…….. 3…….. 4……...… 5…….. 6……..……

22. List challenges faced by artisanal fisher when participating in contract fishing
    1. ……
    2. ……
    3. ……
    4. ……
    5. ……
    6. ……
    7. ……
    8. ……

SECTION H: WELL BEING

1. Taking everything into account, how satisfied are you in this fishing life in a way you live these days for the past twelve months? Choose one response
   (1) Very Dissatisfied (2) Dissatisfied (3) Satisfied ☐

2. Following your participation in fishing activity, respond if you have been benefited from it on the following assets

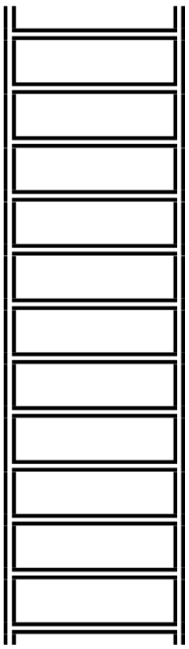
Tick where appropriate

2.1. Fishing Assets	Qty	Value (TZS)	2.2.Agricultural Assets	Qty	2.3. Non Agricultural Assets		2.4. Houses
(a)Fishing gear:					(a)Car		(a)How many

			(a)Tractor				houses do you own?…..
(b) Handline			(b)Plough		(b)Motorcycle		(b)House made of Burnt bricks……1 Cement blocks……2 Mud and trees…….3 Un burnt bricks…...4 Grass……..5 Iron sheets……..6 Timber……7
(c)Longline			(c)Wheelbarrow		(c)Livestock		
(d)Trawl			(d)Cart		(d)Television		
(e)Cooling Storage			(e)Hand hoe		(e)Radio		
(f)Small wooden sailboats					(f)Bicycle		
					(g) Mobile phones		
(g)Canoes							

3. Below is a picture of a ladder; The top of the ladder ‘10’ is the best possible life ‘completely worthwhile’ for you and the bottom ‘0’ is the worst possible life for you ‘not at all worthwhile’. In general, where on the ladder do you feel you stand at the moment? Please tick the box next to the number that best describes where you stand.

10



0

4. How is the income from Fish contributes to that level you achieved on the ladder.
Give reasons by ranking the first to the least reasons that income plays to advance your life
(1)…….....
(2)…….....
(3)…….....
(4)…….....
(5)…….....
(6)…….....
(7)…….....
(8)…….....
(9)…….....
(10)…….....
(11)Others……

5. Please choose the answer that best describes your feeling experience of each item that you perceived to affect your wellbeing

S/n	Statements	None of the time	Rarely	Some of the time	Often	All of the time
1	Feeling optimistic about the future landing price					
2	Feeling useful in determine price					
3	Feeling relaxed for landing price					
4	Dealing with price problems well					
5	Thinking clearly to get better price					
6	Feeling close to other buyers					
7	Able to make up my mind about fishing					

6. Below are some more questions about life on fish landing price determination. Please choose the correct answer that describes your feelings

S/n	Questions	Very Dissatisfied	Dissatisfied	Satisfied
1	Overall, are you satisfied with fish landing price paid in life nowadays?			
2	Overall, did you feel happy during past days in determination of landing price?			
3	Overall, did you feel worried past days in landing price?			
4	Overall, to what extent do you feel on fish price setting in your life is worthwhile?			

7. Generally speaking, would you say that most partners in fishing business can be trusted, or that you can't be too careful in dealing with other partners?

Please give a score of 0 to 10, where 0 means you can't be too careful and 10 means that most partners on fishing contractual arrangement can be trusted.

Worse -off			**Average**				**Most people can be trusted**			
0	1	2	3	4	5	6	7	8	9	10

<table>
<tr><th colspan="6">SECTION G-1: SELF EMPLOYMENT</th></tr>
<tr><td rowspan="2">1.
Did you operate any business activity in the last year other than fishing?

YES…...1
NO…….2</td><td rowspan="2">2.
What kind of business do you operate?

Agricultural……1
Mining……...2
Carpentry……...3
Masonry…….4
Petty business…….5
Other (specify)……6</td><td colspan="3">3.
How much income do you earn per DAY/MONTH/YEAR from your business?</td><td rowspan="2">4.
How much were the operating costs related to your business?

TSHS.</td></tr>
<tr><td>DAY</td><td>MONTH</td><td>YEAR</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Appendix 2: Focus Group Discussion Guide

General Questions

1. What type and size of fish you normally catch?
2. What are the factors influence fish landing price?
3. How do you preserve fish for a sell?
4. What are the most preferred characteristics of fish to obtain better landing price?
5. What is the mechanism used for landing price determination?
6. Which methods or mechanism for determine landing price is mostly preferred by fishers and why?
7. How is the landing price contributing to your subjective wellbeing?
8. What are your agreement terms in relation with buyers, any written and signed documents?
9. How do you benefit in this paid landing price?
10. How satisfied are you in this fishing life in a way you live these days?
11. When you, loss profit in this scheme? How do you feel, when you don't and why?
12. What other technical and financial services are provided by agents as per contract?
13. What types of loans in cash or in kind you received and how do you repay?
14. Are these services contributing to your wellbeing? How?
15. Are you intend to quit this occupation?
16. In this agent system, are there other stakeholders in the chain support fishers? How?
17. How do you manage risks on contractual agreement in agent system? How is the loss distributed?
18. In agent system, are the buyers dominate price determination?

Appendix 3: Key Informant Interview Guide

General Questions

1. What are fishing activities normally done by fishers
2. How fish price is determined by fishers as well as by buyers?
3. Which methods or mechanism is mostly preferred and why?
4. What are the preferences of the buyers in accepting the stated price?
5. What agreement terms with buyers, any written and signed documents existing with fishers?
6. How do fishers benefit in price paid by buyers? How does it affect their wellbeing?
7. How fishers are satisfied in this fishing life in a way they live these days?
8. When fishers, loss profit in this scheme? How do they feel, when they don't and why?
9. What other technical and financial services are provided by agents as per contract?
10. What types of loans in cash or in kind received and how do you repay?
11. Are these services contributing to your wellbeing? How?
12. Why fishing occupation remains difficult for fishers to quit?
13. In this agent system, are there other stakeholders in the chain support fishers? How?
14. How do fishers manage risks on contractual agreement in agent system? How is the loss distributed?

Appendix 4: Data collection clearance from the University

G-020

MOSHI CO-OPERATIVE UNIVERSITY (MoCU)
CHUO KIKUU CHA USHIRIKA MOSHI
Directorate of Research and Postgraduate Studies

To : **VICE CHANCELLOR**

RESEARCH PERMIT CLEARANCE FORM FOR POSTGRADUATE STUDENTS

This proposal clearance form should be filled by the student and approved by the Research Supervisor.

After approval by the supervisor the student should collect the research permit from the office of the Vice Chancellor ready for data collection.

Name of student: DAMIAN BONIFACE SAMBEO

Programme of study: PHD (Doctor of Philosophy)

Registration number: HD/T/SUA/mocu/001/2015

Research title: Contribution of fish landing price on wellbeing of fishermen in Lake Victoria, Tanzania

Name of supervisor: Dr. Kitala Christian Malamsha

Approval by Supervisor: Proposal Approved for Data Collection and Forwarded.

Student's Signature

Supervisor's Signature

Date: 16/Feb/2017

Date: 20/02/2017

Vision: To become a Centre of Excellence in Co-operative Education and Practice

Centre of Excellence in Co-operative and Business Management Training of the East Africa Community (EAC)

Appendix 5: Researcher introductory letter from studied University to Mwanza Regional Administrative Secretary (RAS)

MOSHI CO-OPERATIVE UNIVERSITY (MoCU)
CHUO KIKUU CHA USHIRIKA MOSHI

Sokoine Road,
P.O. Box 474,
Moshi, Tanzania.
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Fax:+255 272750806
e-mail: info@mocu.ac.tz
Website: www.mocu.ac.tz

OFFICE OF THE VICE CHANCELLOR
P.O. Box 474,
Moshi, Tanzania.
Tel: +255 27 2751833
Fax: +255 27 2750806
E-mail:vc@mocu.ac.tz

Our Ref. No: MoCU/UGS/3/41 **Date:** 23 Februari, 2017
Your Ref. No:

Katibu Tawala Mkoa,
Mkoa wa Mwanza,
MWANZA.

YAH: KIBALI CHA KUFANYA UTAFITI KWA WANATAALUMA NA WANAFUNZI WA CHUO KIKUU CHA USHIRIKA MOSHI (MoCU)

Madhumuni ya barua hii ni kuwatambulisha kwako **Ndugu Damian B. Sambuo** watafiti/mwanafunzi wa Chuo Kikuu cha Ushirika Moshi ambao kwa sasa wanatarajia kufanya utafiti katika eneo lako.

Maombi haya yamezingatia Waraka wa Serikali wenye Kumb. Na. MPEC/R/10/1 wa tarehe 7 Julai, 1980 pamoja na Hati Idhini ya Chuo Kikuu Cha Ushirika Moshi (MoCU). Moja ya majukumu ya Chuo ni pamoja na kufanya tafiti na kutumia matokeo ya tafiti hizo katika kufundishia. Aidha, wanafunzi hufanya tafiti kama sehemu ya masomo yao wakiwa Chuoni.

Ili kufanikisha utekelezaji wa tafiti hizo, Makamu wa Mkuu wa Chuo hutoa vibali vya kufanya tafiti nchini kwa wanafunzi, wahadhiri na wanataaluma wengine kwa niaba ya Serikali na Tume ya Sayansi na Teknolojia.

Hivyo basi, tunakuomba uwapatie mwanafunzi/watafiti waliotajwa hapo juu msaada watakaohitaji ili kufanikisha utafiti wao. Gharama za malazi, chakula pamoja na usafiri wake watalipia wenyewe kutokana na fedha walizopewa na Chuo. Msaada wanaouhitaji ni kuruhusiwa kuonana na viongozi na wananchi ili waweze kuzungumza nao na kuwauliza maswali waliyo nayo kuhusiana na utafiti wao.

Madhumuni ya utafiti wa mwanafunzi/wataalamu waliyotajwa hapo juu ni: **"Contribution of Fish Landing Price on Welbeing of Fishermen in Lake Victoria, Tanzania"**

Sehemu watakazofanyia utafiti huo ni: **MWANZA.**

Ikiwa kuna Sehemu ambazo zinazuiliwa, ni wajibu wako kuzuia zisitembelewe.

Muda wa Utafiti huo ni kuanzia tarehe **20/01/2017** hadi **30/12/2019.**

Ikiwa utahitaji maelezo zaidi tafadhali wasiliana nami.

Wako katika ujenzi wa Taifa,

Prof. F.K. Bee
MAKAMU MKUU WA CHUO

Nakala kwa: Mtafiti

Appendix 6: Data collection clearance from the Regional Administrative Secretary

JAMHURI YA MUUNGANO WA TANZANIA

OFISI YA RAIS

TAWALA ZA MIKOA NA SERIKALI ZA MITAA

MKOA WA MWANZA
Anwani ya Simu: "REGCOM"
Simu: 028-2500690 -2500686
Fax : 028-2501057/2541242
E-mail: rasmwanza@pmoralg.go.t
Unapojibu tafadhali taja

OFISI YA MKUU WA MKOA
S.L.P. 119
MWANZA

Kumb. Na. FA. 222/264/01/42

20 Machi, 2017

Katibu Tawala (W),
S.L.P 89,
SENGEREMA.

Katibu Tawala (W),
S.L.P 02,
UKEREWE.

YAH: KIBALI CHA KUFANYA UTAFITI KWA NDG. DAMIAN B. SAMBULO MWANAFUNZI WA CHUO KIKUU CHA USHIRIKA MOSHI (MoCU)

Rejea barua yako Kumb. Na. MoCU/UGS/3/41 ya tarehe 23/02/2017 ikihusu somo hilo hapo juu.

Namtambulisha mtajwa hapo juu ambaye ni mtafiti/mwanafunzi wa Chuo Kikuu cha Ushirika Moshi **ameruhusiwa** kufanya utafiti katika eneo lako.

Mada yake ya utafiti ni **"Contribution of Fish Landing Price on Welbeing of Fishermen in Lake Victoria, Tanzania"**

Muda wa Utafiti huo ni kuanzia tarehe 20/01/2017 hadi 30/12/2019.

Tafadhali mpeni ushirikiano wenu ili aweze kukamilisha utafiti wao.

B. K. Nyamsenda
Kny: KATIBU TAWALA MKOA
MWANZA.