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Socio-Economic Implications of Imported Frozen Tilapia on the Local Fish Production and Value Chain Linkages: Case of Kisumu County, Kenya

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Abstract: The amount of frozen tilapia import from China has increased over the past five years to the current 20,000 tons per year. The imports have assisted in bridging the fish production deficit in the country. This study was conducted to determine the socio-economic effects of imported tilapia on thelocal fish market and value chain in Kisumu County. Primary data was collected using questionnaires, direct interviews and observations from 120 randomly selected fishermen and fish farmers, 100 fish traders and 96 households. Results revealed that 57% of the fish traders sold imported fish, 27% sold fish from capture fisheries while 16% sold fish from aquaculture facilities. Imported tilapia was sold at Ksh. 200 per kg while local tilapia fish were sold at Ksh. 320 per kilo for aquaculture and Ksh. 300 for captured fish, respectively. Due to the cheap cost of imported fish, up to 62% of the households consumed imported tilapia regularly. About 46% of the respondents have gained direct employment and improved socio-economic status due to the imported fish, of which 90% of them are women and young girls who are directly engaged in fish value addition and marketing. However, 51% of the respondents reported job losses and degraded socio-economic status due to declining aquaculture and fishing activities, attributed to imported fish. Fish market in Kisumu County is dominated by imported tilapia which is cheaper than locally produced fish. The fish importation has negatively affected local aquaculture and artisanal wild fish capture in the nearby beaches. National and County governments should provide favorable policy guidelines in the aquaculture sector to cushion local fish farmers from the effects of imported fish.

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INTRODUCTION

Fish production from natural waters has been declining over the years. This is true for Keya as it is for the entire world[1]. The decrease in wild fish production is attributable to natural and anthropogenic factors that have threatened the life of aquatic biodiversity[2]. Aquaculture has always been considered the best option to bridge the fish supply deficit. However, the aquaculture sector is facing critical challenges ranging from quality seed and feed production to lack of reliable technology for mass fish production[3]. Today, total fish production in Kenya is estimated at 180,000 tons annually, against an annual demand of 500,000 tons[4]. To bridge the fish supply gap, aquaculture activities have been increased while entrepreneurs have taken the advantage to import frozen tilapia from China which is estimated at 20,000 tons annually.

Kisumu County is an emerging economic hub and is expected to increase its economic status after the up-coming Africities Summit in November 2021. There are several industries including fish importing, processing and supplying companies in the lake side County. The companies fillet and sell both Nile perch and tilapia. The Tilapia is mostly imported while the Nile perch are caught in the local waters of Lake Victoria. The imported tilapia are sold to the local fish traders around the lake region while Nile perch are processed into fillets and exported to international markets.

Despite importation of frozen tilapia in Kenya, fish supply deficit continues to bite as human population is growing and eating habits changing[5]. The current fish consumption percapita in Kenya is about 4-5 kg of fish/person/year[4] which is much lower than 20 kg/person/year as recommended by FAO[6]. Today, several communities in Kenya have embraced fish eating, thanks to the 'Fish Eating Campaigns' as initiated by the government to improve fish consumption. Fish has high quality proteins with several health benefits, especially to children, lactating mothers and people with various illness, hence, the need to produce sufficient fish for the growing population[7]. Importation of frozen tilapia in the Kenyan fish market has generated mixed reactions from the local fishermen, fish traders, processors and consumers. There has also been media reports indicating possible impacts of imported frozen tilapia on human health (https://www.kenyans.co.ke/news/35478-fish-imports-china-found-contain-toxic-substances). However, scientific information on the socio-economic impacts of the imported frozen tilapia is scanty, hence, the need for the study.

Based on the aforementioned merits and demerits of fish importation, coupled with the cognizance of the weaknesses and gaps in the fisheries and aquaculture sector in Kenya, there is need to strike a healthy balance. This study, therefore, sought to investigate the socio-economic implications of imported fish on the local fish market and value chain in Kisumu County. The study findings would be important for reviewing fisheries and aquaculture policies, especially in regards to marketing and value addition.

MATERIALS AND METHODS

Study area and data collection: The current human population in Kisumu County is estimated at 1,155,574 (KNBS 2019) (Fig. 1). The land area of Kisumu County is 2085.9 km^2 with a shoreline on Lake Victoria, occupying Northern, Western and part of the Southern

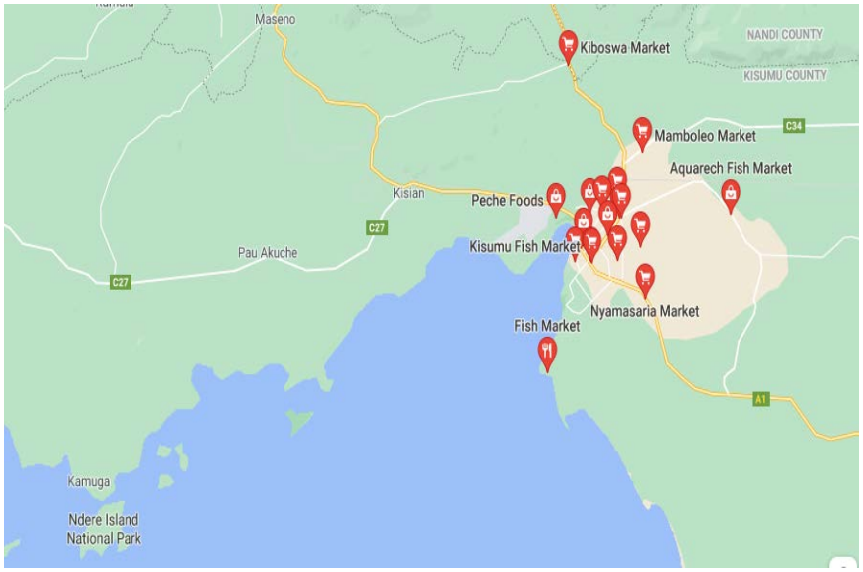

Fig. 1: Map of Kisumu County showing beaches (Dunga and Usoma) and the fish markets

shores of the Winam Gulf, thus, making it a major center of fishing. Kisumu County have several processing industries including fish.

A cross sectional survey design was employed to gather data using a pretested structured questionnaire administered to randomly selected fishermen, fish traders, processors and fish consuming households in Kisumu County. The questionnaires were fed into Open Data Kit (ODK) and transferred into Smart mobile phones for easy data capture by the enumerators. Data was collected during April to June 2020 in Kisumu County. Data was obtained on the demographic information, fish species, source of fish, size, quality and pricing, type of fish traders and consumer fish preferences. Key informant interviews were also used to obtain insights from opinion leaders in the fish production, processing and market.

Data analysis: Data was analyzed using the Statistical Package for the Social Sciences (SPSS Inc. Version 23.0). Descriptive analyses were done using means, median, percentages, standard deviation and ranges. Statistical significance was considered when $\alpha = 0.05$.

RESULTS

Fish farmers and fishermen: A total of 60 fish farmers and 60 fishermen were interviewed. All the fishermen and fish farmers interviewed were males. Fishermen in Usoma and Dunga beaches reported the months of March to May as high season months, when fish are caught in large quantities. Months of August to January were reported to be low season months when the catch is low. The fishers further reported the months of June and July as months when there is almost no fish in Lake Victoria. Fish farmers harvest from their ponds when customers place orders. The result showed that the farmers harvest up to an average of 80 kg of fish per month. All the 80 kg harvested are sold at the farm or supplied to different hotels in Kisumu town.

In a month, the fishermen reported to sell an average of 192 kg of fish. During high seasons, Nile perch was sold at Ksh. 150 kg while tilapia and catfish were sold at Ksh. 280 kg. It was also determined that fish prices were higher during low fishing seasons where a kilogram of Nile perch was sold at Ksh. 350 while a kilogram of tilapia and catfish were sold at Ksh. 400 each (Table 1).

Fish sales in Kisumu County: A total of 100 fish sellers from different markets in Kisumu County were interviewed. Of these, 80% were females while 20% were males. The fish sellers were distributed among different age brackets. The majority of the sellers fell in the age bracket of 45-54 years and no representation of the age brackets 15-24 years (Fig. 2).

Table 1: Prices per kg of different fish type sold in fish farms and landing beaches in Kisumu County

	Price (Ksh/kg)		
Type of fish	High season	Low season	Average
Nile perch	150	350	250
Tilapia	280	400	340
Catfish	200	400	300
Omena	200	250	225
Others	150	300	225

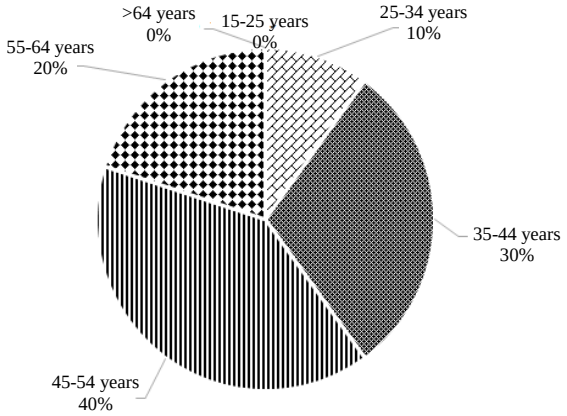

Fig. 2: Age classes for fish sellers in different fish markets Kisumu County

Nile perch (*Lates niloticus*), tilapia (*Oreochromis niloticus*), omena (*Rastrineobola argentea*) and catfish (*Clarias gariepinus*) are among the types of fish sold in different fish markets in Kisumu County. Of the fish traders interviewed, 42% traded in tilapia while 25% trade in Nile perch. Other fish species sold in the markets include *Synodontis* species ("okoko"), *Haplochromis* species ("fulu"), *Schilbe mystus* ("sire") and *Barbus* species ("fuani"). These other fish species recorded the least, sold by 8% of the fish sellers interviewed as presented in Fig. 3.

Fish traders in fish markets in Kisumu County obtain their fish in different forms from the fish landing sites, fish farms and fish depot. The forms include; whole, fresh, scaled, gutted, frozen and smoked. The survey revealed that tilapia was sold in all the forms in the fish markets. Catfish and omena were bought whole and fresh while Nile perch was found to be bought both whole, fresh and gutted (Table 2). This revealed that value addition is still practiced at low levels in the market.

According to the survey, fish traders got their fish from different sources including wild (Lake Victoria), fish farms and imported fish depot. Of the fish traders who sell tilapia, 57% reported to obtain their fish from the imported fish depot. Lake Victoria was reported to be the only source of Nile perch in the county. Catfish was obtained from the wild and fish farms in the County. Tilapia was obtained from all the fish sources; from the wild, fish farms and from imported fish depot.

Table 2: Forms in fish are sold by fish sellers from landing site, fish farms and fish depot in Kisumu County

	Forms of the fish sold in the market					
Types of fish	Whole	Fresh	Descaled	Gutted	Frozen	Smoked
Omena	*	*	-	-	-	-
Nile perch	*	*	-	*	*	-
Tilapia	*	*	*	*	*	*
Catfish	*	*	-	-	-	-

(*) fish sold in that form (-) fish not sold in that form

Table 3: Prices per kilogram of fish at which fish sellers buy and sell the fish during high and low fishing seasons and profit margin for each type of fish

	Price of fish (Ksh/kg)						
	Buying price (BP)			Selling price (SP)			
Type of fish	High season	Low season	Average (ABP)	High season	Low season	Average (ASP)	Profit (ASP-ABP)
Nile perch	150	350	250	180	450	315	65
Tilapia	200	400	300	300	500	400	100
Catfish	200	400	300	250	450	350	50

ASP = Average Selling Price; ABP = Average Buying Price

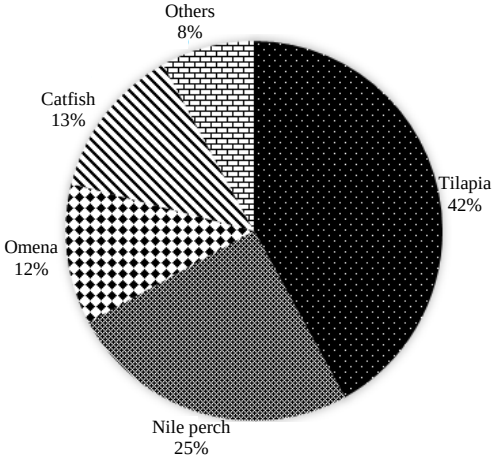

Fig. 3: Fish sold in different fish markets in Kisumu County

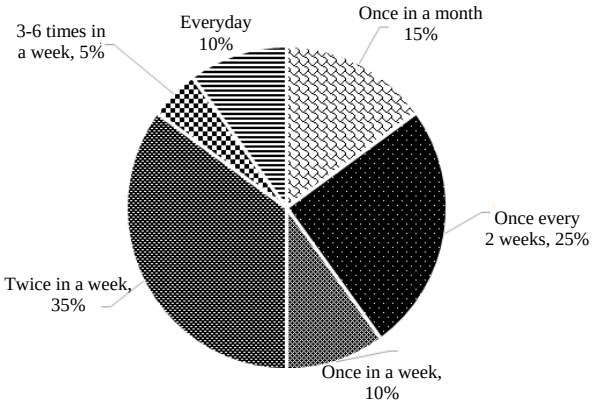

Fig. 4: Fish consumption patterns in selected households in Kisumu County

Fish prices available for consumers in the markets in Kisumu County varied depending on the fishing seasons. It was observed that the prices were high during low fishing seasons and lower during high fishing seasons. A kilogram of tilapia was sold at Ksh. 300 during high seasons and Ksh. 500 during low seasons thus an average price of Ksh. 400 per kg. Fish traders make an average profit of Ksh. 100 per kg of fish sold with an average buying price of Ksh. 300. A profit of Ksh. 50 is made from the sale of catfish from an average buying price of Ksh. 300 and an average selling price of Ksh. 350 per kg. Table 3 shows the prices per kilogram of different types of fish at which fish sellers buy and sell the fish during high and low fishing seasons and profit margin for each type of fish.

Fish consumption patterns: All the households interviewed in Kisumu County buy and eat different types of fish and fish products while 10% do not buy or eat fish and fish products. Majority of the households (35%) reported to eat fish twice a week while the lowest frequency reported was 3-6 times a week (Fig. 4).

The results revealed that every household in Kisumu County consumes an average of 1.5 kg of fish in a typical meal. The 50% of the fish consuming households buy their fish from markets within Kisumu County while 20% reported to be buying their fish from the landing sites and fish farms. The results also revealed that fresh fish is consumed the most in Kisumu County by 50% of the interviewed households who reported to be buying and eating fish. Canned and frozen fish are the least consumed fish, consumed by 5% of the households who buy and eat fish in Kisumu County as presented in Fig. 5. It was revealed that all the households in Kisumu County prefer local fish to imported fish.

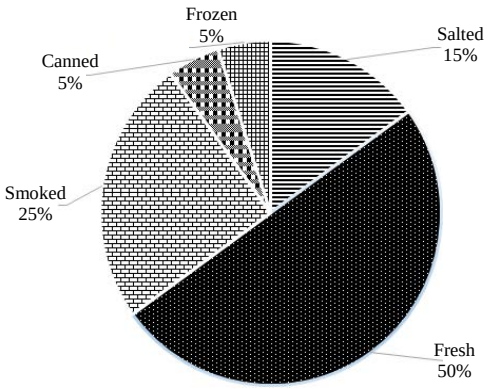

Fig. 5: Consumption of different forms of fish by fish consuming households in Kisumu County

DISCUSSION

The importation of fish into Kenya has varied socio-economic implications on the production and value chain linkages in Kisumu County. Kenya's demand for fish is at 500,000 MT against the domestic production capacity of 180,000 MT in 2019[8]. Domestic production has therefore, proven unable to meet the demand thus allowing importation to bridge the demand supply deficit. A Chinese fish company, Zhangzou Longyi Food Company Limited imports tilapia into Kenya through East African Sea Food Company (EASFC) in Kisumu County labelled as its Kenyan agent.

Majority of the youths living along the shores of Lake Victoria view fishing as a quicker way of improving their standards of living. This has caused increased fishing efforts in the lake, thus, overexploitation of the fisheries resources[9]. This has become the reason for decline in the fish catch over the past years as reported by fishermen in Usoma and Dunga Beaches of Lake Victoria. Fishing efforts and unsustainable fisheries in Lake Victoria will continue to increase until the open-access fishing system is replaced by proper enforcement of the licensing system[10]. Fishermen experience fluctuation in the amount of fish catch at different periods of the year. High seasons are periods when the Catch Per Unit Effort (CPUE) is high whereas low fishing seasons are periods when fish are hardly caught despite spending longer hours in the lake. This fluctuation in the amount of catch is brought about by variation and shift in the seasonal pattern of the hydro-climatic factors such as rainfall, river flow and fluctuation in the water levels that influence fisheries production in inland waters[6]. Increase in rainfall and water level favors the reproduction, recruitment and immigration of fish in the waters[11]. According to the Flood Pulse Concept, fish migrate to the newly inundated areas and shallow peripheries during heavy rainfall[12], leading to a reduction in catches at the main lake. Reduction in the CPUE causes a decrease in supply of fish to fish sellers. When the supply is low fish prices shoot due to an increase in demand by the sellers as dictated by the market forces of Demand and Supply. The increase in price of fish by fishermen is to enable them meet their profit margins during low fishing seasons[13]. On the other hand, fish farmers have a constant (although, low) production pattern, since, they have control over the factors of production including water, feeds and the nature of breeding of the fish in the ponds, thus, a constant fish price during the production period.

Fish consumed in Kisumu County is either obtained from the wild (lake, rivers and other large streams), farmed (ponds) or from the imported fish depots. The place from which sellers get their fish mainly depends on the types of fish they deal with. Imported fish companies in Kisumu County only deal in frozen tilapia. Therefore, fish traders dealing in other fish types rather than tilapia are obliged to get their fish from either wild or from fish farms. Despite the fact that tilapia is obtained from all the three fish sources in Kisumu County, majority of the fish sellers obtain their tilapia from the imported fish depot. The fish sold at the depot are relatively cheaper than the local fish harvested in the fish farms or captured from the wild. Furthermore, the imported fish are packed in different sizes and therefore available as preferred.

As revealed in the study, 57% of the local fish sellers prefer the imported fish to the locally produced fish because of their low prices compared to the local fish. Furthermore, the imported fish are readily available at the depot regardless of the production season. The declining catches in Lake Victoria has raised uncertainty on the availability of fish among fish traders who go to the beaches daily to wait for fishermen from the lake after trapping fish overnight[14]. Whenever, the fishermen return to the landing sites with no catch, it was observed that some fish traders, make a call to their motorists who bring them the imported fish to the beach. The fish are then unpacked from the white boxes into the troughs. After gutting and scaling, they are sold to customers who believe the fish are caught from the lake.

Consumption of fish across the country is continuing rise due to the rapid population increase[15]. Fish is a low-fat high quality protein as compared to other proteins making it helpful in reducing the risk of heart attack or stroke. Omega-3 fatty acids in fish aid in healthy brain function and infant development of vision and nerves during pregnancy[16]. Furthermore, its soft flesh content makes it easily digested as compared to other proteins like beef, mutton, chevron and chicken[13]. Import of cheap fish from China has not only ensured steady supply of fish within the City of Kisumu but also fairly reduced the pressure on the already heavily exploited fish stocks of Lake Victoria. However, imported fish of low costs has appeared to slow down growth of small-scale fisheries.

The fish imports from China have been doubling every year. The fish were initially restricted to Gikomba market in Nairobi County but due to shortage in other parts of the country due to depleted stocks coupled with low aquaculture production, the fish have ended up in other parts of Kenya too. For the fish to be able to be distributed effectively, companies in Kisumu sell boxes of frozen fish to middlemen who then sell them to fish mongers.

CONCLUSION

The study has revealed that the imported fish have several (mostly negative) socio-economic implications on the production and other value chain linkages associated with locally produced fish. There is therefore, need to review fisheries and aquaculture policies, especially in regards to marketing and value addition. This will cushion local fish producers and the entire value chain from the negative influences associated with the relatively cheaper fish imported from China which have also been reported to pose health risks to consumers due to microbial and heavy metal contamination.

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