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GUINEA FOWL (*NUMIDA MELIAGRIS*) VALUE CHAIN: PREFERENCES AND CONSTRAINTS OF CONSUMERS

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ABSTRACT

Despite the increasing production of guinea fowls in most African countries, consumer preference information and constraints remain largely undocumented. A study involving 200 consumers and 50 processors was done in the Tamale metropolis to assess their respective roles in the guinea fowl value chain. Consumers were categorised into households and institutions. Household consumers were further partitioned into lower-, middle- and upper-income classes. Most (99%) of the consumers interviewed ranked guinea fowl meat as their most preferred poultry product, and taste was ranked as the top most reason for their choice. A large proportion of household and institutional consumers ate guinea fowl meat once monthly (42%) or weekly (33.5%). All categories of consumers preferred farmers as the source of birds for consumption. Live birds were the most preferred form of guinea fowl by both consumers and processors. Most (93.7%) consumers indicated that there are seasonal fluctuations in the price of guinea fowl leading to the use of products that are substitutes for guinea fowl. Price instability was ranked as the top constraint to guinea fowl consumption in the metropolis. Beef was the cheapest fresh guaranteed halal meat product on the market, and the prices of beef, mutton and chevon were the most stable, while that of the guinea fowl was the least stable. Institutional consumers used guinea fowls more frequently ($p<0.05$) as compared to household consumers. Similarly, upper- and middle-income households, as well as male heads of households used guinea fowls more frequently ($p<0.05$) as compared to low-income and female heads of households. Most (60%) processors processed birds either once weekly or monthly. The level of education of the heads of households had no effect ($p\geq0.05$) on the frequency of use of guinea fowl meat. There was also no difference between male and female heads of households in preference for guinea fowl packaging. Similarly, household consumers of all income classes chose all packaging of guinea fowl equally, while households and processors ranked friends as the top source of food safety information and institutional consumers ranked television as the number one source of food safety information. Guinea fowls have huge market potential, but the seasonal price fluctuations still remain a challenge. Additionally, the preference for live birds among institutional and household consumers seem to be related to uncertainty about conforming to halal standards in slaughter of birds by processors and poor meat handling and hygiene standards among processors in the metropolis.

Key words: Consumption patterns, packaging, consumer preference, guinea fowl, *Numida meleagris*

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INTRODUCTION

The term "Value Chain" was used by Michael Porter in his book "Competitive Advantage: Creating and Sustaining Superior Performance" [1]. The value chain analysis describes the activities an organization does, and links them to the organization's competitive position. It is a high-level model used to describe the process by which businesses receive raw materials, add value to the raw materials through various processes to create a finished product, and then sell the end product to customers.

Poultry are domestic fowls including chickens, geese, ducks and turkeys that are raised for the production of meat, eggs and feathers. The domestic guinea fowl (*Numida meliagris*) is a poultry bird that derives its name from the guinea coast of West Africa, where it originated [2-3]. The commonest variety of guinea fowl raised in Ghana is the Pearl helmeted guinea fowl [4]. Its origin notwithstanding, the commercial viability of the bird on the African continent is yet to be fully realised [5]. On the contrary, guinea fowl production has proven to be commercially viable and they are raised in large numbers in Europe and the United States of America, where they have been successfully commercialized [5-6]. In Africa, guinea fowls are still raised as free range scavenging birds, and have seen little genetic improvement [7]. Guinea fowls are easier to manage by resource poor farmers with hardly any access to formal veterinary services because they are resistant to most poultry diseases as adults [8]. Housing is rudimentary and health management practices depend largely on ethno-veterinary medicine [7]. In Ghana, guinea fowl production is restricted, generally, to the Northern Savannah zones of the country and is an integral part of the farming system in these areas [4]. Guinea fowls are said to be the commonest poultry species in Northern Ghana [9]. The birds, apart from contributing to household income, play an important role in the sociocultural lives of the people of Northern Ghana [10].

Despite the high level of production of guinea fowls in many countries [11], and their potential and advantages over chicken, there is still no formal market for guinea fowl products compared to chickens [12]. There are a lot of weak links in the value chain which need work to improve the marketing of guinea fowl, leading to enhanced income and poverty alleviation among rural farmers [11]. For instance, consumer preference information on guinea fowl meat in Ghana is largely undocumented. Additionally, consumer constraints to guinea fowl meat consumption remain unknown. Understanding consumption patterns, consumer expectations and constraints will help guide the development of the guinea fowl marketing system. The present study, therefore, sought to evaluate consumer preferences and major constraint to consumption to help understand their market potential.

MATERIALS AND METHODS

Study area

The research was done in the Tamale metropolis in the Northern region of Ghana. The Tamale metropolitan area which is located in the centre of the Northern region shares boundaries with the Savelugu-Nanton district to the north and Tolon-Kumbungu

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district to the east. The metropolis occupies about 750 Km^2, about 13% of the total land area of the Northern region. Geographically, the metropolis lies between latitude 9º16 and 9º 34 N and longitudes 0º 36 and 0º 57 W. According to the 2010 population and housing census, the metropolis has a population of about 233,252, with an urban population of about 73.8%. The metropolis is a cosmopolitan area with Dagombas as the major ethnic group, and Gonja, Mampurusi, Akan and Dagabas as the major minority groups. Islam is the predominant religion with Muslims constituting 90.5 % of the population, and almost 90% of the Dagombas are Muslims [13].

Sources of Data and Sampling Techniques

Data for this work were primarily obtained from guinea fowl consumers and processors (grilled guinea fowl sellers, restaurants, hotels, food vendors and frozen meat dealers) in the metropolis. Butchers specialized into the butchering of sheep, goat and cattle were also interviewed on the prices of their products to facilitate comparism with the price of guinea fowl meat (edible parts of guinea fowl including the muscles, feet, head and internal organs). Consumers were categorized into institutional (organizations that purchase food stuff to cook for its members following a standard meal plan, and include: schools, banks, hospitals and offices of government and non-governmental organizations) and household consumers. Data on consumption patterns, consumer preferences and their constraints to guinea fowl meat consumption were obtained using structured and semi-structured questionnaires.

A multi-stage sampling technique was used to derive the data. The first step involved sampling of communities from urban and peri-urban areas of the metropolis. The next step was stratifying consumers into two groups, namely, households and institutions. Households were further stratified into lower- (below 27.25 Ghana Cedis (GHS) [below 6 United States Dollars (USD)] daily), middle- (GHS 27.26 - GHS 90.82 [6-20 USD] daily) and upper- (above GHS 90.82 [above 20 USD] daily) income families [14], based solely on the income of the head of household. Households were also partitioned based on the sex of the head of household. Male heads of households were considered as single or married males, and may have children, while female heads of households were considered as single females with or without children. In all, 250 respondents were interviewed, fifty each of institutional consumers and processors, and 150 households. The households comprised 50 each of lower-, middle- and upper-income earners. These individuals were purposively sampled.

Data analysis

Data were analyzed using SPSS (version 20) [15]. Consumer and processor agreements on ranking of various constraints to consumption, reasons for choice of guinea fowl meat and sources of food safety information were assessed using Kendall's tau test (W). The effects of educational and income levels, and sex of heads of households on packaging preference, rate of use and preferred source of birds were established using the chi-square procedure. All assessments were at 5% level of significance.

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RESULTS AND DISCUSSIONS

Most (98.8%) of the household and institutional consumers interviewed ranked guinea fowl as their most preferred poultry species, while the remaining chose chicken (0.8%) and turkey (0.4%). On the other hand, Joseph *et al.* [16] in Nigeria and Madzimure *et al*. [17] in Zimbabwe indicated that consumers preferred the local and exotic chickens, respectively, followed by guinea fowl. Similar to the results of Madzimure *et al.* [17], chicken was the most (60%) sold poultry species by processors, followed by guinea fowl (39%) and then turkey (1%).

There were significantly high levels of agreements among households (N = 150, W = 0.786, X^2 (5%) = 707.1, df = 6, p = 0.001) and institutions (N = 50, W = 0.673, X^2 (5%) = 198.0, df = 6, p = 0.001) on their respective reasons for preferring guinea fowl to any other poultry product. In each case, the predominant reason for the choice of guinea fowl was the taste and the least was price stability (Table 1). Similarly, there was high level of agreement (W = 0.660) among processors on their perceptions of why consumers choose guinea fowl over other poultry products and this was significant (N = 50, X^2 (5%) = 194.2, df = 6, p = 0.001) (Table 1). Madzimure *et al.* [17] reported that consumers listed taste as the most important reason for their choice of guinea fowl. In agreement with these results, other workers [18-19] indicated that guinea fowl have a gamey flavour, are tastier and have better nutritional properties than chicken and other meat types. For instance, the carcass fat and cholesterol levels in guinea fowl meat are lower than in chickens, but other nutrients, especially, protein, minerals and some vitamins are higher [20].

Figure 1 shows the frequency of consumption of guinea fowl meat among institutional and household consumers. A larger proportion of the consumers used guinea fowl once monthly (42%) or weekly (33.5%), while only 5.5 % did so yearly. Over 18% of the consumers used guinea fowl meat once per day, while only 0.5 % used guinea fowl meat in at least two daily meals. A greater proportion of institutional consumers (34%) used guinea fowl once daily as compared to household consumers (13.3%). Conversely, a higher proportion of household consumers (43.3%) used guinea fowl monthly than institutional consumers (26%). A few (7.3%) household consumers used guinea fowl only once a year, and no such thing occurred among institutional consumers (Table 2). The more frequent use of guinea fowl by institutions may be related to the use of standard menus by these institutions, as opposed to households. The use of guinea fowl meat once monthly by households may be related to the income patterns of heads of households, as salaries are mostly paid monthly in Ghana, and they may be encouraged by the immediate availability of cash to purchase their preferred meat. In agreement with the results of the present study, Madzimure *et al.* [17] reported that Zimbabwean households used guinea fowl meat once monthly. Similar proportions of processors processed guinea fowls once daily (40%) and weekly (40%), while only 20% processed once monthly (Figure 2). The infrequent processing seen among over half of the processors may be related to the higher prices of the guinea fowl meat

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compared to other meat types, negatively influencing the purchasing power of consumers and, therefore, the rate of purchase. Processors mostly recycle such meats into the following day, and as occurs with most meat grillers/smokers (98%) and food vendors (95%), without the use of cold chain or any special efforts at preservation, a practice that predisposes the meat to bacterial infestations. Only restaurants and hotel operators indicated they store left over products in refrigerators.

The proportions of upper- (38%) and middle-income (37%) class consumers using guinea fowl meat once weekly were much higher than the proportion of lower-income class (19%) consumers. A significantly ($p<0.05$) higher proportion (62%) of the lower-income class used guinea fowl meat monthly than the upper- (44%) and middle-income (37%) classes (Table 3). The more frequent use of guinea fowl meat by middle- and upper-income class families is understandable, as guinea fowl meat is a delicacy in Ghana [21] and therefore more expensive than all other types of meat, except turkey, and individuals in the lower-income bracket could only afford cheaper meat more regularly compared to their middle- and upper-income counterparts. Meat consumption has been identified as a function of income [22-23] and largely dictated by affluence [24].

Significantly ($p<0.05$) more male heads of households purchased guinea fowl weekly as compared to female heads of households. Conversely, a larger proportion of females buy guinea fowl once monthly or yearly than males (Table 4). The more frequent purchase from male compared to female heads of households is not surprising, as males in urban and peri-urban areas of developing countries are mostly in formal employment and have more regular income compared to their female counterparts. Social roles are organized so that women are more likely than men to be homemakers and primary caretakers of children and to hold caretaking jobs in the paid economy. In contrast, men are more likely than women to be primary family providers and to assume full-time roles in the paid economy, often ones that involve physical strength, assertiveness, or leadership skills [25]. This argument is supported by the finding that heads of households in formal employment were less likely to be poor [13]. Male heads of household are, therefore, likely to afford guinea fowl meat more frequently than their female counterparts. Level of education of heads of households did not influence the frequency of purchase of guinea fowl (Table 5).

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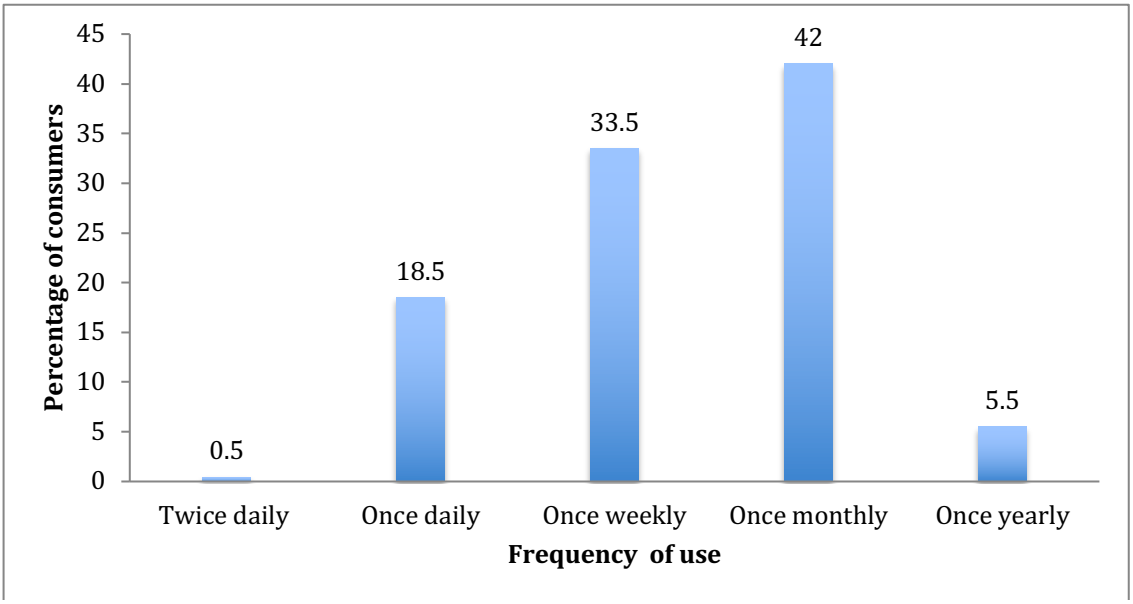

Figure 1: Rate of use of guinea fowl by institutional and household consumers in Tamale metropolis

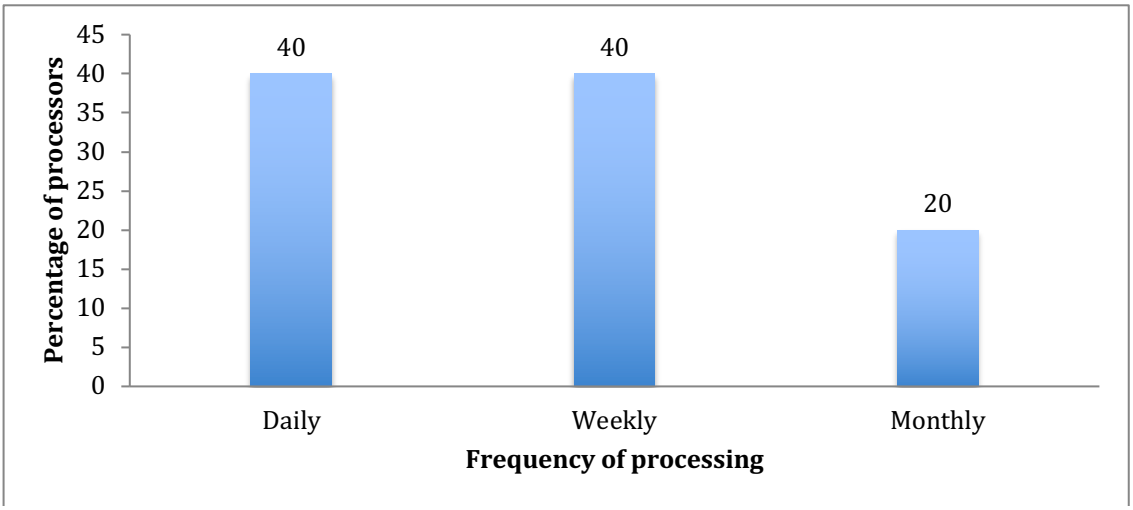

Figure 2: Frequency of processing of guinea fowl by processors in the Tamale metropolis

None of the household and institutional consumers interviewed had any preference for the sex of the guinea fowl used. Similarly, processors were indifferent to the sex of guinea fowls they purchased for processing. A conflicting observation was made by Zeberga [26]. The author reported that in Ethiopia, processors mostly preferred female to male guinea fowl due largely to their comparative price advantage over males, while consumers have preference for male birds. No reason was, however, assigned for the choice of male birds among consumers. In the Cambodian backyard chicken value chain, most consumers preferred female birds due to greater fat content [27].

Household (62%) and institutional (52%) consumers mostly ($p>0.05$) preferred farmers as the main suppliers of their birds (Figure 3), while processors purchased from wholesalers (54%) and farmers (46%). The fact that processors chose wholesalers as

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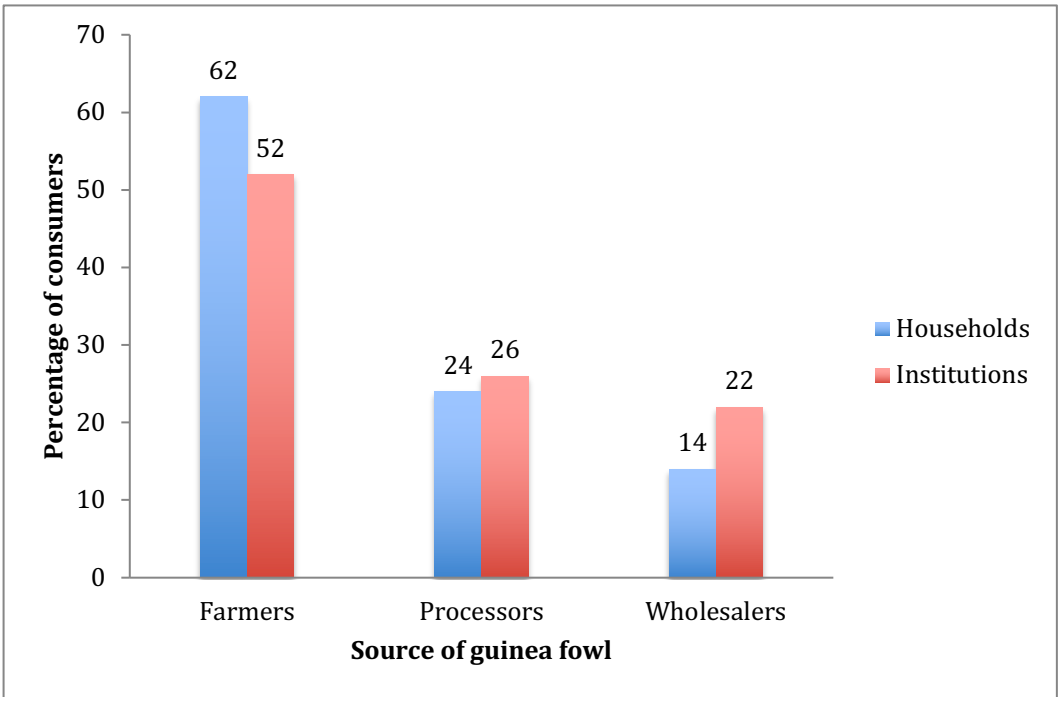
their predominant source of guinea fowl may be linked to the seasonal availability of these birds [28] and the volume of guinea fowls they may have to process in a day, given that consumers will mostly prefer fresh products [29]. Wholesalers deal directly with collectors who are farmers themselves, and they assemble birds at the village level to sell to the farmer [29]. Where demand is not met as occurs during the rainy season, the wholesalers travel far, assembling birds from the few farmers willing to sell to meet the demand of their clients [29]. The seasonal availability of products may be related to the seasonal breeding habit of these birds [30-31], as farmers are usually unwilling to sell their birds during the breeding season, which occurs in the rainy season.



X2 (5%) = 44.7, df = 2, p = 0.064

Figure 3: Influence of consumer type on preferred source of birds

Both household (77.3%) and institutional (84%) consumers preferred live to any processed form of guinea fowl. The least preferred form of guinea fowl was in soup (Figure 4). Most (72%) processors also preferred live to dressed guinea fowl (This is a bird slaughtered, defeathered and eviscerated, with the head and feet removed, and occasionally, kept back into the bird i.e., a ready-to-cook whole bird). The remaining processors buy dressed whole birds from cold store operators. The reasons given for the choice of the particular packaging of guinea fowl were affordability (37.8%), convenience (25.5%), availability (21.1%), proper handling during packaging (9.2%) and accessibility (6.0%). Similarly, live birds were preferred by processors in the Ethiopian guinea fowl value chain [26]. The high level of preference for live birds among institutional and household consumers in the present study, however, may be linked to the fact that most of the consumers in the study area were Muslims (90.5%) [13], and may prefer meat processed according to Halal requirements. Halal is Arabic term for permissible. Halal food is that which adheres to Islamic law, as defined in the Koran. The Islamic form of slaughtering animals or poultry, involves killing through a cut to the jugular vein, carotid artery and windpipe. The animal must be alive and

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healthy at the time of slaughter, and all blood must be drained from the carcass. During the process, a Muslim will recite a dedication, known as "tasmiya or shahada". There is a debate about whether stunning is allowed. It is, however, certain that stunning cannot be used to kill an animal, but to calm a violent animal prior to slaughter by the Halal standard [32-33]. Buying dressed meat may, therefore, not guarantee this. The poor hygienic standards, and consequently, high bacterial loads found in meat processed in the Tamale metropolis [34], may also play a role in the choice of live over dressed birds among consumers in the metropolis. On the other hand, consumers in the Zimbabwean guinea fowl value chain mostly preferred dressed to live birds [17] suggesting a higher level of confidence in the meat handling and processing systems, compared to those found in the Tamale metropolis. Sex and educational level of head of household had no influence on their choice of guinea fowl packaging (Table 6). The income class of household consumers also did not influence their choice of guinea fowl packaging. Consumers of all income classes [upper- (63%), middle- (73%) and lower- (88%) income classes] mostly preferred live birds (Figure 5).

Institutional consumers (N = 50, W = 0.295, X^2 (5%) = 99.1, df = 7, p = 0.001) and households (N=150, W = 0.223, X^2 (5%) = 234.0, df = 7, p = 0.001) also showed a significant level of agreement on their source of food safety information. Similarly, processors showed significant (W = 0.641) level of agreement on their source of food safety information (N = 50, X^2 (5%) = 219.9, df = 7, p = 0.001). Households and processors ranked friends as the top source of food safety information. While households considered posters as the least common source of food safety information, processors listed the Internet as the least. Institutional consumers ranked television as the number one source of food safety information and posters as the least (Table 7). The fact that friends were the predominant source of food safety information among household consumers and processors is problematic, as information delivered via this channel may be woefully inadequate, both in quality and quantity.

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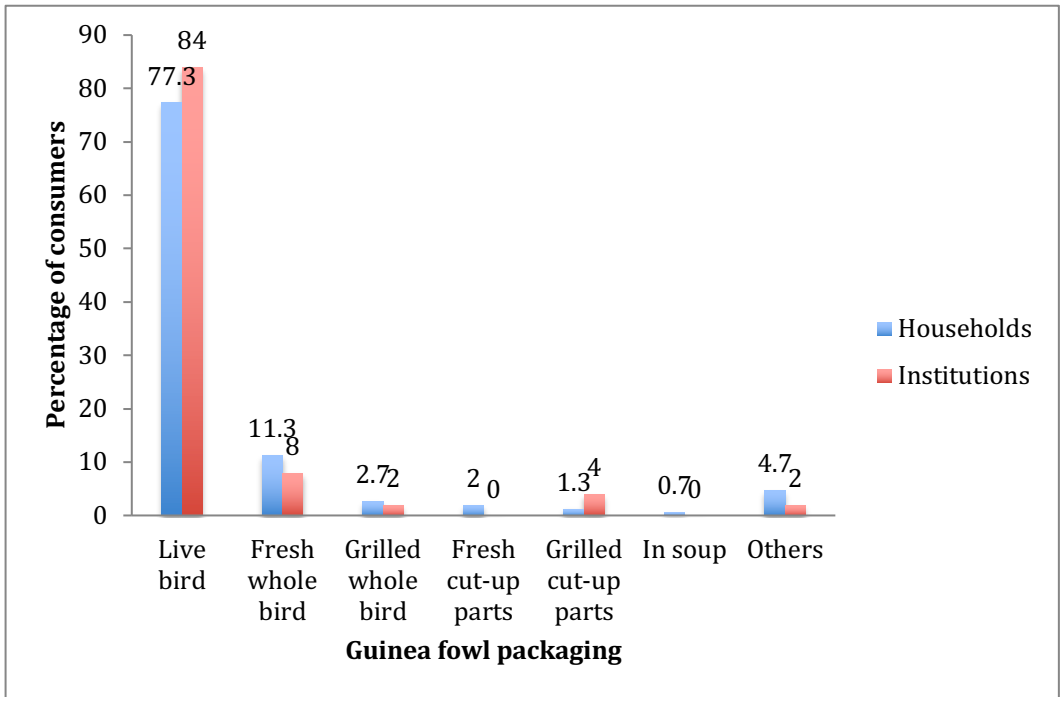

Figure 4: Consumers' preference of guinea fowl packaging in the Tamale metropolis

The majority (93.2%) of institutional and household consumers and nearly all processors (99%) indicated there are seasonal fluctuations in the price of guinea fowl. During the rainy season when birds are scarce, Institutional/household consumers and processors paid an average of GHS 28.5±1.7 (6.33 USD) per live bird, while aggregators paid GHS 21.8±0.9 (4.84 USD) for a live bird. Average prices of GHS 19.2±0.7 (4.26 USD) and GHS 24.2±0.9 (5.37 USD), respectively, were paid by aggregators and consumers during the periods of abundant supply. The average live weight at slaughter and dressed weight of such birds (from 18 weeks of age) are 1112.5g and 782.6g, respectively [35]. Institutional and household consumers who bought dressed and grilled birds paid an average of GHS 34.50 (7.60 USD) and GHS 36.7 (8.08 USD), respectively, per kg irrespective of season. At the processor's level, the seasonal price fluctuations are not seen, since according to them, they absorb the difference in prices resulting both at the farmers and wholesalers/aggregators level, lowering their margins. Processors, therefore, choose fluctuating profit margins over increasing their prices. According to them, seasonal price increase at their level could decrease purchases significantly. Other meat types in the metropolis do not see such seasonal price fluctuations. For instance, the price of a kg of beef on the local market remained at GHS 13. 20 over the past 5 years while that of dressed whole broiler chicken remained at GHS 17.14 per kg over the past 2 years (Table 8). As a result of these price fluctuations, about 28% of the consumers go for substitutes to guinea fowl meat. These substitutes include beef (53%), chicken (37%), mutton (3.1%) and chevon (6.9%) {Figure 5}. Chickens are sold live, mostly on festive occasions, while frozen imported chicken parts are the commonest available form year round. The locals have nicknamed these products "Kofi Nkorigi" translated into English as "slaughtered by Kofi". Kofi is a name of someone of an Akan tribe, a Ghanaian tribe that is predominantly non-Muslim. The phrase simply implies chicken slaughtered not inline

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with the Halal standard. Consumers are, therefore, forced to buy these products when they have no other choice. Cattle, sheep and goats, however, are slaughtered and sold by only Muslim butchers in the metropolis. Additionally, beef is the cheapest fresh halal product on the market (Table 8). It is, therefore, not surprising that most of the inhabitants resort to beef when guinea fowls are in scarce supply and more expensive. In the early part of the dry season immediately following the breeding season (October to January); there is abundant supply of birds on the market indicating that farmers will only sell their adult birds when they are certain about having replacements from the previous breeding season.

In each case, consumers generally agree [household (W = 0.383) and institutional (W = 0.250) consumers] on what their respective constraints to the consumption of guinea fowl were, and levels of agreements were significant [households (X^2 = 285.5, df = 5, p = 0.001), and institutions (X^2 = 61.4, df = 5, p = 0.001)]. Processors also have similar perceptions of the constraints to guinea fowl consumption among their consumers (W = 0.252, X^2 = 61.6, df= 5, p = 0.001) In each case, the predominant constraint was seasonal price fluctuations, while the least was irregular availability of frozen products (Table 9). Irregular availability of frozen products was considered a possible problem because only a few (14%) of the cold store operators are engaged in guinea fowl processing, and concentrate mostly on frozen imported products.

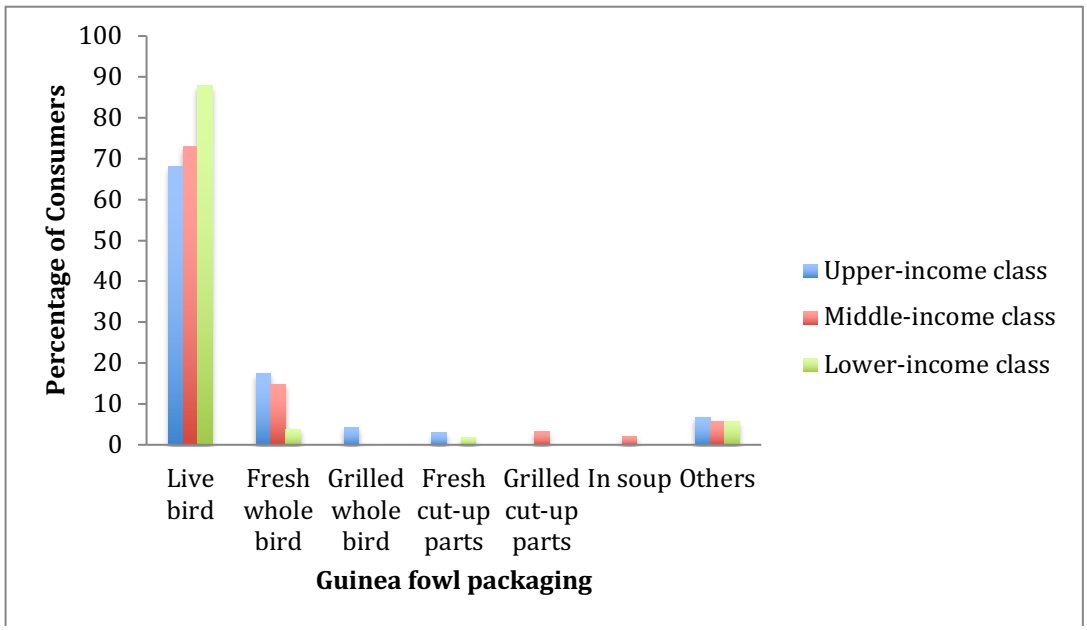

Figure 5: Effect of income of head of **household on consumer preference of various packaging of guinea fowls**

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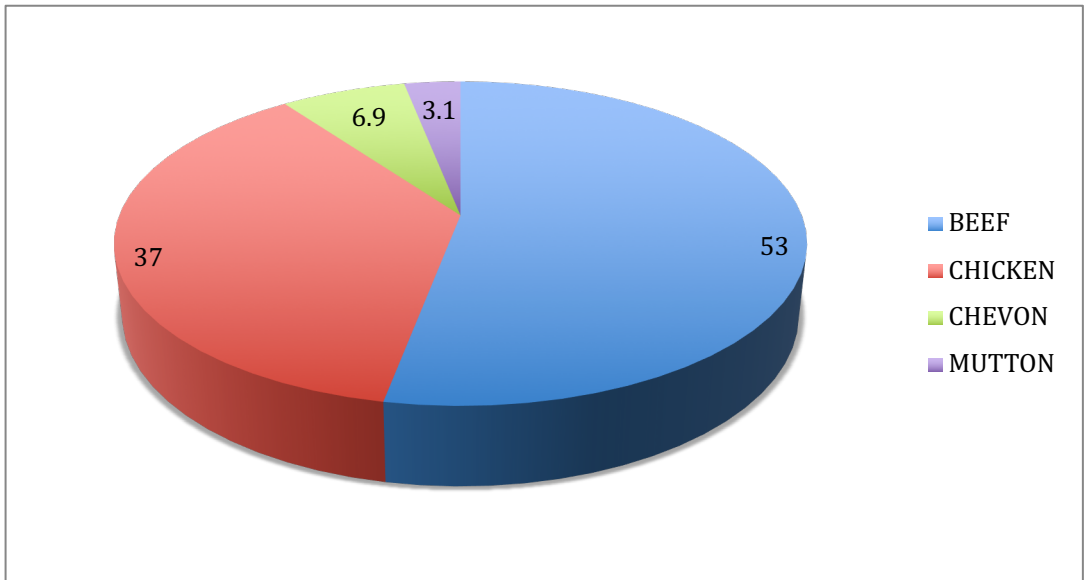

Figure 6: Choice of substitute to guinea fowl by institutional and household consumers due to price fluctuations

CONCLUSION

Consumers prefer guinea fowl to any other poultry product, indicating a bigger market potential. Live birds are preferred and taste is the predominant reason for the choice of guinea fowl. Institutional consumers use guinea fowl more regularly than household consumers. Similarly, middle- and upper-income families use guinea fowls more regularly than lower-income families. Male heads of households used guinea fowl meat more regularly than female heads of households. Price fluctuation is the top constraint to guinea fowl consumption. Friends are the predominant source of food safety information to consumers.

A serious look should be made at breaking the seasonal breeding habits of the local guinea fowls through research, to ensure all year production and, therefore, availability. Additionally, developing the hatchery industry should also help in improving availability despite the seasonality problem. Also, establishment of more hygienic and modern processing plants will help improve food safety standards and, therefore, increase confidence in the meat processing industry within the metropolis. Such a system should factor in Halal requirements to cater for the Muslim majority. This might help to avoid the problems associated with live bird handling at the consumer level.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the article.

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Table 1: Reasons for choice of guinea fowl by consumers, and processors perceptions of the reasons for consumer choice

	Households		Institutions		Processors		Overall	
Choice	**Mean**	**Rank**	**Mean**	**Rank**	**Mean**	**Rank**	**Mean**	**Rank**
Taste	1.19	1	1.46	1	1.41	1	1.28	1
Healthy	4.19	4	5.31	6	4.78	4	2.27	2
Ease of preparation.	2.23	2	2.28	2	2.61	2	4.26	4
Appearance/colour	3.16	3	3.06	3	2.79	3	4.77	5
Known brand	4.68	5	4.51	4	4.90	5	5.90	6
Price stability	6.78	7	6.34	7	6.38	7	6.55	7
Leanness	5.26	6	5.05	5	5.14	6	2.96	3

Overall (N = 250, W = 0.795, X^2 (5%) = 1192.5, df = 6, p=0.001), Households (N = 150, W= .786, X^2 (5%) =707.1, df= 6, p=0.001) Institutions (N = 50, W = .673, X^2 (5%) =198.0, df= 6, p>0.001), Processors (N = 50, W = 0.660, X^2 (5%) =194.2, df= 6, p=0.001)

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Table 2: Effect of consumer type on the rate of use of guinea fowl meat in Tamale metropolis

Purchaser type	Frequency (%) of use of guinea fowl meat					
	Twice daily	Daily	Weekly	Monthly	Yearly	X^2 (5)
Households	1(0.7)	20(13.3)	47(31.3)	71(47.3)	11(7.3)	34.681
Institutions	0(0)	17(34)	20(40)	13(26)	0(0)	

df= 8, p= 0.001

Table 3: Influence of income level of heads of household on guinea fowl use in Tamale metropolis

	Frequency (%) of patronage of guinea fowl meat					
Income Class	Per meal	Daily	Weekly	Monthly	Yearly	X^2 (5)
Upper	0(0)	6(12)	19(38)	22(44)	3(6)	15.694
Middle	1(2)	11(21)	19(37)	19(37)	2(3)	
Lower	0(0)	3(6)	9(19)	30(62)	6(13)	

df = 8,p = 0.040

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Table 4: Influence of sex of heads of households on the use of guinea fowl meat in Tamale metropolis

	Frequency (%) of patronage of guinea fowl meat					X^2 (5)
Gender	Per meal	Daily	Weekly	Monthly	Yearly	
Male	0(0)	10(13)	31(42)	31(42)	2(3)	11.383
Female	1(1)	10(13)	16(21)	40(53)	9(12)	

df = 4, p = 0.023

Table 5: Effect of educational level of heads of households on the use of guinea fowl meat in the Tamale metropolis

	Frequency of patronage of guinea fowl meat (%)					X^2 (5)
Educational level	Per meal	Daily	Weekly	Monthly	Yearly	
Basic	0(0)	0(0)	5(29)	12(71)	0(0)	18.796
Secondary	1(2)	6(14)	18(42)	12(28)	6(14)	
Tertiary	0(0)	9(16)	18(29)	33(52)	2(3)	
None	0(0)	4(15)	6(22)	14(52)	3(11)	

df= 12, P= 0.84

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Table 6: Influence of sex and level of education of heads of households on guinea fowl packaging of preference

	Frequency (%) of patronage of guinea fowl meat							X^2 (5)
Parameter	**Live bird**	**Fresh whole bird**	**Grilled whole bird**	**Fresh cut-up parts**	**Grilled cut-up parts**	**In soup**	**Others**	
Sex								
Male	58(78.3)	6(8.1)	2(3)	0(0)	1(1.3)	1(1.3)	6(8)	8.025
Female	57(75)	11(14.4)	2(3)	3(4)	1(1.3)	1(1.3)	1(1)	
Education								
None	27(100)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	19.684
Basic Education	13(76)	2(12)	0(0)	1(6)	0(0)	0(0)	1(6)	
Secondary	29(67.4)	6(14)	3(7)	1(2.3)	1(2.3)	0(0)	3(7)	
Tertiary	46(73)	9(14.3)	0(0)	1(2)	1(2)	1(2)	4(6.3)	

Sex: df = 6, p= 0.236, Education: df = 18, p = 0.351

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Table 7: Sources of food safety information among consumers and processors

	Households		Institutions		Processors		Overall	
Source	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
Radio	3.65	3	3.35	2	3.36	3	3.53	2
Television	3.62	2	2.75	1	4.10	4	3.56	3
Internet	5.10	5	3.38	3	7.15	8	5.18	5
Newspapers	5.33	6	4.85	5	6.01	6	5.37	7
Friends	3.01	1	4.34	4	1.78	1	3.02	1
Processors	3.75	4	5.57	7	2.24	2	3.78	4
Books	5.15	7	4.97	6	6.33	7	5.34	6
Posters	6.40	8	6.78	8	5.03	5	6.19	8

Overall (N = 249, W = 0.222, X^2=386.4, df = 7, p = 0.001), Households (N = 150, W = 0.223, X^2 (5%) =234.0, df = 7, p = 0.001) Institutions (N = 50, W = 0.295, X^2 (5%) = 99.1, df = 7,p = 0.001), Processors (N = 50, W = 0.641, X^2 (5%) =220.0, df= 7, p = 0.001)

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Table 8: Comparative prices of competing meat products and period of price stability

Species	Edible part	Price/kg (GHS)	USD equivalent (USD)	Period of price stability until present (Years)
Guinea fowl	Whole bird (dressed)	34.50±3.1	7.60	1
	Whole bird (grilled)	36.70±3.2	8.08	1
Chicken	Broiler (whole bird)	17.14±2.1	3.77	2
	Spent layer (whole bird)	15.00±1.8	3.30	
	*Thighs	9.60±0.3	2.11	2
	*Wings	15.00±0.8	3.30	2
	*Backs	6.60±0.2	1.45	2
	*Gizzard	12.20±1.2	2.69	2
	*Hard chicken thighs (spent layer thighs)	11.20±1.6	2.47	
Cattle	§Beef	13.20	2.91	5
Sheep	§Mutton	15.40	3.39	5
Goat	§Chevon	17.60	3.88	5

*Products were imported into the country and are usually frozen longer/not fresh

§These products have fixed prices throughout the metropolis

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Table 9: Constraints to guinea fowl consumption among various categories of consumers and processors perception on constraints to consumption in the Tamale metropolis

	Households		Institutions		Processor		Overall	
Problem	**Mean**	**Rank**	**Mean**	**Rank**	**Mean**	**Rank**	**Mean**	**Rank**
Affordability	2.78	3	2.74	2	3.47	4	2.90	3
Price fluctuation	2.02	1	2.54	1	2.34	1	2.20	1
Less meaty	2.76	2	2.84	3	2.87	2	2.80	2
Handling during processing	4.26	5	4.00	5	4.55	5	4.26	5
Seasonal availability of live birds	4.08	4	3.98	4	3.10	3	3.88	4
Irregular availability of frozen products	5.09	6	4.90	6	4.67	6	4.97	6

Overall N = 249, W = 0.310 X^2 (5%) = 386.3, df = 5, p = 0.001, Household (N = 150, W = 0.383, X^2 (5%) = 285.5, df = 5, p = 0.001) Institution (N = 50, W = 0.250, X^2 (5%) = 61.4, df= 5, p>0.001), Processor (N = 50, W = 0.252, X^2 (5%) = 61.6, df = 5, p>0.001)

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