

Full Length Research Paper

Marketing potential of improved dried sardine (*Sardinella gibossa*) and capelin (*Mallotus villosus*) in the Southern Kenyan coast

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Traditional dried small fish are an important source of protein for low income people in many developing countries. The aim of this study was to determine marketing potential of improved dried sardine and capelin as new products in markets accustomed to traditional dried small fish. One hundred and twenty participants were recruited among shoppers at supermarkets and open-air markets in Kenya. Each participant received 500 g of each product to be prepared and consumed at home, before evaluating acceptability and willingness to buy. The products obtained high acceptability ratings. Middle income classes were willing to pay up to USD 6 for 500 g of capelin but USD 4 for sardine, while low income classes were willing to pay up to USD 4 the reference price for both products. There is market potential for new dried small fish products that are of improved quality among consumers accustomed to traditionally dried fish.

Key words: Marketing, capelin, sardine, acceptability, willingness to buy.

INTRODUCTION

In Eastern Africa, particularly Kenya, Uganda and Tanzania, there is a high demand for dried fish, mainly small pelagic species (IOC, 2012). Originally, the main market for small pelagic fish was the animal feeds industry. However, due to an increase in human population, reduced availability of high value fish species in local markets and improved fish drying methods, over 80% of small pelagic fish now goes to human

consumption (IOC, 2012). Consumer preference for dried small pelagic fish is not only because of the flavor, but also the reasonable price, availability and stability during storage (Oduor-Odote et al., 2010). Dried small pelagic fish are traditionally sold in open-air markets in small portions to meet the needs of the low income class (FAO, 2007; Oduor-Odote et al., 2010).

The growth of the middle class in East Africa

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(African Development Bank, 2014) and reduced availability of high value species (IOC, 2012) has resulted in a demand for premium dried small pelagic fish. Small pelagic fish dried on improved traditional racks raised on ventilated platforms in open-air, are widely available in open-air markets (Oduor-Odote et al., 2010). But their quality is still uncertain owing to dependence on weather conditions and mostly it does not meet the local food regulation standards (Kenya Bureau of Standards, 2015; Langat and Rey, 1999). Quality uncertainty notwithstanding, small quantities of packed fresh water dagaa (*Rastrineobola argentea*) dried on racks have gained access to national retail stores, largely supermarkets, although a much higher proportion is still sold unpackaged in open-air markets.

There is a growing awareness of the nutritional and health benefits associated with fish consumption, especially the omega-3 polyunsaturated fatty acids (Bilgin et al., 2008; Stołyhwo et al., 2006). Dried small fish are highly nutritious (Jain and Pathare, 2007) and improving the quality, and marketing in national retail stores is likely to increase consumption among the middle class. This will raise the value of the fishery thereby creating more employment and higher income along the value chain, especially among women who play an important role in the processing and marketing of this fishery (Schuurhuizen et al., 2006).

Fresh water dagaa (*R. argentea*) landed from the Kenyan part of Lake Victoria was about 92,000 MT comprising about 54% of the total catch of fish in Kenya (Lake Victoria Basin Commission, 2015; Munguti et al., 2014) and sardine landings estimated at 535 tons being 6% of 8,947 tons of artisanal marine fish landed (Warui, 2014) cannot meet the existing demand. Most developing countries import low value fish while they export more valuable species landed from their waters. In 2008, 75% of fishery exports (in value terms) from developing countries were exported to developed countries, while 40% of fish they imported (in value terms) for local consumption (mainly low-priced small pelagic and also high-value species for their processing industries) originated from the developed countries (FAO, 2010). Capelin landing in Iceland has exceeded half a million tons in recent years (Statistics Iceland, 2015). Capelin is not used in Iceland for human consumption and most of it is reduced to fish meal and oil (Statistics Iceland, 2015; Shahidi et al., 1995). Therefore, there is a potential to introduce dried capelin as a new product into the East African markets.

The choice and acceptability of a food product is mainly based on sensory properties. If a product has low sensory acceptability, no brand or nutritional and/or health benefit promise will manage to get it accepted by consumers (Sosa et al., 2008; Hough et al., 2006). But if a product has high sensory acceptability, there are additional issues that have to be resolved to ensure overall acceptability, for instance packaging, price,

convenience and cultural habits. In the East African markets, fish price is a major determinant of consumer purchasing decisions (IOC, 2012). Before deciding on the introduction of a new product into the market, it is necessary to obtain information about sensory acceptability and possible pricing of the product (Grunert et al., 2009; Sosa et al., 2008). Such information can also aid in deciding on the launching strategy.

Home use tests and standardized situation tests are universally used in consumer research (Boutrolle et al., 2007; Sosa et al., 2008). Home use tests are more reliable as they are conducted in a setting where the product being tested is normally consumed (Boutrolle et al., 2007; Boutrolle et al., 2005). Larger amounts of products tend to be consumed in home use test and consumers are free to choose when to prepare and consume the product (Boutrolle et al., 2007, 2005). Since dried small fish are mainly cooked and consumed in the homes as part of the main course of a meal, home use test was found to be ideal for the current study. In Kenya, the majority of low income consumers shop for food in open-air markets whereas middle income groups especially in towns do most of their shopping in supermarkets. Therefore, Mombasa city and Kwale County in Kenya were selected for the study. Mombasa is cosmopolitan in nature and hosts the main supermarkets along the Kenyan coast, with the majority of its population belonging to middle income class (Ipsos-Synovate, 2013; Kenya National Bureau of Statistics, 2015). The main sardine landing beaches along the Kenyan coast are in Kwale County where consumption of dried sardine is widespread. Majority of the population in Kwale belong to the low income class (Ipsos-Synovate, 2013; Kenya National Bureau of Statistics, 2015).

The objective of this study was to determine the marketing potential of dried sardine of improved quality and indoor dried capelin among low and middle income consumers presumed to be represented by respondents shopping in open-air markets and supermarkets, respectively. The information is necessary to evaluate the feasibility of improving drying methods and packaging of sardine, and the introduction of new dried fish products such as capelin to the markets accustomed to traditionally dried small fish.

MATERIALS AND METHODS

Samples

Sardine were dried on raised rack drier in Mombasa, Kenya and packed in sealed polyethylene bags weighing 500 g each before the study (water content 24%, fat 9%). Capelin were dried under controlled drying conditions (Cyprian et al., 2015) in Iceland and transported by air freight to Mombasa Kenya. Capelin (water content 19.5%, fat 27%) was packaged in the same way as sardine in polyethylene bags weighing 500 g. Processing and packaging complied with local food regulations (Kenya Bureau of Standards, 2015; Langat and Rey, 1999).

Subjects/Respondents

The study was carried out in Mombasa city and Kwale County that are located in southern part of the Kenyan coast. Participants were recruited among shoppers in three supermarkets in Mombasa and three open-air markets in Kwale County over a four week period. They were adults willing to take part in the study. Their contact details for instance phone number and place of residence were obtained. In the open-air markets, a local person from each area was hired during the period of study to collect completed questionnaires. Participants shopping in supermarkets returned completed questionnaire at the supermarkets and those who returned completed questionnaires could win a prize which were announced in the radio. A total of 120 consumers participated; 60 supermarket shoppers and 60 open-air market shoppers.

Evaluation protocol

The participants among shoppers in the open-air markets were visited in their homes twice, while those from supermarkets returned completed questionnaires at the supermarkets. Home use test was used in this survey. Participants were given a pack of the first product (500 g) with the instructions that they were free to prepare the product as they habitually do when it suited them best together with family and/or friends and complete the questionnaire within one week. Completed questionnaires were returned by participants from supermarkets on a specified date at the supermarket, and were collected during the first visit a week later for participants from open-air markets. Once the completed questionnaires were collected, the respondents received the second product (500 g) to be consumed within one week's time. Product presentation order was balanced while issuing out products with a half the number of participants receiving the sardine first and the other half got the capelin first.

Questionnaire

Standardized structured questionnaires were administered to respondents to rate their liking of the product appearance, flavour and texture using a 9-point hedonic scale ranging from 1 (dislike extremely) to 9 (like extremely). Respondents were also asked about their general willingness to buy 500 g of the products at US dollars (USD) 2, 4, 6 and 8 on a 9-point scale from 1 (very unlikely) and 9 (very likely). The participants were informed that the price of dried sardine in the market was around USD 4 (reference price). Socio-economic demographic questions (gender, religion, education level, occupation, household size and who consumes dried fish in the household) was also included in the questionnaire since they have been found to relate to the preferred type of food and reason for purchase (Green et al., 2003; Obiero et al., 2014). The questionnaires were translated into local dilate ('Swahili') and briefly explained to participants when they received the first product. On returning completed questionnaires (supermarkets shoppers) or during the first visit, seven days after giving out the first product (open-air markets shoppers), completed questionnaires were collected and the respondents received the second product (500 g) with the same instructions. Within seven days, participants were contacted and the supermarket shoppers were asked to return completed questionnaires, whereas open air market shoppers were informed of a planned second visit to collect completed questionnaires about the second product. The whole process, across the study areas lasted four weeks.

Data analysis

Data was analyzed using the Statistical Package for the Social

Sciences (IBM - SPSS Inc. version 20.0). Descriptive analyses were done by use of means, standard error, percentages and frequency distribution of responses. The influence of product presentation order, product liking rating and willingness to buy based on the product type and shopping location were tested with ANOVA (score = product × subject/consumers) followed by Duncan's means separation test (Post-hoc) for differences between groups. P values of < 0.05 were considered significant.

RESULTS AND DISCUSSION

Socio-economic profile of fish consumers

A hundred and twenty completed questionnaires were collected (60 supermarket shoppers and 60 open-air market shoppers). This number of respondents is considered according to Hough et al. (2006) to be adequate for a consumer test. The socio-demographic characteristics of the two groups differed (supermarkets and open-air markets) except for gender that was relatively similar in both groups (Table 1). Although more than half of the participants (58%) were women, the proportion was less than expected as females are the primary shoppers of households in most parts of Africa (Obiero et al., 2014; Schuurhuizen et al., 2006). Women were less willing than men to participate in the study, possibly because of a high rate of illiteracy among the women. Majority of respondents shopping in open-air markets were Muslims (80%) unlike the supermarkets which were dominated by Christians (67%). This was expected given that the population of Kwale County is largely Muslims while a higher proportion of the population in Mombasa is Christians.

Seventy-two percent of the respondents shopping in open-air markets had only elementary education, followed by high school level (28%) with none of the respondents having obtained a university degree (Table 1). Sixty-three percent of respondents shopping in supermarkets had completed high school, followed by those with a university degree (30%) and elementary education (7%). Most of the respondents shopping in open-air markets were working as fishermen (27%), businessmen (27%) and farmers (25%) with the most common household size of 7 to 9 people. The respondents shopping in supermarkets were mainly working for private companies (48%) and government (30%) with a common household size of 4 to 6 people.

Respondents shopping in open-air markets consumed dried fish more frequently (33%, more often or equal to four times a week) than those shopping in supermarkets (5%, more often or four times a week) (Table 2). This indicates that shoppers in open-air market consume dried fish on a regular basis. Consumption of dried fish was negatively influenced by education, with high consumption frequency among less educated consumers (Table 2). Educated consumers are generally more aware of the health and other benefits associated with fish consumption. In a study on preferences for fish and

Table 1. Socio-economic profile of respondents shopping in supermarkets (Mombasa) and open-air markets (Kwale) in Kenya.

Variable	Response	Village markets, % (n=60)	Supermarkets, % (n=60)	Average, % (n=120)
Gender	Male	43.3	41.7	42.5
	Female	56.7	58.3	57.5
Religion	Islam	80.0	33.3	56.7
	Christian	20.0	66.7	43.3
Education level	Elementary	71.7	6.7	39.2
	High school level	28.3	63.3	45.8
	University level	0.0	30.0	15.0
Occupation/Working with	Government	5.0	30.0	17.5
	Private company	19.0	48.3	29.2
	Farmer	25.0	0.0	12.5
	Fisherman	26.7	3.3	15.0
	Businessman	26.7	6.7	16.7
	Unemployed	6.7	11.7	9.2
Household size	1 - 3	3.3	8.3	5.8
	4 - 6	28.3	58.3	43.3
	7 - 9	46.7	30.0	38.3
	> 10	21.7	3.3	12.5
Purchase location	Open market	95.0	58.3	76.7
	Supermarket	5.0	41.7	23.3
Consumer in family	Child/children	5.0	18.3	11.7
	Adults	1.7	13.3	7.5
	All members	93.3	68.3	80.8

Table 2. Dried fish consumption pattern among respondents at the coast of Kenya divided by shopping location and education level.

Education level/shopping location	% respondents consumption frequency					
	Less than once a month	Once a month	2-3 times a month	Once a week	2-3 times a week	More often
Elementary education	4.3	6.4	14.9	10.6	29.8	34
Secondary education	22.2	5.6	38.4	11.1	11.6	11.1
University degree	25.6	20.9	18	18.2	8.2	9.1
Village markets	1.7	8.3	10	16.7	30	33.3
Supermarkets	30	8.3	33	11.7	11.7	5

seafood using an 'evoked set' analysis education was found to positively influence peoples preference for fish (Kinnucan et al., 1993). Health benefits are however questionable when it comes to low quality products that are contaminated. Kenyan consumers consider dried small pelagic fish to be an inferior quality product sold mainly in rural areas (Oduor-Odote et al., 2010), where a majority of the population are poor with limited education.

A majority of the respondents shopping in the supermarkets are most likely middle class as they were mainly working for private companies or government and had relatively small households. Therefore, they are able to purchase more expensive protein sources than dried fish whose quality is uncertain and not often available in the supermarkets.

Dried fish is largely sold in open-air markets, with 95

Table 3. Overall acceptability of improved dried sardine and indoor dried capelin. Average (Std. Error) values based on a 9-point hedonic scale ranging from 1 (dislike extremely) to 9 (like extremely) (n=120).

Sensory attribute	Capelin		Sardine	
	Open market	Supermarket	Open market	Supermarket
Overall acceptability*	8.0 (0.2) ^a	7.1 (0.3) ^b	7.7 (0.2) ^a	7.0 (0.2) ^b
Appearance***	8.4 (0.2) ^a	7.8 (0.2) ^b	6.8 (0.2) ^c	6.8 (0.2) ^c
Flavour***	6.7 (0.2) ^a	6.3 (0.2) ^a	7.6 (0.2) ^b	7.4 (0.1) ^b
Texture	7.2 (0.2)	7.4 (0.2)	7.0 (0.2)	7.1 (0.2)

^aDifferent letters (superscript) indicate significantly different values between samples within a row. *p < 0.05, ***p < 0.001.

and 58% of respondents shopping in the open-air markets and supermarkets, respectively purchasing dried fish in open-air markets (Table 1). Forty two percent of supermarket shoppers and 5% open-air markets shoppers purchased dried fish from supermarkets. The low proportion of consumers purchasing dried fish from supermarkets is mainly attributed to restricted sales of dried fish to low price open-air markets and people with low income in Kenya (Oduor-Odote et al., 2010) with only small quantities reaching national retail stores/supermarkets.

Product acceptability

The products were generally well received with acceptability rating scores ranging between seven and eight (Table 3). Although the overall acceptability values were relative for both products, respondents shopping in open-air markets rated both products higher than those shopping in supermarkets. Open-air shoppers rated the products higher as familiar and regular consumers of dried fish. The result is in agreement with a study by Boutrolle et al. (2005) who reported that greater familiarization with a product which resulted in higher acceptability ratings. Dried capelin had significantly (p<0.05) higher appearance rating irrespective of the respondents' shopping location. On the other hand, sardine obtained the highest flavor rating. Texture was not significantly different (p>0.05) between the two locations, with a higher rating for capelin than sardine. Capelin appears to be attractive to consumers but the flavor was moderately ranked and needs to be improved. Both dried capelin and improved processed sardine were acceptable in the Kenyan markets and could in general be accepted in East African markets accustomed to dried small fish.

The socio-demographic did not appear to influence product acceptability except for level of education (Table 4). Earlier studies (Obiero et al., 2014; Green et al., 2003; Kinnucan et al., 1993) reported similar results where education was reported to primarily determine the consumers occupation and in this case the income. Most

respondents shopping in the supermarkets commented that poor quality dried products (contaminated with soil) and unavailability in national retail stores limited dried fish consumption among the group. Even though the majority of respondents shopping in supermarkets were irregular dried fish consumers, they rated products highly implying that they might accept new dried fish products such as capelin if quality could be improved. Gender, religion and household size had no significant influence on product acceptability.

Respondents' willingness to buy

The results shows consumers were willing to buy the products irrespective of the shopping location (Table 5). The average values of willingness to buy capelin and sardine were relatively high and very close, with a significant difference (p<0.05) only obtained based on respondents shopping location. Those shopping in open-air markets were more willing (p<0.05) to purchase the products than those shopping in supermarkets. This may be because consumers shopping in open-air markets were more familiar with dried fish.

On the specific amount of money, the respondents were willing to pay for 500 g of the product, open-air markets and supermarkets shoppers had high rating for both products at USD 2, but significantly higher rating was obtained for capelin than sardine (Table 5). Consumers were not willing to pay more than the reference price of USD 4 for improved dried sardine, but supermarket shoppers were willing to pay up to USD 6 for dried capelin (Table 5). The unwillingness of consumers to pay more than the reference price for sardine could be that they were not able to see the difference of improved dried sardine from traditionally dried. Sosa et al. (2008) reported food product choice and acceptability to be based on the sensory properties. Sardine was dried in raised drier that depended on weather conditions and may have only reduced contaminations from the environment (such as soil) but not lipid oxidation that affects color development during drying resulting in unattractive products. Also, the

Table 4. Overall acceptability (1 = “dislike extremely” to 9 = “like extremely”) and willingness to buy (1 = “very unlikely” to 9 = “very likely”) of dried capelin and improved dried sardine by demographic variables. Responses from open market and supermarket compiled.

Variable	Character/Response	Overall Acceptability		Purchase intent	
		Capelin	Sardine	Capelin	Sardine
Gender	Male	7.4 (0.2)	7.3 (0.2)	7.8 (0.3)	7.5 (0.2)
	Female	7.6 (0.2)	7.4 (0.2)	7.9 (0.2)	7.6 (0.2)
	P-value	0.517	0.623	0.769	0.645
Religion	Islam	7.8 (0.2)	7.5 (0.2)	8.0 (0.2)	7.7 (0.2)
	Christian	7.2 (0.3)	7.2 (0.2)	7.6 (0.2)	7.5 (0.1)
	P-value	0.83	0.223	0.207	0.45
Education level	Elementary	7.9 (0.3) ^a	7.6 (0.2) ^a	8.2 (0.3) ^a	7.9 (0.2) ^a
	High school	7.5 (0.2) ^a	7.7 (0.3) ^a	7.8 (0.2) ^{ab}	7.6 (0.3) ^a
	University	6.6 (0.5) ^b	6.4 (0.2) ^b	7.1 (0.4) ^b	6.9 (0.2) ^b
	P-value	0.028	0.045	0.046	0.039
Household size	1 to 3	8.3 (0.5)	7.4 (0.7)	8.1 (0.5)	8.3 (0.3)
	4 to 6	7.4 (0.3)	7.3 (0.2)	7.6 (0.2)	7.3 (0.2)
	7 to 9	7.4 (0.3)	7.4 (0.2)	7.8 (0.3)	7.8 (0.2)
	Equal to/More than 10	8.3 (0.4)	7.5 (0.3)	8.4 (0.3)	7.5 (0.3)
	P-value	0.203	0.929	0.402	0.091

^aDifferent letters (superscript) indicate significantly different values between samples within a column for a specific variable ($p < 0.05$).

Table 5. Willingness to buy (1 = “very unlikely” to 9 = “very likely”) capelin and sardine at specified amount (1 USD =100 KES).

Willingness to buy	Capelin		Sardine	
	Open market	Supermarket	Open market	Supermarket
Unlikely/Likely to buy ^{***}	8.33 (0.191) ^a	7.30 (0.212) ^b	7.97 (0.130) ^a	7.18 (0.192) ^b
At USD 2 ^{***}	8.57 (0.209) ^a	8.83 (0.135) ^a	7.90 (0.134) ^b	7.78 (0.209) ^b
At USD 4 ^{***}	6.73 (0.271) ^a	7.48 (0.212) ^b	6.12 (0.167) ^a	5.20 (0.261) ^c
At USD 6 ^{***}	4.03 (0.223) ^a	6.40 (0.234) ^b	3.15 (0.187) ^c	2.13 (0.211) ^d
At USD 8 ^{***}	1.43 (0.133)	3.80 (0.260) ^a	1.18 (0.087)	1.15 (0.085)

^aDifferent letters (superscript) indicate significantly different values between samples within a row, ^{***} $p < 0.001$.

reference price used in the study was based on the supermarket price of a product similar to the improved sardine used in this study and therefore more expensive than traditional dried sardine sold at about USD 3 in open-air markets.

Conclusions

Dried capelin and improved dried sardine received relatively high acceptability ratings. However, the products differed in definite attributes with capelin obtaining significantly higher ratings for appearance, while sardine obtained significantly higher flavor ratings. These resulted in high acceptability rating for capelin especially among the consumers shopping in supermarkets. Consumers

shopping in supermarkets considered to represent middle income groups were willing to pay up to USD 6 for 500 g of capelin. Consumers shopping in open-air markets who consume dried fish on regular basis were willing to buy 500 g of dried capelin and sardine at up to KSH 400. The consumers of traditional dried small fish as well as new consumers especially in the middle income class might accept new dried fish products if overall quality could be guaranteed. A follow-up study covering a large geographical area is recommended to assess business feasibility.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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