DETERMINATION OF FISH VALUE ADDED PRODUCT- PREFERENCES AMONG THE RESIDENTS OF WOTE TOWN, MAKUENI COUNTY, KENYA

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Abstract

This study was conducted during a fish eating campaign to determine the preference of fish and fish value added products in Makueni County. The data is important for advising fish farmers, traders, processors and policy makers in the aquaculture value chain. The data was obtained by randomly administering questionnaires to respondents who were served with the fish products. A total of 60 questionnaires were administered. The average quantity of fish consumed by a household was 0.74±0.6 Kg/market visit. Nile Tilapia was the most preferred fish species (74%) compared to Nile perch (10%), African catfish (5%) and other species at 3%. Farmed fish contributed 43%, fish from L .Victoria 40% while fish from other sources contributed 8% of the total fish supplied in the County. A number of the respondents (9%) were not sure of the sources of fish. Consumers who were eating fish once a week were 48.8%, bi-weekly 20.9%, monthly 18.6% and the occasional fish consumers at 7.0%. The number of consumers eating fish daily was the least at 4.7%. Fish samosa was the most preferred of the value added products (45%) compared to fingers and balls (10% respectively). About 92.7% were willing to incorporate value added products in their diet while 7.3% were not. The main reason for fish consumption was for health benefits (37%) compared to taste (32%), easy to cook (14%) and availability (12%). Age was the only factor that showed a relationship with the quantity of fish purchased. Fried form of fish was the most preferred compared to smoked and dried forms. It is recommended that consumption of African catfish to be promoted in the county since it is viable for production.

Key word: Fish value added products, preference, consumers.

DÉTERMINATION DES PRÉFÉRENCES POUR LES PRODUITS À VALEUR AJOUTÉE À BASE DE POISSONS CHEZ LES RÉSIDENTS DE WOTE TOWN DANS LE COMTÉ DE MAKUENI AU KENYA

Résumé

Une etude a été menée au cours d'une campagne de consommation de poissons, dont le but était de déterminer les poissons et les produits à valeur ajoutée à base de poissons préférés par les consommateurs dans le comté de Makueni. Les données produites par l'étude sont importantes dans la mesure où elles permettent de donner des conseils aux acteurs de la chaîne de valeur aquacole, notamment les pisciculteurs, les négociants, les transformateurs et les décideurs. Les données ont été obtenues par administration aléatoire de questionnaires à des répondants auxquels des produits de pêche ont été servis. Au total, 60 questionnaires ont été administrés. La quantité moyenne de poisson consommée par un ménage était de 0,74 ± 0. 6 Kg / visite de marché. Le tilapia du Nil était l'espèce de poisson la plus préférée (74%), par rapport à la perche du Nil (10%), au poisson-chat africain (5%) et aux autres espèces (3%). Les poissons d'élevage ont contribué pour 43%, les poissons du lac Victoria 40% tandis que les poissons provenant d'autres sources constituaient 8% de l'ensemble des poissons fournis dans le comté. Un certain nombre de répondants (9%) n'était pas sûr des sources des poissons consommés. Les résultats ont révélé

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que les consommateurs qui mangeaient du poisson une fois par semaine constituaient 48,8%, deux fois la semaine 20,9%, une fois le mois 18,6% et les consommateurs de poisson occasionnels 7,0%. Le nombre de consommateurs quotidiens de poissons était le moins élevé (4,7%). Le samosa de poisson était le plus préféré de tous les produits à valeur ajoutée à base de poissons (45%) par rapport aux bâtonnets et boulettes de poissons (10% respectivement). Près de 92,7% étaient disposés à incorporer les produits à valeur ajoutée dans leur régime alimentaire, contre 7,3%. La principale raison de la consommation du poisson était ses bienfaits sanitaires (37%) qui primaient sur le goût (32%), la facilité de préparation (14%) et la disponibilité (12%). L'âge est le seul facteur qui a montré une relation avec la quantité des poissons achetés. La forme frite était la plus préférée par rapport aux formes fumées et séchées. Il est recommandé de promouvoir la consommation du poisson-chat africain dans le comté, car il y est viable pour la production.

Mots-clés : produits à valeur ajoutée à base de poissons, préférence, consommateurs.

Introduction

The world fish food supply is growing at an average of 1.5 percent higher than the 1.7 percent world population growth (FAO, 2012). The world per capita fish consumption has increased from an average of 9.9 kg in the 1960s to 14.4 kg in the 1990s and 19.7 kg in 2013 (FAO, 2016). In Kenya, the fisheries sector plays an important role in the national economy contributing about 0.5% to the GDP in 2011. Fish and fishery products are high in protein and essential minerals in human diet (Rashilah *et al.,* 2010) and therefore the per capita fish consumption is expected to continue increasing (FAO, 2008). Previous studies on fish source preferences have indicated a preference to capture fisheries than aquaculture products with consumers viewing farmed fish as fish of low quality and unsafe for human consumption (Meas and Hu, 2014). In view of this, the future preference of fish and fishery products especially in the developed countries would be determined by quality assurance, food safety, freshness, diversity and convenience (FAO, 2012).

The main fish preferred in North Europe and North America is dermasal fish while cephalopods are the favorites for Mediterranean and Asian countries (FAO, 2008). In Kenya, the demand for aquaculture fish products is increasing due to the rapid population growth and the declining catches from capture fisheries (Githukia *et al.,* 2014). The main freshwater species are Nile Tilapia (*Oreochromis niloticus*), African catfish (*Clarias gariepinus*) Omena (*Rastrineobola argentae*), Nile perch (*Lates niloticus*) and Nile Carps. Tilapia (*Oreochromis niloticus*), African catfish are the main cultured species in the country with the supply of the other fish species coming from inland capture fisheries. Owing to its high perishability and shorter shelf life, fresh fish is of little significance at the international trade (FAO, 2012). The increasing demand for products that have longer shelf life, cater for consumer taste and diversity of products have placed pressure for fish value addition (FAO, 2012).

Fish preferences and purchasing decisions by consumers are influenced by different attributes. According to (Polanco and Luna, 2010), food purchasing decisions are directed by cultural, psychological, lifestyles, culinary trends and diet restrictions. Socio-demographic information from respondents such as age, gender, marital status, family size, income levels and household size are explanatory variables in previous fish preferences and market research. Studies have further shown that attitude affects the choice of a given product, quantity and quality (Al-Mazrooei *et al.,* 2003). Recent studies have further brought in other attributes influencing consumer purchasing decisions for fish and fishery value added products such as form of the product, package size, method of cooking, price, smell, appearance, taste, size, quality, color, nutritional value, availability and the source of fish (Githukia *et al.,* 2014; Jabbar, 2007). This study focuses on the consumers' preference for the commercially important fresh water

fish species in Kenya and value added fish products. It also investigates the effects of socio-demographic variables on the quantity of fish bought per market visit and also the preferred form of fish species.

Methodology

Study area

The study was conducted at Wote town which serves as the headquarters of Makueni County lower Eastern Kenya ((1° 47' 0" South, 37° 38' 0" East). The town has a population of 56,419, of whom 5,542 are classified as urban dwellers. The main economic activities in the area are trading, fish farming, cash crop and livestock farming. The study area was specifically selected because it's one of the counties in Kenya where aquaculture production has borne huge benefits besides the fact that the inhabitants are not historical a fish eating community. The study was conducted during a fish eating campaign held at Wote town where each constituency of the County was represented. The 60 questionnaire respondents were randomly selected from the people who ate fish in the function. Among the information collected included socio-demographic variables such as age, sex, gender, occupation, income, education level, family size and marital status since they are perceived to influence preferences for products. All socio demographic variables were categorical.

Data analysis

The data was entered and coded under spreadsheet and analyzed using SPPS version 17 for statistical analysis. Descriptive analysis was done by use of means, standard deviation, percentages and frequency distribution of responses. A chi-square test was used to test for significant differences between different classes of socio-demographic variables and products preferences. A two-way ANOVA was used to test for significant differences between different ratings of fish sizes and consumers consideration variables. All statistical tests were considered significant at 95% confidence interval.
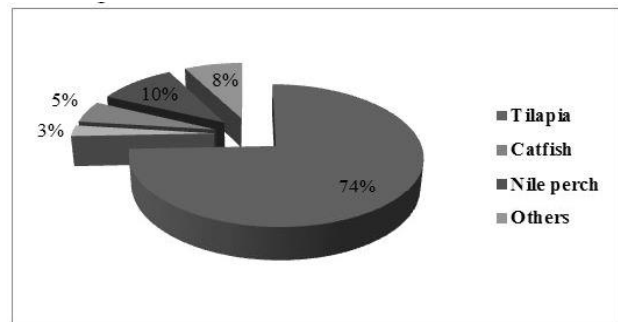
Figure 1: A pie chart illustrating fish species preferences
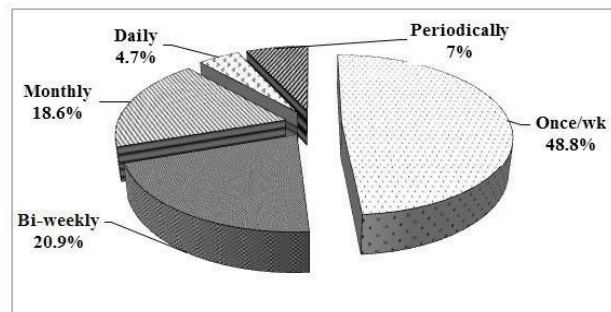
Figure 2: Frequency of fish consumption

Fish preference

Observations on fish preferences are summarized in figure 1. The data indicated a statistical significance in fish preferences among the respondents. ($\chi 2$= 59.63; df= 4; p= .000). Tilapia was the most preferred species (74%), while other fish species were the least preferred (3%). Nile perch was twice more preferred (10%) to catfish (5%). Other small sized fish Omena scored higher preference (8%) compared to catfish and other types of fish but lower than Nile perch and tilapia. Aquaculture contributes 43% of the total fish consumed, 40% from L. Victoria while other sources including rivers contribute 8%. However, 9% of the respondents were not sure about the source of fish.

Frequency of fish consumption

Figure 2. represents a summary of the rate of fish consumption among the respondents. There was a significant difference between the different rates of fish consumption ($\chi 2$=26.65; df=4; p=0.000). Weekly fish consumers were the highest at (48.8%) followed by the bi-weekly consumption respondents at (20.9%) then monthly consumers at 18.6% and periodically

Table 1: Relationship between socio demographic variables and the mean quantity bought per market visit. ± indicates standard deviation

Variables	Mean/market visit	Df	F	p
Gender		1	0.97	0.344
Male	0.81±0.761			
Female	0.60±0.505			
Age(yrs)		4	9.126	0.000
18 to 27	0.59±0.491			
28 to 37	0.60±0.376			
38 to 47	0.48±0.335			
48 to 57	0.69±0.375			
58 to 67	2.50±0.707			
Marital status		2	0.124	0.884
Single	0.75±0.565			
Married	0.75±0.752			
Divorced	0.50±0.27			
Education level		4	0.258	0.903
Illiterate	0.50±0.34			
Primary	0.68±0.73			
Secondary	0.86±0.761			
Post secondary	0.58±0.411			
University	0.63±0.530			
Occupation		3	0.764	0.555
Farmer	1.11±1.019			
Business/Trader	0.64±0.475			
Formal Employment	0.56±0.315			
Casual Laborer	0.90±1.181			
Student	0.63±0.530			
Family size		3	1.701	0.184
1 to 3	0.66±0.553			
4 to 6	0.68±0.610			
7 to 9	1.35±1.140			
>10	0.38±0.177			
Monthly income		3	0.664	0.580
<5000	1.00±0.54			
5000 to 10,000	0.89±0.870			
10,000 to 20,000	0.50±0.306			
>20,000	0.75±0.354			

fish consumers at 7.0%. The least category was for those who consumed fish on daily basis at (4.7%).

Relationship between socio-demographic variables and fish consumption

The relationship between socio-demographic variables and the quantity bought per market visit is presented in Table 1. The average consumption per household was 0.74± 0.6kg/per market visit. There was no significant difference (F=0.917, df=1, p=0.344) between male fish consumers purchasing trend (0.8± 0.76kg/market visit) against female fish consumers (0.6±.51kg/market visit). However, the quantity of fish bought per market visit across the age categories varied significantly (F= 9.126, df= 4, p= 0.000). Respondents between 58 to 67 years bought the highest quantity per market visit (2.50± 0.707kg) followed by 48 to 57 years category (0.69± 38kg) then 28 to 37 and 18 to 27 categories at 0.60± 0.38 kg and 0.59± 0.11kg respectively. The lowest age category was 38 to 47 years at 0.48± 0.34kg/ market visit.

The results also indicated that married couples and single couples bought the highest quantity per market visit (0.75± 57kg and 0.75± 0.75kg respectively while divorcees bought the least (0.5± 0.27kg/market visit). However, there was no significant difference between the quantities purchased by people in the different marital status. Analysis of the relationship between education level and quantity of fish bought per market visit did not show any significant relationship (F=0.258, df=4, p= 0.903). That average quantity bought by secondary school leaver was (0.855±0.76kg/ market visit) followed by primary school leavers (0.67± 0.73kg/market visit) then university and post secondary at 0.63± 0.53 and 0.58± 0.42kg/market visit respectively, while illiterate people bought the least quantity(0.5± 0.34kg/ per market visit). The relationship between occupation and the quantity bought per market visit also did not show any significant difference (F=0.764, df=4, p=0.56). Farmers bought the highest quantity per market visit (1.01±1.02kg) followed by casual laborers (0.9±1.18kg)

then businessmen and students (0.64±0.48kg and 0.63±0.53kg) respectively. The lowest consumers are those in formal employment at 0.56±0.32kg/market visit.

The relationship between quantity bought per market visit and family size did not show any significant relationship (F= 1.701, df= 3, p= 0.184). Families' sizes of between 7 to 9 members purchased the largest quantity per market visit (1.35±1.14kg) followed by those of 4 to 6 members (0.68±61kg) with the purchase quantity per market visit being even lower for family sizes of 1 to 3 members (0.66±0.55kg). The least were family sizes of more than10 members at 0.38± 0.18kg/market visit. The level of family income also does not affect the quantity bought per market visit (F=0.664, df= 3, p= 0.58). Small monthly income earners (<, Ksh5000) purchase the largest quantity per market visit (1.0±0.54kg) followed by Ksh5000 to Ksh10000 earners (0.89±0.87kg) then >, Ksh10000 earners at 0.79±0.72kg and the least were the, Ksh10000 to, Ksh20000 earners at 0.5±0.31kg.

Forms of fish species and their consumption

The results for the preferences of different fish forms (fresh, fried, smoked, salted and dried) are presented in Figure 3. Fried tilapia was the most preferred at (92%) compared to fresh tilapia at 5%. A few respondents (3%) preferred all tilapia forms. All the respondents who consumed other fish preferred them fried. African catfish was preferred in fried form (82%) to dried catfish (9%). Those who preferred all forms of catfish were (9%). Nile perch was preferred in fried and smoked forms. Those who preferred fried Nile perch were higher (67%) compared to 33% for those who preferred it in smoked form. The other fish consumed was Omena and was only consumed when dried.

Fish value added products consumption

Value added fish products consumption was analyzed and the results presented in figure 4. The results indicated a significant difference between those who had consumed value added fish products, those who had

not consumed value added fish products and those who said products were not available. (χ^2= 7.302; df= 2; p= 0.026).Those who had not consumed value added fish products were higher (44.2%) compared to who have consumed (41.9%) and for those who said the products were not available (14%). On the willingness to incorporate the products in their daily meal, majority of the respondents (92.7%) were willing to incorporate the products while a few of them (7.3%) had a contrary opinion on incorporating the products in their daily meal. The most preferred fish value added product was samosa at (45%) compared to fish fillet (28%), fish balls and fingers at 10 respectively. Some people had more than one product preference. Those who preferred both samosa and fish fingers were higher (5%) than those who preferred both samosa and fish fillet (3%). However, a χ^2-test did not indicate any significant difference in the products preferences (p= 0.52).

Consumers' considerations when buying fish products

The ratings of factors affecting the buying of fish products are presented in table 2. More than a half of the respondents (55%) considered the health value as being an important factor while 54% deemed source of fish being not important. Processed form of fish was considered important (49%) whereas 17% of the respondents rated size of fish as being slightly important. Analysis of variance indicated significant difference between the rating levels of consumer consideration (F= 11.538; df= 3; p= 0.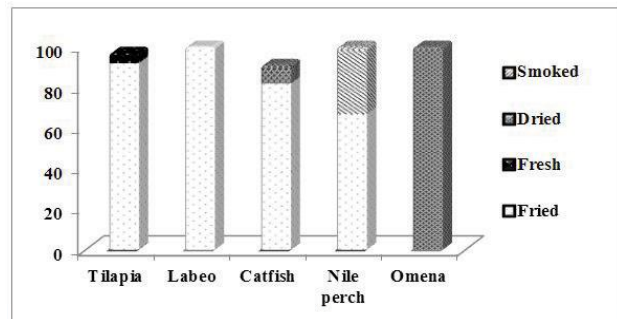00705). However, there was no significant difference between the consumers consideration factors (F= 0.014; df= 8; p= 1.000).
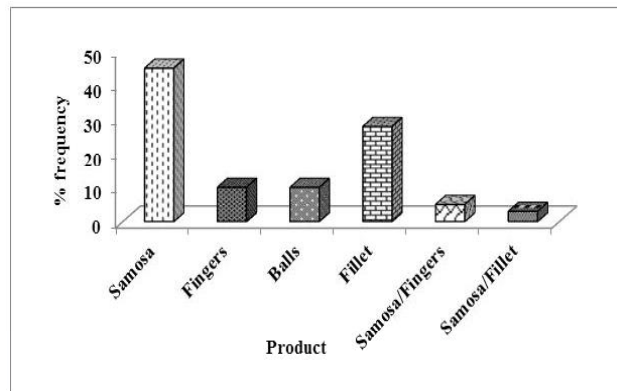
Sources of fish in Makueni County

The sources of fish in Makueni were
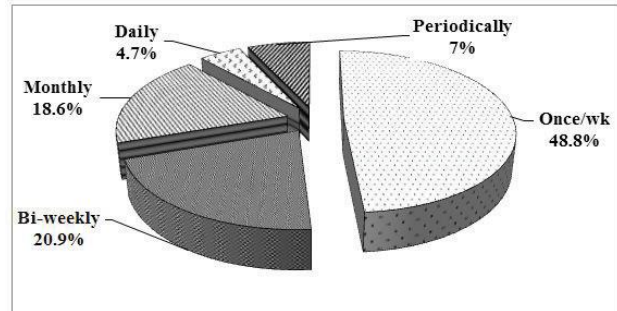
**Figure 2:** Frequency of fish consumption


Figure 3: Fish form preferences

Figure 4: Comparison of value added products preferences

Table 2: Rating of fish consumers' consideration factors

	Price	Appearance	Taste	Size	Value	Health	Availability	Source	Form
Very important	48%	35%	50%	34%	49%	55%	42%	31%	33%
Important	27%	48%	45%	34%	30%	32%	35%	5%	49%
Slightly important	9%	10%	2%	17%	16%	11%	14%	10%	9%
Not important	16%	8%	2%	15%	5%	2%	9%	54%	9%
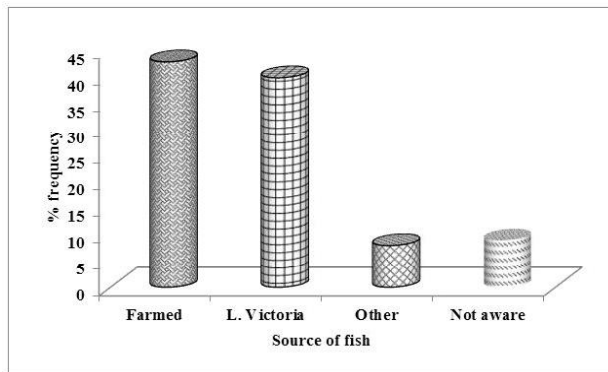
Figure 5: Comparison of fish sources in Makueni county
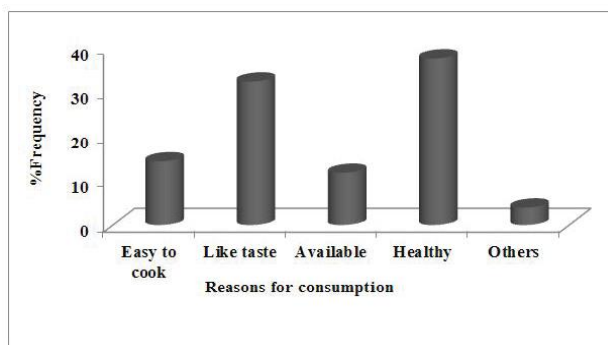
Figure 6: Comparison of reasons for fish consumption

analyzed and presented in figure 5. There was a significant difference between the different fish sources. (χ^2=24.074; df=3; p= 0.000). Majority of the respondents indicated that their fish came from fish farms (43%); another 40% confirmed that their fish came from L. Victoria while a few sited other sources (8%) including dams and rivers. Those who were not aware about the sources of fish constituted (9%) of the respondents.

Reasons for fish consumption

The reasons for fish consumption are summarised in figure 6. A significant difference existed between the various reasons given (χ^2= 31.896; df= 4; p= 0.000). Majority of the respondents consumed fish because they thought it was healthy (37%) while those who said they liked the taste were 32%. Those who said fish was easy to cook were 14% while those who ate fish due to its availability were 12%.

Discussion

The results of this study have indicated a higher preference for Nile tilapia (74%) compared to 10% and 5% for Nile perch and African catfish respectively. Other fish were the least preferred at 3%. Other species also consumed by the respondents was Omena at 8%. The main cultured fish species in Kenya are Nile tilapia and the African catfish (Nyonje *et al.,* 2011). However, tilapia normally contributes a bigger share of the market supply since it accounts up to (70%) of the total aquaculture production compared to catfish which contributes 21% of the total aquaculture production in Kenya. The higher preference for tilapia from this study could be associated with its large production hence readily available at the market compared to the African catfish. Obiero *et al.,* (2014) noted that some consumers took fish because it was readily available. The findings were in agreement with previous studies which indicated higher preference for tilapia in Kenya (Obiero *et al.,* 2014; Githukia *et al.,* 2014). Dalhatu and Ala, (2011) also noted higher preference of tilapia from a study of fish preference in Sokoto State, Nigeria.

The fish consumption frequencies of the respondents were daily, weekly, bi-weekly, once a month and periodically. All the consumption rates were represented in the study. However, it was revealed that most of the respondents preferred consuming fish once a week (48.8%) and a few (4.7%) respondents consumed fish daily. Makueni is mainly inhabited by Akamba community who are not traditionally fish eaters. The highest fish eating regions in Kenya are the Western, Coast and Nyanza (Aloo, 2006). Thus the lower representation of daily fish consumers in this study may be associated with the cultural fish consumption habits of the Akamba community. The findings of this study agreed with Obiero *et al.,* 2014 who also noted that once a week consumers were higher while daily fish consumers were the lowest. However, the findings conflicts with (Haq *et al.,* 2014) who stated that once a month fish consumers were highest while twice a week consumers

were the lowest.

Socio-demographic variables such as age, gender, occupation, family size, marital status and education level are believed to influence consumers preference for product (Quagrainie, 1998). Though education is believed to enlighten consumers about the health related benefits of fish consumption (Kinnucan *et al.,* 1993), the findings of this study have not indicated any significant difference across the different education levels. University and post secondary graduates who were expected to be more enlightened purchased less per market visit (0.63±0.53 and 0.58±0.42 respectively) compared to primary and secondary school leavers (0.67±0.73 and 0.855±0.76 respectively) who were considered to be less enlightened.

As it would be expected, the quantity purchased by a family should be determined by the family income and size. Families with higher incomes and larger number of family members are expected to purchase larger quantities of fish per market visit. However, the findings of this study have not indicated any relationship between family income and size with the quantity purchased per market visit. The average purchased for a household per market visit was very low (0.74kg/per market visit).

The study indicated higher consumption of fish among older people (58 to 67 and 48 to 57 years) and male consumers compared to female and youth consumers. According to (Darko, 2011), females usually are the main shoppers in a family while the young play an important role in future fish consumption. It's therefore necessary for fish producers to attract and retain more consumers from these two groups in future. Unlike Githukia *et al.,* (2014), who noted that larger fish consumers were skewed towards the young people, the high fish consumers of this study were skewed towards the elderly people in Makueni County. Occupation as a factor is also thought to influence fish consumption level. Interestingly, low income earners (<Ksh5000) purchased the larger quantity per market visit compared to large income earners (Ksh10000 to 20000 and >Ksh20000).

Fried tilapia was the most preferred form compared to smoked form. This could be associated with the habit of people in Kenya to consume fried tilapia with ugali which is a local dish most consumed throughout the country (Quagrainie, 2010). In general, fried form is the most preferred to smoked and dried forms except Omena which is preserved by drying after being landed.

Most of the respondents consumed fish for health reasons. The respondents were aware of the health benefits of fish consumption such as reduction of risks of heart attack and good brain development for the unborn child. (Githukia *et al.,* 2014). Nauman *et al.,* (1995) also noted that most consumers surveyed consumed fish because it was healthy. The value added products presented to respondents were fish samosas, fingers, and fillet and fish balls. Larger proportions of the respondents (59.1%) were taking fish value added products for the first time compared to 41.9%who had earlier taken the products. Fish samosas were the most preferred with a larger proportion attributing the taste to be delicious compared to the other products presented to them. Majority of the respondents also indicated interest in incorporating the products in their daily diet.

Studies by Polanco and Luna, (2010) have shown that food purchasing decisions are directed by cultural, psychological, lifestyles, culinary trends and diet restrictions. In this study, the purchasing decision attributes considered were price, healthiness, and availability of fish, source of fish, processed form, and taste among others. Healthiness of fish was considered as the most important attribute influencing purchasing decision of fish consumers while the source of fish rated as not important in decision making. The findings were not in agreement with Githukia *et al.,* (2014; Jabbar *et al.,* (2007) who noted that purchasing decision of fish consumers are based on prices and cooking methods respectively. Fish in Makueni County came mostly from two main sources; L. Victoria and aquaculture farms. However, there were other sources such as rivers and dams which also supplied the market but in small

quantities as shown by the smaller proportion of the respondents.

Conclusion

Most of the respondents preferred consuming fish at the rate of once per week with the most preferred fish species being Nile tilapia and fish samosa as the most preferred value added fish product. The association tests conducted did not indicate any significance relationship between the quantity purchased per market visit and the socio demographic characteristic except age. It can therefore be concluded that age affect the level of fish consumption. Most of the respondents liked fish fillet while small fish was not preferred. It is clear from this study that many people were aware of the health benefits of consuming fish since majority of the respondents consumed fish for health reasons. Fried fish form was the most preferred compared to the smoked and dried fish forms.

Nile tilapia and African catfish are the main cultured fish species in Kenya. However, African cafish is not available in most places. This coud be due to its lower contribution to the total aquaculture production and lower supply at the market. The government should therefore encourage African catfish production through the aquaculture development initiatives such as supplying quality catfish fingerlings to farmers and promoting its farming. It is also necessary to diversify fish and fishery products so that consumers have a varriety of products to choose from. Fish studies in Kenya have shown high preference for fried fish compared to smoked and dried forms. According to this study, some other fish species such as Labeo and Omena should also be promoted since they are 100% consumed in fried and dried forms respectively thus reducing wastage. Value added fish products consumption campaigns should be intensified especially in rural areas since this study has indicated that most people are either not aware of the products or have never consumed fish value added products.

Acknowledgements

Public Brief:

A policy to promote consumption of fish and fish products should be implemented in the respective counties in Kenya for health and wealth.

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