NILE PERCH PRICING IN MFANGANO ISLAND OF LAKE VICTORIA, KENYA.

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NOVEMBER, 2021

DECLARATION

This project is my original work and has not been submitted for examination in any other university.

Signature ……. Date…05/11/2021……

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This research project has been submitted for examination with my approval as the university supervisor

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LIST OF ACRONYMS AND ABBREVIATIONS

BMU – Beach Management Units

EEZ – Exclusive Economic Zone

FAO – Food and Agriculture Organization

GDP – Gross Domestic Product

GOK – Government of Kenya

IFAD – International Fund for Agricultural Development

LVFO – Lake Victoria Fisheries Organization

SACCOs – Savings and Credit Cooperative Societies.

ABSTRACT

One of the causes of excessive depletion of natural resources is their low price at the production level. The Nile perch continues to face depletion in its natural stock and is in this category of natural resources with low prices. However, the price benefits largely accrue to traders and buyer agents, and not the fishermen. Only a fraction of the traders appreciates the use of weighing scale as an accurate measure to the value of Nile perch weight. The fish is therefore valued on guesswork, depending on size and general appearance. The study explores the interaction between the parties, a factor ignored but largely determines the price of Nile perch. The fish processors and agents determine their pricing based on several economic and social factors. It is not clear how fishermen get raw price deals from agents and not the other way round. The main objective of this study was to analyze the interaction of players and identify the type of games between fishermen on one side, and buyers/agents on the other. Primary data was obtained from 144 respondents: fishermen, agents, traders and end user buyers from 11 landing sites in Mfangano island of Lake Victoria. The research findings indicated that prices negotiated and paid are largely determined by possession of market information, age of respondent, size, quality and negotiations between parties. The negotiations in Nile perch prices took the form of ultimatum games, where both parties stood to lose if they failed to reach an agreement and share a pie from the processor's price offer. The findings also indicated the stake of fishermen in price determination is largely limited by beach management units that set a price floor for fresh, high quality Nile perch. The study recommends setting of price floors by the fisheries regulatory bodies to protect parties from exploitation arising from information asymmetry and unstandardized units of measurement.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

According to Food and Agriculture Organization (FAO) 2017, the annual growth rate for the worldeconomy is almost 3%. The changes in GDP per capita income are likely to affect the projection of quantities, compositions and value of agricultural demand especially for low- and middle- income countries where consumer demand reactions to changes in income is expected to be stronger in terms of their demand for food as compared to high income countries.

According to FAO and IFAD (International Fund for Agricultural Development) (2015), based on the current investment pattern and spending on social protection, it would be difficult to eradicate hunger by 2030 due to stagnant income, hence more pressure on existing natural resources.

Kenya's fishery resources are comprised of both inland fresh water and territorial waters including Exclusive Economic Zone (EEZ) and Territorial Sea within the Indian Ocean (NationalCommunication Report, 2020).

123 out of 300 people derived livelihood from fisheries, aquaculture and related activities in 2013 (FAO, 2015). In Kenya, 2014, the fisheries subsector provided direct employment to 2 million people, and contributed to the livelihoods of another 2.3 million, with an average earning of 0.5% of GDP per year in 2014 (FAO, 2016). Kenya is endowed with a vast network of aquatic resources comprising of a coastline of approximately 650 kilometers along the Indian Ocean. Furthermore, Kenya has a 6 percent share of the largest freshwater

lake in Africa, Lake Victoria. These two grounds are the country's biggest fishing grounds with Lake Victoria accounting for 92 percent of the national fish catch. Lake Victoria is also known to provide a wide variety of fish species as well as a hub of 307 fish landing sites.

The main fish species in Kenya include tilapia, Nile perch, clarias, trout, and crayfish. The speciesare found in both fresh and salty breeding grounds with freshwater catch being the highest as exemplified by Lake Victoria catch.

The rapid growth in fisheries and aquaculture in Kenya can be attributed to factors such as availability of highly trained fishermen, many varieties of fish in Lake Victoria, continued government support and availability of local, regional and international markets. (MoF,2013) The fish industryhas however serious bottlenecks among them, low stakeholder participation in policies touching on fisheries and inadequate investment by the respective ministries (National Communication Report, 2020). Despite the bottlenecks, the industry has high potential if well managed that could see its contribution towards GDP increase (World Bank, 2006). The industry relies on what is essentially an artisanal fishery, operating via an array of intermediaries who move the product from production areas to processing units and or consumers in urban areas or to processors and exporters. The tonnage of fishery products consumed locally is currently nearly at par with that which is exported (Wakwabi et al, 2003).

It is key to note that many agents at each level of distribution are involved especially in the domestic market. Most times, the prices are offered by the agents, or it is negotiated between the agents and the fishermen, who are either organized into cooperative societies, others opt to negotiate individually, or through their beach management units. Some however

decide to enter into price contracts with the agents. Agents and other sellers enjoy a margin ranging from 17% to42% of the final market price (Abila, 1995) indicating that the benefits accrue more to sellers leaving behind a trail of poverty among fishermen. The main concern of this study is to find out how price of fish between fishermen and agents is arrived at.

1.1.1 The fisheries industry in Lake Victoria

Lake Victoria is the world's second largest freshwater lake with Kenya enjoying only 6% of this large water body and its resources. However, this percentage sustains the bulk of fisheries and fishing activities in Kenya (Abila, 1995). The Nile perch is the main stock species in Lake Victoria (Lattice Consulting, June 2016). Lake Victoria is also known for the Omena (*Rastrineobola argeantea),* a small fish caught in the shoals and used for human consumption as well as animal feeds. Nile perch and tilapia are the modal fish species in Lake Victoria. They are most popular with fishermen and consumers. The demand exceeds the supply, providing a reason for investments in the sub-sector. Most consumers are middle to high-income groups (Lattice Consulting, 2016). Low-income consumers largely go for Omena fish type which is cheaper.

The Nile perch was introduced in Lake Victoria by the British colonial government around 1950. The development of industrial fish processing started in the 80s. This has resulted in an increase in the demand for the species both for local consumption and export market. Currently fishing is mostly done using small wooden boats thatrely on sails, paddles, or small engines. The bulk of Nile perch fishing is mostly done at night, and fishing crew, mostly hired by boat owners have to venture into deeper waters due to the dwindlingstocks of the species. Some 30,000 fishermen land the bulk of the catch from Lake Victoria on approximately 8,000 artisanal crafts. The fishermen operate in usually loosely organized

cooperatives, as contract fishermen under some fishing agentsor as individuals with the freedom to choose their market.

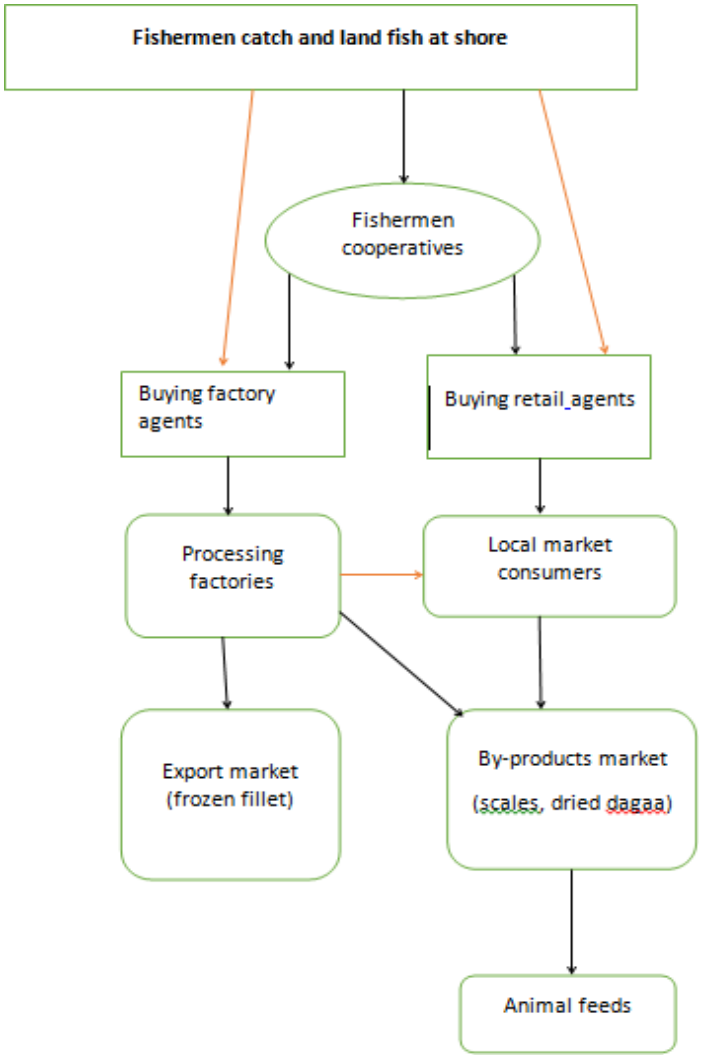
There is very little cooperation amongst fishermen when it comes to purchase of equipment, sales and marketing (Ardjosoediro and Neven, 2008). Every actor in thechain is active, with the intention to maximize his or her outcome from every activity. However, the Kenyan government has a fisheries policy that all landing sites should have a beach management unit to ensure training and implementation of fisheries policies. Despite this, playersin the sector operate individualistically, with high levels of mistrust, as evidenced by the continuous collapse of the poorly managed fishermen cooperative societies (MoF, 2017). This exposes the fishermen to the exploitative practices of buyers and intermediaries. Agents initially started by introducing loans to fishermen in the form of boats and fishing gear. This was followed by the introduction of price contracts, which have significantly reduced fishermen's price bargaining power (Schuurhuizen 2005).

In view of the high poverty levels and the income inequalities, private investments have gone into fisheries and aquaculture in the areas of fish production and distribution (Finegold, 1980) to help distribute the benefits to all players in the sector. Development of fisheries contributes to development of an economy as well as reduction of poverty, which has been a majorconcern to players in the fisheries subsector (FAO, 2005). This contribution is mainly through provision of employment, reduced food insecurity and nutrition, trade and other economic spillovers and multiplier effects (Abila et al., 2009). Kenya's fisheries sub-sector has the possibility of significantly contributing to job creation, forex earnings, combating poverty and food insecurity (GOK, 2006). However, perhaps due to information asymmetry, the profit marginsacross the value chain are quite unequal. The fisherman receives the least

returns while agents receive higher margins through perhaps exploitation of the information gap.

Fig 1 shows the supply chain from the producer (fishermen) to the final market. In all instances, the fishermen do not have direct access to the consumers. They access them through agents.

Schuurhuizen (2005) identifies disparities in the flow of information in the supply chain in the fisheries subsector, with semi-perfect flow of information from the final market and the processors.The agents also enjoy more information flow from processors. However, between the fishermen and the agents, there is a 'wall of ignorance' creating information asymmetry. The fishermen do not enjoy the same information privileges. Due to ignorance, they are blocked from accessing information from the market and the processors.



Source: FAO 2014

Figure 1.1: Kenya's Fish Market Distribution Channels

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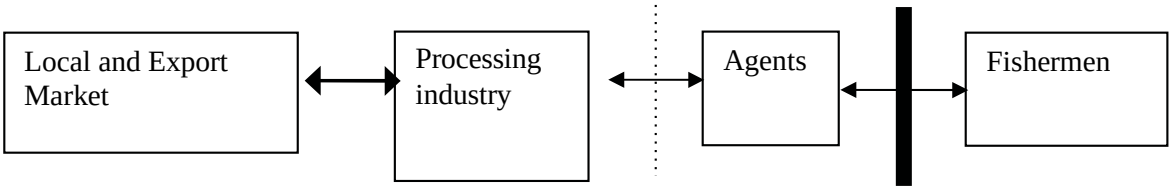


Figure 1.2: **The Wall of Ignorance between players in the fisheries industry.**

Source*:* Schuurhuizen, 2005

1.1.2 Fisheries in Mfangano Island

Mfangano island has a population of 19,000 according to 2009 Kenya population census. It

covers approximately 65 square kilometers of the expansive Lake Victoria. The major economic activity of the inhabitants is fishing, with little subsistence farming. Much of the island is rocky, and most people live along the beaches for ease of accessing water for daily use, and for ease in engaging in fishing or other fisheries dependent economic activities (Ogone, 2008). Prior to the introduction of the Nile perch in the 1950s, fishing and processing were artisanal (Geheb, 2008). Marketing and sale were meant for the surrounding regional markets.

The introduction of international markets for Nile perch in Europe, USA and Israel in the 1980s initially improved thelives of the inhabitants, with a majority upgrading from the traditional grass thatched houses to corrugated iron roofs. Prior to the introduction of the Nile perch, women were the main traders and artisanal processors of indigenous fish stocks whose population has greatly declined. The opening up of markets for the Nile perch, the introduction of a cash-based system of trade and the relegation of women from traders to subsistence farmers has led to men dominating the Nile perchbusiness (Geheb, 2008). The Nile perch business is a supply chain of fishermen, traders and agents, processors, and transporters, who all contribute to reaching the final consumer (Thorpe andBennet, 2004).

1.2 Statement of the Problem

The profit margin between agents and fishermen prices could be due to information asymmetry. The agents on one hand have information on the profit to be shared between them and the fishermen since they know the price offered by processors. However, at the production level, the fishermen are mostly unaware of the processors' price offers. They therefore rely on prices offered by agents. This is a case of moral hazard. Understanding the price formation between fishermen and agents is important in understanding the skewed

income benefits between them. This study examines the price game played by agents and fishermen to understand the price formation.

1.3 Research Questions

This study seeks to answer the following general question: How is the price of Nile perch arrivedat between agents and fishermen in Mfangano island? The specific questions are:

i. How do agents and fishermen arrive at the price of fish in Mfangano island?

ii. What are the main factors that determine Nile perch price in Mfangano Island?

1.4 Research Objective

This study seeks to explore how the price of Nile perch is arrived at between fishermen and agentsgiven the information asymmetry in the market. The specific objective are as follows:

i. Find out how fish price is arrived at in the beaches of Mfangano island.

ii. Identify the main factors that determine the market price of Nile perch in Mfangano island.

1.5 Importance of the Study

Reducing inequalities and alleviating poverty are some of the pillars of government strategic vision2030 goals. Poverty is one of the major problems facing fishing communities along the lake basin, hence a challenge at enforcing sustainable fishing practices. Much if the population around Lake Victoria rely on fishing as their main source of livelihood. However, the poverty levels, overfishing and lack of social amenities plague these regions. The research findings will add existing literature available to policymakers, investors and stakeholders when making decisions that affect sustainable fishing of the Nile perch species, while at the same time shed light in areas less covered by research and policy formulation

by analyzing data from respondents on their role in price determination.

1.6 Limitations of the Study

Although this research has been carefully designed, there still exist some limitations, both in scope and data obtained. First, the research specialized in the factors within price determination among the parties to fish trade. However, literature shows that price of Nile perch is determined by several market factors, these were not be addressed by this study. Second, the population of the respondent might not have been adequately captured, as the study was conducted within Mfangano island where there are hardly official records of participants in the fish trade. However, the target sample was be stratified to cover the salient features of the target population. Additionally, the issues of price paid and received are sensitive income factors and most respondents were adamant to expose the prices paid and received.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews theoretical and empirical literatures on market price determinants, focusing on price formation in production and sale and an overview of literature that identifies the researchgap while concluding the chapter.

2.2 Theoretical Review

Chamberlin 2007and Hicks (2007) have explained howprices are determined. 'Natural price', also interpreted as 'normal price' is the price that occurs when there is free competition unobstructed by monopoly or government regulation, referring to a sense of natural as opposed to artificial pricing (Smith, 1776). However, sometimes there may be obstacles that may keep offered and accepted price above or below this 'natural' price (Marshall & Marshall, 1879). The natural price of a good or service is defined as the value which supports nature's goals of providing and maintenance of participates in production and supply, in a manner sufficient for these activities to continue indefinitely (Andrews, 2010).

The exchange of goods and services amongst various economic agents leads to the creation and transfer of value (Weber, 2010). The price of a good or service is connected to its marginal utility.The initial units may have a higher price. However, the price of additional units may quickly decline (Menger, 1871). The more available a good becomes the lower its price with each subsequent unit.

The price of a good directly depends upon the forces of demand and supply. With high demand, and low supply, the price follows an increasing trend. With low demand and high

supply, the pricedeclines (Walras, 1874).

In classical utility theory, all agents are in a quest to maximize their utility from consumption of a good or service. Agents take the available price as given by the market forces. However, value is determined by a few agents with influential market power. The agents may prevent other agents from entering the market. Ongiro (1979) analyses the poultry market of Mombasa. 8% of the retailers control 50% of the trade.

According to Mishra (2007), most producers have a wide range of output, instead of one. The products have separate demand functions but one cost function. The costs are scarcely divisible for each product, but the need for a variety of products is separable. Producers pursue the price that is at the intersection of combined marginal revenue for the products, and the marginal cost tomaximize their payoff. Separate demand functions give the possibility of price discrimination where prices are charged differently to different buyers to benefit from consumer surplus. The producer must however be able to differentiate between buyers based on demand elasticity. The market has to be separable; producer must be able to prevent resale. Price may be set on quantitiespurchased by a single buyer; or may be charged based on a consumer's willingness to pay.

2.2.1. Neo-classical Theory

Numerous factors determine pricing decision of goods and services. The neo-classical economistsbelieve that forces of demand and supply determine market prices (Mankiw et. al., 2006; Parkin & Bade, 2003). Demand refers to the willingness and ability to buy a good or service at the prevailing market conditions all other factors rendered constant. On the other hand, supply is the ability to produce a good or a service for the market all other factors

constant. At a point where supply equals demand then a market equilibrium of price and quantity is reached (Peterson, 2007).According to the neoclassical theory, the equilibrium in the market would be distorted when any of the factors affecting demand and supply change. Overly, the neoclassical model would when assumptions of many individual buyers and sellers, homogenous products, perfect information, and no government intervention hold (Hirshleifer et. al., 2005). Therefore, this theory holds that priceis a product of demand and supply, under conditions of perfect information, which is scarcely truein the Nile perch market.

Adam Smith (1776) explain that the price of a product is determined by the total cost of the inputs that went into its production. The cost comprises payment to factors of production, - labour, land, and capital. It also includes taxes. In a perfectly competitive market with an efficient allocation of resources, each trading entity will maximize profits when its price equal marginal cost (Scheid & Sutenan, 1979).

However, in an imperfect competition market the margins may be wayabove the cost, hence having higher end prices, while remuneration to the producers remain low (Shepherd & Futre, 1969) as evidenced in the fisheries subsector. According to Agarwaal (1966), estimating cost of marketing, and the marketing margins for cabbage in Malaya, using cross-sectional data, determined that cabbage producers received 60% of the consumer price. Traders received 19% while 9% is spent on transport, handling, and packaging. 12% was spent on processing implying that the price of cabbage is a function of thesecosts. These estimates however do not breakdown the cost of production by the producer.

2.3. Determinants of Fish Market Price

The classifications of markets are based on market concentration, differentiation of products, conditions for entry and market integration (Abila, 1995). In the wholesale markets, the fish

are sold to retailers and on the retailers' market; the fish is sold to the consumers.

Both these markets differ in the prices offered as each of the market players in the respective market has a margin to make in mind. Those who buy on wholesale enjoy the economies of scaleof buying in bulk and saving on unit costs, they are the majority, and they buy and resell most of their products in the inland (Nyanja, 1986). The pursuit for different margins by different playersin the industry has a great impact on prices paid.

Additionally, Kenya produces both farmed fish and wild fish and both of these are sold in differentmarkets (Kenya's Aquaculture Brief, 2017) at different prices since most consumers prefer wild fish to farmed fish. The variations in prices and profits fetched through sale of fish depend on the species sold and hence the market prices of fish are volatile across species. This means that different species of fishattracts different prices across different markets (Roy & Atle, 2014). The species with higher returns are first prioritized (Sethi et. al., 2010). The most common type of fish is the Nile perch, tilapia, tuna and catfish.

Fish is a perishable good. This means that it has to be transported to the market in the shortest time possible so that it is still in good condition. Therefore, the distance andthe locations of the fisheries relative to the markets are key. Long distances call for investment ineither quicker means of transport or having sophisticated preservation methods. This has a direct impact on the cost of production and hence the market price (Mendelsohn, 2006).

Fish size has been changing over time. The size and body weight of fish determines their per kiloprices (Zimmermann & Heino, 2013). It has been hypothesized that big fish within and across different species attract higher prices and are profitable (Tsikliras & Polymeros, 2014).

The crazefor larger species has resulted into fish grading. This means that the fishermen are able to separatebig and small fish. The small fish are discarded, as they do not fetch high prices. According to Sjöberg (2015), increasing price of fish species is dependent on the size of the catch. In Sweden, Rickertsen and Kristofersson (2009) found that size was key determinant of fish price although the practice was totally against the law.

In any market setting, the quality of a product is commensurate to the price offered (Ladd & Suvannunt, 1976). In a similar way, if the fish are fresh and of high quality, they are considered safe for consumption, and hence are highly priced. Additionally, consumers of fish may use the price to determine the quality of fish. A few market research studies (Munroe, 1973; Olso, 1977) have shown that when consumers are not sure of the quality the good, they opt to use price as a surrogate determinant of quality. On the contrary, there are those who feel that quality is not enough to determine the price of a good. Price demand equally affects the market prices of fish inthe sense that fish vendors, fishermen and middlemen are at liberty to change the prices based onthe prevailing market conditions (Alapan et. al., 2016).

Fishing is an activity that has great inclinations to weather. According to Graddy (2006), the number of fish supplied in the market highly depends on a number weather conditions. Heavy winds affect fishing vessels. Fish can only come to the surface of the water when conditions are optimum. Storms, violent tides and heavy waves hinder fishermen from going deeper into the fishing grounds with fear of drowning. During these periods of extreme weather, the price of fishrises because of increased demand and scanty supply. Therefore, weather conditions determine greatly the market price of fish (Brutton, 1990).

2.4 Empirical literature Review

Safiih and Noor (2014) while conducting a study on price control of fish price using Game Theoryin the state of Terengganu found that there was correlation between agencies in price determination. It thus recommended a further analysis of the relationship between agents. To determine the weightage results in pricing, it is important to understand the relationship between agents in the game. Each player in a cooperative game has an opportunity to form a binding agreement that enables the determination of the distinction of 'pay-off' at each level. Every playerhas an equal chance to form a strategic cooperation agreement.

In Ghana, Gifty et al. (2015) conducted a survey investigating the impact of value chain on the prices of tilapia using the evaluation factor matrix. Their study found that the fish farmers had negative price margins while input suppliers obtain the highest margins across the value chain. Other studies focusing on fish prices dynamics in developed markets have been immense in helping decipher the relationships between fish prices (Ling, 2003; Petersen & Muldoon, 2007).

In Norway, Asche F. et al, (2001) conducted an empirical analysis on the relationship between ex-vessel prices and the market prices for fresh codfish. The results indicated that export prices for dried cod were statistically significant in determining the ex-vessel prices. In addition, they foundthat the prices for fresh domestic cod was determined by ex-vessel prices since ex-vessel prices were weakly exogenous. In a similar study in Japan, Shimizu (2005) also found a causal relationship between the prices offered for fresh salmon as compared to salted salmon. He found that the wholesale prices for fresh salmon were determined by the amount of inventory kept of salted salmon.

In Japan, Pan and Pooly (2004) while investigating the main factors of seasonal variations in the prices of tuna fish, found that the volumes of fish landings by Hawaiian vessels was the main factor determining the prices of fish. Other factors considered for this study included the number of tourists visiting Japan as well as substitution effects within some species of fish. On the other hand, Garcia and Salayo (2009) established that there is a cointegration between wholesale and retail prices offered for shrimp, milkfish and tilapia across different location in the Philippines.

Using analysis of variance to quantify the main market determinants of market prices of fish in Northern Philippines, Alapan et al (2016) found that the quality of fish was the main determinant of market prices of fish while water pollution had the least influence. However, price demand, water pollution, weather condition, quality of fish and location was found to be statistically significant in determining the market prices of fish. Namisi (2005) also found that environmentalchanges, quality of fish, water pollution, price demand and location were significant factors in explaining the volatilities of prices of fish. Savin et. al. (2010) agrees that prices of fish vary but he focused more on explaining that the variations could be attributed to the levels of education of both the producers and consumers.

2.5 Overview of Reviewed Literature

From the reviewed literature, it is evident that fishing has an important role to play in any country, especially so in bid to reduce food insecurities and poverty. Moreover, the sector employs a largeportion of the population that rely on it for income and food. Therefore, the fisheries sector cannot be ignored. Various studies have been conducted in developed economies (Kearney & Centaur, 1988; Yashomoto, 1996; Alapan et al, 2016). However, a few studies have been conducted on thedeveloping economies (Brummett, 1999; Namisi,

2000; Namisi, 2005). Majority of the studies have focused on the challenges facing fishing as a sector and proposed solutions (Adhiambo et al,2015).

Apart from Asche (2001) et al, very few studies touch on the relationship between the parties in the fisheries subsector, despite the important role they play in determining the prices. This study therefore seeks to add onto literature on fish pricing in developing countries and bridge the gap between available information, and what is on the ground.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Theoretical Framework

3.1.1 Game Theory

The ‘prisoners’ dilemma’ is used to analyze cooperative and non-cooperative games. Two players must choose between two different strategies, cooperation, or non-cooperation. They are both oblivious of the actions taken by the other party. If one prisoner chooses to cooperate, while the other chooses non-cooperation, the payoffs are different from when both do not cooperate, or when both cooperate.

In a situation where the two players both choose non-cooperation, the payoff would be lower compared to a situation where both would have chosen to cooperate. The dilemma arises in a situation of non-cooperation by both parties where their payoff is lower compared to if both wouldhave chosen to cooperate.

Kopalle and Shumsky (2010) use Game theory to analyze pricing decisions. They define a game as a composition of three elements: players, strategies, and payoffs. The assumption by Kopalle and Shumsky (2010) is that each player is aware of the different strategies available but obliviousof the strategy to be used by the other player. When analyzing a game, there are two basic steps, the first is to make clear the implications of the rules to fully understand the relationships betweenthe strategy and the payoffs (Kopalle and Shumsky, 2010). The players are assumed rational and are expected to make decisions that are meant to increase their income through prices.

Kreps (2005) explains that economic processes are like a game of two or more players who

makedecisions concerning their welfare, for possible gains. The models begin from a point of rationalityof decision and identical decisions that can be expected if the condition system is static. Decision among players is on cooperation, determined by the information asymmetries among them on the one hand and by the different experiences of the participants on the other hand.

The implementation of normal form is prioritized in research if we start from non-cooperation game. In the non-cooperative game theory, decision-making is independent, with no self-restraint. The target is to maximize own payoff by every player. Whether one decision maker knows of the other's preferred choice is of no concern. In describing decisions made simultaneously, the normalform is sufficient, despite the absence of knowledge of the other party's decision. The standard presentation is the description of players' payoffs in a matrix (P), which gives the different pairs of payoffs of strategy pairs.

Table 3.1: Payoffs of two players in a game.

Source: Istvan Takacs

		B	
		S^B_1	S^B_2
A	S^A_1	$a_{1,1};\ b_{1,1}$	$a_{1,2};\ b_{1,2}$
	S^A_2	$a_{2,1};\ b_{2,1}$	$a_{2,2};\ b_{2,2}$

or in matrix form $P = \begin{bmatrix} a_{1,1};\ b_{1,1} & a_{1,2};\ b_{1,2} \\ a_{2,1};\ b_{2,1} & a_{2,2};\ b_{2,2} \end{bmatrix}$

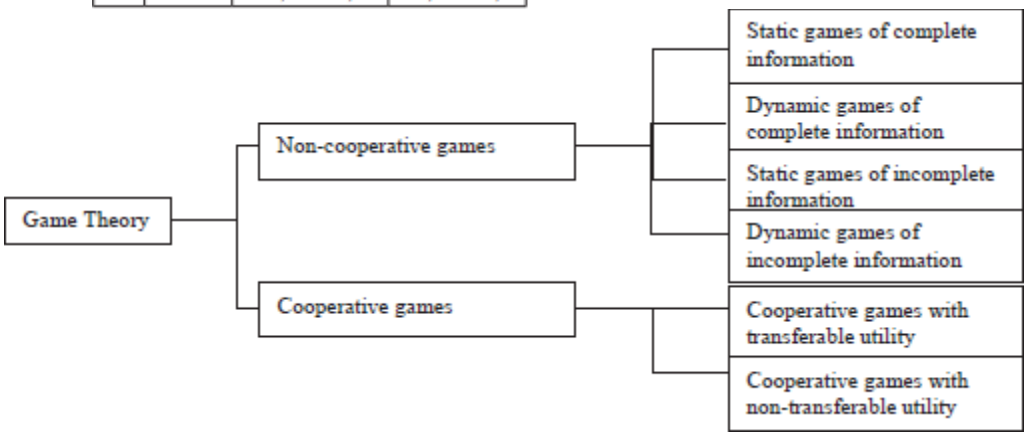


Figure 3.1: Classification of games

Source*:* Kopalle and Shumsky (2010)

3.1.2 Ultimatum Bargaining Games

In an Ultimatum Game, two parties are given a 'pie' to share amongst themselves with the ultimatum that if they do not agree on how to share, they both lose, and get nothing. The two parties, otherwise known as the Proposer and the Responder are engaged in a sequence of bargaining games (Guth and Tietz, 1990). The proposer makes an offer, that if accepted by the responder, they are both likely to gain. If the responder rejects the offer, both parties get nothing. Material opportunism requires that an offer to the responder must be positive to be accepted (Gurth, 1976). According to Selten (1965, 1975) the responder will accept even the least positiveamount offered by the proposer.

Equal splits or offers closer to 40% of the pie are considered by proposers as payoff maximizing(Camerer, 2003), hence they are likely to offer the same to responders who are likely to acceptunder conditions where information on the total amount to be shared is available to both parties. Kreps and Wilson (1982) play an ultimatum game with incomplete information; the result is that inthe offer game, the responder accepts any positive offer from the proposer.

Bolton (1991) however disputes the assumption that the responder will accept any positive offer. He introduces the concepts of absolute payoff, and relative or comparative payoff that introducesa fairness index. The action of players in an ultimatum game is to maximize their payoff. The responder will only accept an offer of only $z \leq \frac{\pi}{2}$ if the utility of accepting z is greater than, or equal to the rejection of the same. This theory predicts similarity in offer and acceptance in situationswhere the amount availed to the proposer is known.

Ochs and Roth (1989) suggest that the minimum a responder will accept is a constant amount,

butnot necessarily small. They predict acceptance patterns where the responder only cares about the absolute payoff. To them, the size of the amount availed to the proposer does not matter. They predict that the responder will always accept a fixed percentage of the total amount availed.

Roth and Erev (1995) however write that the presence of low offers could be the result of the entryof new proposers in a system. The responders end up in a system where they are worn out by constantly rejecting low offers; hence, it becomes the norm for them to accept these low offers. The result is that more proposers are attracted into this system, eventually leading to a convergenceto the sub-game perfect equilibrium (Roth, 1995)

Zamir, (1995) finds little evidence that the experience of a responder over time is likely to change his acceptance behavior. Croson (1992) notes that the assumption of complete information in ultimatum games is unrealisticin the real world. Ultimatum games are played in uncertainty. Since the responder does not knowthe absolute share of the spoils. This makes the idea of fairness and equity ambiguous. Henrich (2000, 2001) has demonstrated that ultimatum games are an important tool that are usedin understanding the economic behavior of small-scale societies.

In Table 1, the rows show the strategy for player A. Strategy for player B is shown by the columns.The option that yields a higher payoff is because of a rational selection. When decision pairs arebalanced, they are referred to as Nash equilibrium (where each player chooses the strategy thatyields a higher pay off until the other player ends up not changing their strategy, and vice versa). The game can be stated in general form follows:

Define a set of N number of players N= (1……., n) with strategy set S_i and payoff function

$\pi i\ (s_{1,.....,}s_{n})$ whereby i=1,…….,n.

The strategy combination $s^{*}= (s_1^{*}….,s_n^{*})$ is a Nash equilibrium if the following conditions are met:$\Pi_i(S_1^{*}….,S_n^{*}) \geq \pi_i\ (s_1^{*},….,s_{i-1}^{*},s_i,s_{i+1}^{*},……s_{n})$

For all $s_i \epsilon S_i$, and for all i=1…...n.

For a game to be defined, it must have the following:N-as a set of players (fisherman and agent)

Π_i –The total sum of payoffs/pie to be shared among the playersH-a set of sequential actions (to negotiate or not to negotiate)

P- a function that assigns a player to every sequence (every point in each terminal history)

F_c- preferences over the set of histories

$J_i)_{i\ \epsilon N}$- collection of player's information sets

Game theory identifies an equilibrium point for negotiations. Payoffs (utilities) reflect the desirability of outcome for a player for whatever reason (Donlinsky and Dunlop,2017). Payoffs are represented by π_i; π_{ii}

π_{ii}- fisherman's payoff

p_1- probability of occurrence (equals 1 in entire game)

The payoff is thus represented as; $(\pi_i * p_1; \pi_{ii} * p_1) = (\pi_i; \pi_{ii})$.

The first interaction, representing a game of perfect information, is illustrated by one node in the decision tree. The next stage, representing a game of imperfect information with behavioral strategies is a collection of Player A's nodes (Fig 4).

In Table 2, the buyer is not privy to information on the previous decision of the seller; whether theseller had negotiated with other parties. In a game with finite horizon, two players are involved in the game. Player A represents the demand side agent, with a relatively higher bargaining power to player B, who represents the supply side fisherman.

Table 3.1: Description of players' decisions in pure strategies

	Player A-Agent		Player B-Fisherman	
Player's decision	U (Up In game theory	D (Down in game theory)	**a** (Accept)	**r** (Reject)
Player's move	Buyer offers fair price	Buyer offers low price	Fisherman accepts price offered, ending game	Fisherman rejects price offered, leading to another sequence of negotiation where the agent offers even a lower price

Source: Dolinsky and Dunlop (2017)

A normal game of negotiation for player B is shown in fig 3. Player B's bargaining power is relatively low compared to player A who offers B a low price.

Player A (agent) beings by playing down (r) and since B (Fisherman) does not have the advantage of negotiating with other potential buyer which could be partly due to fisherman's inadequate information on the possible offers by other buyers, player B plays **r** hence the game ends at **d**. Agent (player A), then sequentially follows by playing down (**r)**, offering a further unfairprice to the fisherman (player B). Whichever path Player B plays, he always ends at **r.**

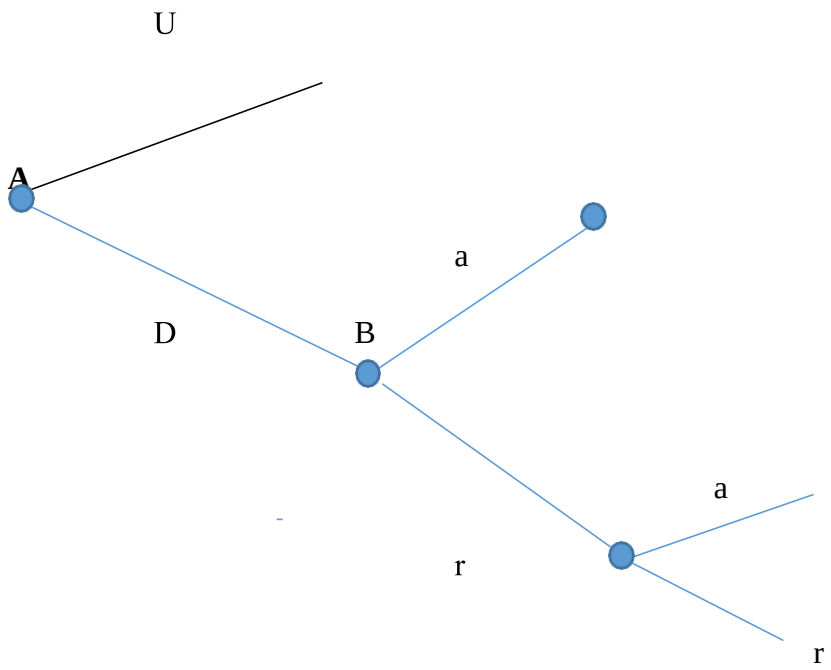


Figure 3.2: Sub game perfect equilibrium for a fisherman with limited choices. equilibrium inpure strategies.

Source: Dolinsky and Dunlop, 2017

Under new conditions, an equilibrating position where the buyer offers new and fair price to the fisherman in the beginning of the game is represented. The game ends with a good payoff. The outcome of the game is at the terminal U, after player A Plays U with a probability of 1, and player B after a history D, goes for strategy r, with probability 1.

The difference between Fig 3 and Fig 4 is the characteristic changes of the game. The subsequentgame represented in Fig 4 changes to include imperfect information of A and B, as the player A, after playing D, does not know whether player B will play **a** or **r** (Dolinsky and Dunlop,2017)

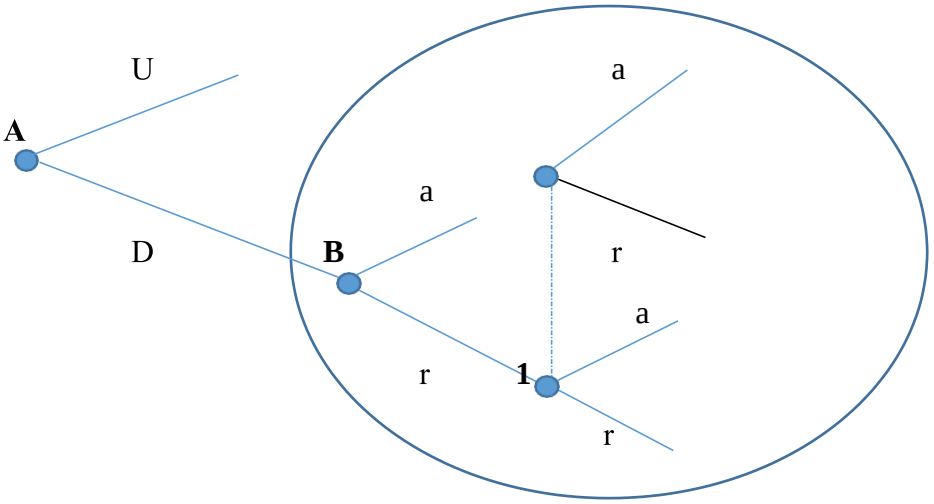


Figure 3.3: Sub game perfect equilibrium in pure strategies where Player B has options
Source: Dolinsky and Dunlop, 2017

Clearly, from Nash (1951, 1953) game theory has evolved into a powerful tool of analysis of strategic interactions. To analyze a game, the first strategy is to make clear the implications of therules-understand the relationship between the strategy and the payoffs. Second stage is to determine which strategy each player will play under various circumstances. The assumption is that players are rational, that is why they make decisions to maximize their returns/profits. We also assume that each player is aware of the other player's rationality; hence he puts himself in the other player's shoes when making decisions.

A non-cooperative strategy is also referred to as Nash-equilibrium after Nash (1951) which refersto a set of strategies where each player's strategy is a best response to the other's equilibrium strategy. It occurs when members decide to work independently due to unenforceability of contracts, high costs of communication and mistrust among members.

A situation of *prisoner's dilemma* occurs when for each player; the strategies that lead to inefficient payoffs are dominant strategies. In such situations, the rents from the game are

completely dissipated.

According to Walker (1959), Game theory does however not attempt to say what a player shoulddo. It only attempts to direct to the strategy that a player can use to obtain the highest sure payoffor the least possible loss. The alternative courses of action open to a fisherman or agent depend on his managerial ability and other physical resources besides the amount of capital available to players in this market. These will differ among fishermen, even for two fishermen at the same time and space.

3.1.3 Perfect and Imperfect Information

A game is the one of perfect information if all players at every move in the game, have knowledgeof the move previously made by other players. This can be applied in firms and consumers having information about price and quality of goods in the market. On the other hand, an imperfect information game is played when the players do not know the moves made by the opponent players.

Perfect information is always confused with complete information though it is a similar concept. Complete information requires that every player know the strategies and payoffs available to the other player but not necessarily the actions taken, whereas perfect information is knowledge of all aspects of the game and players. However, games of incomplete information can be reduced to games of imperfect information byintroducing moves by the nature.

3.1.4 Analytical framework

We studied the interaction among agents and fishermen, role of information on bargaining of

prices, on the agents' proposal and the fisherman's acceptance, while also studyingthe margin between prices offered by agents to fishermen and received by agents from processors.We investigated how the players arrive at a final exchange price. We also investigated the role of access to information among other variables on the final market price that fishermen accept from agents, and the impact it has on the gap on price paid vis a vis price received.

Following Rapoport (1996), assume a sender is to distribute money uniformly between himself and the responder, with information skewed in favor of the sender, the absolute value of amount*S* is known only by the sender. If the sender's offer is rejected, both lose out. If the sender's offer is accepted, then both will gain.

The two players start the game by the sender offering zero proportion of the money to be shared. If the responder accepts the zero offer, the game ends at this level with (1, 0).
However, if the responder rejects the offer, the game moves to the next level, represented by the multi-level game represented under table 3.

In the multistage game, the sender cannot offer zero value as this would lead to both parties losingout. The number of offers is finite due to the constraints of time and resources. We can be able to predict the offer that the agents (henceforth known as the sender) will make.
The table on the next page represents a multi-stage bargaining game.
For a finite period of bargaining.

$$\boldsymbol{S^n = \frac{1 - \delta^n}{1 + \delta}}$$

Where: $\mathbf{S^n}$- represents proposer's offer at stage n

$\boldsymbol{\delta^n}$ –discounting factor representing changes in value due to changes in time factor during bargaining to stage ***n.***

δ - initial amount that the agent will be willing to part with, in anticipation that the fisherman will be willing to accept that offer.

Table 3.2: Sequential bargaining game

Stages	Offer	Acceptance
1	1	0
2	1-δ	Δ
3	1- δ (1- δ)	δ (1- δ)
4	1- δ (1- δ (1- δ)) Summarized as1- δ+ δ^{2-} δ^3	δ (1- δ)1- δ)) Summarized asδ- δ^2+δ^3

Source: Yale Education, 2007: https://oyc.yale.edu › economics › econ-159

3.2. Data and Sources

3.2.1 Target Population

Lavrakas (2008) defines target population as the elements for which data or results are to be usedfor inference to a larger group. Target population is also defined as the entire group of individual elements from which researchers generalize the outcome (Explorable, 2009).

The target population of this study comprised individual Nile perch fishermen and traders' agents registered under beach management units (BMU) in landing sites around Mfangano island of LakeVictoria. Tracking of these fishermen was made by confirming from each BMU register of licensed vessels. Since March 2018, the regional acceptable number of fishing boats for Nile perchin Kenya was a maximum of 7,531 (Tumwebaze, 2016). However, as of 2014, the number of fishing crafts was 13,403, while the number of fishers stood at 47,000 (LVFO, 2016). The researcher used 152 registered crafts as the target population, which is the number of registered vessels for the eleven beaches of Mfangano Island where there are no official data on registered persons. The target population was achieved from written records held by BMUs of the landing sites of Milundu, Ringiti, Ugina, Mauta, Masisi, Sena, Kiwari, Yokia, Kanyohero, Wakula and Nyawalongo. This was spread across the 11 landing sites around Mfangano island of Lake Victoria (Johnson, 2010).

3.2.2 Sample Design

Lavrakas (2008) describes a sample design as a guide towards the selection of a sample that affectsseveral other aspects of a research. A sample is described as that section of the population with characteristics that is representative of the population itself (Kabir, 2016).
It is the absolute size of a sample, and not the size relative size of the sample as a part of the population, which determines the accuracy in a research (Freidman, 2000). The viability of a

sample size considers the limited resources of finance, time, and human resource (Warwick, 1975).

The study assumed a sampling error of ±10%, a 95% confidence level, and a 50% degree of variability.

To calculate the sample size, the study applied Yamane (1967) formula-

$$n = \frac{N}{1 + (e)^2}$$

Where:

n–represents sample size (144 respondents)

N–represents the population size (152 registered from 11 beach records)

e -represents acceptable sampling error 95% of 152 respondents=144 sample size.

In determining the sample size of the population, there are three criteria, which must be specified:Level of precision, level of confidence and degree of variability in attributes being measured.

The level of precision is the sampling error, and it is the range in which true value of the populationis estimated. In our study, there was 144 respondents who were interviewed.

The confidence level is based on ideas encompassed under the central limit theorem. Under this theory, when a population is repeatedly sampled, the average value of the attribute obtained by those sample is equal to the true population value.

Lastly, the degree of variability in the attributes being measured refers to the distribution of the attributes in the population.

3.2.3 Data Collection

This study used semi-structured questionnaire to collect information from fishermen and agents inMfangano beaches. A questionnaire allows the researcher access to more data that is easy for analysis (Mugenda and Mugenda, 2003). The data helped in drawing a game tree that tracked the movement towards the final price settlement.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.0. Response Rate

Out of 150 individuals targeted, 144 successfully responded to all questions, all of which were analyzed. This was a high response rate that was enhanced using different ways. First, the various beach management unit officials interpreted the introductory purpose. Second, the assurance of anonymity of the response provided and thirdly, the use of phone calls made it easier.

4.1 Summary Statistics

Data regarding the characteristics of the respondents including sex, age, highest level of Education, number of years in fishing business, possession of information, willingness to join aSACCO, role in the fishing business were collected.

The study survey revealed that majority of the respondents was female as compared to male respondents. The female percentage of respondents was 40% while male percentage was 60%. Themean of the gender of respondents was 72. The standard deviation of the gender of the respondents was 21.21 and the maximum and the minimum values of gender is 57 for females and 87 for male respondents.

Table 4.1: Gender of Respondents

Gender	No.	Percentage
Male	87	60%
Female	57	40%
Total	**144**	**100%**

Table 4.2: Industry Respondents' Gender

Gender/Participants	Fishermen	Agents	Traders	Buyers	Total
Male	56	25	10	8	99
Female	7	9	21	9	45
Total	**63**	**34**	**31**	**17**	**144**

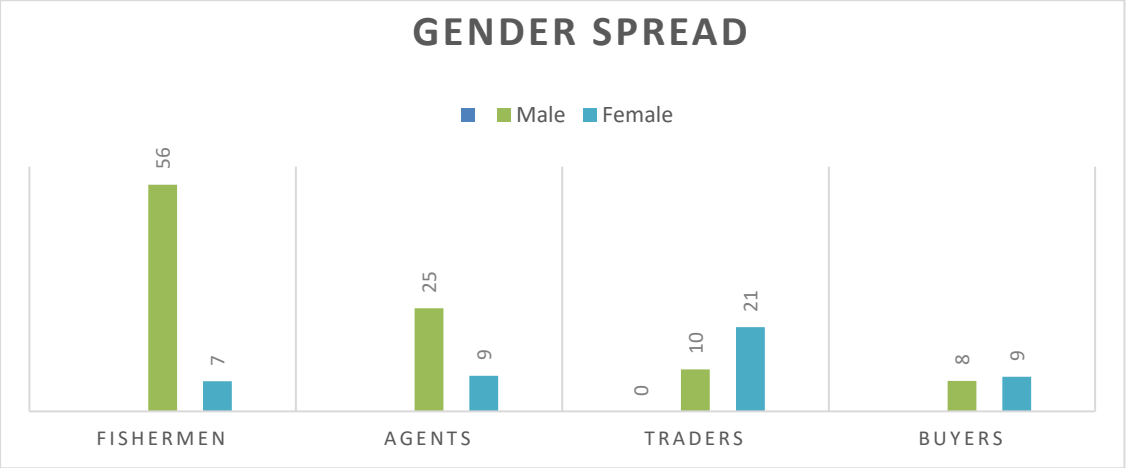


Figure 4.1: Industry Respondent's Gender

The above figure 7 shows that fishermen had the highest male respondents with 88% females at 12%. The highest female proportion was amongst traders, with 67% while males were 33% of respondents. Processor agents had a male proportion of 74% while female proportion was 26%. buyers for consumption had 53% women proportion, while male proportion was 47%.

4.2 Age of Respondents

The study also revealed that majority of the respondents age was between 30-39 years of age whichrepresented a percentage of 36% while the least percentage of respondents being 50 years old andabove. The standard deviation of the age of respondents was 6.130525 while the maximum valueand minimum number of the age of the respondents was 20 and 6 respectively.

Table 4.3: Age of Respondents

Age Bracket	No.	Percentage
Below 29 years	32	22%
30-39 years	52	36%
40-49 years	45	31%
50 years and above	16	11%
Total	144	100%

Table 4.4: Key participants' age.

Age/Participant	**Fishermen**	**Agents**	**Traders**	**Buyers**	**Total**
<29 Years	9	10	8	5	32
30-39 Years	34	5	10	3	52
40-49 Years	16	10	10	8	45
50> Years	5	8	3	0	16
Total	**63**	**34**	**31**	**16**	**144**

The above table shows that majority of respondent fishermen fell within the age bracket of 30-39years while the least age of the respondents was found in Buyers where there was no respondent above 50 years who participated in this Survey of Nile perch price analysis.

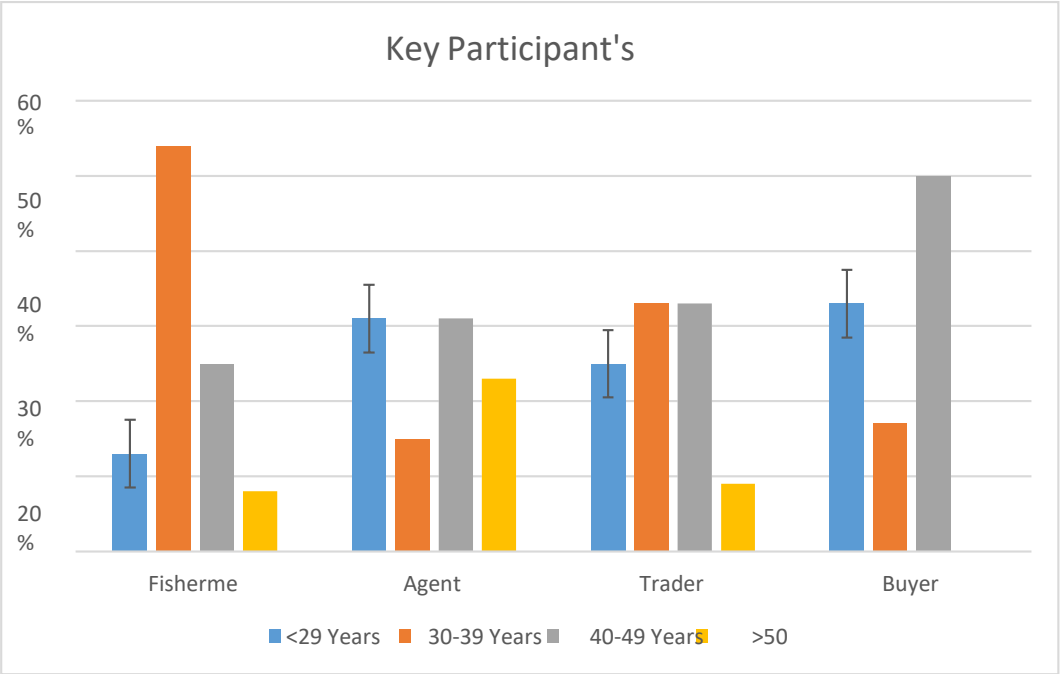


Figure 4.2: Key Participants

From the 63 fishermen respondents, the highest age group was 30-39 years 54.16%, 40-49 years at 25% (16), below 29 years at 12.5% and the least the group above 50 years at 8.33%. Agents had fair age distribution: ages. 40-49 and below 29 both had 30.77% (10 agents). 30-39 years (5 agents) 15.38%, 23.07% (5 agents) for agents above 50years. Traders interviewed had a combined percentage of 66.66% (20 traders) equally spread between 30-39 and 40-49 years. Those below 29 years made up 23.07% while ages above 50 years was the least at 8.33%. End user consumers, categorized as buyers were spread as follows: 40-49 years at 50%, 30-39 years at 16.67% and those below 29 years at 33.33%. None of the respondents above 50 years bought fish for own or family consumption.

4.3 Respondents Level of Education

Majority of the respondents to this study had attained Primary education as their highest level of education. This was represented by 40% while the least percentage of the respondents' level of education was 4% which indicated that they had acquired other forms of training

in school. The maximum and minimum level of respondents' level of education was 58 and 6 respectively which represented the frequency number of respondent's level of education.

Table 4.5: Respondents level of Education.

Level of Education	No.	Percentage
Primary Level	**58**	**40%**
Secondary Level	**39**	**27%**
University/Tertiary Level	**42**	**29%**
Other(s)	**6**	**4%**
TOTAL	**144**	**100%**

Table 4.6: Participants Level of Education

Education Level / Participant	Fishermen	Agents	Traders	Buyers	Total
Primary Level	**27**	**14**	**15**	**4**	**60**
Secondary Level	**19**	**6**	**8**	**5**	**38**
University	**14**	**14**	**8**	**5**	**41**
Other Training	**3**	**0**	**0**	**2**	**5**
Total	**63**	**34**	**31**	16	**144**

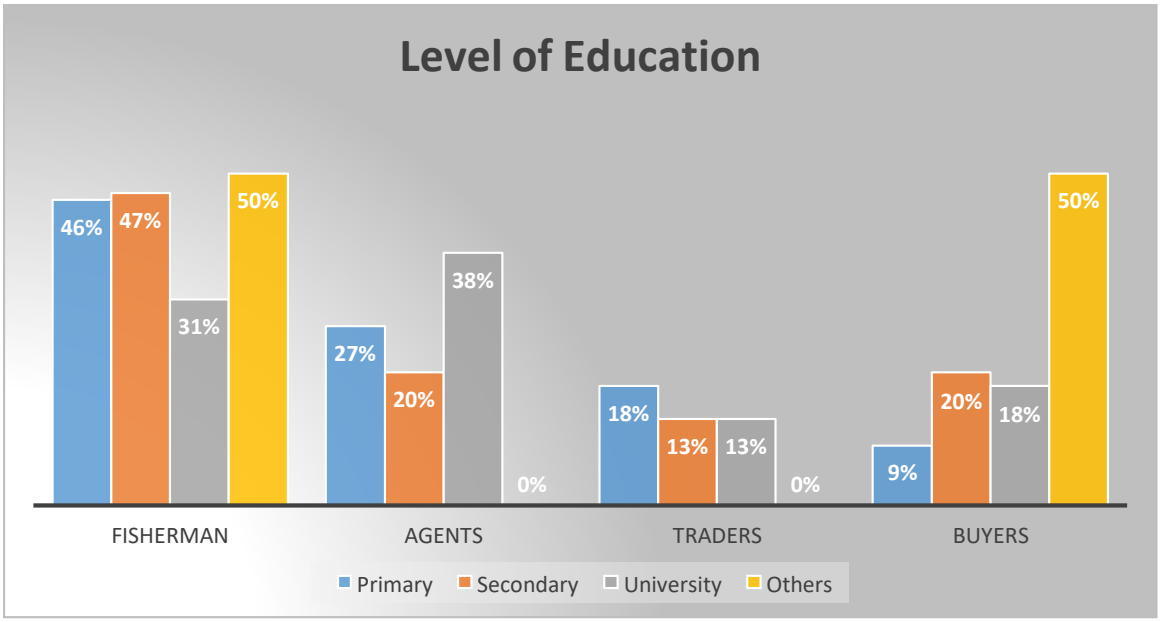


Figure 4.3: Respondents Level of Education

From the above figure, the survey revealed that fishermen had the highest number of respondentswho had attained primary level education with 46% compared to other levels of education. There were other trainings that the respondents had attended, and the least percentage was found in traders and agents who had no respondents with other forms of training.

4.4 Possession of market information

Respondent's possession of market information regarding the conditions around supply and demand of Nile was also investigated and it was measured through a scale of between 1 to 5 where 1 represented respondent had no information at all while 5 represented those respondents who had great extent of information.

Table 4.7: Respondents Possession of Market Information

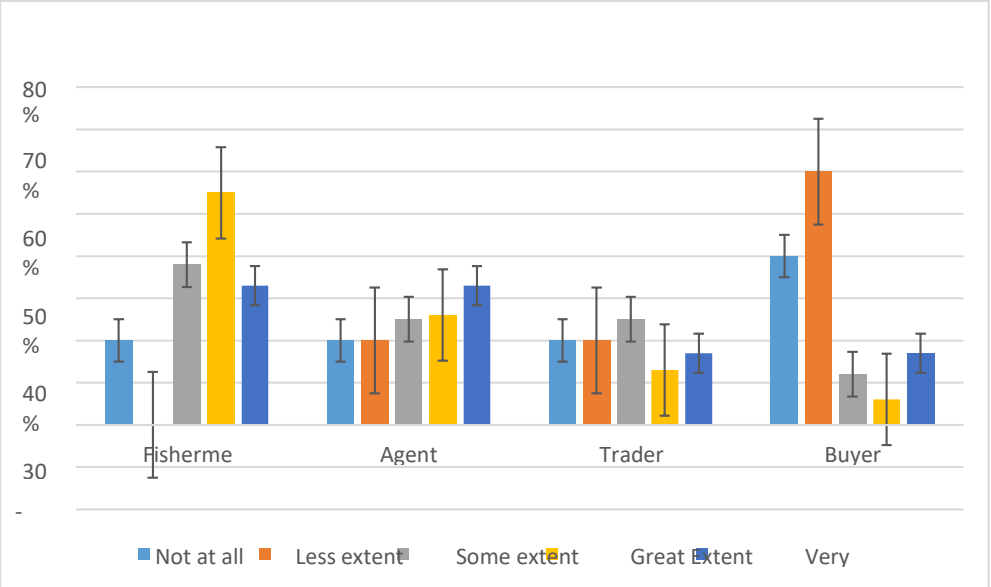
Scale	Response	Percentage
Not at all (1)	**13**	**9%**
Less extent (2)	**13**	**9%**
Some extent (3)	**21**	**15%**
Great extent (4)	**82**	**56%**
Very Great extent (5)	**16**	**11%**
Total	**144**	**100%**

The table on the next page shows extent in which each key industry participant possesses market informationregarding the price of Nile perch.

Table 4.8: Player's Possession of Market Price Information

Possession of Info/Participant	Fishermen	Agents	Traders	Buyers	Total
Not at all (1)	3	2	3	5	13
Less extent (2)	0	2	3	8	13
Some extent (3)	8	5	5	3	21
Great extent (4)	47	19	10	5	81
Very great extent (5)	5	5	3	3	16
Total	63	34	23	24	144

Figure 4.4: Respondent's Possession of Information



The survey revealed that, Fishermen possessed market information to a greater extent compared to other players in the fishing industry with a percentage of 55% and 33% respectively. The buyers and traders had the lowest possession of Nile perch market information.

The table on the next page shows the general statistics of the respondents in relation to the study of Analysis of price of Nile perch in Kenya, data which was collected in Mfangano Island.

Table 4.9: Negotiation by Parties

Negotiation	Fishermen	Agents	Traders	Buyers	Total
Not at all	1	2	1	0	4
1 Stage	22	22	3	7	54
2 Stages	8	5	9	5	27
3 Stages	30	3	9	9	51
More than 3 stages	2	1	1	3	7
Total	**63**	**34**	**23**	**24**	**144**

Table 4.10: General Statistical Data of Respondents

Factor	Min	Max	Mean	Std.dev
Gender	57	87	72	21.2132
Age	16	52	36.25	14.14214
Level of Education	6	58	36.25	13.43503
Sacco Membership	34	110	31	53.74012
Market price information	12	81	28.61	47.78824

Source: Author

From the above table, it can be observed that respondent's SACCO membership has the highest standard deviation but lowest mean in the statistical data of respondents. This indicated that the data for respondent's standard deviation is more spread out compared to the rest of respondent's factors. The factor which had the lowest standard deviation is the level of education, but with an average mean equal to the highest level of respondent's education.

4.5 Stages of Fish Sales

The survey revealed that fish sales are divided into three main stages. The first stages, involving cost pricing for local consumers of fish, sold around the landing sites and involves sale of mediumand low quality. The quality is based on small sizes of below 1kg, and gill color that is turning from red to pink. The second stage is The Agent/Processor, will be able to purchase fresh/high quality fish at a higher price based on fresh red gill color and size. The third stage has end users/local market retailers where players are involved in purchase and resale. The prices here are lower but slightly above the first stage. The stocks for sale are what areleft after end of day sales to both initial landing site buyers and agents.

Table 4.11: Stages of Fish Sales

Participants	Size	Price Rate
Local consumers	Small Fish	Low
Retailers	Medium Fish	Medium
Agent/Processors	Large Fish	High

Local consumers can decide to buy small fish directly from fishermen or even agents at a low pricefor domestic consumption. Agents and Fish processors may prefer to buy larger fish at a higher price where they would in turn sell the fish to the final consumers at a margin. Analysis of the relationship between parties is important at determining weighted results in the pricing of goods.

In cooperative games, each player can form a binding agreement to determine the division of "payoff" for each price level. Final consumer or buyer of the fish can decide whether to buy directly from the fisherman or through retailers and wholesalers. They had no binding agreements with any of the sellers as purchase and sale was on first come basis hence trade was non-cooperative.

Table 4.12: Buyers Choice of Fish Supplier

	Accept	Reject
Fisherman	0.6	0.4
Retailer	0.4	0.6
Wholesaler	0.5	0.5

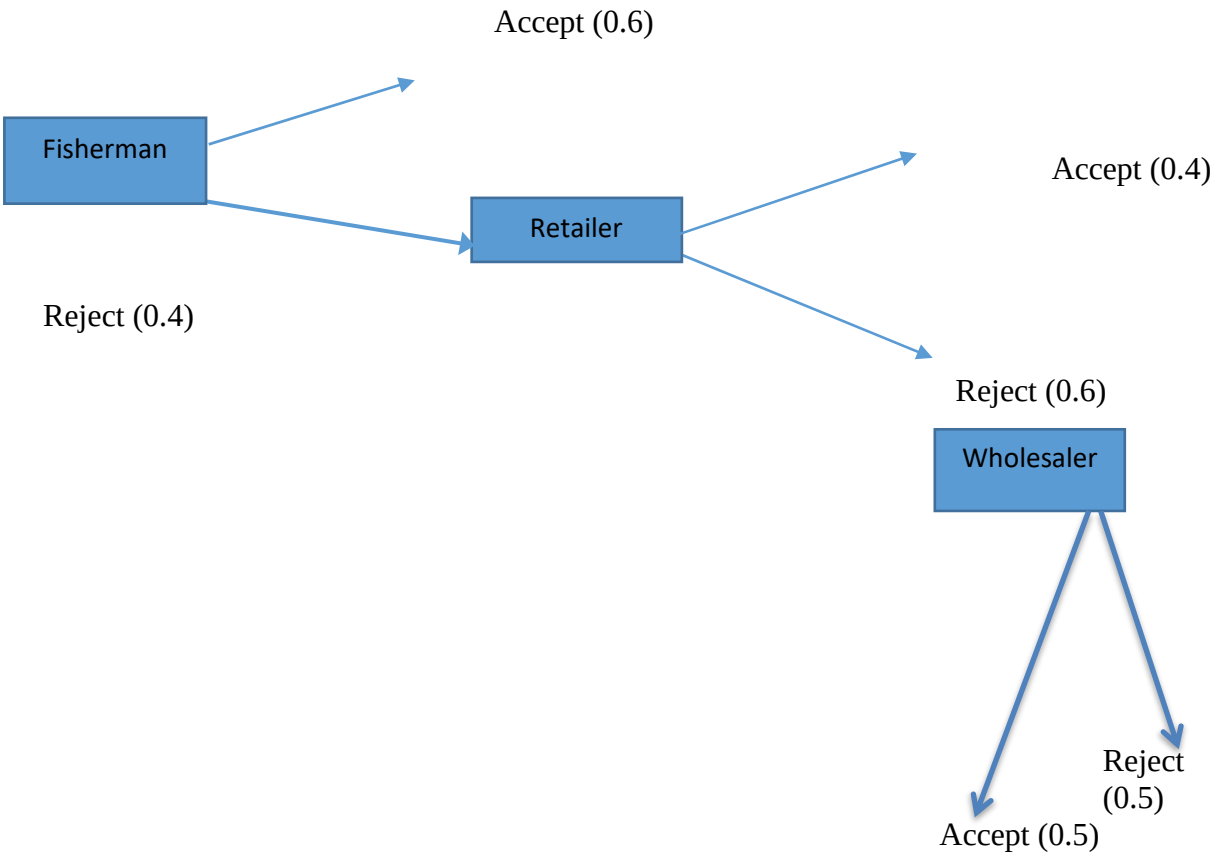


Figure 4.5: Buyer Decision

4.6 Price Equilibrium

From the study, both the fishermen and buyers are engaged in a sequential bargaining game for a finite period. The relative impatience by both parties is almost the same, based on the perishability of Nile perch. The number of offers and acceptance is limited due to time and resources (Rapoport, 1996)

Both parties want a share of the surplus, hence there is offer and final acceptance up to three stages. None of the parties loses out from the discounting at every stage of negotiation, denoted partly by a positive coefficient of 0.003. The negotiation game takes the form of an Ultimatum Game, in other words, both parties risk getting nothing if they do not reach an agreement, despite the few moves.

For any price (value) satisfying $0 \leq x \leq 1$ is likely to be accepted by both parties, fisherman

and any of the buyers (agents and market buyers). The presence of a positive 0.003 coefficient of negotiation at 5% level of significance points to $x \geq 0$.

The fisherman demands $a=x$, the buyer/agents can only offer $b= 1-x$.

Any payoffs (x, $1-x$) are acceptable irrespective of the levels of negotiation.

The parties to the Nile Perch trade attain an equilibrium if $a + b \leq 1$, besides which each would receive zero. Before arriving at price P there are up to three decision nodes between the fishermen and the agents/buyers.

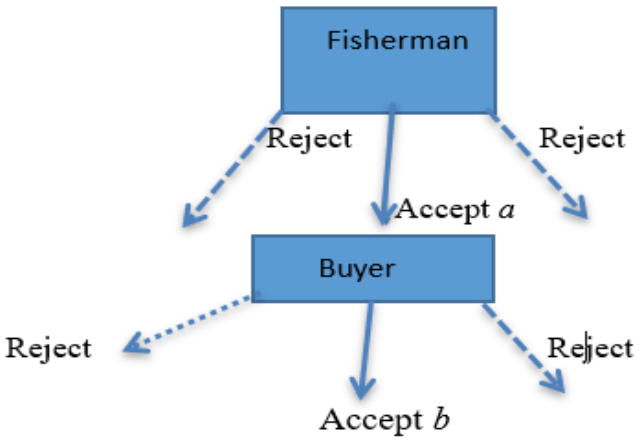


Figure 4.6: Price Equilibrium

(a,b) if a + b ≤ 1, and they both lose out if a + b > 1 (0,0).

Between the fishermen and the agents, 1= price given by processor.

Between the fishermen and the end user consumers, 1= $P_2 \geq$ Utility of rejecting P_0.

Both parties will thus attain an equilibrium at P= [a + b ≤ 1](a,b) ≥ Utility of rejecting P_0.

P_0 = Initial price offer.

P= Final price at equilibrium.

a = Fisherman's final acceptance.

b = Buyer's final price acceptance

4.6.1 Pricing of Fish

The price of fish was established for the lowest and most common measure of weight, kg. In determining the final price of the commodity, there were variations based on other subjective unitsof measurement. The prices also varied from one landing site to the next, and one agent to another.

From the data collected, the average price of 1kg of Nile perch with deep red gills (termed as high quality) ranges between ksh.380-700 depending on the category of the buyer and seller of the fish. A buyer who would buy directly from the fishermen may incur fewer costs than the agents and wholesalers, while transporting thecommodity, a cost which will be added to the final price of the fish. The average cost of transporting and processing a kilogram of fish is estimated to be kshs.30 to the wholesaler's pointof receipt.

Therefore, assuming majority of final consumers buys from either retailer or wholesalers, the costof availing the commodity to the consumers will be charged at the price of the fish from the

fisherman to the wholesaler, inclusive of the cost of ksh 30 per kg.

Average price of Fish per kg= [highest price (700) + Lowest price (380)]/2) =540 per kg.Hence average market price across board is 540+30=570ksh per kg.

The cost of purchase from the fisherman=540 ksh (no transport or processing cost at initial point).

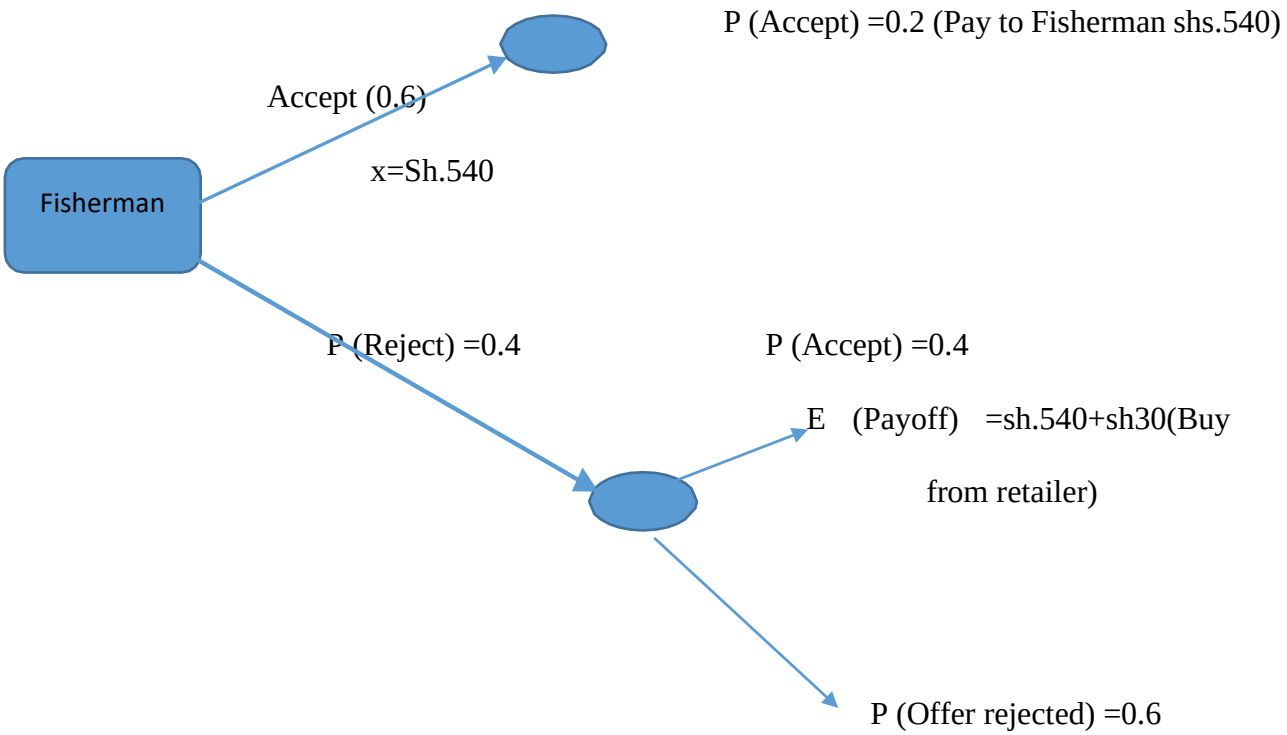


Figure 4.7: Price of Fish

The price is high when buying from the retailer compared to when buying the fish directly from the fisherman because of additional costs incurred by the retailer, which are carried forward to the buyer. There are two categories of players in the fishing industry; Fishermen who source the fish from the Mfangano Island waters, and the second player is categorized as player 2 that comprises agents/processors and the local market retailers. In this case, while the Fishermen are worried about maximizing their income per kg by getting thehighest possible price from the traders, the traders are worried about minimizing costs and buying at the lowest possible price and selling at higher price to maximize profit. The study assumed fixedcosts per kg of Nile perch, both for the fishermen and buyers. Fishermen could get to the market through the sale of commodity directly to consumers, agents of processors and local retailers. The modal buyers of fish from the fishermen are agents.

The highest quality of Nile perch (with deep red gills and weighed on a metallic scale as ≥1kg) were sold through the agents, while lowest quality (pink gills, not deep red/also referred to as

rejects and most not put through a weighing scale) were sold to the local consumers by the landingsites.

4.7 Price negotiation sequence

Under sequential bargaining, the first player, fisherman offers the fish at a price based on the weight and quality rating of the catch. The buyer on the other hand mentions their possible price, which is not less than half the offer price. Under this instance, the players may give offers of bargain for an averagenumber of 3 times before the final price is settled on. Data collected indicated the sequential bargaining went on up to three levels before a final price isarrived at. The minimum number of offers made for Nile perch is 1. The fishermen accept price P_2 if the utility or satisfaction of accepting P_2 is greater than, or equal to the rejection of the same (Bolton, 1991).

Due to noncooperation and limited stock, most buyers preferred to use fishermen's initial offers as an anchor. Fishermen on the other hand used agents' offers as an anchor for what the manufacturer was offering. This was partly due to information asymmetry. Failure to reach a price agreement between fishermen and agents could lead to losses due to perishability of Nile perch, and already incurred costs of petrol by both parties. The game in this instance takes the form of an Ultimatum game.

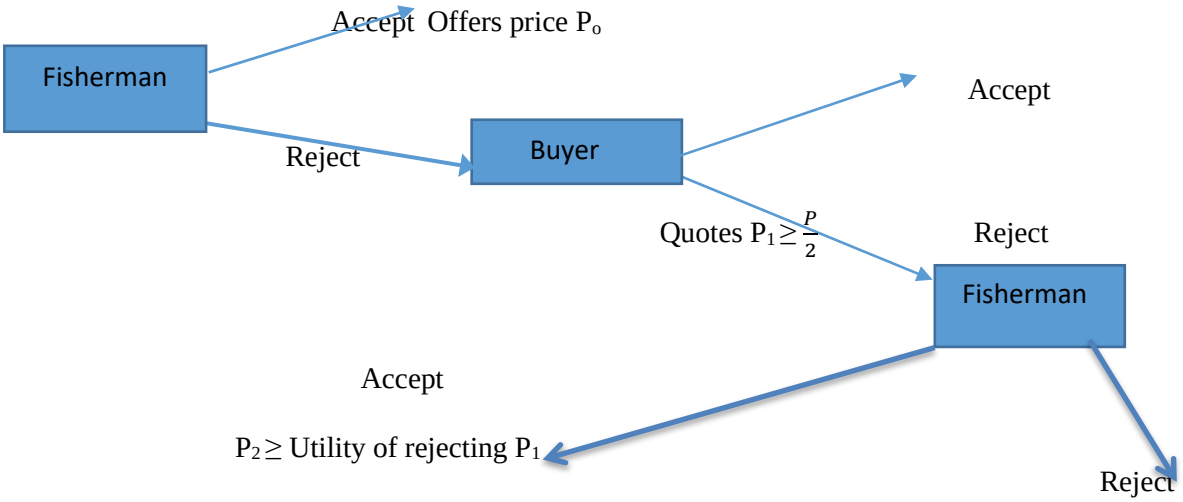


Figure 4.8: Price Negotiation Sequence

Table 4.13: Attributes of Fishermen.

Attribute		Percentage	Total
Boat ownership	Hire-44%	Own-56%	100
Boat sharing	Yes-60%	No-40%	100
Directly sales to Processors	Yes-54%	No-46%	100
Nile Perch Dealer	Yes-70%	No-30%	100

From the findings, it was observed that 56% of the fishermen in Mfangano Island own boats while44% hire the boat for fishing. It was also observed that several fishermen share boats in their fishing business. Those who wereinterviewed to be sharing boats represented 60% while those who do not share boats represented 40%. The sharing is on joint renting or ownership through kinship and inheritance. The fishermen were also interviewed on whether they sell their catch directly to processors. Largest percentage indicated that majority of fishermen sales go directly to processors through agents. This was represented by 54% while those who use

intermediaries were represented by 46%. Nile perch represented 70% of main fish sold while those who trade in other types of fish was represented by 30%. At the landing sites, it was observed that measurement tools included containers or troughs and plastic bowls. Weighing scales were used at the BMU run fish *bandas* where fish was sold to agents. The buying prices of Nile perch ranges between kshs.100 to even 600 depending on size of the fish. It was also observed that majority of fishermen are men, which represented a percentage of 86%.

Among the key players in the fishing industry, wholesalers would buy from different beaches as local assemblers or stockiest of Nile perch. Majority of these wholesalers were observed to be operating from the mainland of Mbita and Sindo.

For ease of analysis, consumers were categorized into two, Industrial and domestic consumers. Industrial consumers consist of small and medium sized companies that are involved in the processing of Nile perch. Domestic consumers on the other hand consists of individuals or familieswho bought Nile perch for personal consumption.

The major challenge which was observed was the unit of measure of the Nile perch since some retailers and wholesalers could only use perception, containers, and basins for measurement. As noted by Manyala and Gitonga (2008) in their study on pricing and quantity, variances in measurement introduces avenues for hard price and bargaining, which is commonly known as *nyongeza.*

4.8 Fish Quality

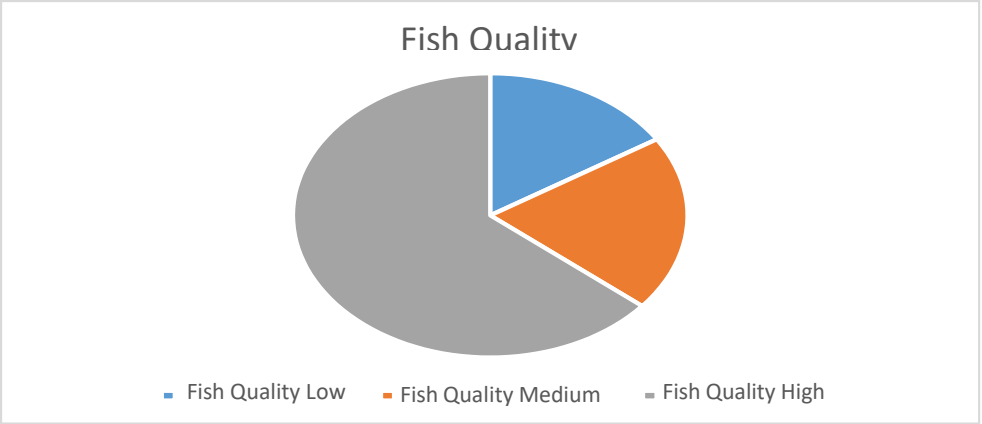


Figure 4.9: Fish Quality

From the data that was collected and analyzed, the largest percentage of the Nile perch fish which is harvested from Mfangano Island, is of high quality, and identified by deep red gills. The size is ≥1kg on a weighing scale. This is represented in the pie chart above with a percentage of 64%. The lowest quality had a percentage of 16%. low quality was identified by discolored (non-red) gills and categorized as *undersized* (below1kg on the weighing scale).

4.9 Fishermen and SACCOs

Data was collected and analyzed on respondents' membership to a Savings and Credit Cooperative Societies. 76% were members of a fishermen SACCO, and the SACCOs were mainly to negotiate for better trading terms and encourage savings. 24% preferred to keep working independent of any SACCO. SACCOs represented an avenue for cooperation amongst fishermen at setting minimum prices.

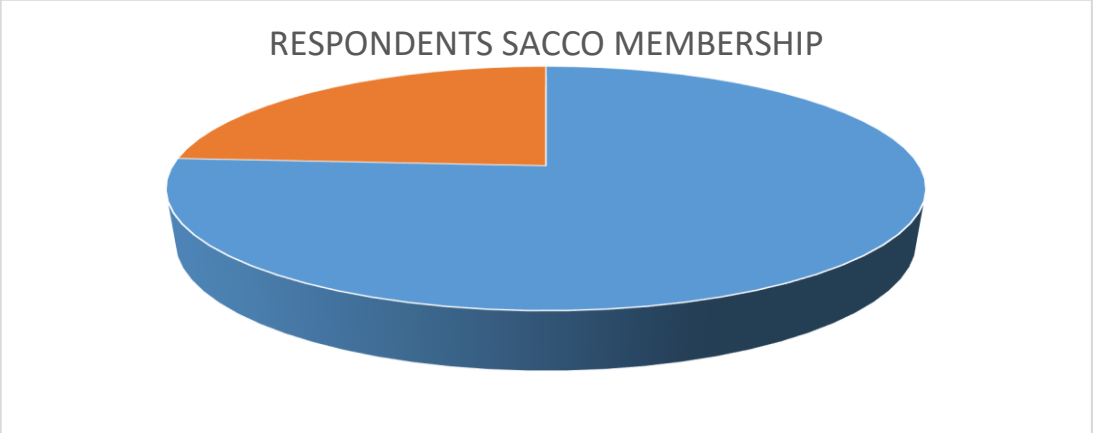


Figure 4.10: SACCO membership

4.10 Regression Analysis Results

The statistical regression analysis of the research findings was done with the Price of Nile Perch being the dependent variable, while the independent variables were Fish quality, market information and Participant Sacco movement.

Table 4.14: Variable Definition and Measurements

Variable	Variable definition	Measurement
Price	Price of Nile perch	Price paid to fishermen on-spot market
Quality	Quality of Nile perch sold	Quality measured by color of fish gills-deep red or pink, categorized as High Quality, or Reject
Size	Size of each individual fish	Size of fish in kilograms (Kgs)
Information	Access to market information	Access to manufacturer, peer market conditions on quantities and prices at shore received via phone call or other means
Sacco Membership	Number of respondents registered to a SACC	Absolute Number of Membership registration to a registered fishermen Sacco

Education	Attained education Level	Level of Formal or informal education acquired. Primary to Tertiary education, and other non-formal education
Age	Age of respondent	Age of respondents in number of years.
Negotiations	Price Negotiation/Bargaining	Number of times parties bargain before final price is paid.

Source: Study 2021

Table 4.15: Regression Output coefficients

Variables	Coefficients	t-statistic
(Constant)	270.23 (131.884)	2.049
Quality (Q)	1.202 (0.604)	1.992
Size (S)	0.186* (0.076)	2.450
Market information (I)	0.112* (0.048)	2.341
Sacco Membership (M)	0.184 (0.506)	0.364
Level of Education (E)	2.445 (1.38)	1.771
Age of Respondent (A)	-0.998 (0.500)	-1.996
Negotiations (N)	0.003** (0.001)	3.00

**5% level of significance, *10% level of significance. R^2 =0.873

From the data, 87.3% of the Nile perch price paid or received is driven by respondent's access to market information, fish quality, fish size, price negotiation, and age of respondent. All these aspects have an impact on determining the final price of Nile perch among parties in Kenya. The total number of observations is 144 which represents the sample size of the study.

The findings show that, all factors held constant, fish quality, fish size, market information, and number of times of negotiations each had positive coefficients. However, respondents' age had a negative coefficient (-0.998), pointing towards decline in control or negotiation over prices as respondents grew older.

The next subsections discuss the findings of table 6.1.

Quality of fish

Quality of fish was found to significantly affect the price of fish, with a coefficient of 1.202 at 5% level of significance. The study found that much of the high-quality fish with deep red gills are sold to agents, hence higher prices than *rejects,* which are sold to local consumers on shore. The high-quality fish had a wider range of buyers and were mostly weighed at the fish

bandas using the weighing scales. The *rejects* were not sold at the fish *bandas*, and mode of measurement was through approximation of weight by viewing.

A respondent at Milundu beach explains that the uses of *reject* are limited to extraction of swim bladder, *ambomo* for sale, and sun-dried *afuayo* that takes several weeks to dry, and it has low demand.

Size

The size of fish was found to significantly affect the price of fish, with a coefficient of 0.186 at 5% level of significance. Fish below 1kg were considered *undersize* and were not sold to agents. They were instead sold to the local consumers as *kanjwele* which is sold to the market after deep frying or smoking. The bigger the size, the easier it is to sell to the agents and achieve economies of scale. This created a larger market hence higher prices in comparison to *kanjwele*.

Market information

Access to market information was found to significantly affect the price of fish, with a coefficient of 0.112 at 5% level of significance. The study found that fishermen tend to negotiate for higher prices when they have information on prices paid to fishermen in other beaches. Information also revolved around what other agents elsewhere were paying, quantities of catch in other beaches, and number of agents traversing the island. This information was mostly exchanged via phone calls. A respondent at Ugina beach explained the above, pointing towards peers as the main source of information pointing towards horizontal movement of information

Age of Respondent

The age of a fisherman was found to be statistically significant with a negative coefficient of -0.998 at 5% level of significance. The older the fishemen grew, the more they lost their negotiation power and access to market information. Most fishermen above 50 years had lower catch as the sector is labour intensive, hence no motivation to sell at the *bandas.* The modal fisherman age group of 30-39 were active in the sector, delving deep into the lake seeking higher quantities. They provided much of the catch hence had more bargaining power than those from 40 years and above.

Negotiation

Negotiation by fishermen and buyers significantly affected the price of fish paid, with a positive coefficient of 0.003, statistically significant at 5% level of significance. Fishermen negotiated for prices with all types of buyers, both agents and end market consumers. More negotiation was on *reject* and *undersize* fish as the measurements were arbitrary, and prices would range from buyer to buyer, and negotiation went to the third stage. Negotiation with agents was however scarce as prices were almost the same within a particular beach, and payment was per kilogram. There was little interaction between individual fishermen and agents as price agreements were mostly quoted to the BMU leadership who bargained on behalf of all fishermen within the beach. The few that sold directly to agents had the various beach prices as an anchor and would briefly negotiate individually and be at the mercy of agents.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the findings generated in the previous chapter and the conclusions that can be drawn from the above findings. It also highlights policy recommendations that as well as suggestions for further studies.

5.2 Summary

The general objective of the study was to find the factors that determine the price of Nile perch paid to fishermen by agents and buyers. The study analysed how access to market information, fish quality, level of education, price negotiation (bargaining) sequence, age of fishermen and fish size determined the price paid to fishermen.

A total of 144 respondents from 11 landing sites were interviewed from Mfangano Island of Lake Victoria. The respondents were identified into the different categories of fishermen, agents, wholesalers, and buyers (end user consumers). The study used semi-structured questionnaires to collect data. The strength of the resultant relationships between variables was tested using both parametric and non-parametric statistical methods such as multiple regression analysis. It was established that prices paid varied amongst the players to the price game.

A multi-variate regression model was applied to determine the relative importance of qualitative and quantitative variables with respect to price paid or received. The highest quality of fish was sold through agents for industrial consumption while the low-quality fish is sold locally for local consumption by the Mfangano island dwellers. Negotiations on prices moved to a maximum of three levels due to the perishable nature of Nile Perch, harsh afternoon

weather and few agents available to purchase Nile Perch.

5.3 Conclusion

This study found that fish price is dependent upon several factors. Negotiation amongst parties to the Nile Perch trade affects prices, but the length and duration of these negotiations is limited by the perishability of Nile perch, and limited preservation and storage. Prices offered to fishermen by agents are heavily reliant on prices offered by processors, hence negotiation takes the form of an ultimatum game, as this price must be divided between agents and fishermen, upon agreement. In a case where trade between the two parties fails to occur, they both lose. Fish is a highly perishable commodity, the fishermen could lose their products, and the agents could waste petrol in travelling and going back with nothing.

Majority of Nile perch traders was found to be doing their sales though the agents to maximize on profit and achieve economies of scale since they buy in larger quantities. The Nile Perch trade is highly male dominated, especially the labor-intensive segment of fishermen. An observation was also made on how the price of Nile Perch changes from one vendor to another. The prices changed from one landing site to another. The BMUs played a crucial role in determining the price floors offered by agents for high quality fresh fish. This study concludes that the price of Nile perch is determined by several factors beyond the ones in this study.

The behavioral aspect of the parties plays a crucial role in price determination, and this is evidenced in negotiations (bargaining), age and the desire by parties to maximize their gain using their existing heuristics of quantity and quality. Fish must be sold by the end of the day, otherwise, agents and fishermen risk losing out of the utility of fresh fish sale and purchase.

5.4 Recommendations

The study recommends a standard measure of the quantity of the Nile perch for all the landing sites. This is to protect the interest of the buyers and sellers to avoid exploitation and arbitrary pricing especially for *reject* and *undersize*. Information asymmetry is a large contributor to price differences between parties in the Nile perch trade. SACCOs should therefore act as agents of information dissemination on market prices and conditions and should be empowered to act as negotiators for fishermen. BMUs, established as enforcers of fishing regulations may not fully represent the interests of fishermen. It is recommended that regulators in the ministry of fisheries, or county governments find ways of setting minimum prices to protect fishermen from undue exploitation due to information asymmetry. More studies need to be conducted on the interaction within the agents and manufacturers and other parties to identify equilibria and recommend suitable decision points in the Nile perch trade.

REFERENCES

Abila, R. O., Odongkara, K. O., & Onyango, P. O. (2009). Macro-economic assessment of Lake Victoria Fishing Industry in East Africa. Technical Report: 1-8.

Agarwaal, M.C. (1966), Marketing Margins for Malayan Cabbage. *Journal of Agricultural Economics*, Vol XVII No.1 1966. Agricultural Economics Society

Alapan, M. P., Arpilleda, E. L. I., Altizo, K. J. R., Frias, G. K. R., Ravelo, J. D., & Cuartero, O. L. (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.

Andae, Gerald. (2018) Fish Exports earn more than Imports https://www.tralac.org/news/article/12741-kenya-fish-exports-earn-more-than-imports.html

Asche, F., Flaaten, O., Isaksen, J. R., & Vassdal, T. (2001). Derived demand and price relationships: an analysis of the Norwegian cod sector.

Babbie, Earl. The Practice of Social Research. 8th ed. Detroit: Wadsworth Publishing Company, 1998.

Barbalet, Jack. (2010). Citizenship in Marx Weber. Journal of Classical Sociology. 10.201-216.

Bade, Robin & Parkin, Michael. (2003). *Foundation of Economics*. Pennsylvania State University.

Basurto, X., A. Bennett, A. Hudson Weaver, S. Rodriguez-Van Dyck, and J.-S. Aceves-Bueno. 2013. Cooperative and non-cooperative strategies for small-scale fisheries' self-governance in the globalization era: implications for conservation. Ecology and Society.

Cuthill, Michael. "Exploratory Research: Citizen Participation, Local Government, and Sustainable Development in Australia." *Sustainable Development* 10 (2002): 79-89.

Explorable.com (Nov 15, 2009). Research Population. Retrieved Jul 21, 2020 from Explorable.com: https://explorable.com/research-population.

FAO 2005a. Yearbook of Fishery Statistics: Summary table A-2. Estimated Total International Trade in Fishery Commodities. ftp://ftp.fao.org/FI/STAT/summary/ default.htm. Accessed 30/03/08.

FAO 2005b. Mainstreaming Fisheries into National Development and Poverty Reduction Strategies: Current Situation and Opportunities. Food and Agriculture Organization, Rome.

FAO 2015, Fisheries and Aquaculture Country profile, The Republic of Kenya.

FAO 2016, Fisheries and Aquaculture Country profile, The Republic of Kenya.

Finegold, C. (1980). The importance of fisheries and aquaculture to development. America, 1990(1980), 1970.

Fudenberg, D., and J. Tirole. (1991). Game Theory. Cambridge, MA: The MIT Press.

Garcia, Y. T., & Salayo, N. D. (2009). Price dynamics and cointegration in the major markets of aquaculture species in the Philippines. Asian Journal of Agriculture a Development, 6(1), 49-82.

Geheb, K., Kalloch, S., Medard, M., Nyapendi, A., Lwenya, C., Kyangwa, M., 2008. Nile perch and the hungry of Lake Victoria: Gender, status and food in an East African fishery. Food Policy 33(1), 85–98.

Gustav, Alexandrie, Surveillance cameras and crime: a review of randomized and natural experiments, Journal of Scandinavian Studies in Criminology and Crime Prevention, 10.1080/14043858.2017.1387410, 18, 2, (210-222), (2017).

Hirshleifer, J, Amihai, G, Hirshleifer, D. (2005). Price Theory and Applications; Decisions, Markets, and Information. Cambridge.

Johnson, Jennifer Lee. (2010) 'From Mfangano to Madrid: The global commodity chain for Kenyan Nile perch', Aquatic Ecosystem Health & Management, 13: 1, 20 — 27.

Kabir, S. M. (2016). Sample and sampling designs.

Kaliba AR, Ngugi CC, Mackambo JM, Osewe KO, Senkondo E, Mnembuka BV, Amisah S (2007) Potential effect of aquaculture promotion on poverty reduction in Sub-Saharan Africa. Aquacult Int 15(6):445–459.

Lattice Consulting (June 2016). Report on Market Study of the Aquaculture Market in Kenya. Kenya Market-Led Aquaculture Programme (KMAP).

Lavrakas, P. J. (2008). *Encyclopedia of survey research methods* (Vols. 1-0). Thousand Oaks, CA: Sage Publications, Inc. doi: 10.4135/9781412963947.

Mankiw, N. Gregory & Reis Ricardo. (2006). Pervasive Stickiness. American Economic Review.

Marshall, Alfred, and Marshall, Mary. (1879). The Economics of Industry. London: Macmillan.

Mishra, Trupti Lecture no.37: Application of Game Theory and Product Pricing. Shailesh J. Mehta School of Management. IIT Bombay

Ogone John Obiero. (2008) "A Case of a Mother Tongue and Another Mother Tongue in School: Efforts at Revitalization of Olosuba Language in Kenya." *Journal of Third World Studies*. vol. 27, no. 2, pp. 227–350.

Lavrakas, P. J. (2008). *Encyclopedia of survey research methods* (Vols. 1-0). Thousand Oaks, CA: Sage Publications, Inc. doi: 10.4135/9781412963947.

Okechi, J. K., & Owili, M. (2006). An overview of fisheries and aquaculture in Kenya (poster). In *Workshop on fisheries and aquaculture in southern Africa: Development and management. Kenya Marine Fisheries Research Institute (KMFRI), Namibia*.

Ongiro O. (1979), Marketing of Eggs and Poultry Meat in Mombasa Metropolitan Urban area, University of Nairobi.

Pooley, S. G., & Pan, M. (2004). Tuna price in relation to economic factors and sea surface temperature in Hawaii's market.

Rubistein, A. 91998) Modelling Bounded Rationality, Cambridge, MA: MIT Press.

Scheid A.C. and J.C. Sutenan (1979), The Structure and Performance of Wholesale Marketing of Fin Fish in Costa Rica. ICMRD Working Paper No.4, USAID, Costa Rica.

Schuurhuizen, R. & Tilburg, Aad & Kambewa, E.. (2005). Fish in Kenya: The Nile-perch chain. Agro-Food Chains and Networks for Development. 10.1007/1-4020-5006-2_13.

Sethi, S. A., Branch, T. A., & Watson, R. (2010). Global fishery development patterns are driven by profit but not trophic level. Proceedings of the National Academy of Sciences, 107(27), 12163-12167.

Shackle, G.L.S. (1949). Probability and Uncertainty. Volume 1, Issue 3. 161-173. London.

Shepherd, G.S. and G.A. Futrell (1969), Marketing Farm Products. Iowa State University Press, Iowa.

Shimizu, I. (2005). Economic factors effecting salmon fisheries in Japan. Bulletin-National Salmon Resources Centre, *7*, 105.

Shitote, Z., Wakhungu, J., & China, S. (2001). Challenges facing fish farming development in Western Kenya. *Greener Journal of Agricultural Sciences*, 3(5), 305-311.

Simon, H.A. (1956). Rational Choice and the Structure of the Environment, Psychological Review, 63(2): 129-138.

Sjöberg, E. (2015). Pricing on the Fish Market—Does Size Matter? Marine Resource Economics, 30(3), 277-296.

Smith, A. (1776) 1976. An Inquiry into the Nature and Causes of the Wealth of Nations. Oxford: Clarendon Press (WN).

Staatz, John M. (1986), The Cooperative as a Coalition: A Game Theoretic Approach. American Journal of Agricultural Economics 65(1983).

Subasinghe, R. (2017). World aquaculture 2015: a brief overview. FAO Fisheries and Aquaculture Report, (1140).

Thaler, R.H. (1999), Mental Accounting Matters. Journal of Behavioral Decision Making, 12(3): 65-86.

Thorpe, A., Bennet, E., 2004. Market-Driven International Fish Supply Chains: The Case of Nile Perch from Africa's Lake Victoria. International Food and Agribusiness Management Review. Vol. 7, Issue 4. Available from: http://www.ifama. org/members/articles/v7i4/20041088 Formatted.pdf.

Tsikliras, A. C., & Polymeros, K. (2014). Fish market prices drive overfishing of the 'big ones'. PeerJ, 2, e638.

Tumwebaze, Rhoda. (2016). The status of Lake Victoria Fisheries under limited access fisheries. Fisheries Management and Development Lake Victoria Fisheries Organization, Uganda, Lake Victoria Fisheries Organization Catch Assessment Report.

Tversky, A, Kahneman, D. (1981) The Framing of Decisions and the Psychology of Choice. Science, 211(4481):453-458.

Walker, Larry Odell, (1959) Game Theory Applications in Agricultural Decisions. Iowa State University.

Walras, L. (1874) Elements of Pure Economics, UK: Allen and Unwin Translation, 1954.

Weber, Marx. (2010) Journal of Classical Sociology. 10.1177.

World Bank. 2006. Aquaculture: Changing the Face of the Waters. Meeting the Promise and Challenge of Sustainable Aquaculture. The World Bank, Washington DC.

Zimmermann, F., & Heino, M. (2013). Is size-dependent pricing prevalent in fisheries? The case of Norwegian demersal and pelagic fisheries. ICES Journal of Marine Science, 70(7), 1389-1395.

APPENDICES

APPENDIX 1: GENERAL QUESTIONNAIRE

TITLE: ANALYSIS OF NILE PERCH PRICING IN KENYA: A CASE STUDY OF MFANFANO ISLAND

This questionnaire is designed to collect information on pricing of fish around Lake Victoria in Kenya. The information obtained will be used for academic purposes only and shall be treated in utmost confidence. Do you agree to answer the questions? Yes…...No…, If yes, then kindly proceed.

1. Name (optional) ……

2. Sex of respondent

   (a) Male ( )

   (b) Female ( )

3. Age of respondent

   (a) 29 years and below ( )

   (b) 30-39 years ( )

   (c) 40-49 years ( )

   (d) 50 years and above ( )

4. What is your highest level of education?

   (a) Primary education ( )

   (b) High school/O-level or equivalent ( )

   (c) University/Tertiary/College ( )

   (d) Other (Kindly specify) _____

5. What is your role in the fishing industry?

   (a) Fisherman ( )

   (b) Agent ( )

(c) Other (please specify) ……

6. How long have you been in this business?

(a) Less than 5 years ( )

(b) 5-10 years ( )

(c) 11-15 years ( )

(d) Over 15 years ( )

7. Possession of information

On a five-point likely scale where [1] = Not at all, [2] = Less extent, [3] = some extent, [4] = Great extent, [5] =Very Great extent}, to what extent do you consider yourself to be having market information on Nile Perch pricing?

5	**4**	**3**	**2**	**1**

APPENDIX 2: AGENTS QUESTIONNAIRE

TITLE: ANALYSIS OF NILE PERCH PRICING IN KENYA: A CASE STUDY OF MFANFANO ISLAND

1. Between you and the fisherman, who starts price negotiation?
    - Me……
    - Fisherman…….
2. Do you sell fish to customers who are not processors? Yes…. No….
    - Are you a member of a Cooperative Society for price negotiation? Yes…No……
3. What price do processors pay per kg of Nile perch you sell to them based on the following:
    i. Size: Less than 5 kgs_____ 5-15kgs_____16-30kgs_____Above 30kgs_____
    ii. Quality: High_____, Medium_____, Low_____
4. Do you negotiate the first price offered by processors? Yes… No…

    If yes, how? ……
5. What price do you offer fishermen in return for a kg of Nile perch based on the following:
    i. Size: Less than 5 kgs_____ 5-15kgs_____16-30kgs_____Above 30kgs_____
    ii. Quality: High_____, Medium_____, Low_____
6. Please indicate the number of offers you make before final price is arrived at

    Total offers made……

    Accepted…….

    Rejected…….

7. Do you know a priori the lowest price fishermen are willing to accept from you? Yes… No….

   If yes, please explain your prior knowledge of this price ……

8. On a four-point likely scale where [1] = Not at all, [2] = Some extent, [3] = Great extent, [4] = Very Great extent, to what extent do you consider the below players to affect Nile perch price?

Processors	**Agents**	**Fishermen**	**Consumers**

9. Are you a member of a buying cooperative? Yes…… No……

   If Yes, do they play a role in pricing, Yes…… No……

   If answer to 9 above is No, would you want to join a cooperative, Yes…….. No……

10. Do you receive fish market information alerts? Yes…….. No……

    Please explain the medium you receive market information alerts from

    ……..

APPENDIX 3: FISHERMEN QUESTIONNAIRE

TITLE: ANALYSIS OF NILE PERCH PRICING IN KENYA: A CASE STUDY OF MFANFANO ISLAND

1. Who are your main fish customers?

   Agents…...Wholesalers…...Retailers…Consumers…...

2. Do you own a boat? Yes…….No……..

3. Are you a member of a Cooperative Society for Nile perch price negotiations?

   - Yes
   - No

4. Which Fish do you sell most?.....

5. Who starts the price negotiation between you and the buyer?

   - Fisherman…… Buyer…….

6. Do you normally have a reserve price/minimum price before you enter into price negotiation? Yes…… No…..

   If yes, how do you arrive at the reserve price? ……

7. Do you usually sell below or above the reserve price? Below...…... Above…....

8. What price do your main customers offer per kg of Nile perch based on the below:

   i. Size: Less than 5kgs _____ 5-15kgs_____16-30kgs_____Above 30kgs_____

   ii. Quality: High_____, Medium_____, Low_____

9. Do you know the price paid to agents by processors for a kg of Nile perch? Yes …..No ……

10. Do you know the final market prices for the above fish weights? Yes….. No……

    If yes, pleased indicate these prices

i. Size: Less than 5kgs _____ 5-15kgs_____16-30kgs_____Above 30kgs_____

ii. Quality: High_____, Medium_____, Low_____

11. Do you accept the first price offered by buyers? Yes……No…….

12. What is the least price you are willing to accept from different buyers for a kg of Nile perch based on the below: agents/ wholesalers/retailers/consumers (where applicable)

i. Size: Less than 5 kgs_____ 5-15kgs_____16-30kgs_____Above 30kgs_____

ii. Quality: High_____, Medium_____, Low_____

13. What do you think is the lowest price each buyer category should pay for a kg of Nile Perch based on the below:

i. Size: Less than 5 kgs_____ 5-15kgs____16-30kgs_____Above 30kgs_____

ii. Quality: High_____, Medium_____, Low_____

Explain what determines your knowledge of this price ……

14. Please indicate below final price that you receive for a kg of Nile Perch based on the following:

i. Size: Less than 5kgs_____ 5-15kgs_____16-30kgs_____Above 30kgs_____

ii. Quality: High_____, Medium_____, Low_____

15. Please indicate number of offers received from agents/buyer category before a final price is paid:

Total offers made……

Accepted…….

Rejected…….

16. In your opinion, what determines the final price you receive from agents? ……..

17. On a four-point likely scale where [1] = Not at all, [2] = Some extent, [3] = Great extent, [4] = Very Great extent, to what extent do you consider the below players to affect Nile perch price?

Processors	**Agents**	**Fishermen**	**Consumers**

18. Are you a member of a fishermen cooperative? Yes…… No……...

If Yes, do you negotiate prices through the cooperative? Yes……. No…….

If No, would you like to join a fishermen cooperative? Yes……. No…….

19. What medium do you receive market information alerts from? ……

APPENDIX 4: BUYER'S QUESTIONNAIRE

TITLE: ANALYSIS OF NILE PERCH PRICING IN KENYA: A CASE STUDY OF MFANFANO ISLAND

1. Where do you source your fish?
    - Individual fishermen…… Fishermen Sacco……. Agents…Other…
2. How do you determine the buying price of a fish?
    - Direct Observation…….
    - Personal Communication……
    - Using agents…….
    - Using grades……
    - Other (specify)…….
3. Do you consider the buying price affordable? Yes…….No……
4. For what purpose do you buy the Nile Perch for?
    - Human Consumption…….
    - Animal Consumption……
5. Do you offer different prices to individual suppliers? Yes……. No……
6. Who initiates fish price negotiation between you and your supplier? Buyer… Supplier…
7. What price do you offer per kg of Nile perch received based on the below:
    i. Size: Less than 5kgs_____ 5-15kgs_____16-30kgs_____Above 30kgs_____
    ii. Quality: High_____, Medium_____, Low_____

8. Do you accept the first price demanded by your suppliers or do they accept the price you offer them?

   …….

9. Please indicate number of offers you make before you settle on a final price with your supplier:

   Total offers made……

   Accepted…….

   Rejected…….

10. What is the final price that you pay to your supplier for a kg of Nile Perch based on the following:

    i. Size: Less than 5 kgs_____ 5-15kgs_____16-30kgs_____Above 30kgs_____

    ii. Quality: High_____, Medium_____, Low_____

11. In your opinion, what determines the final price you pay to your suppliers?

    ……

12. Do you know the lowest price agents are willing to accept from you? Yes…No…

13. Explain what determines your knowledge of this price……

14. On a four-point likely scale where [1] = Not at all, [2] = Some extent, [3] = Great extent, [4] = Very Great extent, to what extent do you consider the below players to affect Nile perch price?

Processors	**Agents**	**Fishermen**	**Consumers**

15. Are you a member of a fish buyers association? Yes…….. No……

16. If yes, do they play a role in pricing? Yes…….. No…….

17. If No to 11 above, would you like to join one, Yes……. No……..

18. How do you gather fish market information? ……

APPENDIX 5: TRADERS (WHOLESALERS/RETAILERS) QUESTIONNAIRE

TITLE: ANALYSIS OF NILE PERCH PRICING IN KENYA: A CASE STUDY OF MFANFANO ISLAND

1. What type of trader are you?
    - Wholesaler/Stockist…….
    - Retailer…….

2. For how long have you been trading Nile Perch?
    - Less than 1 year……..
    - Less than 2 years…….
    - 2-3 Years…….
    - 3-5 Years…….
    - Above Five years…….

3. What quantities of Nile Perch do you handle in a day?
    - 1 bag (90 kgs)…….
    -
    - 1-5 bags…….
    - 5-10 bags…….
    - 10-20 bags……
    - 20-50 bags……
    - 50-100 bags…….

4. At what price do you buy Nile Perch?

    Kshs._____/kg/bag/tonne

    (Please select appropriate unit of measure)

5. How do you determine the Buying price of Nile Perch?
    - Direct observation……
    - Using agents……

- Using grades……
- Personal communication…….
- Others (Specify)

6. Do you consider the buying price affordable?

   Yes……..No…….

7. How long does it take to collect Nile Perch from the buying area?

   - 1 day…….
   - 2-3 days…….
   - 3-5 days……..
   - More than 5 days…….

8. What mode of transport do you use in transporting your stock?

   - Public means……
   - Bicycle……
   - Handcart…….
   - Others…….

9. How is the transport cost of Nile Perch determined?

   - Per weight (kgs)……..
   - Per distance(Kms)……..
   - Per trip(Frequency)…….

10. In your opinion, do you think transport cost contributes to the price change of Nile Perch?

    Yes……No……

    If Yes, briefly give reasons……

    ……

    ……

……...

11. Do we have enough market for Nile Perch in Kenya?

Yes…….No……

If No, what do you think should be done in order to create enough market for the Produce?.....

.....

.....

.....

12. Does the government of Kenya have an impact on the price of Nile perch?

Yes……No…….

13. What kind of losses do you usually make in Nile Perch business?