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Consumer preference and marketing of farmed Nile Tilapia (*Oreochromis niloticus*) and African Catfish (*Clarias gariepinus*) in Kenya: Case Study of Kirinyaga and Vihiga Counties

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ABSTRACT
Kenya has a great potential for aquaculture growth by producing additional volumes of fish to fill the growing gap in national fish supply, as wild fish catches continue to decline. In order to balance the shortfall between fish production and high increase in demand, the Kenyan government drafted a fiscal policy measure in the form of Economic Stimulus Program (ESP) to stimulate economic growth in the industry. Despite increased aquaculture adoption and subsequent increase in fish supply in the country, little is known about consumer preference of farmed fish products that ultimately may hinder optimization of production and marketing of the aquaculture sub-sector. This study examined factors influencing consumer preferences and marketing trends in the demand for Nile tilapia (Oreochromis niloticus) and African catfish (Clarias gariepinus) in Kirinyaga and Vihiga Counties in Kenya. A total of 153 questionnaires were administered to 95 and 58 respondents in Kirinyaga and Vihiga counties respectively. There was no significant difference among the various education levels with regard to their fish buying preferences. Similarly, the different gender groups do not influence the purchase of fish or consumption rates. Tilapia is the most frequently purchased fish in both counties. Over 60% of Kenyan consumers purchase fish mainly from open markets in fresh and fried forms. Fish product attributes such as overall quality, ready availability and taste had the greatest influence on consumer preferences; hence these attributes need to be stressed in market promotional activities. It is therefore recommended that improved marketing through a target-oriented approach of existing customers and attracting new consumers for market penetration will guide the aquaculture industry to improve production and profits.

Keywords: Aquaculture, Consumer preference, Marketing, Nile tilapia, Catfish, Kenya.

1. Introduction
The fisheries sub-sector plays a significant role in the Kenyan economy and for the health of its population. In 2011, the sector contributed about 0.5% to the GDP but has greater room for expansion through exploitation of marine and inland fresh water fisheries [1]. As an economic activity, aquaculture is very important to rural communities, fish traders, and processors. It also plays a key role in food security, not only for subsistence and small scale fishers who rely on fishery for food, income generation and services but also for consumers who regard it as a source of affordable high quality animal protein. Although fish provides a cheap and highly nutritious source of protein, several people in different parts of Kenya are still not assured of this very basic need [2, 3]. The per capita annual consumption of fish in Kenya 2009 was 5 kg compared to the world average of 18.6 Kg/capita/year in 2010 [4]. At the rate of the world per capita, Kenya's population of 40 million according to the 2009 Census require over 500000 MT annually for domestic consumption alone which can be met by improving the aquaculture sector.
Kenya has great potential for aquaculture to produce the critical volumes of fish to fill the growing gap in national fish demand. Over the last five decades, the Kenyan government has drafted several policy and fiscal measures to stimulate the potential in aquaculture sub sector. These include the "eat more fish" campaign by the Fisheries Department in the 1960s and in 2009 through the Economic Stimulus Programme (ESP) which led to the rapid spread of rural pond fish farming across the country. Fish Farming Enterprise Productivity Program (FFEPP)

under the ESP program was a Kenyan government initiative that targeted the improvement of fish farming in the country through provision of seed, feed, cost of pond construction and capacity building to farmers [5]. This program led to increased fish production from about 1% (962 metric tons) in year 2002 to over 12% (19,584 metric tons) in year 2011 [1].

This increase in aquaculture production requires coordination between commercial farmers and the ultimate consumers. The initiative taken by government to promote aquaculture coupled with a review of past research studies reveal a strong focus on production [6, 7]. Studies on farmed fish demand and consumption has received little or no research attention resulting in insufficient knowledge on consumer preference that may hinder optimization of production and marketing of fish. According to [8], a study of consumer preferences is necessary because information on fish consumption and preferences may lead to development of fish products geared towards meeting specific demand by consumers. The need to place some emphasis on consumer preference research and market research derives from the strategic challenges that the Kenyan aquaculture industry faces. The study focused on assessing the factors influencing consumer preferences and marketing trends in the demand for Nile tilapia and Catfish within Kirinyaga and Vihiga Counties in Kenya.

2. Materials and methods

The consumer survey was conducted in Kirinyaga and Vihiga Counties located in Central and Western Kenya regions respectively. A multistage purposive sampling procedure was employed in the selection of the survey population with the main sampling units being fish markets in the counties. The study areas were purposively selected due to high population densities and existence of many commercial oriented fish farmers most of whom were starting to turn to entrepreneurial aquaculture practices. Subsequently, random sampling was done in the identified areas to select fish consumers to participate in the survey as respondents. A total of 153 questionnaires were administered to 95 and 58 respondents in Kirinyaga and Vihiga counties respectively. Standard socio-demographic variables on age, gender, marital status, household size, income and education levels were included in the questionnaire since they have been found to relate to the type of and reason for food purchases [9]. Data collected from the field was entered and analyzed statistically using the Statistical Package for the Social Sciences (IBM - SPSS Inc. version 20.0). Descriptive analysis was done by use of means, standard deviation, percentages and frequency distribution of responses. Inferential statistics was done using Chi-square (χ^2) test of goodness of fit. All data analyzed were considered significant at 0.05 level of significance.

3. Results

3.1 Socio-economic characteristics of fish consumers

Table 1 summarizes the socio-demographic characteristics of fish consumers in the study areas. The gender composition of respondents was 52% males and 48% females. Age distribution ranged from 18-68 years with respondents aged between 18-27 years comprising 33%, closely followed by those in the range of 28-37 years at 29%, then those in the range of 38-47 years at 24% while those in the range of 48-68 years at 13%. This implied that over 50% of fish consumers are below the age of 40 years. On average, 67% of the respondents were married, while 28% were single. Education levels varied among respondents in the two study sites. Most of the respondents (53%) had attained secondary level of education, followed by respondents with primary level of education at 32% and tertiary education at 12%. Only 2% of the respondents had no formal education. However, there was no difference among the various education levels with regard to their fish buying preferences. Exactly a half (50%) of all respondents interviewed had a household size of between 4-6 people followed by 1-3 people at 35% and 12% comprising of 7-9 members. Consumer households with more than 10 people were the least at 3%. The main occupations of the respondents were trading and small business activities (73%), farming (12%) and formal employment (11%). An average of 40% of the respondents earned a monthly income of between KShs 4,000-6,000, 23% earned KShs 4,000 and below, 18% earned between KShs 6,000-10,000 while 20% reported earning more than KShs 10,000 per month.

3.2 Consumer fish preference and consumption

All the respondents in Vihiga and Kirinyaga Counties stated that they ate fish as part of their diets. Among those who purchased fish, an average of 37.5% of respondents bought fish "more than once a week" with fish consumers in Vihiga county constituting over 50% of fish purchased in this category while 31.5% of consumers purchased fish "once in a week" (Figure 1). An average of 15% of consumers in both counties purchased fish "once a month", 12.5% of consumers reported purchasing fish in no particular pattern, while only 5% of consumers purchased fish daily in Vihiga County.

3.3 Rating of fish consumption

Most of the fish consumers (69%) rated fish consumption as 'very important' while only 3% ranked fish as 'not important' in household diets (Figure 2). The age, gender, and level of education did not influence the purchase of fish or consumption rates in the two counties. For instance, there is no statistically significant association between level of education and rating of fish consumption ($\chi^2 = 2.883$; df =6; $p = 0.823$); the gender and ranking of fish consumption ($\chi^2 = 4.289$; df=1; $p=0.038$) and the age distribution against fish consumption ($\chi^2 = 1.031$; df=10; $p=0.355$). Although the lower age class of respondents appeared to have a greater preference for fish, the chi-square test showed no significant difference among the various age groups ($\chi^2 = 10.274$; df =10; $p = 0.47$). Interestingly, 39% of respondents living in rural areas and 18% in peri-urban areas rank fish consumption as 'very important' compared only to 12% in urban areas that regard fish rank fish as 'very important' although the differences is not statistically significant ($\chi^2 = 5.595$; df=4; $p = 0.232$).

3.4 Sources of fish in markets

Majority of the respondents (70%) in Vihiga County stated that wild caught fish is common in the markets as compared to 30% in Kirinyaga County (Figure 3). Conversely, 37% of respondents in Kirinyaga stated that farmed fish is commonly found in the markets compared to only 3% in Vihiga County. About 24% of respondents in Vihiga and 18% in Kirinyaga reported that fish found in their markets is both from wild and culture sources. About 18% and 2% of the respondents from

Kirinyaga and Vihiga Counties respectively were unsure of the source of fish in the market.

Further questions sought to know the availability of farmed fish in the markets and results are presented in Figure 4. Most respondents (average of 70%) stated that farmed Tilapia and Catfish were 'rarely' found in the market in both counties, while an average of 6% stated that farmed fish is found in the market 'most of the times'.

Table 1: Socio-economic characteristics of fish consumers in Kirinyaga and Vihiga Counties.

Variables	Response	Kirinyaga County		Vihiga County		Total Frequency (N = 153)	Average percent
		Frequency (n=95)	Percent	Frequency (n=58)	Percent		
Gender	Male	53	56	26	45	79	52
	Female	42	44	32	55	74	48
Age (Years)	18 – 27	27	28	24	42	51	33
	28 – 37	29	31	16	28	45	29
	38 - 47	25	26	11	19	36	24
	48 – 57	11	12	2	3	13	9
	58 - 67	2	2	2	3	4	2
	>68	1	1	3	5	4	2
Marital status	Single	26	27	17	31	43	28
	Monogamous	64	68	38	67	102	67
	Polygamous	1	1	0	0	1	1
	Divorced	2	2	1	1	3	2
	Widow(er)	2	2	1	1	3	2
Education level	None	1	1	3	5	4	2
	Primary	29	31	20	35	49	32
	Secondary	52	55	29	50	81	53
	Tertiary	13	14	6	10	19	12
Place of residence	Urban	6	6	27	47	33	22
	Semi-urban	32	34	11	19	43	28
	Rural	57	60	20	34	77	50
Household size	1 - 3	38	40	15	26	53	35
	4 - 6	47	49	29	50	76	50
	7 - 9	9	10	9	16	18	12
	>10	1	1	5	8	6	3
Occupation	Traders	59	65	52	90	111	73
	Farmers	16	17	1	1	17	11
	Employed	12	13	3	2	15	10
	Informal sector	5	6	1	1	6	4
	Students	1	1	1	1	2	1
	Housewife	2	2	0	0	2	1
Household monthly income	< 4,000	20	21	15	26	35	23
	4,001 – 6,000	38	40	23	40	61	40
	6,001 – 10,000	19	20	8	14	27	18
	>10,000	18	19	12	20	30	20

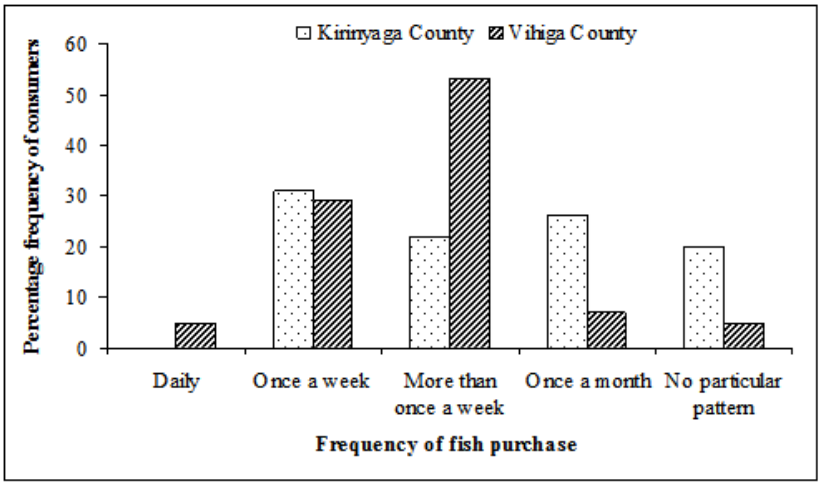

Fig 1: Frequency of purchase in the study areas in Kenya during the study period.

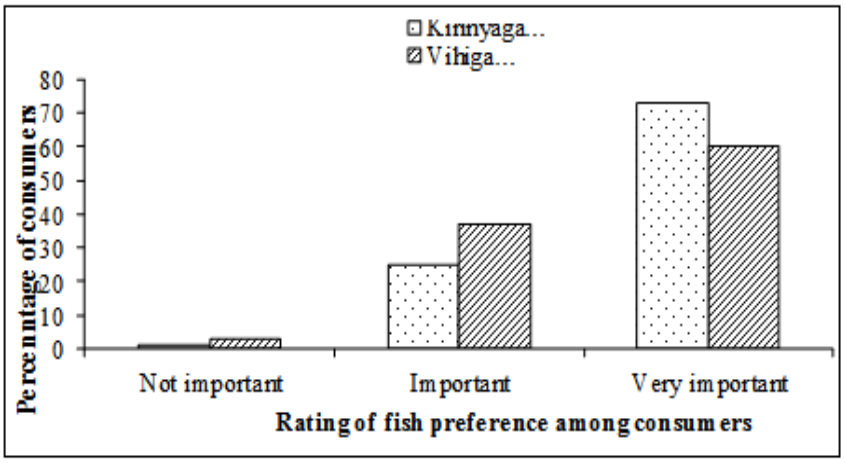

Fig 2: Rating of fish preference among consumers in sampled counties.

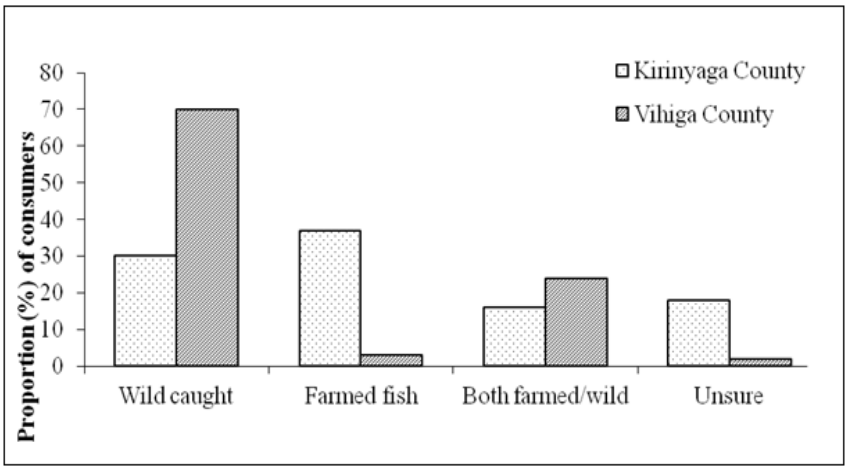

Fig 3: Sources of fish in sampled markets in Kirinyaga and Vihiga Counties.

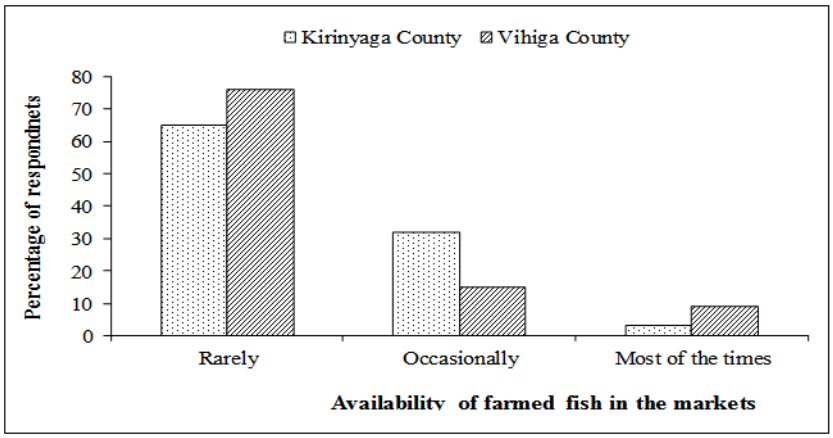

Fig 4: Availability of farmed fish in the markets in Kirinyaga and Vihiga Counties.

3.5 Fish species preference by consumers

There are several fish species consumed in Kenya most of which are from the wild sources and only a handful from the cultured systems, especially Nile tilapia and African Catfish, The results show that Nile tilapia is the most preferred fish in Vihiga 90% (n=52) and Kirinyaga 52% (n=49) Counties (Figure 5a and 5b). However, 45% of consumers in Kirinyaga County preferred catfish compared to a dismal 3% in Vihiga County.

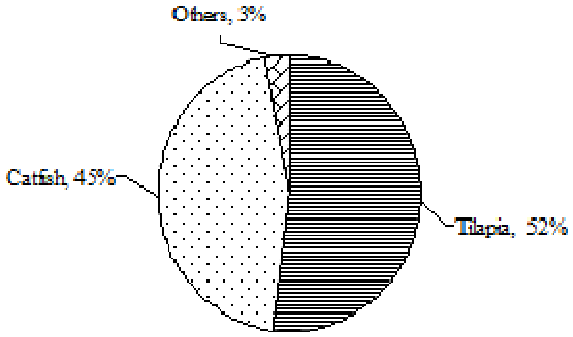

Fig 5a: Fish species preference in Kirinyaga County.

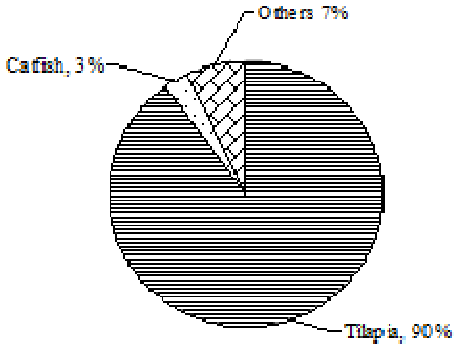

Fig 5b: Fish species preference in Vihiga County.

3.6 Place of fish purchase and persons selling fish

Fish purchase points by consumers was varied in both counties (Figure 6). Fish consumers in Kirinyaga County made purchases mainly from fish vendors/hawkers (67%), 20% from open fish markets and 11% from fish farm gates; while less than 2% bought fish from wholesalers. In Vihiga County, 70% of consumers purchased fish mainly from open markets, 11% from fish vendors while less than 2% purchased fish from fish farmers. Wholesalers are a little more important sources for fish purchases in Vihiga County (5%) than they are in

Kirinyaga County (2%).

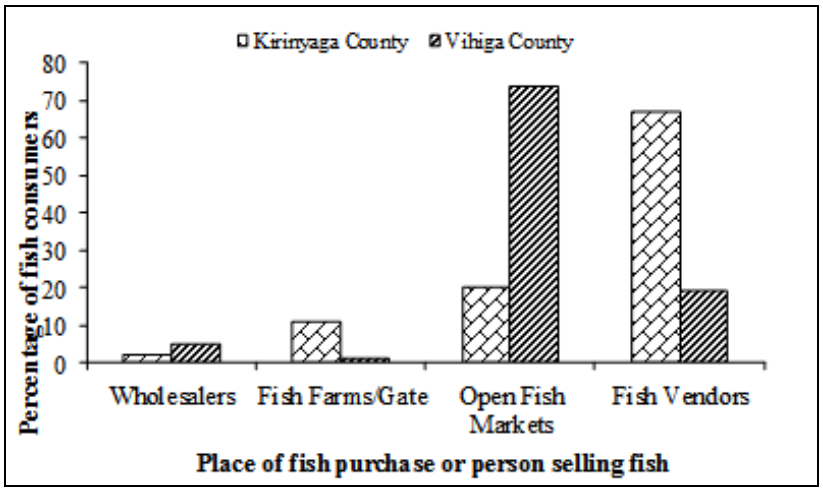

Fig 6: Place of fish purchase in the study areas during the study period.

3.7 Reasons for consuming fish

Results indicate that the reasons for consuming fish were comparatively similar among the consumers in the study areas (Figure 7). On average, 63% of respondents in both counties purchased and consumed fish because they perceived fish to be of 'good quality', 25% purchased fish since it was 'readily available', 8% because fish is tasty and 3% regard fish as cheap compared to other alternative protein sources. A few respondents (< 4%) reported other factors which include fish being healthy, smells good and has high nutritive value.

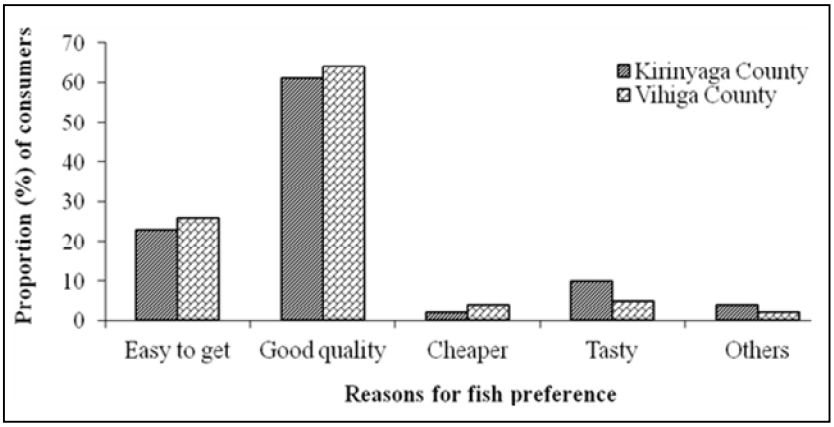

Fig 7: Reasons for fish preference in Kirinyaga and Vihiga Counties.

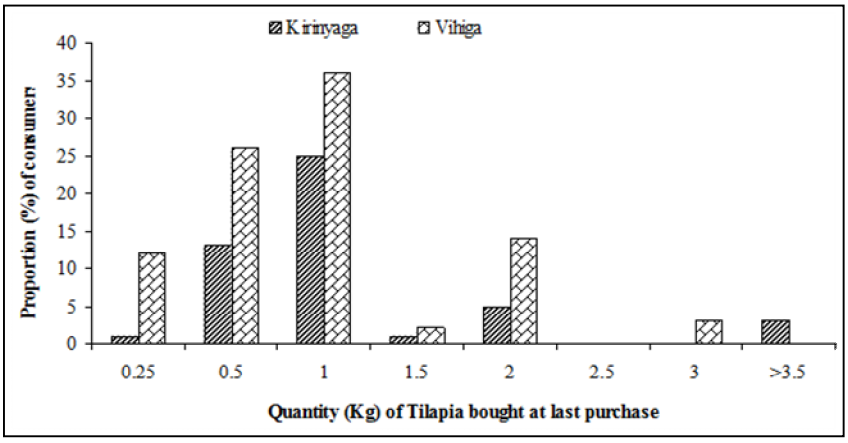

Fig 8a: Quantity (in Kgs) of Nile tilapia bought by consumers at last purchase in Kirinyaga and Vihiga counties.

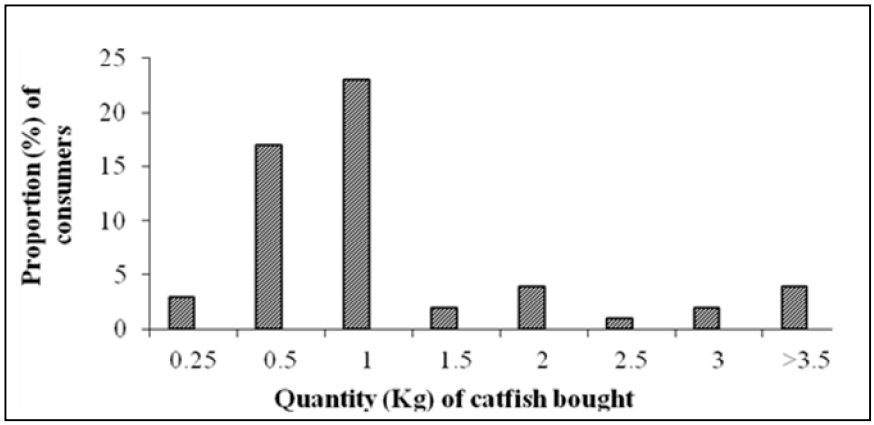

Fig 8b: Quantity (in Kgs) of Catfish bought by consumers at last purchase in Kirinyaga County.

3.8 Quantity and cost of fish purchase

The quantity of tilapia and catfish purchased by consumers in Kirinyaga and Vihiga County is presented in Figures 8a and 8b. Results indicate that most consumers in Vihiga and Kirinyaga Counties purchased tilapia fish with an average weight of 1kg during the last shopping trip as reported by 36% and 25% of the consumers, respectively. About 26% of consumers in Vihiga County and 13% in Kirinyaga County bought 0.5 kg per shopping trip. Of the total respondents (n=95) in Kirinyaga County, 57% (n=54) stated that they purchase catfish. Out of the 54 respondents, 23% (n=22) reported that they purchased 1 kg during the last shopping, followed by 17% (n=16) who purchase 0.5 kg during their last shopping.

3.9 Cost of fish purchased

Most of the respondents in Vihiga (38%) and 16% in Kirinyaga Counties purchased tilapia at a cost ranging from of Kshs 80-160; the other group of consumers (24% and 5%) bought fish at a cost ranging from Kshs 160-240 in the two counties respectively. An average of 15% in both counties purchased fish at a cost of between Kshs 240-320 while those who purchased fish above Kshs 320 constituted 14% in Kirinyaga and 20% in Vihiga respectively. Thus, consumers in Vihiga County bought fish at a slightly higher cost compared to those in Kirinyaga County.

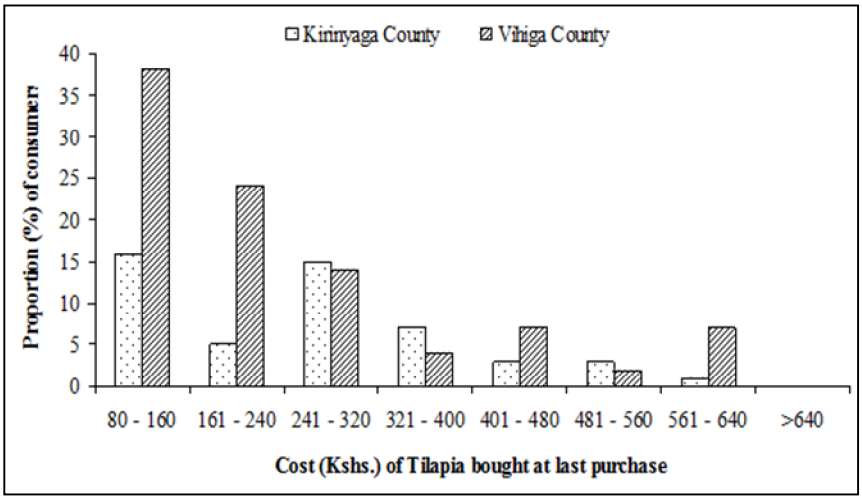

Fig 9: Cost of Nile tilapia at last purchase in Kirinyaga and Vihiga Counties.

3.10 Forms of fish product preferences

In Kirinyaga County, 48% of respondents preferred fresh Nile tilapia product, 37% in fried form while 8.5% had preference for filleted form (Figure 10). Catfish was primarily preferred in fresh form (39%) followed by fried form (24%) and filleted (7%). The least preferred fish product forms for both tilapia and catfish was smoked fish.

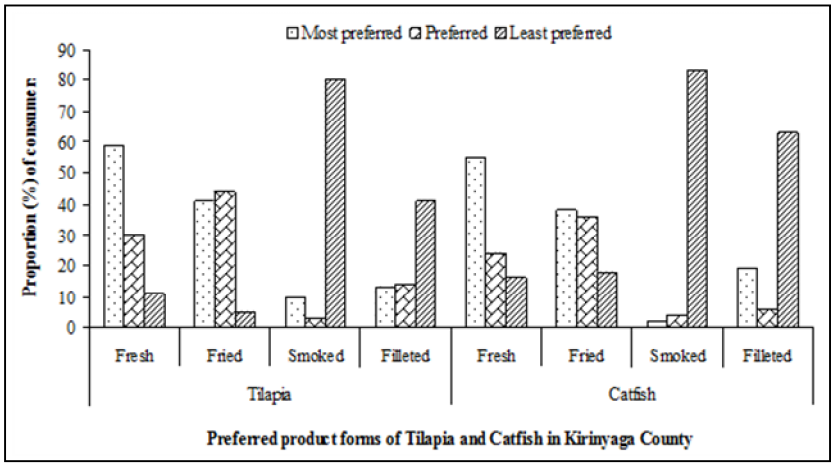

Fig 10: Forms of fish product of Tilapia and Catfish preferred in Kirinyaga County.

3.11 Contribution of aquaculture to livelihoods and food security

The rating of importance of aquaculture and its contribution to livelihoods and food security is presented in Figure 11. The livelihoods of ESP supported farmers rose due to improved nutrition from protein consumption and through increased incomes from sale of fish. Improved nutrition was rated as "very important" by 54% of the respondents, followed by 51% who considered aquaculture as a 'cheap protein source'. About 47% of the respondents rated fish as "important" in terms of improving their livelihoods, followed by 42% who considered aquaculture to have enhanced their economic gains from sale of fingerlings and food fish. About 32% of the respondents stated that fish farming has made fish readily available.

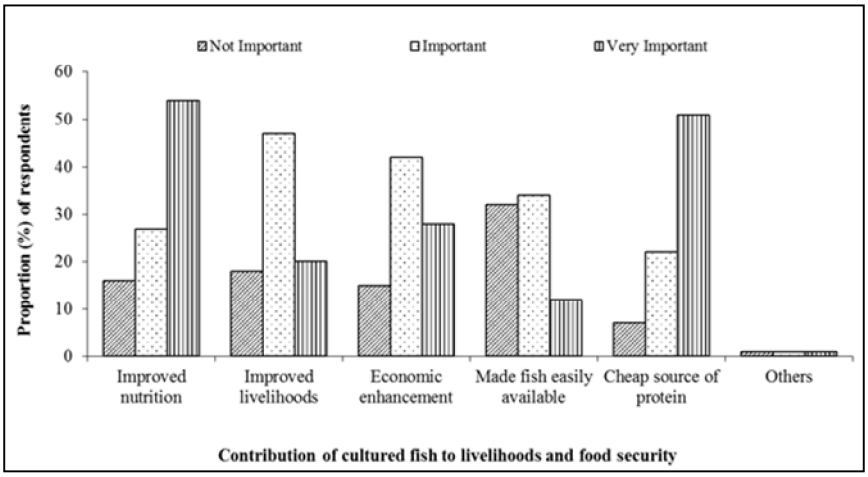

Fig 11: Rating of the importance and contribution of cultured fish to livelihoods in study sites during the study period.

4. Discussion

Consumer's preference for fish is generally influenced by socio-demographic characteristics like gender, age, income, level of education, employment status, location and family size [10]. There were a slightly high proportion of male consumers (52%) in this study which is not consistent with the culture in most parts of Africa where the principal shoppers of households are predominantly matured females. [11] argue that the increase in international fish supply chains has led to disruptions in traditional arrangements and that traditional female roles are disappearing. Women mostly participate at the peripheral parts of the value chain, such as fish processing and trading. However, as men enter the processing business they appear to displace women from those activities and women may also be required to work as laborers in male-managed agricultural activities. Moreover, over 50% of fish consumers are below the age of 40 years indicating more economic participation by youths in the market.

Education is assumed to enlighten consumers about the health and other benefits of fish consumption hence, positively influences the generally preference of consumers [12]. This study also found that close to three quarters (73%) of the consumers in the study areas were business people involved in different kinds of business activities. Most of these consumers

were fish traders who were easily located in the markets. Over a half of the households had between 5-6 members. In addition, majority of the consumers earned an average monthly income of Kshs 4,000–6,000. This scenario threatens household food security since poor families as a result of low incomes may be forced to purchase and consume low quality food items to satisfy the large household especially in cases where income is low.

The most preferred species by consumers was Nile tilapia by 90% of consumers in Vihiga and 52% in Kirinyaga counties. This is also in agreement with recent production studies that indicate that the most commonly farmed fish species in Kenya are the Nile tilapia and African catfish which comprises about 70% and 21% of aquaculture production respectively [13]. Within the two counties, Kirinyaga consumers on the average purchased more catfish, but less tilapia, than those in Vihiga. The preferences of consumers for catfish in Kirinyaga could be because it is relatively more fleshy, easy to fillet and less bony compared to tilapia. It is worth noting that most residents of Kirinyaga are traditionally not fish eaters but have in recent year's embraced fish in their diets. [14] also reported that fish consumption varies from one region to another, with the highest levels reported in Nyanza, Western and Coast constrain supply of fish. Compared to the capture fisheries value chain, almost all aquaculture output of the country ends up in the domestic market. The market for farmed fish products is mainly local, as the volume of production is too low to generate significant export revenues in relation to the Nile perch [17].

The quantities and prices of tilapia and catfish are important determinants of the preferences of Kenyan consumers for both farmed tilapia and catfish. Study findings reveal that Tilapia is relatively more expensive than catfish in both counties, but there is no significant difference between the amount of tilapia and catfish that the average household in the two counties purchased per shopping trip. The most preferred product forms are fresh and fried fish hence traders can ensure that products reaching consumers in the market are of the required form. [18] noted that Kenyans are traditionally used to the consumption of fresh tilapia, and fresh fish in general, because of the frequent supply of fresh fish from especially Lake Victoria to open markets. Fried tilapia is also highly preferred since it is the main form of tilapia consumed with Ugali, a local dish widely consumed throughout Kenya [18].

The main reasons for fish consumption were because consumers perceived fish to be of good quality and readily available. These findings are in agreement with those of [19] who found that 33% of the inhabitants of Lake Naivasha environs consumed fish due to availability. Elsewhere, [20] pointed out that fish destined for the market requires that quality be maintained throughout the growing period. Ensuring fish quality through the value chain demands that farmers provide balanced and nutritious diets, prevent or minimize disease occurrence, maintain proper stocking densities, and handle fish appropriately during production and transportation to the market. Healthy-looking fish reflects its quality and attracts higher premiums [21, 22].

5. Conclusion and Recommendations

The present study indicates that Nile tilapia is the most frequently purchased fish in both counties. Over 60% of provinces.

Demand for fish is rising owing to the growing population and the changing feeding habits among Kenyans as they move towards healthier living. According to [15], cultural tradition and proximity to fishing areas affect fish consumption patterns in Kenya. Traditionally the major fish consumers have been the Luo ethnic group, inhabiting areas around Lake Victoria. This ethnic tag associated with fish consumption seems to have disappeared with time as fish is now used in many household across the country. Currently, fish consumption patterns in many households have shifted from depending on tradition and proximity to taste and availability [7, 16]. Fish farming has been in practice in many parts of Kenya thus encouraging fish eating even among communities like the Kikuyu and Kamba, who were not traditionally fish eaters.

Farmed fish is usually produced at the farm level and individual farmers sell directly to individual consumers, fish retailers or nearby small establishments such as restaurants, schools, and hotels. Quantities sold are generally small and supply is inconsistent [16]. Most fish purchases in the two study sites were at the open market followed by sales fish vendors who purchased fish at farm gates. These results indicate that there are few areas where fish can be obtained and hence may

Kenyan consumers purchase fish mainly from open markets in fresh and fried forms. Fish product attributes such as overall quality, ready availability and taste had the greatest influence on consumer preferences; hence these attributes need to be stressed in market promotional activities. As long as the aquaculture industry continues to produce a consistently high-quality product, potential consumer demand will continue to support further growth of the sector in Kenya and beyond. Findings from this study may form the basis for formulating a national strategy for consumer awareness regarding the benefits of fish consumption on human health. It is therefore recommended that improved marketing through a target-oriented approach of existing customers and attracting new consumers for market penetration will guide the aquaculture industry to improve production and profits.

6. Acknowledgments

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