

**APPLICATION OF A VALUE CHAIN APPROACH TO UNDERSTANDING  
WHITE *KENKEY* PRODUCTION, VENDING AND CONSUMPTION  
PRACTICES IN THREE DISTRICTS OF GHANA**

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## ABSTRACT

Traditional processing and street vending of foods is a vital activity in the informal sector of the Ghanaian economy and offers livelihood for a large number of traditional food processors. *Kenkey* is a fermented maize ‘dumpling’ produced by traditional food processors in Ghana. Ga and Fante *kenkey* have received research attention and there is a lot of scientific information on *kenkey* production. White *kenkey* produced from dehulled maize grains is a less known kind of *kenkey*. A survey was held in three districts of Ghana to study production, vending and consumption of white *kenkey* and to identify major bottlenecks related to production, which can be addressed in studies to re-package *kenkey* for a wider market. Questionnaires were designed for producers, vendors and consumers of white *kenkey* to collate information on Socio-cultural data, processing technologies, frequency of production and consumption, product shelf life, reasons for consumption and quality attributes important to consumers using proportional sampling. The survey was conducted in white *kenkey* production zones and trade centers. Results showed that production of white *kenkey* is done on small-scale levels by middle-aged women in households with 10-50 kg of dehulled maize processed into white *kenkey*, 1-3 times weekly. A third (28%) of the women processed up to 50-100 kg of maize per week. Although 62% of vendors sell 50-100 balls of white *kenkey* daily, 15% of them sell more than 170 balls. Majority of consumers (45.9%) liked white *kenkey* because of its convenience (ready-to-eat). Texture and taste were quality attributes desired by *kenkey* consumers. Producers did not have written records of process controls and product throughputs. In spite of their cottage nature, production of white *kenkey* is a profitable employment for producers and vendors and is popular among consumers. Product improvement, process and product characteristics could offer scale-up criteria for development of white *kenkey* production using standardized procedures for steeping times, steeping temperature and fermentation times.

**Key words:** maize, white *kenkey*, value chain, traditional, product development, re-engineering



## INTRODUCTION

*Kenkey* is one of the most popular traditional fermented maize foods in Ghana. It is prepared from maize that has been fermented into a sour meal and subsequently cooked. The basic steps in the production of *kenkey* are steeping and milling of maize grains which are kneaded with water and allowed to ferment spontaneously into a sourdough [1,2]. The dough is pre-cooked into a gelatinous paste and wrapped in dried plantain leaves or maize husk and cooked into *kenkey*. The production is based on traditional technologies that have been handed down for generations. Production is usually done on a small scale artisanal level. Processors carry out their activities either as individuals or as a family business often depending on family's capability to produce and retail the product [1]. The socio-economic importance of *kenkey* stems from the fact that it is an affordable principal meal consumed regularly by many Ghanaians and serves as a source of livelihood for many families engaged in its production and retailing [1].

“Ga” and “Fante” *kenkey* are two types of *kenkey*, which are indigenous to two different socio-cultural groups located on the coastline of Ghana [1]. Other types of *kenkey* are also known, but are less widespread and found in specific communities in the Eastern Region and to a lesser extent, in the central region of Ghana. Among these lesser known *kenkey* types is “white” *kenkey*. The key variation with white *kenkey* is that it is made from dehulled and/or degermed maize grains. In addition, white *kenkey* is sometimes sweetened with sugar, which is not common with other forms of *kenkey*. The two types of white *kenkey* are ‘non-sweetened’ (*nsiho*) and ‘sweetened’ (*asikyere dokunu*) [2]. Commercial production of white *kenkey* and street vending make a sizeable contribution to the rural and urban economy and provide informal and self-employment opportunities [3]. White *kenkey* is produced at the artisanal level and varies widely in quality from one producer to the other and even with the same producer. The effect of various production steps on the finished product's quality has, however, not been previously considered [4]. Information on production, vending and consumption of white *kenkey* in Ghana is also lacking. Such a body of knowledge is needed to identify major problems and bottlenecks related to its production in order to address them in future studies, with the aim to repackage the product for a wider market. The aim of this study, therefore, was to determine the perceptions, attitudes and consumption practices of the different types of white *kenkey* as well as the traditional production and distribution practices.

## MATERIALS AND METHOD

### Survey area and sample selection

A survey of white *kenkey* (*nsiho*) producers, retailers and regular consumers was conducted in the Asuogyaman (Atimpoku, South Senchi, and Anum), Manya Krobo (Kpong, Somanya) and Fanteakwa (Osino) districts of the Eastern Region of Ghana. The choice of study locations was informed by the fact that white *kenkey* is predominantly produced in these districts. The Asuogyaman District is one of the twenty-one (21) districts of the Eastern Region of south Ghana. The capital is Atimpoku. The Manya Krobo District was a district of Ghana located in the Eastern Region of south Ghana until it was split in 2008 to form the Lower Manya Krobo District and the Upper Manya Krobo



District. Fanteakwa district is located within the central part of the Eastern Region of Ghana and shares boundaries with other Districts.

### **Survey tool, sample selection and location**

Three different questionnaires were designed to obtain information on the production, retailing and consumption of both sweetened and non-sweetened white *kenkey* (*nsiho*). The first questionnaire was administered to *kenkey* producers, the second to *kenkey* retailers or vendors and the third to consumers. This is because these actors are part of the *kenkey* value chain. A total of 82 producers, 71 vendors and 135 consumers were interviewed. The number of questionnaires administered to each site was proportional to the population of the community. Producers were interviewed at their production sites whereas consumers and vendors were selected randomly in the streets and market places. Each respondent was given information and consent form to sign to seek their approval before administering the questionnaire. The interviews were conducted in English and local dialects, depending on the respondent's preference.

### **DATA PROCESSING AND ANALYSES**

Completed questionnaires were coded into the Statistical Package for Social Scientists (SPSS) for Windows, version 16.0 and analyzed using descriptive statistics. Frequencies were generated for variables and significant associations were tested at  $p < 0.05$ .

### **RESULTS AND DISCUSSION**

#### **Demography and socio-cultural characteristics of producers**

All the white *kenkey* producers were females and 60% of them over 40 years old (data not shown). Relating to previous studies, it was surprising that middle-aged women were involved in *kenkey* production because it is considered to be a labour intensive operation [1]. They had large family sizes and in many cases (60%) were heads of households. White *kenkey* production is dominated by processors who learnt the trade from their family members; the trade is handed over from generations [2]. Consequently, majority (60%) of *kenkey* producers had little or no formal education. A few learned ones (8%) had only up to senior high school education. While about half of the producers either completed primary or junior high school, 27 % had no formal education and nearly 5 % attended senior high school. Other authors have also reported that *kenkey* production is predominantly family-based vocations undertaken by women with little or no education. The female children of producers grow up and offer inexpensive labour and in the process learnt and engaged in the white *kenkey* business at the expense of formal education, because they are attracted to the money from the business. White *kenkey* productions were generally small operations based in households and involved small quantities at a time because production equipment consisted of simple traditional tools. [1, 4, 5, 6].

In Ghana, the vending of *kenkey* is predominantly undertaken by women. Similar studies on vending of street foods reported that about 81 % of street food vendors were women and those women constituted the majority of vendors [7, 8].



### Types of white *kenkey*

Two types of white *kenkey* produced from dehulled maize grains were encountered during the survey, with different production sites showing different interests and emphasis on these *kenkey* types. Processors in the Asuogyaman district mainly produced the *nsiho* type of *kenkey* whilst sweet *kenkey* is produced in the Fanteakwa district. Apart from processors in Anum, who ferment dehulled maize dough for 12 hours, producers of sweet *kenkey* and *nsiho* in other locations did not ferment the milled steeped grains. The sweetened type is packaged in *awurom* (*M. cuspidata*) leaves, whilst maize husk is used for non-sweetened white *kenkey* (*nsiho*).

### Reasons for white *kenkey* production and production levels

The main reason producers indicated for production of white *kenkey* was that it was a family business, which they engaged in to earn a living. The enterprises such as production and vending of white *kenkey* that brought an income were worth undertaking to support their families.

Due to a poor cold chain and a low availability of refrigeration facilities among the rural poor, excess white *kenkey* is handled differently by different processors in order to extend shelf life.

Figure 1 shows the quantity of maize processed into white maize. Most producers processed 10-50 kg of maize into white *kenkey* weekly, and just under a third (28%) processed up to 50-100 kg of maize per week. This indicates that *kenkey* production is done on a small-scale artisanal level as reported by previous researchers [1, 2, 6]. Maize dough obtained after milling of steeped dehulled maize is the base raw material for white *kenkey* (sweetened or non-sweetened). Regardless of the size of operation, all the maize dough may be used up per batch of the process. One-third of producers used the dough in less than a day.

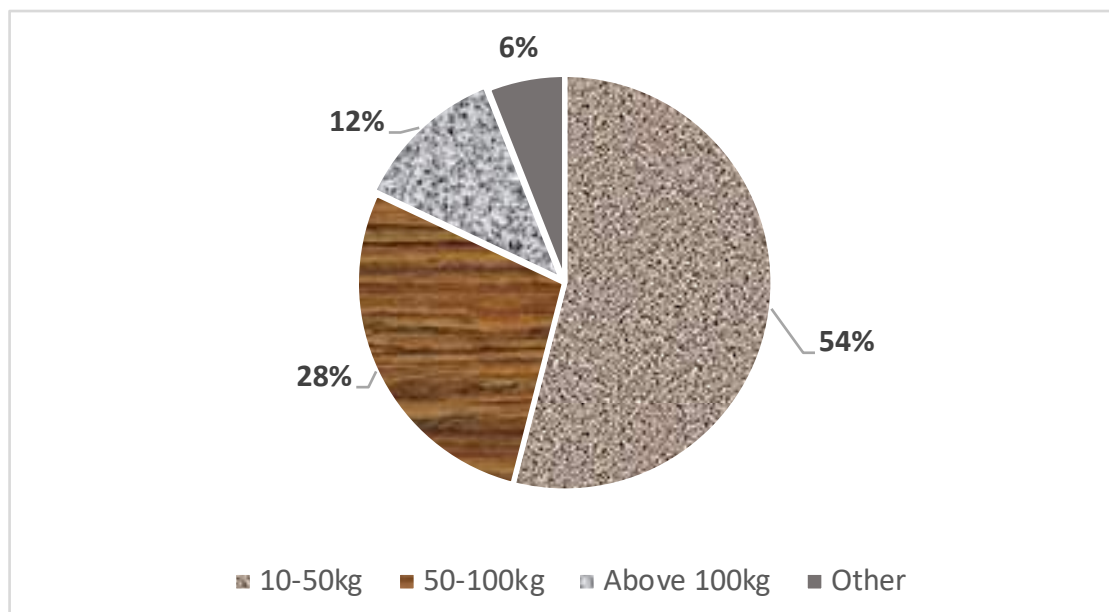
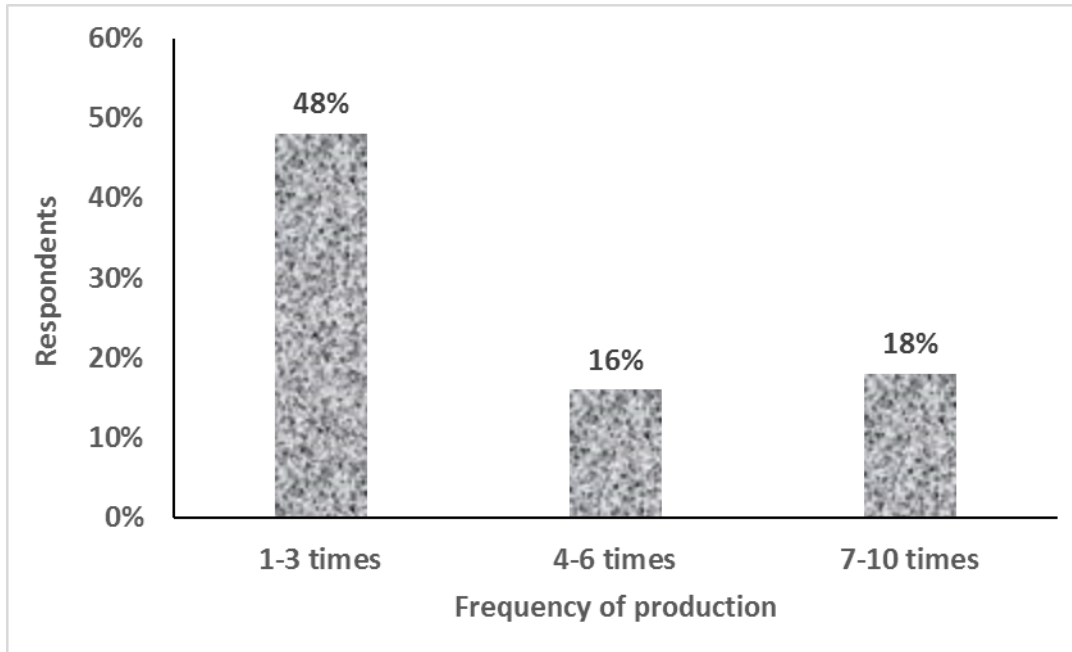


Figure 1: Quantity of maize produced weekly into white *kenkey*

As shown in Figure 2, more than half of producers processed 1-3 times per week, while twenty percent (20%) produced 7-10 times weekly. The production of white *kenkey* was done on alternative days because a shift system is operated by the producers.



**Figure 2: Frequency of white *kenkey* production**

Vending of white *kenkey* was lucrative since they depended on it to support and sustain their families' expenditure. The enterprise of producing and vending white *kenkey* is largely run by women who are of very modest means. Just as they employ simple traditional equipment in the manufacture of *kenkey*, they do not own vehicles to transport raw materials, or finished products to the points of buying/sale. Consequently, they rely on commercial transport services.

### **White *kenkey* production**

The main raw materials for white *kenkey* production are dehulled maize, maize husk and table salt (for non-sweetened white *kenkey*) or sugar for sweet *kenkey*. All these materials are purchased locally. The process flow chart for white *kenkey* is shown in Figure 3. Processing involved winnowing and sorting of maize to remove dust, chaff and stones. The cleaned maize is dehulled in an Angelbell mill (similar to rice mill) and steeped in water for 48 h. After steeping, the grains are washed and milled into a smooth meal. Two different procedures were observed for further processing after production of the smooth meal and this depended on the locality. At Atimpoku and Senchi, all the milled meal is pre-cooked, for about 30-60 min, into a thick gelatinous paste (*aflata*), which is shaped into balls and wrapped in clean maize husks. The balls are loaded into a pot containing small amounts of water lined with sticks and maize husk and steamed for 1-2 h. In another processing procedure observed in Anum Township, the milled meal is kneaded into stiff dough and fermented spontaneously for 12 h. After fermentation, two-third portion of the dough is pre-cooked for about 30-60 min into *ohu*. The hot *ohu* is mixed with the remaining one-third uncooked dough as done for Ga and Fante *kenkey* [1, 2].



The mixture formed is shaped into balls and wrapped in clean maize husks. The balls are packed into a perforated pan and placed over a pot of boiling water and steamed for 1 to 2 h. In the case of sweet white *kenkey*, the meal obtained is divided into two, a portion is pre-cooked for 20 min into *aflata*, after which the dough is reconstituted into slurry and mixed with *aflata* before adding sugar. The paste obtained is packaged into *aworum* leaves (*M. cuspidata*) and steamed for an hour.

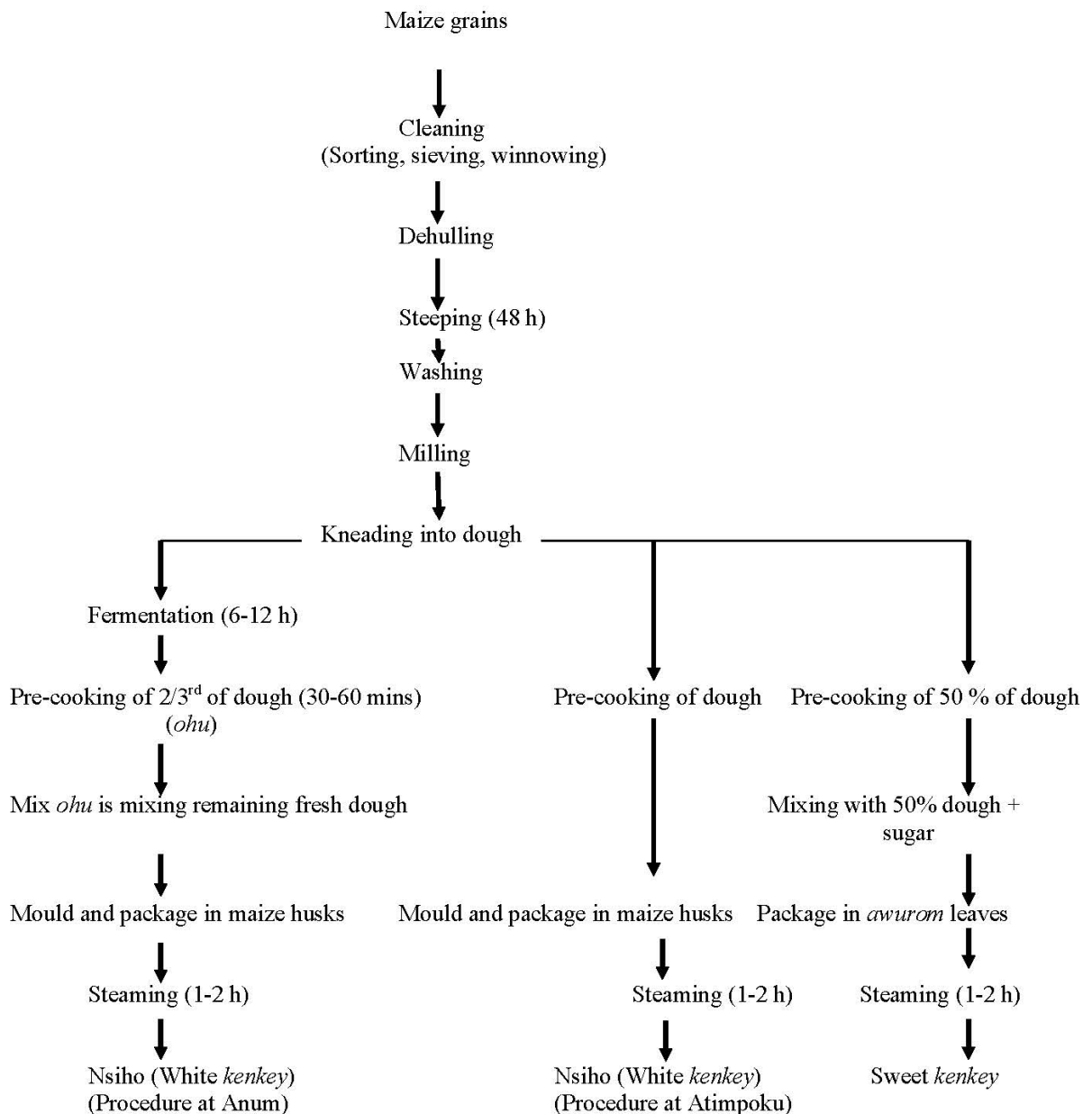


Figure 3: Flow diagram for the production of *Nsiho* (white-kenkey) and sweet white *kenkey*

The operations in the white *kenkey* process are largely manual and require a great deal of human labour. Consequently, the size of operations is limited and within the capability of human labour available to the household. The labour intensive unit operations during white *kenkey* production as identified by the processors are listed in Table 1. *Aflata* preparation was identified as the most labour intensive unit operation, followed by shaping of the *kenkey* and mixing of *aflata* with fresh dough.

### Practices that affect white *kenkey* quality

Problems encountered in white *kenkey* production and solutions proposed by producers are illustrated in Table 2. Producers indicated that *kenkey* would have a bad odour and or become discoloured as a result of the following practices: using of contaminated maize, dipping contaminated hands into steeped maize, improper washing of utensils for steeping maize, inadequate pre-cooking of dough (*aflata*), and inadequate mixing of pre-cooked dough (*aflata*) with uncooked dough. They also attributed the use of over-fermented dough, contaminated water, and dirty maize husk to the unacceptable aroma in *kenkey*. It was observed that producers used sensory attributes like colour, odour, taste and texture through experience, to assess quality of *kenkey* and intermediates (Table 2).

### Handling of left-over white *kenkey* and shelf-life of white *kenkey*

While only about 10 % are able to sell the entire batch in a day, majority of producers (about 49 %) reheated the left over *kenkey* and sold it as a fresh batch. This trend has been previously reported [2]. Other producers (1%) mash the left over *kenkey* and add it to *aflata* in the production of a fresh batch of *kenkey*. Many other producers (24 %) simply keep it and continue sales the next day and this could affect the quality of the *kenkey* sold. Half of the producers acknowledged that the product has a shelf life of 4-6 days, while 48 % indicated that it does not keep beyond 1-3 days. According to Halm *et al.* [1], the shelf-life of white *kenkey* is 4-6 days. Producers indicated mouldiness and over-fermented odour as indicators of spoilage. The shelf-life of sweet and non-sweetened white *kenkey* was different based on the vendors' experience. The non-sweetened white *kenkey* generally had longer shelf stability than the sweetened white *kenkey*. This is because the portion of sugar in the sweetened *kenkey* acts as a humectant and absorbs more water which makes the *kenkey* more susceptible to spoilage. The pH is reduced and is susceptible to microbial degradation (Personal communication).

### Commercialization of white *kenkey*

#### Demographic characteristics of white *kenkey* vendors

White *kenkey* when produced may be sold directly by the producer or by vendors to consumers. Vending of white *kenkey* was dominated by middle-aged women with nearly 50 % of them above 40 years and only about 4 % below 20 years of age. Most producers were vendors as well, and white *kenkey* was the primary item they sold. They all sold fried fish as a secondary item, since consumers eat white *kenkey* with fried fish. Majority of the vendors (55 %) sold both sweetened and non-sweetened types. All the vendors were females, which is in contrast to results that found majority of street foods consumers in West Africa to be male [10].





Most vendors had some minimum formal education and some working knowledge of English language. While only 20% of vendors had no formal education, those with junior high school level of education (41%) dominated, and 23% of vendors had primary education.

### **Transportation costs and white *kenkey* sales**

Generally, the costs incurred in transportation depend on the size of operations and may vary among the producers and vendors. White *kenkey* (*nsiho*) vendors (35%) generally spend Ghana cedis (GH¢) 2-4 per batch to transport their products to vending sites (Table 3). Nearly 3 %, however, paid more than GH¢ 5. The majority of sweet *kenkey* vendors did not incur transportation costs because they handled relatively small quantities of product that was easily conveyed on the head as they walked to the sales sites. Vendors (5%) who were far from sales points use commercial vehicles which cost GH¢ 2. The unit sale price of average sized non-sweetened white *kenkey* ranged from GH¢ 0.2 to 0.5. However, majority of vendors confirmed selling it for GH¢ 0.30. The sweetened white *kenkey* was generally sold at a higher price of GH¢1.0. Most vendors sold between 50-100 balls of *kenkey*, while a smaller number of non-sweetened white *kenkey* vendors sold above 170 balls daily (Table 3). Sweet *kenkey* vendors sold between 100-170 balls daily. Most white *kenkey* vendors generated GH ¢20-40 daily. Some vendors, however, generated above GH¢100 for both white *kenkey* (*nsiho*) and sweet *kenkey* [2].

### **Shelf-life of white *kenkey* from vendors' perspective**

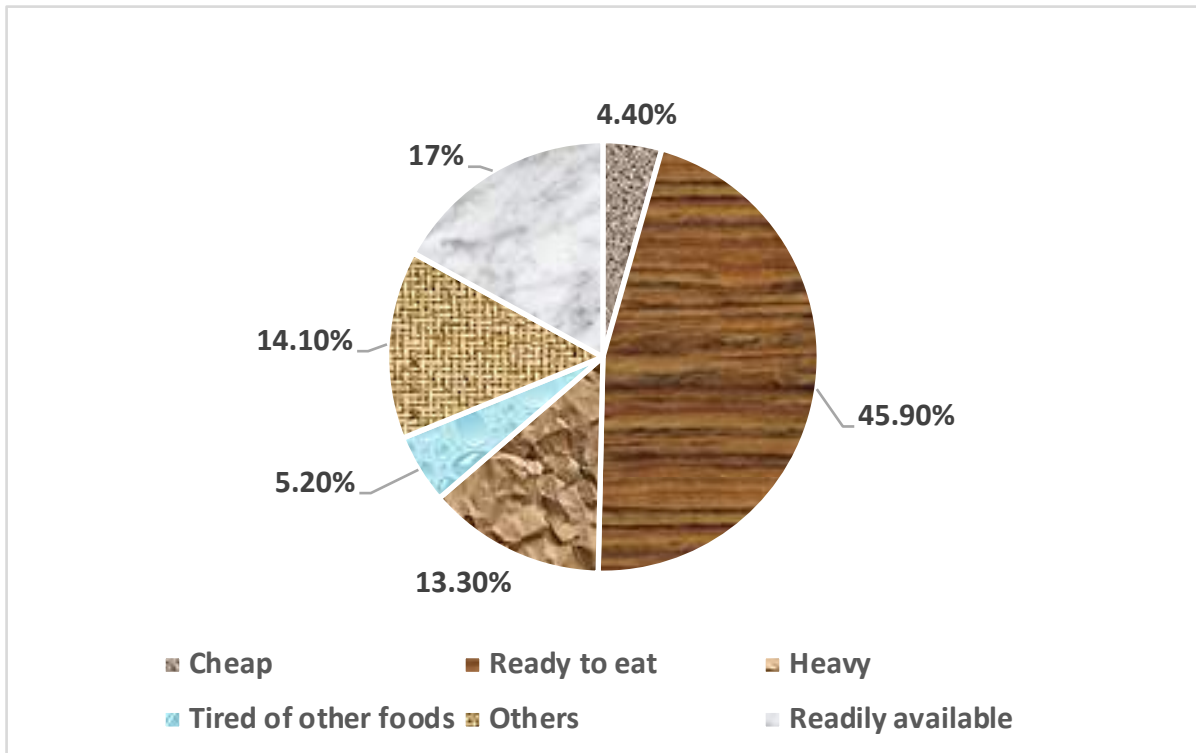
Majority of the vendors indicated that white *kenkey* would keep for 3-5 days, while sweet *kenkey* would not keep longer than 2 days.

### **Consumption of white *Kenkey***

Demographics and socio-cultural characteristics of white *kenkey* consumers

One hundred and thirty-five (135) consumers made up of sixty (60) males and seventy-five (75) females took part in the survey. Female consumers dominated for the two white *kenkey* types. White *kenkey* (sweetened or non-sweetened) is dominantly preferred by singles (particularly females) in 20-29 year age groups. The preference of single consumers for white *kenkey* could be attributed to its convenience and affordability. Majority of consumers (45.9%) liked white *kenkey* because of its convenience (ready-to-eat) (Figure 4). Only a small fraction (4.4%) liked white *kenkey* because it was perceived to be inexpensive.





**Figure 4: Reasons for white *kenkey* consumption**

Consumers of white *kenkey* frequently consume it as a breakfast or lunch item, and seldom for dinner because of the heaviness and energy-density nature of the product as previously reported [1].

**Modes of consumption of white *kenkey***

Non-sweetened white *kenkey* is usually eaten with or without sauce. Most consumers eat sweet white *kenkey* without an accompaniment and others eat it with roasted peanuts.

More than half of the number of consumers indicated that they ate white *kenkey* with small tilapia (*Oreochromis niloticus*), and some consumers (2.2%) also eat it with red fish (*Sebastes Marinus*). Consumers mostly eat sweet white *kenkey* alone or with roasted peanuts. For those who eat white *kenkey* with fish, most of them (more than two-thirds of consumers) indicated that they preferred the fish fried as compared to grilled. The traditional way of eating *kenkey* is with fried fish. In addition to fried fish, many respondents (66%) ate non-sweetened white *kenkey* with fresh pepper sauce, just as for Ga- *kenkey* as previously reported [1]. The pepper sauce is usually a blend of onions, tomatoes, pepper, and salt, which is freshly prepared.

Consumers of white *kenkey* eat it on regular basis. Respondents (54%) indicated that they consumed white *kenkey* 2-3 days in a week, whilst 20% consumed white *kenkey* 4-5 times a week. Fifty-three per cent of respondents consumed *kenkey* for lunch whilst (44%) eat *kenkey* as breakfast. Survey results revealed that as much as 64.4% consumers buy white *kenkey* from hawkers. Consumers who buy white *kenkey* from street vendors and other



sources constituted 17.8% of respondents. The process of *kenkey* making is lengthy and strenuous, and consequently, it is more often purchased from a commercial *kenkey* producer rather than cooked at home [1, 4]. The survey results also indicated that most consumers bought both types of *kenkey* from hawkers and consumed them at their homes.

### Quality attributes desired by white *kenkey* consumers

Consumers (36.0 %) liked white *kenkey* because of its taste (Figure 5). Only a small fraction of consumers (7.4%) looked out for appearance and other characteristics in quality of white *kenkey*.

As much as 24 % of consumers indicated softness as best quality attribute for non-sweetened white *kenkey*. The quality characteristics of white *kenkey* are very important to consumers. In order of preference for quality attribute of non-sweetened white *kenkey*, consumers indicated softness > taste > crumbliness > appearance as the quality attributes they preferred. The consumers (36%) pointed out that taste was the best quality attributes they looked for in sweetened white *kenkey*. Taste is important in sweet *kenkey* because of the sweetness impacted as a result of sugar addition.

## CONCLUSION

As a result of the drudgery involved in *kenkey* production, it is feasible that the methods could be improved by mechanizing labour-intensive operations such as pre-cooking, mixing of pre-cooked and uncooked dough, as well as molding while the long steaming period could be reduced by using other means of cooking. This could be achieved through the help of Entrepreneurs. The producers could be trained to keep records of process controls and product throughputs. The enterprise of white *kenkey* (*nsiho*) processing has remained at the level of “ethnic food”, restricted to very few communities unlike Ga- and Fante- *kenkey*. This means that white *kenkey* is not as popular as the other types of *kenkey*. In spite of their cottage nature, production of white *kenkey* is a profitable means of employment for producers and vendors.

Through rebranding, new markets and trade opportunities for improved traditional white *kenkey* will be created, which will increase economic returns for all stakeholders involved in the production chain, down to the community level. There is a need for the process and product characteristics of white *kenkey* to be optimized so that it could provide scale-up criteria for the industrialization of white *kenkey* production to improve the livelihood of producers and vendors.

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**Table 1: Labour intensive unit operations during *kenkey* production**

Operations	%
Making of slurry for cooking into <i>aflata</i>	5.1
<i>Aflata</i> preparation	27.9
Mixing of <i>Aflata</i> with fresh dough	21.0
Molding of <i>kenkey</i>	25.6
Mixing of <i>Aflata</i> with fresh dough +	8.9
Molding of Kenkey	
<i>Aflata</i> preparation + molding of <i>kenkey</i>	11.5

**Table 2: Problems encountered in *kenkey* production and solutions proposed by producers**

Intermediate and final products	Criteria used to assess quality of the product	Problems encountered with quality	Proposed solution by producers
Steeped maize	Softness and swelling of grains	Bad odour of maize grains; Meal after milling not smooth	Use sorted grains, clean water; do not put hand in steep water during steeping
Fermented maize dough	Colour, odour, taste, texture, swelling of dough	Bad odour, dough too sour	Ferment dough for only 12h for white <i>kenkey</i>
Pre-cooked dough ( <i>aflata</i> )	Aroma, colour and textural changes	Poor consistency, too soft, lumps in <i>aflata</i> .	Good consistency and lump-free <i>aflata</i> , <i>aflata</i> well cooked.
<i>Kenkey</i>	Aroma, texture, taste, softness and elastic <i>kenkey</i>	Bad odour, hard texture of <i>kenkey</i> , rough and lumps in <i>kenkey</i>	Use only well-cleaned maize, do not ferment the dough for more than stipulated time. Use well-cooked <i>aflata</i> . Mix <i>aflata</i> and fresh dough well

**Table 3: Daily sale of white *kenkey* by vendors**

Type of <i>kenkey</i>	50-100 balls	110-160 balls	Above 170 balls
White <i>kenkey</i> ( <i>Nsiho</i> )	29	14	8
Sweet <i>kenkey</i>	15	2	3
<b>Total</b>	44	16	11



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